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AUSTIN AREA TECHNOLOGY TALENT LABOR MARKET STUDY AND STRATEGY



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Workforce Solutions Capital Area Workforce Board (WFSCA) is the leadership and governing body for the regional workforce system. We are responsible for the planning, oversight, and evaluation of workforce development activities in the Austin/Travis County area. We are a private, publicly funded nonprofit organization.

Through the fostering of partnerships and collaborations, researching and sharing of labor market and economic information, identifying workforce needs of employers and residents, and consulting and advising on public policy, WFS Capital Area helps to connect and align the efforts of the regional workforce system. Together we are enabling people and businesses to be competitive in a global market.



Austin Technology Council is the leading unifying voice of technology in Central Texas. Since 1992, ATC has been the informed opinion leader, providing our member companies with the insights, resources and connections they need to grow and thrive.



The City of Austin has established itself as a world leader in technology, innovation, energy, workforce development, music and creativity that has led to significant business expansion and overall growth. The Economic Development Department supports and recruits business to Austin through all our divisions: Cultural Arts, Global Business Expansion, Heritage Tourism, Music & Entertainment, Redevelopment, and Small Business.

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AT-A-GLANCE, AUSTIN MSA



Information Technology (IT) includes network systems, software, hardware, and related peripherals.



The Technology Workforce, or

"Tech" Workforce, includes workers employed in one of the 13 computer occupations as defined by the US Bureau of Labor Statistics.

739

65,000

Tech Jobs in 2019

Projected Growth:

+12,584

Change in Jobs 2019-2024

+19%

% Change in Jobs 2019-2024

38,577

Openings (2019-2024)

TOP INDUSTRIES THAT EMPLOY TECH WORKERS

- 1. Computer Systems Design and Related Services
- 2. Professional and Commercial Equipment and Supplies Merchant Wholesalers
- 3. Computer and Peripheral Equipment Manufacturing
- 4. Data Processing, Hosting, and Related Services
- 5. Software Publishers
- 6. Management, Scientific, and Technical Consulting Services
- 7. State Government, Excluding Education and Hospitals
- 8. Education and Hospitals (State Government)
- 9. Other Information Services
- 10. Wired and Wireless Telecommunications Carriers

OCCUPATIONAL DEMAND

BY ANNUAL OPENINGS, 2019-2024

TOP 10 SOURCES OF COMPUTER SCIENCE/IT GRADUATES DEGREE AND FOR-CREDIT PROGRAMS ONLY

OCCUPATIONS	ANNUAL OPENINGS	The University of Texas at Austin	
Software Developers, Applications	1,840	Texas State University	323
Computer Systems Analysts	1,032	Austin Community College	268
Computer User Support Specialists	1,060		200
Software Developers, Systems Software	821	Strayer University-Texas	45
Network and Computer Systems Administrators	528	CyberTex Institute of Technology	35
Computer Programmers	316	Saint Edward's University	33
Computer Occupations, All Other	518	Southern Careers Institute-Austin	17
Computer and Information Systems Managers	472		
Computer Network Support Specialists	292	The Art Institute of Austin	15
Computer Network Architects	220	South University-Austin	9
Web Developers	283	Concordia University Texas	8
Database Administrators	191	concerna enivereny rexae	
Information Security Analysts	142	Other	17

Source: Emsi 2020.2 – QCEW Employees, Non-QCEW Employees, and Self-Employed, and National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS). All statistics for the Austin Metropolitan Statistical Area (MSA), which includes Travis, Bastrop, Caldwell, Hays, and Williamson Counties.

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Information Technology and the associated technology workforce are primary economic drivers in the Austin region, with a foundation of large technology stalwarts, a healthy community of startups, and the accelerating need for technology workers across all industries. However, the region's talent pipeline is not positioned to meet the need for technology workers over the long-term. For every one graduate of an IT or computer science program in the region, there are five openings in technology jobs. In addition, the current pool of tech workers is not diverse; 77 percent of tech workers in the Austin region are male and 64 percent are white. It is clear that the region needs a larger, more diverse tech talent pool to sustain the long-term growth prospects of this key economic driver.

"The region needs a larger, more diverse tech talent pool to sustain the longterm growth prospects of this key economic driver."

To address this challenge, Austin's employers of tech talent will need to come together with the region's talent development partners to align and "right-size" the tech talent pipeline. The structure for collaboration will be in the form of the Capital Area Technology Workforce Coalition (CATWC), which will be a coalition of civically-minded employers of tech talent. The purpose of this coalition will be to define common workforce-related pain points, document and communicate critical and emerging workforce needs, adopt strategies to address these needs and pain points, and work actively and collaboratively with a network of education and training providers, business associations, community-based organizations, government, and philanthropy to implement the strategies. The structure of the coalition provides a platform for addressing tech workforce challenges on a scale that no single business or employer can address on their own, creating the opportunity to materially change the composition and size of the regional tech talent pool.

Furthermore, the Master Community Workforce Plan (the Master Plan) provides a comprehensive framework for strengthening the regional talent pipeline through a workforce system that cultivates interest in high-demand careers, equips workers with the skills they need to succeed, connects employers with local talent, and assists workers in acquiring skills to advance in their careers. This framework serves as the basis for additional strategies to address the tech talent challenges:

STRATEGY 1. AWARENESS & ENROLLMENT:

Cultivate interest in high-demand, IT careers, particularly in under-represented groups

- Utilize the CATWC to provide better insights and granularity into the tech-related career opportunities in the Austin region.
- Leverage WFSCA's existing outreach channels to raise awareness of tech-related career opportunities among its target populations veterans, job-seekers, dislocated workers, and others.
- Engage active employee resource groups at tech employers to increase participation in volunteer activities focused on educating students from diverse backgrounds about tech careers.
- Produce career exploration events and activities to raise awareness of tech careers among target audiences.

STRATEGY 3. PLACEMENT:

Connect employers with local talent to fill IT jobs

- Expand the number of employers that offer earn-and-learn opportunities in tech-related careers.
- Promote local talent by highlighting pathways to hiring.

STRATEGY 2. TRAINING:

Equip workers with the skills they need to succeed in IT careers

- Ensure that regional computer science and IT programs are training for high-demand, marketable skills.
- Expand the network and reach of local organizations who are engaged with developing diverse sources of talent.
- If needed, recruit national organizations with successful, evidencedbased models to the Austin MSA to assist in developing a more diverse tech talent pipeline.

STRATEGY 4. UPSKILLING:

Assist workers in acquiring skills to advance into IT jobs

- Develop and launch pilots to demonstrate upskilling models and document their specific outcomes.
- Build awareness and resources for employers of tech talent to actively upskill frontline workers for more technical roles in their organization.

INTRODUCTION

Information technology (IT), which includes network systems, software, hardware, and peripherals, is a primary economic driver in the Austin-Round Rock Metropolitan Statistical Area (Austin MSA or the region). The region has an expanding core of mature IT businesses, a robust startup community, and a rising need for technology talent across industries. Currently, there are 65,000 IT-related jobs in the MSA, representing almost 6 percent of the employment base. The talent needs are diverse in both the array of required skills and the range of industries that utilize tech talent, beyond just the technology industry sector.

Prior to the COVID-19 crisis, demand for IT-related jobs was expected to grow significantly in the Austin region as some of the country's largest tech companies, such as Apple, Amazon, Facebook, Oracle, and Google, plan to expand operations in the region. And these companies only represent a fraction of the demand, as a multitude of businesses, from small to large, seek tech talent. The Greater Austin Chamber of Commerce has documented 28 different companies with IT-related operations or products that have announced in the last two years that they plan to expand existing offices or setting up new offices in the Austin region. These expansion projects are expected to create 15,000 new jobs. The impact of the recent economic downturn on these expansions is unknown.

While the short-term outlook for IT in the region is uncertain, the long-term outlook is strongly positive. However, the positive long-term outlook corresponds with a concern that our local tech workforce is not prepared to sustain the needs of the economy. Insufficient workforce preparedness and misaligned talent pipelines can result in a significant loss of economic opportunity for members of our community, as businesses resort to recruiting talent elsewhere.

In response to this concern, Workforce Solutions Capital Area and Austin Technology Council developed a partnership in 2019 to better understand the supply and demand of Austin's technology workforce - the distinct needs of employers, and the preparedness of training and educational institutions to prepare and connect workers to jobs. The aim is to better align the talent pipeline with the needs of regional employers, to open tech-related career opportunities to middle-skill workers, and to develop a set of strategies and practices that will ensure a robust economic landscape ripe with opportunity for Central Texans.

The initiative, with support from Workforce Solutions Capital Area, Austin Technology Council, the City of Austin Economic Development Department, and the Texas Workforce Commission, contracted with Alexander Research and Consulting (ARC), in partnership with City Lights Group, to conduct a study of the IT labor market in the region.

The initiative was conducted in two phases:

- Phase 1 explores current and future employer demand for IT workers, and how local training organizations and educational institutions are preparing our workforce to meet it. This is included in Appendix A.
- Phase 2 will investigate model programs and provide a set of recommendations to improve alignment between the talent pipeline and the needs of regional employers.

A full discussion of Phase 1 findings can be found in Appendix A. Key findings are summarized in the bullets below. These findings are based on a comprehensive review of available public and proprietary data and interviews with employers, educational institutions, and training providers.

DEMAND-SIDE

- Prior to the COVID-19 crisis, the labor market was tight, and competition was increasing. Employers resorted to importing talent from outside the region and came to expect that employees would be hired away in one to three years. Austin's lower cost of living in comparison to Silicon Valley and other expensive coastal markets facilitated sourcing talent from these markets. However, the global shortage of technology workers meant that the war for tech talent is increasingly competitive.
- Employers expressed an interest in expanding the diversity of their workforce. The tech industry remains one of the least diverse industries in the country. Workforce diversity in IT is a pronounced challenge in Central Texas. When asked, companies are genuinely interested in recruiting from a larger, more diverse pool of workers. However, there is not a broad, coordinated effort to develop a more diverse talent pipeline, and some of the local sources of diverse talent are overlooked.

Companies are beginning to seek qualifications that are less constrained by traditional benchmarks of success. A four-year college degree has historically been the ticket to entry for employment in a tech job. However, hiring managers have become increasingly interested in reviewing an applicant's portfolio of work to understand whether a person has the necessary skills to succeed in a job. A disconnect still remains between HR departments, who typically focus on academic credentials to narrow the job candidate pool and select finalists, and hiring managers, who emphasize specific, demonstrated skills and experience.

SUPPLY-SIDE

- Central Texas has a shortage of computer science and IT graduates. Students are not graduating from higher education institutions in Central Texas in computer science and IT programs at the rate required to fill local demand. Currently, there is about one graduate for every five technology job openings.
- The K-12 efforts in IT/computer science are increasing and evolving with recent changes in state and federal legislation. All of the school districts in Central Texas have begun to offer new and less duplicative pathways in tech careers for students, with classes beginning in middle school. These efforts have been bolstered by new state legislation, House Bills 3 and 963, that allows for Technology Applications to be considered under Career and Technical Education (CTE) and provides increased funding opportunities, as well as the Perkins V reauthorization. In addition, new P-TECH programs offer more intensive training programs where students who complete the program can obtain up to an associate degree. The two tech-oriented P-TECH programs in the region have been established in the last year or two.
- Mid-career adults are showing an interest in building their technology skills to transition careers. Technology training programs across the board reported that a high percentage of their students were midcareer professionals seeking to upskill or to re-tool their skills to transition careers. Interest from mid-career adults presents a significant opportunity for tech talent, as these professionals often possess the soft skills and professional experience that companies are seeking.
- Low and moderate-income individuals have distinct barriers to technology careers and training. Low and moderate-income individuals may have difficulty accessing the opportunities in the technology industry due to unique barriers, including awareness of career opportunities, the cost of training, and less experience identifying training opportunities.
- Technology employers can be difficult to engage. Employer engagement was a difficulty that many trainers and educational institutions encountered. Whether input on their curriculum, speakers in their classroom, or internships for their students, trainers encountered some difficulty developing meaningful relationships with employers. One source of the challenge is that trainers are all doing their own employer engagement, which lacks cohesion. The same people and employers are often asked to assist. Additionally, the requests for assistance may not be clearly articulated. Furthermore, many employers were not aware of all of the different programs that are offered and found it difficult to locate the appropriate contact when they did want to engage.

Phase 2 of the initiative explored model programs from around the country, to better understand methods to effectively expand and improve the preparedness of the IT talent and to build more streamlined relationships between the local talent pipelines and employers. Several meetings were held with employer-led initiatives from the technology industry, as well as other industries, that had launched partnerships to address similar issues around strengthening and aligning the local workforce with the needs of employers. These findings are presented in Appendix B.

The section of the report that follows lays out a set of strategic recommendations. These recommendations align with the framework of the Austin region's Master Community Workforce Plan (Master Plan), which provides a comprehensive framework for strengthening the regional talent pipeline through a workforce system that cultivates interest in high-demand careers, equips workers with the skills they need to succeed, connects employers with local talent, and assists workers in acquiring skills to advance in their careers.

Ultimately, the findings recommend the creation of the Capital Area Technology Workforce Coalition (CATWC), which provides a structure for taking action on the recommendations. It will be a coalition of civically minded business leaders who want to take a collaborative approach to developing the region's tech talent workforce. The structure of the coalition will provide a platform for addressing tech workforce challenges on a scale that no single business can address on their own. The goal will be to build a diverse and prepared talent pool to meet the 21st Century needs of our Central Texas economy, so our businesses and our citizens can thrive.

EMPLOYER-LED PARTNERSHIP

Across the US, communities are embracing employer-led partnerships to better align the regional workforce system with employers' needs. Under the Austin region's Master Community Workforce Plan (Master Plan), WFSCA has supported the launch of partnerships in healthcare and manufacturing, which have become important drivers of change within these industries. This study makes the case for a partnership focused on the regional technology workforce; the proposed name for this partnership is the Capital Area Technology Workforce Coalition (CATWC).

The CATWC will be a coalition of civically minded employers of tech talent who work together to address their shared workforce needs. It will also be a primary driver and partner in the implementation of these strategies. It will be supported by a network of partners that includes decision-makers from the workforce system, education and training providers, community-based organizations (CBOs), philanthropy, economic development organizations, business associations, and other stakeholders. It will also serve as a mechanism for deepening and broadening employer engagement, thus, enhancing the alignment of the tech talent pipeline with employers' needs.

The purpose of this coalition will be to:

- Define common workforce-related pain points.
- Document and communicate critical and emerging workforce needs.
- Adopt strategies to address these needs and pain points.
- Work actively and collaboratively with a network of education and training providers, business associations, community-based organizations, government, and philanthropy to implement the strategies.

The structure of the coalition provides a platform for addressing tech workforce challenges on a scale that no single business or employer can address on their own. The collaboration can amplify the impact of employer-led Science-Technology-Engineering-Math (STEM), diversity, and talent initiatives by pooling resources and reducing the fragmentation of the tech-related workforce landscape. This allows the collective initiatives to reach scale more quickly, potentially touching thousands rather than hundreds of individuals.

To identify best practices of organizing the CATWC, we conducted interviews with stakeholders involved in the existing healthcare and manufacturing partnerships and with the conveners of various tech-related partnerships across the US. These best practices include:

- Identify one or two champions to anchor and lead the initiative. These champions should be influential leaders in the tech community who can draw in other participants and who can generate excitement about the partnership and its work.
- Meet the employers at a table where they already gather and have already built trust. Rather than creating a new group or a new organization, it is advantageous to piggy-back with organizations where employers of tech talent already convene, and where they have built relationships with one another. Industry associations, for example, can be excellent partners.
- Ensure that you have the right representatives from employers at the table. In the case of the CATWC, Chief Information Officers (CIOs) or the executive equivalent should be engaged, commit to participating in the partnership, and set the agenda. For certain goals or tasks, it may make sense for them to select a representative with a particular expertise, but buy-in and involvement at the executive level will be extremely important. Also, keeping the partnership an "employers-only" space is imperative. Nothing discourages employer participation more quickly than meetings where service providers dominate the attendance.
- Let the employers set the agenda of the group. The employer participants should prioritize their challenges or pain points and choose the strategies they want to pursue. Having the activities of the partnership be truly employer-led is vital to the long-term engagement of the participants.
- Accomplish some early wins to prove the value of the partnership and build momentum. Focus on one or two goals that can be achieved over a short timeframe.
- Coordinate responses with the network of workforce partners. When the time is appropriate, bring in the right workforce partners to work with the CATWC to achieve their goals.

Successful technology-related, talent-focused partnerships are relatively rare. While there are plenty of examples of technology associations and technology councils, many of which are involved with some kind of talent initiative, few of them have organized the kinds of partnerships that are focused on moving the needle on their systemic, tech talent issues. Through our research, we did identify five different active partnerships that are organized through one of the leading national models for employer-led and/or demand-driven partnerships – Next Generation Sector Partnership, Talent Pipeline Management, and National Fund for Workforce Solutions. Short summaries of each partnership are provided below:

THE WASHINGTON TECHNOLOGY INDUSTRY ASSOCIATION (WTIA). In response to the state's dramatic shortage of tech talent, WTIA convened the largest tech employers in the state to determine the hiring and education requirements for various tech positions with an emphasis on determining which positions need a college degree and which do not ("competency over pedigree"). Separately, WTIA brought together community partners (including the Women's Funding Alliance and National Urban League) to determine barriers to entry in the tech industry. Out of these conversations, the Apprenti program officially launched in November of 2016 "to create a new talent pipeline for the industry and to help solve the [tech sector] diversity dilemma." The Apprenti apprenticeship program is currently operating in 13 states and 15 markets. Apprenti is working to scale the program nationally.

THE NORTHERN VIRGINIA TECHNOLOGY COUNCIL. By convening employers of tech talent, NVTC was able to identify high-demand technology jobs, document the skills and competency requirements of those jobs, and communicate these findings with education and training providers to align their programs. They also analyzed where they were collectively sourcing talent and identified new sources of talent that they had not tapped. They are now exploring non-traditional educational models, such as apprenticeship, to meet the demands for experienced tech talent.

GREATER PHOENIX CHAMBER. When employers of tech talent were convened in 2016, they decided to focus specifically on **cybersecurity talent because of the 6,000+ open positions in Arizona**. They mapped out the core competencies for those roles and worked with Maricopa Community Colleges to align their programs around those industry-defined competencies. They review these competencies periodically to ensure that the programs remain relevant. The employer collaborative also identified where members are sourcing their talent and what they specifically need. This has helped the Chamber identify and attract new programs to the region (e.g. Apprenti) and seek ways to improve existing programs in the region. In addition, the employer collaborative is exploring ways for their member companies to upskill existing employees to transition into cybersecurity roles because they found that employees with deep industry knowledge and understanding of the industry-specific regulatory environment are preferred candidates among their members.

PATHWAYS TO WORK (DFW REGION). Pathways to Work is a collaborative of funders of workforce initiatives that focus on two key sectors of the DFW economy – healthcare and IT. Started in 2014, they have **focused on bringing proven programs to DFW to expand the regional training capacity** for IT jobs, with a focus on nonprofit training providers that serve underrepresented groups. The first program that they brought to DFW was NPower, which targets veterans. Per Scholas, which focuses on individuals from low-income or other "overlooked" talent pools, soon followed. Apprenti was the most recent program that they brought to DFW. Together, these train about 200+ individuals from diverse backgrounds for IT jobs in the region.

TECH TALENT DENVER. Founded in 2017, Tech Talent Denver, which includes about 45 active employer partners, was convened by the Colorado Technology Association to connect member companies with strategic talent pipeline efforts. One of the group's broadest reaching initiatives has been the development of techtalentcolorado.com – a webtool that connects the tech industry and public partners across the state to facilitate "giving and getting talent." Through the webtool, companies can communicate their tech employment needs, and public partners, like community colleges, can inform industry when they are graduating new cohorts of students in particular tech areas.

See Appendix B for more detailed case studies related to employer-led partnerships.

STRATEGIC RECOMMENDATIONS

The Fourth Industrial Revolution requires rapidly evolving technology skills and advanced digital fluency, impacting tech workforce demand for the foreseeable future. The study findings identified the need for a larger, more diverse tech-related talent pool to sustain the long-term growth prospects of the region's key economic drivers. At the same time, the region's education and training providers need to have better information about what employers of tech talent seek and to be better coordinated with each other to create more dynamic, responsive programs that are aligned with the tech workforce demand.

To address these challenges, the Austin region must undertake a coordinated, long-term approach to developing a larger, dynamic, more inclusive talent pool. Such an approach aligns well with the Master Plan, which provides a comprehensive framework for strengthening the regional talent pipeline through a workforce system that cultivates interest in high-demand careers, equips workers with the skills they need to succeed, connects employers with local talent, and assists workers in acquiring skills to advance in their careers. The strategic recommendations follow the framework of the Master Plan. A foundational element for implementing the Master Plan is employer partnerships. Thus, the launch of the CATWC will be a vital part of creating the implementation structure for these strategic recommendations.

STRATEGY 1. AWARENESS & ENROLLMENT:

Cultivate interest in high-demand, IT careers, particularly in under-represented groups

The Challenge:

- Standard occupational codes and related labor market data do not evolve as quickly as technology-related occupations. Therefore, secondary data often does not reflect the reality of tech careers and can be less useful in career education.
- Awareness of tech careers in under-represented groups is lagging.
- Efforts to raise awareness and interest in tech careers among these groups are often fragmented and smaller in scale.

- 1.1. Utilize the CATWC to provide better insights and granularity into the tech-related career opportunities in the Austin region.
 - 1.1.1. Map competencies and skills requirements for critical and emerging occupations.
 - **1.1.2.** Develop and maintain career lattices based on job posting analytics and business input to demonstrate more accurate skills-acquisition journeys and advancement pathways.
- **1.2.** Leverage WFSCA's existing outreach channels to raise awareness of tech-related career opportunities among its target populations veterans, job-seekers, dislocated workers, and others.
 - **1.2.1.** Work with the WFSCA Career Centers to raise awareness of opportunities to build digital skills and pursue IT-related training among job seekers.
 - 1.2.2. Assist WERC partners in educating their clients (and their families) about careers in technology. A nearpeer model of delivery could be effective (e.g. successful program alumni or others from the community who work in tech).
 - **1.2.3.** Partner with the Austin Opportunity Youth Collaborative to expand outreach to Opportunity Youth and access to IT and computer science training programs specifically for this population.
 - **1.2.4.** Utilize WFSCA workforce specialists' network to promote tech-related programs and careers in the high schools in which they work and to make connections with participants in the CATWC.
 - 1.2.5. Help recruit employers of tech talent to serve as hosts in the teacher externship program.

- **1.3.** Engage active employee resource groups at tech employers to increase participation in volunteer activities focused on educating students from diverse backgrounds about tech careers.
 - **1.3.1.** Encourage technology employee leaders to register for the <u>Chamber's Talent Ambassador Program</u> and indicate areas of interest.
 - **1.3.2.** Encourage CBOs and school districts to register volunteer opportunities on <u>Texas STEM Connections</u>, and encourage volunteers to register and connect with relevant volunteer activities through <u>Texas STEM</u> <u>Connections</u>.
 - **1.3.3.** Fundraise through employee resource groups for scholarships to tech-related training programs and summer camps for target populations.
- 1.4. Produce career exploration events and activities to raise awareness of tech careers among target audiences.
 - **1.4.1.** Scale up national awareness events such as Computer Science Education Week.
 - 1.4.2. Expand tech-awareness building activities related to SXSW, such as a SXSW Fellows program or a series of panels aimed at high school and college students interested in tech careers (see <u>Career Fair for the Future</u>).
 - **1.4.3.** Work with nonprofit and education partners to launch and scale events such as a Central Texas Technology Careers Showcase and/or a <u>Student Startup Crawl</u>.

STRATEGY 2. TRAINING: *Equip workers with the skills they need to succeed in IT careers*

The Challenge:

- The region is not producing enough graduates of computer science and IT programs.
- While the diversity of graduates is better than the diversity of the tech workforce overall, white students and male students are disproportionately represented.
- The high cost of many of the private bootcamps and short-term training providers are a barrier to access for low and middle-income individuals.
- Some education and training providers have difficulty engaging enough employers to provide input on program development and curricula.

- 2.1. Ensure that regional computer science and IT programs are training for high-demand, marketable skills.
 - 2.1.1. Organize curriculum review panels composed of CATWC members to provide needed input on techrelated training programs and to serve as a centralized business advisory council for education and training providers who would like to participate.
 - 2.1.2. Connect CATWC members with computer science and IT training programs that seek employer input and instructors with recent industry experience.
- 2.2. Expand the network and reach of local organizations who are engaged with developing diverse sources of talent.
 - **2.2.1.** Identify resources to increase capacity of computer science and IT programs as well as organizations that provide support and wrap-around services to under-represented students pursuing tech careers.
 - **2.2.2.** Recruit new members for tech training on the Eligible Training Providers List to enable these programs to access Workforce Innovation and Opportunity Act (WIOA)-funding.
 - **2.2.3.** Expand access to high-quality, non-credit computer science and IT programs by exploring public funding streams and employer-sponsored scholarships for students from under-represented groups.
 - **2.2.4.** Facilitate Income Share Agreements or other such financing mechanisms between trainers and employers, whereby trainers prime, find, and support diverse talent from under-represented groups.

- 2.3. If needed, recruit national organizations with successful, evidenced-based models to the Austin MSA to assist in developing a more diverse tech talent pipeline. A list and description of some of these programs is provided on page 55.
 - 2.3.1. Work with the CATWC members to identify which programs would be best suited to operate in the Austin market.
 - **2.3.2.** Invite the selected programs to present to the CATWC members.
 - **2.3.3.** Collaborate with the CATWC to identify funding sources to support the program expansion in the region.
 - **2.3.4.** Assist the program in connecting with regional employers, including but not limited to CATWC members, who are interested in hiring graduates of their programs.

STRATEGY 3. PLACEMENT: *Connect employers with local talent to fill IT jobs*

The Challenge:

- Employers are not fully aware of the full range of local tech talent sources and resources.
- Many employers have a preference for tech talent with mid-level experience, which makes entry into tech careers for recent graduates difficult.
- Training providers and nonprofits have trouble finding enough businesses to host students interested in internships and apprenticeships related to tech careers.
- There is evidence of a disconnect between HR, who write job postings requiring a four-year degree, and hiring managers, who place more emphasis on the quality of a candidate's portfolio and their soft skills.
- Employers often recruit workers from outside the region rather than cultivating locally.
- Some employers export entry-level jobs to other geographies, which can occlude talent pipelines locally and limit diverse talent that is built through relationships over time.

- 3.1. Expand the number of employers that offer earn-and-learn opportunities in tech-related careers.
 - **3.1.1.** Leverage the <u>Chamber's Talent Ambassador Program</u> to identify employers interested in offering internships or apprenticeships.
 - **3.1.2.** Work with CATWC members to facilitate additional internship and apprenticeship programs through technical assistance and support.
- 3.2. Promote local talent by highlighting pathways to hiring.
 - **3.2.1.** Work with CATWC members to analyze their sources of talent and identify new local sources that fit their needs.
 - **3.2.2.** Work with CATWC members to reduce the use of four-year degree filters in job postings and to raise awareness of the benefits of hiring talent with "right-sized" education levels.
 - **3.2.3.** Promote relationships with local talent resources for employers to encourage employers to build long-term relationships with local talent pools.

STRATEGY 4. UPSKILLING:

Assist workers in acquiring skills to advance into IT jobs

The Challenge:

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- > The shortage of labor, in general, and tech talent, in particular, makes hiring for many tech positions difficult.
- The Society for Human Resource Management (SHRM) estimates that the average cost-per-hire is more than \$4,000.
- The American Community Survey (2018, 1-yr estimates) reports that more than 22,000 individuals worked fulltime, year-round in the past 12 months and earned below the poverty level.
- SHRM also reports that 67% of employers offer educational assistance to some or all employees, but only 36% of employees take advantage of it.
- Digital transformation and technological advancement require continuous reskilling and upskilling of workers.

- 4.1. Develop and launch pilots to demonstrate upskilling models and document their specific outcomes.
 - 4.1.1. Pilot a model for each method apprenticeship, in-house training, external training provider, and on-thejob training - for tech-related occupations.
 - **4.1.2.** Measure and document outcomes for the employer and employee to demonstrate the bottom-line impact for business and families alike.
- **4.2.** Build awareness and resources for employers of tech talent to actively upskill frontline workers for more technical roles in their organization.
 - **4.2.1.** Showcase examples of tech companies or employers of tech talent who have embraced upskilling initiatives.
 - **4.2.2.** Schedule a series of upskilling workshops specifically targeted toward employers of tech talent.
 - 4.2.3. Share available training resources with CATWC members and other employers of tech talent.
 - **4.2.4.** Create an upskilling community of practices as part of the CATWC to provide a forum for members to share knowledge and best practices related to their own upskilling initiatives.
 - 4.2.5. Facilitate partnerships with employers and nonprofits that can support the upskilling of frontline workers.
 - 4.2.6. Assist employers and their partners in securing financial support for their upskilling programs, as needed.

APPENDIX A. DEMAND-SUPPLY REPORT

Appendix A represents the findings of Phase 1. The findings are informed by a broad review of data on IT job openings, an inventory of both for-credit and non-credit IT training and educational programs, as well as contextual information gleaned from meetings with more than 50 public and private employers, training providers and educational institutions. This work was done between October 2019 and February 2020 at the conclusion of the US' longest running economic expansion on record and in one of the tightest labor markets in the country.

The COVID-19 crisis has brought a great deal of uncertainty to the region's short-term economic future. Between March 15 and May 16, 2020, about 136,000 individuals in the Austin MSA filed for unemployment. And dozens of businesses announced layoffs and furloughs of workers. Many workplaces transitioned to virtual work environments and workers transitioned to working from home. Retail and food service businesses transitioned to different sales models during the forced closure of their physical locations or closed down entirely.

While the occupational categories related to retail, food service, and hospitality sectors experienced extremely high rates of unemployment, computer occupations experienced relatively few job losses. In fact, computer occupations represented less than 2 percent of unemployment claims in Travis County in March and April.

At the same time, many digital transformation initiatives in workplaces across the region have accelerated or are likely to accelerate in the COVID-19 environment. Workplaces and processes have been transformed with new technologies to enable virtual work, alternative sales models, reduced headcounts, and new health safety practices. This trend highlights the importance of digital skills in our economy and the ever-increasing need for a robust tech workforce to support our regional economy.

Note: the occupational projections and estimated openings presented in this report are pre-COVID figures. As such, the exact figures may overestimate demand for 2020 and perhaps 2021. However, the relative magnitude of the figures should hold true and by 2024, the figures will likely be conservative.

AUSTIN'S TECHNOLOGY WORKFORCE

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In 2019, there were almost 65,000 jobs in 13 computer occupations in the Austin Metropolitan Statistical Area (MSA), which includes Travis, Williamson, Hays, Bastrop, and Caldwell Counties. For the purpose of this study, these 13 occupations are how we define "technology" or "tech" workforce. These jobs represent nearly 6 percent of all jobs in the Austin region.

FIGURE 1. TECHNOLOGY WORKFORCE, AUSTIN MSA JOBS IN COMPUTER OCCUPATIONS, 2019



Source: Emsi 2020.2 - QCEW Employees, Non-QCEW Employees, and Self-Employed.

INDUSTRIES THAT EMPLOY TECHNOLOGY WORKERS

This base of tech talent is spread across a wide-range of industries. While the information technology sector is the largest employer of technology workers, state and local government, consulting firms, corporate headquarters, education, healthcare, and various professional services are also important employers of tech talent. In fact, technology workers fill critical functions in just about every organization.

Industry sectors that are part of the information technology sector employ roughly 38,000 technology workers. Sectors that are part of federal, state, and local government employ about 6,000 technology workers. Management consulting employs more than 2,000 technology workers. Employment services, architectural services, and corporate headquarters each employ about 1,000 technology workers each.

FIGURE 2. TOP 20 INDUSTRIES THAT EMPLOY TECHNOLOGY TALENT, AUSTIN MSA BY TOTAL NUMBER OF TECHNOLOGY JOBS IN INDUSTRY, 2019

NAICS	INDUSTRY	TECH JOBS IN INDUSTRY	% TECH JOBS OF INDUSTRY EMPLOYMENT
5415	Computer Systems Design and Related Services	25,376	39.0%
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	3,137	4.8%
3341	Computer and Peripheral Equipment Manufacturing	3,095	4.8%
5182	Data Processing, Hosting, and Related Services	3,028	4.7%
5112	Software Publishers	2,947	4.5%
5416	Management, Scientific, and Technical Consulting Services	2,448	3.8%
9029	State Government, Excluding Education and Hospitals	1,995	3.1%
9026	Education and Hospitals (State Government)	1,808	2.8%

Source: Emsi 2020.2 - QCEW Employees, Non-QCEW Employees, and Self-Employed.

FIGURE 2. TOP 20 INDUSTRIES THAT EMPLOY TECHNOLOGY TALENT, AUSTIN MSA (CONTINUED) BY TOTAL NUMBER OF TECHNOLOGY JOBS IN INDUSTRY, 2019

NAICS	INDUSTRY	TECH JOBS IN INDUSTRY	% TECH JOBS OF INDUSTRY EMPLOYMENT
5191	Other Information Services	1,539	2.4%
5173	Wired and Wireless Telecommunications Carriers	1,335	2.1%
3344	Semiconductor and Other Electronic Component Manufacturing	1,052	1.6%
5613	Employment Services	1,040	1.6%
5413	Architectural, Engineering, and Related Services	1,022	1.6%
5511	Management of Companies and Enterprises	1,000	1.5%
9039	Local Government, Excluding Education and Hospitals	972	1.5%
9036	Education and Hospitals (Local Government)	844	1.3%
5611	Office Administrative Services	713	1.1%
5241	Insurance Carriers	614	0.9%
5221	Depository Credit Intermediation	546	0.8%
5222	Nondepository Credit Intermediation	496	0.8%

Source: Emsi 2020.2 - QCEW Employees, Non-QCEW Employees, and Self-Employed.

EMPLOYERS OF TECHNOLOGY WORKERS

The Austin Metro Area hosts a diverse set of employers whose products and services center on information technology, software, and other tech-related services. It is a mix of homegrown successes, offices of new and old technology giants, and technology centers of major global corporations. Some of these companies have been in the Austin area since the late 1960s (IBM) and others have arrived more recently (Amazon).

FIGURE 3. MAJOR INFORMATION TECHNOLOGY AND SOFTWARE FIRMS

AUSTIN EMPLOYEES > 1,000)	
	AUSTIN EMPLOYEES	
COMPANY NAME	(2019)	PRODUCTS & SERVICES
Dell Technologies Inc.*	13,000	Information technology, computers, software, and related services
Apple Inc.	6,200	Mobile communication, computers, music players, related software/services, peripherals, third-party digital content and apps
IBM Corp.	6,000	IT infrastructure, services, consulting, hardware/software, microelectronics, research
Amazon.com LLC	4,000	Online retailer with distribution center in San Marcos and an office at the Domain
Accenture PLC	3,200	Professional services; technology, strategy, consulting, digital, technology and operations
AT&T Inc.	2,800	Advanced IP-based business services, wireless high-speed Internet access and voice service
Oracle Corp.	2,500	Fully integrated stack of cloud applications and platform services
General Motors IT Innovation Center	2,300	Creating the future of personal mobility with services like OnStar and Maven, and leadership in electric vehicles and self-driving technology
National Instruments Corp.*	2,200	Empowers engineers and scientists with a software-defined platform, modular hardware and an expansive ecosystem of support to solve engineering challenges
Indeed*	2,000	Job search engine, selling recruiting products (job postings, job advertising, resume subscriptions, employer branding products)
Vrbo / Expedia Group (formerly HomeAway)	1,900	Vacation rental industry for booking beach houses, cabins and condos with more than two million places to stay in 190 countries
Visa Inc.	1,736	Payment technology with global network connecting thousands of financial institutions with millions of merchants and cardholders every day
HP Inc.	1,100	Printing, PCs, software, services and IT infrastructure for cloud, security and big data

Source: Austin Business Journal, Book of Lists.

* Headquarters in Austin Metro.

FIGURE 4. SELECT INFORMATION TECHNOLOGY AND SOFTWARE FIRMS HEADQUARTERED IN AUSTIN *AUSTIN EMPLOYEES < 1,000*

COMPANY NAME	(2019)	PRODUCTS & SERVICES
Silicon Labs	700	Semiconductors; software; integrated circuits and module products for the Internet of Things (IoT); Internet infrastructure; industrial automation; consumer electronics; automotive
Netspend Corp.	625	Provides prepaid debit cards and commercial payroll card options serving underbanked consumers
SolarWinds Worldwide LLC	578	IT operations, outsourced IT (MSP); cloud and security management software; applications and databases on-premises; managed services; hybrid IT environments
Bazaarvoice Inc.	559	SaaS platform offering an online marketplace that connects brands and retailers to consumers
SailPoint	523	Identity governance software and services: IdentityNow, IdentityIQ, IdentityAI
RetailMeNot	410	Promotional media solutions including mobile coupons and codes, cash back offers, discount gift cards and browser extensions
BigCommerce Inc.	400	Cloud e-commerce platform; combines enterprise functionality, open architecture and performance
WP Engine	400	WordPress Digital Experience Platform provider
Accruent	380	Operational and financial performance software (SaaS) focused on facilities management for Fortune 500, real estate, hospitals
Drillinginfo Inc.	315	SaaS providing data and analytics to the energy industry to enable better, faster decisions
Planview Inc.	271	Software for strategic planning; work and resource management; Lean and Agile delivery; innovation and collaborative work management
Epicor Software Corp.	229	Provides flexible, industry-specific software designed around the needs of our customers.
Volusion LLC	226	Ecommerce platform built specifically for the needs of small- and medium-sized businesses
Spiceworks	218	Software and services for tech vendors: Demand generation; brand engagement; marketing services; online IT tools; product, reviews; Spiceworks Learn; Spiceworks Community
DISCO	200	Cloud software platform focused on ediscovery services for the legal market
RigUp Inc.	197	Marketplace for energy jobs, on-demand labor system, mobile app with in-app messaging and labor sourcing capabilities, flexible payment terms such as NextDay Payu2122, Global MSAu2122
Mitratech Holdings Inc.	190	Global enterprise legal, risk and compliance software solutions including matter management, e-billing, risk management and policy management
Civitas Learning Inc.	187	Provides software tools and services to help educators measurably improve student success outcomes.
Data Foundry	150	Colocation, disaster recovery, network services and managed data center services
ESO Solutions	150	Develops patient-care software for emergency medical service providers and other first responders
AffiniPay LLC	137	Payment processing software for associations offering applications and platform-as-a- service for professional markets
VirTex Enterprises LP	126	Electronic manufacturing and design, supporting industrial, medical, mil-aero and automotive OEMs; performs PCBA assembly, system build, test and supply chain services
Builder Homesite Inc.	125	Digital marketing for new home industry: online listings; display advertising; digital media; SEO/Social; custom web/mobile development; staff augmentation
Carnegie Technologies	125	Software that transforms how businesses and boards interact with their most valuable stakeholders: Carnegie Network Convergence Platform; SatBridge Satellite HotSpot Longview IoT Solution; The NXTBoard Platform

Source: Austin Business Journal, Book of Lists.

FIGURE 4. SELECT INFORMATION TECHNOLOGY AND SOFTWARE FIRMS HEADQUARTERED IN AUSTIN (CONT.) AUSTIN EMPLOYEES < 1.000

COMPANY NAME	AUSTIN EMPLOYEES (2019)	PRODUCTS & SERVICES		
Dosh	95	A consumer financial services platform with a cash-back app		
Phunware Inc.	90	Fully-integrated enterprise software platform for mobile that provides companies the products, solutions, data and services necessary to engage, manage and monetize their mobile application audiences globally at scale		
Mutual Mobile Inc.	86	App development, Internet of Things (IoT), virtual reality, augmented reality products and experiences		

Source: Austin Business Journal, Book of Lists.

In addition to these private sector employers of tech talent, there are a number of public sector entities in Austin that employ a wide range and large number of technology workers. These entities include Federal agencies, departments of the State of Texas, and local government. Together, the public sector employed 6,087 technology workers in 2019.

FIGURE 5. SELECT PUBLIC SECTOR EMPLOYERS OF TECH WORKERS

NAME

Texas Health and Human Services Commission
City of Austin
The University of Texas
Internal Revenue Service
Electric Reliability Council of Texas (ERCOT)
Deputy Assistant Secretary for Information & Technology, Veteran's Affairs
Texas State University
Texas Department of Family and Protective Services
Texas Department of Information Resources

Source: Gartner Talent Neuron (formerly Wanted Analytics) and WorkinTexas.com.

WORKFORCE CHARACTERISTICS

Retirement exposure, wage pressure, and automation risk are three important characteristics that influence the future demand for workers in each of the 13 occupations.

Retirement exposure is measured by the percent of workers in that occupation that are 55 years old or older, or those workers that will be eligible to retire in the next 10 years. The technology workforce is relatively young and none of the 13 occupations is facing a large wave of retirements. This is in contrast to the Austin region's workforce as a whole, where almost 20 percent of workers are age 55 and older. The retirement exposure, as measured by the percent of workers age 55 or older, ranges from a low of 9 percent for software developers, applications, to a high of 15 percent for database administrators.

A comparison of the median hourly wages in the Austin MSA to the US can indicate where regional wages are significantly out of line with the US overall. Significant wage differentials can be reflections of labor shortages or the level of experience of the workers in those occupations. Wages in technology occupations are generally high. They range from a median hourly wage of \$22.53 for computer use support specialists to a high of \$69.66 for computer and information systems managers. The median hourly earnings for most of the occupations is in line with the US median. However, the median hourly wage in Austin is more than 10 percent higher than the US for computer network architects and information security analysts.

Automation risk is measured by an automation index. The automation index captures an occupation's risk of being affected by automation. A score of 100 represents the risk that the average worker faces. A score below 100 indicates lower than average risk and a score above 100 indicates higher than average risk. The automation risk for these technology occupations is relatively low. The automation index for the occupations ranges from a low of 78 for software

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developers, systems, to a high of 88 for web developers and database administrators. This means that workers in these occupations spend a relatively smaller amount of time on work that is at high-risk of being automated.

FIGURE 6. TECHNOLOGY WORKFORCE, AUSTIN MSA

COMPUTER OCCUAPTIONS, 2019

			RETIREMENT			AUTOMATION
			EXPOSURE	WAGE PI	RESSURE	RISK
				Median	Earnings	
				Hourly	Premium	Automation
SOC	Description	2019 Jobs	% 55+	Earnings	(AUS/US)	Index
15-1132	Software Developers, Applications	13,989	9%	\$51.36	1.03	81
15-1121	Computer Systems Analysts	9,254	14%	\$39.89	0.94	82
15-1151	Computer User Support Specialists	8,615	12%	\$22.53	0.92	83
15-1133	Software Developers, Systems Software	7,769	10%	\$53.66	1.02	78
15-1142	Network and Computer Systems Administrators	5,109	10%	\$41.38	1.05	87
15-1199	Computer Occupations, All Other	4,252	13%	\$39.61	0.92	86
11-3021	Computer and Information Systems Managers	3,443	14%	\$69.66	1.02	80
15-1131	Computer Programmers	3,263	14%	\$39.82	0.99	83
15-1152	Computer Network Support Specialists	2,435	12%	\$29.29	0.97	87
15-1134	Web Developers	2,217	7%	\$32.73	1.05	88
15-1143	Computer Network Architects	1,970	10%	\$59.37	1.14	87
15-1141	Database Administrators	1,793	15%	\$45.72	1.06	88
15-1122	Information Security Analysts	891	12%	\$52.81	1.12	86

Source: Emsi 2020.2 - QCEW Employees, Non-QCEW Employees, and Self-Employed.

Note: dark gray shading denotes %55+>20%, earnings premium>1.1, or automation index>110.

The Automation Index capture the risk of being affected by automation. 100 = risk for the average worker.

The gender and racial/ethnic composition of the technology workforce is also important.

Technology workers in the Austin region are, for the most part, white and male. Almost two of every three workers are white (non-Hispanic/Latino) and three out of every four workers are male. About 13 percent of the technology workforce is Hispanic/Latino.

By comparison, in the civilian employed population in the Austin MSA, males represent 54 percent, white (non-Hispanic/Latino) workers represent 54 percent, and Hispanic/Latino workers represent 31 percent. Asians represent 6 percent and Black or African Americans represent 7 percent.

In comparison to the pool of tech workers in the US overall, Austin has a similar gender split and share of white (non-Hispanic/Latino) workers. Austin's pool of tech workers has a much higher share of Hispanic/Latinos. Black or African Americans in the Austin region represent a very small share of the technology workforce in comparison to the US.

In general, though, the technology workforces of Austin, other major tech markets such as Silicon Valley (San Jose MSA) and Seattle, and the US overall lack diversity of gender and race (non-White and non-Asian). Male and White (non-Hispanic/Latino) technology workers are over-represented across the board.

FIGURE 7. TECH TALENT DIVERSITY COMPUTER AND MATHEMATICAL OCCUPATIONS, 2018





Females represent 46% of Austin's civilian employed population





Whites (non-Hispanic/Latino) represent 54% of Austin's civilian employed population



Source: US Census Bureau, American Community Survey 1-year Estimates, 2018.

CURRENT AND FUTURE WORKFORCE DEMAND

In 2019, there were 58,649 unique job postings for positions related to the 13 technology occupations. The most common job titles in the job postings were software engineer, java developer, software developer, data analyst, systems engineer, and devops engineer. The top employers posting were Dell, IBM, Visa, Charles Schwab, Apple, and Deloitte.

FIGURE 8. TOP JOB TITLES AND EMPLOYERS

COUNT OF UNIQUE JOB POSTINGS, JANUARY 1, 2019 - DECEMBER 31, 2019

TOP 30 JOB TITLES	COUNT
Software Development Engineer	5,422
Java Developer	1,728
Software Developer	1,157
Data Analyst	861
Systems Engineer	799
Devops Engineer	764
Solutions Architect	747
.Net Developer	744
Developer	686
User Experience (UX) Designer	634
Applications Engineer	587
Network Engineer	558
Systems Analyst	504
Front End Developer	466
Project Manager	444
Security Engineer	436
Senior Developer	415
Systems Administrator	412
Java Engineer	403
Business Systems Analyst	398
Python Developer	395
Quality Assurance Engineer	367
Web Developer	363
User Interface (UI) Developer	343
Database Administrator	337
Senior Systems Engineer	321
Data Engineer	302
Information Technology Project Manager	274
Applications Developer	264
Engineer	261

TOP 30 EMPLOYERS POSTING	COUNT
Dell	1,234
IBM	1,204
Visa	533
Charles Schwab	509
Apple Inc.	438
Deloitte	409
The Home Depot Incorporated	398
Amazon	394
University of Texas	360
Advanced Micro Devices, Inc.	299
Accenture	270
Cisco Systems Incorporated	250
Whole Foods Market, Inc.	247
Wipro	242
Infosys	233
Anthem Blue Cross	210
Allied Consultants Incorporated	202
Q2 Software, Inc	194
Tan Check Consolidated Incorporated	192
ldc Technologies	190
Arm Incorporated	171
Primus Global Services Incorporated	154
NTT Data	153
Roc Search	150
Chandra Technologies Incorporated	147
Technology Navigators	147
Health Human Services Communication	143
Fiserv	140
Vmware Incorporated	140
General Motors	136

Source: Burning Glass.

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Of these job postings, only about 5 percent listed an educational requirement for something less than a Bachelor's degree. The job titles most commonly associated with the educational requirements of less than a Bachelor's degree were software development engineer, data analyst, technical support specialist, information technology specialist, and systems engineer. The top employers posting for these middle-skill positions were Ascension Health, Accenture, University of Texas, Fiserv, and Booz Allen Hamilton. The top specialized skills requested in these postings were customer service, technical support, repair, scheduling, and project management.

			EXPERIENCE LEVEL FOR < BACHELOR'S		
	TOTAL	< BACHELOR'S DEGREE	JUNIOR (0-2 YRS)	MID-LEVEL (3-8 YRS)	SENIOR (9+ YRS)
2020 (01-01-2020 – 05-24-2020)	27,769	1,303	482	409	108
2019 (01-01-2019-12-31-2019)	58,649	3,178	1,055	1,106	206

FIGURE 9. JOB POSTINGS FOR POSITIONS THAT REQUIRE LESS THAN A BACHELOR'S DEGREE

Job Titles:

Less than Bachelor's Degree – software development engineer, data analyst, technical support specialist, information technology specialist, systems engineer, help desk technician, business systems analyst, systems administrator, software developer, user experience (UX) designer, help desk analyst, technician, systems analyst, help desk specialist, credentialing specialist, information technology technician, solutions architect, desktop support technician, applications specialist, technical support analyst

TOP EMPLOYERS	COUNT
Ascension Health	92
Accenture	69
University of Texas	68
Fiserv	67
Booz Allen Hamilton Inc.	65
Austin Energy	59
The Home Depot Incorporated	47
IBM	45
City Austin	43
Teacher Retirement System of Texas	35
Army National Guard	30
Texas Department of Transportation	29
Texas Department Public Safety	28
Charles Schwab	24
Hanger Incorporated	17
Health Human Services Communication	17
US Government	17
Attorney General Texas	15
Rackspace	15
Accruent	14

TOP HARD SKILLS	COUNT
Customer Service	796
Technical Support	704
Repair	453
Scheduling	417
Project Management	380
Information Systems	358
SQL	355
Help Desk Support	312
Software Development	309
Customer Contact	298
Hardware and Software Installation	297
Printers	257
Microsoft Active Directory	253
Software Installation	245
Quality Assurance and Control	232
Linux	227
Java	219
Budgeting	195
Business Process	190
IT Support	180

Source: Burning Glass.

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Over the next five years, the 13 computer occupations are expected to have 7,715 openings on average each year. Openings include both new jobs and replacement jobs. New jobs are positions that did not exist in Austin previously; replacement jobs are existing positions that are open because a worker exited the occupation due to retirement, leaving the workforce, changing occupations, etc.

The largest number of openings is in software development, applications. Over the next five years, it is estimated that the Austin region will have more than 1,800 annual openings in this occupation and more than 700 of these openings will be new jobs.

Computer user support specialists and computer systems analysts are also areas of high-demand. Each of these occupations are expected to have about 1,000 annual openings over the next five years and about 300 of these openings will be new jobs.

Note: these projections do not fully reflect the economic shock caused by the COVID-19 crisis. The annual openings figure may overestimate demand for 2020 and possibly 2021 but will likely underestimate demand for 2022-2024.

FIGURE 10. ANNUAL OPENINGS BY OCCUPATION

COMPUTER OCCUPATIONS, 2019-2024



Source: Emsi 2020.2 – QCEW Employees, Non-QCEW Employees, and Self-Employed.

Most computer occupations typically require a bachelor's degree. The exceptions are computer network support specialists, computer user support specialists, and web developers. These three occupations require an associate's degree or less. For these occupations, there will be an estimated 1,352 openings annually over the next five years, which is 18 percent of the annual openings for all the computer occupations.

Ten of the thirteen computer occupations offer entry-level opportunities. Information security analysts do typically require some work experience but less than five years of experience. Computer and information systems managers and computer network architects typically require five or more years of experience.

None of the thirteen occupations typically require on-the-job training.

It should be noted that each of the occupations encompass a range of job titles and experience levels. Thus, there may be some positions in other occupations that require less than a four-year degree or that require more experience.

FIGURE 11. TYPICAL EDUCATION AND TRAINING REQUIREMENTS COMPUTER OCCUPATIONS

PROGRAM OF STUDY	DESCRIPTION	TYPICAL EDUCATION REQUIRED FOR ENTRY	WORK EXPERIENCE REQUIRED	TYPICAL ON-THE- JOB TRAINING
Business Information Management	Computer and Information Systems Managers	Bachelor's degree	5 years+	None
Programming and Software	Computer Systems Analysts	Bachelor's degree	None	None
Development	Software Developers, Applications	Bachelor's degree	None	None
	Software Developers, Systems Software	Bachelor's degree	None	None
	Computer Programmers	Bachelor's degree	None	None
Network Systems	Network and Computer Systems Administrators	Bachelor's degree	None	None
	Computer Network Architects	Bachelor's degree	5 years+	None
	Database Administrators	Bachelor's degree	None	None
	Computer Network Support Specialists	Associate's degree	None	None
	Information Security Analysts	Bachelor's degree	<5 years	None
Information Support and Services	Computer User Support Specialists	Some college, no degree	None	None
	Computer Occupations, All Other	Bachelor's degree	None	None
Web and Digital Communications	Web Developers	Associate's degree	None	None

Source: Bureau of Labor Statistics, Perkins IV Crosswalk.

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The technology sector and the tech workforce continue to expand in the Austin area. In the last two years, the Greater Austin Chamber of Commerce documented 28 companies with tech-related operations who are expanding or opening up offices in the region and creating more than 100 new jobs. Together, these companies estimate that they will create more than 15,000 jobs in the region. It is not known how many of these jobs will be in tech-related occupations.

This growth is evidence of the momentum that the Austin region's reputation as a technology hub has generated. It is also evidence that the projected annual openings of 6,599 for the technology occupations is likely a conservative figure.

FIGURE 12. ANNOUNCED COMPANY EXPANSIONS AND RELOCATIONS WITH TECH-RELATED OPERATIONS 2018-2019, 100+ JOBS CREATED

COMPANY NAME	TYPE OF OPERATION	JOBS CREATED	TYPE OF ACTION
Apple	Computer maker's tech, chip engineering, & admin support center (Americas Hdq.)	5,000	New/ Expanded
Charles Schwab	Investment trading technology development	1,500	New/ Expanded
Indeed	Online job search website (Hdq.)	1,500	Expanded
Oracle Corp.	Chip, hardware, & software design, data center	1,000	Expanded
Amazon	Online retailer's digital product dev.	800	Expanded
Google	Internet search & related tech dev & sales, marketing & staffing	750	Expanded
Arrive Logistics	Shipping management software (Hdq.)	500	Expanded
U.S. Army Futures Command	Military modernization/technology dev. center (Hdq.)	500	New
General Motors	IT innovation center, vehicle applications & business processes	500	Expanded
Zoho	Integrated business applications cloud platform (Hdq.)	440	New/ Expanded
H-E-B Innovation Hub	Grocery retailer's digital innovation hub	250	Expanded
Opcity	Real estate agent-homebuyer matching & lead optimization platform (Hdq.)	200	Expanded
Ericsson	Application specific IC design center	200	Expanded
Babylon	Digital healthcare services (Hdq.)	200	New
BigCommerce	e-commerce solutions (Hdq.)	150	Expanded
DISCO	e-discovery software for law firms (Hdq.)	150	New/ Expanded
ScaleFactor	Accounting SaaS for small business & entrepreneurs (Hdq.)	140	Expanded
Vrbo / Expedia Group (formerly HomeAway)	Online vacation home rentals (Hdq.)	140	Expanded
Resideo Technologies	Internet-connected devices for the home software (Hdq.)	120	New
ReliaQuest	Cyberthreat detection software	100	New/ Expanded
RigUp	Procurement & bidding platform for oil/gas industry (Hdq.)	100	Expanded
Shipwell	Shipping efficiency software (Hdq.)	100	Expanded
WP Engine	Web hosting for word press sites (Hdq.)	100	Expanded
ESO Solutions	Electronic patient care software for EMS & fire orgs (Hdq.)	100	Expanded
Roku	Video stream players firmware design center	100	Expanded
BitMED	Telehealth platform/services (Hdq.)	100	Expanded
Insurance Zebra	Online marketplace for insurance quotes (Hdq.)	100	Expanded
Spreetail	Ecommerce company's software engineering	100	New

Source. Greater Austin Chamber of Commerce.

KEY TRENDS AND WORKFORCE IMPLICATIONS

As the world enters the Fourth Industrial Revolution (4IR), the workforce will be impacted by increasing utilization and innovation of digital technologies across every sector. 4IR is characterized by intersecting relationships between the digital, biological, and physical worlds, as well as the growing use of technologies such as artificial intelligence, cloud computing, robotics, the Internet of Things, and advanced wireless technologies.¹

Implications for the workforce are significant as the 4IR is creating demand for new skill sets, displacing existing jobs and forming new ones. The consequences will ripple throughout the workforce. These changes are creating a growing demand for digital skills in almost every sector, affecting the workforce spectrum from low-skilled employment to jobs that require more sophisticated expertise.

According to an estimate by the World Economic Forum's 2018 Future of Jobs Report, the labor market transformation brought about by the 4IR may lead to the creation of 133 million new jobs globally, and the simultaneous displacement of 75 million jobs over the 2018–2022 period. The report estimates that in 2018, wholly new roles accounted for 16% of all jobs, and is expected to rise to 27% by 2022. Many of these new jobs will be concentrated in a set of professional clusters: data and artificial intelligence (AI); engineering and cloud computing; product development; sales, marketing, and content; people and culture; care economy; and green economy. Within these clusters, jobs require a high degree of digital fluency. In product development, engineering and cloud computing, and data and AI, the skills required also include expertise in the use and design of technologies that are set to impact business models and the labor market.²

However, there currently is a scarcity of talent to fill these jobs. In the CIO Survey 2019 conducted by Harvey Nash/KPMG, 67 percent of respondents report they are struggling to find the right talent. Big Data/analytics, cybersecurity, and AI are the top three areas experiencing skills shortages.³

The following trends represent both directional changes that affect the workforce, as well as specific technology advancements that will drive workforce needs.

- 1. Digital Transformation is happening in every industry. Digital transformation is the use of digital technology to do business in fundamentally new ways. A recent survey reveals that 53 percent of companies are undergoing digital transformation in some way.⁴ As a result, the digital skills required of jobs at all skill levels are increasing, and basic digital literacy is becoming ubiquitous for all workers. As the world's businesses confront dramatic changes in economic and social conditions related to the Coronavirus Pandemic, trends related to e-commerce, online service delivery, and remote work have accelerated rapidly. The post-pandemic impact of this will likely be lasting, in some cases.⁵ This will lead to a further acceleration of job digitalization.
- 2. As technologies change more rapidly, companies are seeking people who are flexible and able to engage in continuous learning. Job churn will be different than it has been historically more job loss and more job creation. Over the next decade, a meaningful share of newly created jobs will be in entirely new occupations, or for existing occupations undergoing significant transformations in terms of their job content and skills requirements.⁶ The result is that companies are seeking workers who possess diverse competencies, proven ability to learn, and flexibility so they can transition into new roles or gain new skills as needed.
- 3. US firms look abroad for tech talent. More and more corporations are establishing IT-related research and development hubs in emerging markets such as China, India, and Israel. A key driver in this shift is the shortage of software and IT engineers in the US.⁷ Access to talent is also driving firms to look at expanding into the UK, Japan, and India. Changes in US immigration policy have made Canada an attractive, more immigration-friendly destination for tech hubs.⁸ Additionally, some entry and middle-skill jobs that are more rote can be exported to less expensive geographies. While exporting these jobs may save money initially for companies, it makes it difficult for entry-level

¹ Capturing the Fourth Industrial Revolution. Ndung'u, Njuguna. Brookings Institution. January 8, 2020.

² Jobs of Tomorrow Mapping Opportunity in the New Economy. World Economic Forum. January 2020.

³ CIO Survey 2019. Harvey Nash/KPMG. 2019.

⁴ 2017 Digital Business Study. MIT Sloan Management Review and Deloitte. 2017.

⁵ Pandemic Widens Divide between Online, Traditional Businesses. Wall Street Journal. April 1, 2020.

⁶ Jobs of Tomorrow Mapping Opportunity in the New Economy. World Economic Forum. January 2020.

⁷ ZDNet. "US Companies Continue to Look Overseas for Tech Talent." August 2018. See https://www.zdnet.com/article/u-s-companiescontinue-to-look-overseas-for-tech-talent/.

⁸ Technology Companies Are Looking Abroad for Talent. SHRM. July 2019.

workers to find jobs that can put them on a path to upskilling and advancement. The practice can occlude talent pipelines locally, limiting diverse talent that is built through relationships over time.

- 4. Widespread automation will continue to accelerate. Automation can be accomplished by a wide array of technologies, including robotics, software, AI, and a combination of all of these. The McKinsey Global Institute (MGI) estimates that within 60 percent of all jobs, at least 30 percent of activities could be automated with current technologies. While it is estimated that automation will eliminate 73 million jobs by 2030, it is also creating new job opportunities. One area of demand will be for workers that develop and manage automation.⁹ The adoption of AI, including machine learning, is also increasing. Between 2014 and 2018, AI adoption increased 270 percent.¹⁰ However, one of the biggest barriers to implementing AI is finding the talent to manage it.¹¹ The most needed roles are "AI builders" researchers, software developers, data scientists, and project manager and "AI translators" those who bridge the divide between business and technical staff.¹²
- 5. Data collection technologies are driving exponential proliferation of data. Data collection has been widely integrated into business processes, supply chains, and consumers' life streams. IDC predicts that the Global Datasphere the data created, captured, and replicated will grow from 33 Zettabytes (ZB) in 2018 to 175 ZB by 2025. For the most part, enterprises are the stewards of this data.¹³ At leading organizations, data is becoming viewed as a crucial asset and is the centerpiece of competitiveness, enabling digital transformation and unlocking Al's potential.¹⁴ Data collection is also posing new challenges, such as data privacy and ethical use of data, which are becoming growing the concerns for individuals and companies.¹⁵ Additionally, new data regulation has already increased demand for workers who can untangle the ethical and regulatory requirements of data storage, collection and use. The rising value and importance of data to organizations means greater investments in the workforce that can manage, protect, transform, analyze, and interpret data.
- 6. Data proliferation has resulted in innovations in data storage. Cloud computing has become mainstream, and cloud adoption continues to rise. More than three-quarters of CIOs report that their organizations have adopted the cloud.¹⁶ By 2025, IDC predicts that 49 percent of the world's stored data will reside in the cloud.¹⁷ At the same time, with the increase in Internet of Things (IoT) devices and the portability of computing power, "Edge Computing" is expected to grow exponentially. IDC predicts that by 2023, 45 percent of IoT-generated data will be stored, processed, analyzed, and acted upon close to or at the edge of networks.¹⁸ More talent is needed to build, manage, integrate, and service these networks.
- 7. Cybersecurity has risen to the forefront of organizations' core functions. Cybersecurity is now seen as "table stakes for survival." Businesses not only see the importance of avoiding the negative impacts of cyberattacks, they also see the potential for cybersecurity to be a competitive differentiator.¹⁹ However, there is not enough talent to go around. (ISC)² estimates that the cybersecurity workforce gap in the US was nearly 500,000 in 2019 this is the difference between the number of cybersecurity professionals working in the field and the number needed to keep organizations safe. Cybersecurity roles include security operations and administration, risk management, compliance, operational technology security, secure software development, penetration testing, and forensics.²⁰
- 8. Blockchain technology will also be a growing trend as it offers security that is useful in multiple ways. And as the use of blockchain technology increases, so too does the demand for skilled professionals. According to Techcrunch, blockchain-related jobs are the second-fastest growing category of jobs. Companies with jobs requesting blockchain experience shot up 517 percent in 2018.²¹
- **9. Virtual and Augmented Reality will have increasing real-world applications.** Virtual Reality (VR) and Augmented Reality (AR) immerse or enhance the user's environment. Both VR and AR have enormous potential in

⁹ Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages. McKinsey Global Institute, 2017.

¹⁰ 2019 CIO Survey. Gartner. January 2019.

¹¹ Al adoption advances, but foundational barriers remain. McKinsey. November 2018.

¹² Talent and workforce effects in the age of Al. Deloitte Insights. March 3, 2020.

¹³ The Digitization of the World – from Edge to Core. IDC White Paper. November 2018.

¹⁴ 2020 Technology Industry Outlook. Deloitte Center for Technology, Media, and Telecommunications.

¹⁵ CompTIA. "IT Industry Outlook 2018." See https://www.comptia.org/resources/it-industry-trends-analysis.

¹⁶ CIO Survey 2019. Harvey Nash/KPMG. 2019.

¹⁷ The Digitization of the World – from Edge to Core. IDC White Paper. November 2018.

¹⁸ 2020 Technology Industry Outlook. Deloitte Center for Technology, Media, and Telecommunications.

¹⁹ How business leaders can close their cybersecurity skills gap. World Economic Forum. January 2020.

²⁰ Strategies for Building and Growing Strong Cybersecurity Teams. (ISC)² 2019.

²¹ Here are the Most In-Demand Jobs and Languages According to Hired. TechCrunchFebruary 28, 2019.

training, entertainment, education, and marketing. For example, they can be used to train medical professionals in new procedures, create more immersive entertainment, or enhance marketing. IDC estimates that worldwide spending on AR/VR products and services will grow at a compound annual growth rate of 77 percent from 2019 to 2023.²² This According to an article at Monster.com, the demand for job candidates with VR knowledge is up 37 percent, but the potential employees are in short supply.

²² Worldwide Spending on Augmented and Virtual Reality Expected to Reach \$18.8 billion in 2020. IDC. November 2019.

THE TECH TALENT PIPELINE

The Austin region's tech talent pipeline is shaped by all of the institutions that provide education and training related to technology occupations. This ranges from school districts to universities and everything in between. It includes career and technical education programs, noncredit programs, certificate programs, and degree programs.

Note: the information presented on the next pages reflects what has been collected to date but may not be a comprehensive listing of all programs in the region.

DEGREE AND FOR-CREDIT PROGRAMS

The programs included in this analysis are recognized postsecondary credentials and awards conferred by a postsecondary institution that participated in the Integrated Postsecondary Education Data System (IPEDS) survey conducted annually by the National Center for Education Statistics. This data does not include noncredit programs.

In the 2017-2018 school year, the most recent data available, educational institutions in the Austin metro area conferred 1,518 awards related to information technology and computer science. This represents an 82 percent increase since 2014.

FIGURE 13. INFORMATION TECHNOLOGY AND COMPUTER SCIENCE COMPLETIONS 2014 – 2018, AUSTIN METRO



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Note: Includes only for-credit completions data for postsecondary institutions in the Austin MSA.

Over the last five academic years, the diversity of the graduating students has improved slightly. The share of male students has fallen from 75 percent to 73 percent, and the share of white students has declined from 49 percent to 42 percent. Although the share of male students is similar to that of the technology workforce overall, the share of white students is much lower among graduates than in the technology workforce, which signals that racial diversity could be improving in the regional talent pipeline.



FIGURE 14. DIVERSITY OF GRADUATES

Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Note: Includes only for-credit completions data for postsecondary institutions in the Austin MSA.

Postsecondary institutions report completions by fields of study through the IPEDS survey using the Classification of Instructional Programs (CIP), a taxonomic scheme that standardizes fields of study to facilitate the aggregation of data and more accurate tracking of completions. The fields of study discussed below correspond to the titles assigned by the CIP.

The University of Texas at Austin (UT) awards the most information technology and computer science degrees in the Austin Metro area. UT awarded 739 degrees in 2018. The vast majority of these were bachelor's in computer and information sciences, general. Texas State University is the second largest source of degrees; they conferred 323 awards in 2018. The majority of these were bachelor's degrees in computer science. Austin Community College awarded the next highest number of awards in 2018. They conferred 268 awards, largely associate degrees in computer systems networking, computer and information sciences, or computer programming.

Overall, the largest number of graduates were from computer and information sciences, general. The next most-popular field of study was computer science. Approximately two-thirds of the awards were for bachelor's degrees or higher.

FIGURE 15. COMPLETIONS BY INSTITUTION, AUSTIN METRO FIELD OF STUDY AND AWARD LEVEL, 2018

CIP CIP DESCRIPTIO CODE AWARD LEVEL		CONCORDIA UNIVERSITY TEXAS	CYBERTEX INSTITUTE OF TECHNOLOGY	HUSTON-TILLOTSON UNIVERSITY	NATIONAL AMERICAN UNIVERSITY-AUSTIN	NATIONAL AMERICAN UNIVERSITY-GEORGETOWN	SAINT EDWARD'S UNIVERSITY	South University-Austin	SOUTHERN CAREERS INSTITUTE-AUSTIN	SOUTHWESTERN UNIVERSITY	STRAYER UNIVERSITY-TEXAS	TEXAS STATE UNIVERSITY	THE ART INSTITUTE OF AUSTIN	THE UNIVERSITY OF TEXAS AT AUSTIN	VIRGINIA COLLEGE-AUSTIN*	GRAND TOTAL
11.0101 Computer and Info A general program that focuses	rmation Sciences, on computing, c	, Gener ompute	al er scien	ce, and	d infor	matior	scien	ice and	d syste	ems. S	Such p	rogram	is are	undiffer	entiate	ed as to
title and content and are not to	be confused with	specifi	c progr	ams in	comp	outer s	cience	e, infor	matior	n scier	nce, or	related	d supp	ort serv	/ices.	
Award < 1 academ	nic year 9													149		158
Associate's degree	9 78															78
Bachelor's degree				4			9			5		77		423		518
Postbac certificate												1				1
Master's degree												0		31		31
Doctor's degree														19		19
11.0103 Information Techno A program that focuses on the data and communications supp databases, telecommunications	blogy design of technolo ort needs. Include , user tactics, app	ogical i es instru plication	nformat uction in testing	tion sy n the p g, and	stems, principl humar	incluc es of c n interf	ding co compu ace de	omputi iter ha esign.	ng sys rdware	stems, e and	as so softwa	lutions are com	to bus	siness a nts, algo	and responsible	search
Associate's degree)				0											0
Bachelor's degree					0	3					26					29
11.0201 Computer Program A program that focuses on the generally prepares individuals to maintenance. Includes instruction prototype testing; troubleshooting	ming/Programme general writing an o apply the metho on in software des ng; and related as	er, Gene d imple ods and sign, low pects c	eral emental procee w- and l of opera	tion of dures on high-le	gener of softw vel lan ystems	ic and ware d guage s and r	custo lesign es and networ	mized and p progra	progra rogran am wr	ams to nming iting; p	o drive to sol progra	operat ftware i m custo	ing sy nstalla omizat	stems a tion and ion and	and tha d I linkin	at g;
Award < 1 academ	nic year 46															46
Award of >1, <2 yr	s 0															0
Associate's degree	e 48															48

Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS)

Note: Includes only for-credit completions data for postsecondary institutions in the Austin MSA.

* Virginia College is no longer operating in Austin.

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FIGURE 15. COMPLETIONS BY INSTITUTION, AUSTIN METRO (CONT.) FIELD OF STUDY AND AWARD LEVEL, 2018

CIP	CIP DESCRIPTION /	ISTIN COMMUNITY COLLEGE DISTRICT	DNCORDIA UNIVERSITY TEXAS	BERTEX INSTITUTE OF TECHNOLOGY	JSTON-TILLOTSON UNIVERSITY	TIONAL AMERICAN UNIVERSITY-AUSTIN	ITIONAL AMERICAN UNIVERSITY-GEORGETOWN	INT EDWARD'S UNIVERSITY	DUTH UNIVERSITY-AUSTIN	DUTHERN CAREERS INSTITUTE-AUSTIN	UUTHWESTERN UNIVERSITY	RAYER UNIVERSITY-TEXAS	XAS STATE UNIVERSITY	IE ART INSTITUTE OF AUSTIN	IE UNIVERSITY OF TEXAS AT AUSTIN	rginia college-austin*	SRAND TOTAL
CIP CODE	CIP DESCRIPTION / AWARD LEVEL	AUS	CON	СУВ	SUH	NAT	NAT	SAIN	sou	sou	sou	STR.	ТЕХ	THE	THE	VIRG	

11.0401 Information Science/Studies

A program that focuses on the theory, organization, and process of information collection, transmission, and utilization in traditional and electronic forms. Includes instruction in information classification and organization; information storage and processing; transmission, transfer, and signaling; communications and networking; systems planning and design; human interfacing and use analysis; database development; information policy analysis; and related aspects of hardware, software, economics, social factors, and capacity.

,	Award < 1 academic year				0			0
,	Award of >1, <2 yrs				0			0
[Bachelor's degree			8	6			14
	Postbac certificate				0			0
I	Master's degree			1	7		101	109
l	Doctor's degree						5	5
11.0701	Computer Science							

11.0/01 Computer Science

A program that focuses on computer theory, computing problems and solutions, and the design of computer systems and user interfaces from a scientific perspective. Includes instruction in the principles of computational science, computer development and programming, and applications to a variety of end-use situations.

Bachelor's degree		8	2		24			191		225
Postbac certificate								4		4
Master's degree								50		50
Doctor's degree								0		0
11 0001 Wab Daga Digital/Multimadia	and Infa	rmatia	0.1.1.000	~~						

11.0801 Web Page, Digital/Multimedia and Information Resources Design

A program that prepares individuals to apply HTML, CSS, XML, JavaScript, graphics applications, and other authoring tools to the design, editing, and publishing (launching) of documents, images, graphics, sound, and multimedia products on the World Wide Web. Includes instruction in Internet theory, web page standards and policies, elements of web page design, user interfaces, vector tools, special effects, interactive and multimedia components, search engines, navigation, morphing, e-commerce tools, and emerging web technologies.

Award of >1, <2 yrs							0		0
Associate's degree							3		3
Bachelor's degree							12		12

Source: National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS) Note: Includes only for-credit completions data for postsecondary institutions in the Austin MSA.

* Virginia College is no longer operating in Austin.

FIGURE 15. COMPLETIONS BY INSTITUTION, AUSTIN METRO (CONT.) FIELD OF STUDY AND AWARD LEVEL, 2018

CIP CODE	CIP DESCRIPTION / AWARD LEVEL	AUSTIN COMMUNITY COLLEGE DISTRICT	CONCORDIA UNIVERSITY TEXAS	CYBERTEX INSTITUTE OF TECHNOLOGY	HUSTON-TILLOTSON UNIVERSITY	NATIONAL AMERICAN UNIVERSITY-AUSTIN	NATIONAL AMERICAN UNIVERSITY-GEORGETOWN	SAINT EDWARD'S UNIVERSITY	SOUTH UNIVERSITY-AUSTIN	SOUTHERN CAREERS INSTITUTE-AUSTIN	SOUTHWESTERN UNIVERSITY	STRAYER UNIVERSITY-TEXAS	TEXAS STATE UNIVERSITY	THE ART INSTITUTE OF AUSTIN	THE UNIVERSITY OF TEXAS AT AUSTIN	VIRGINIA COLLEGE-AUSTIN*	GRAND TOTAL
11.0901 A program	Computer Systems Networking that focuses on the design, imple	and Te ementat	lecom tion, ar	munic nd ma	ations nagen	nent of	f linked	d syste	ems of	f comp	outers,	perip	herals,	and as	sociate	ed soft	ware to
maximize e instruction manageme	fficiency and productivity, and the in operating systems and applica ent and control; network and flow	at prepa tions; s optimiz	ares in ystems ation; s	dividu s desig securi	als to gn and ty; cor	functic d analy nfigurir	on as r /sis; ne ng; anc	networ etwork d troub	k spec ing the leshoo	cialists eory a oting.	and r nd sol	nanag utions	ers at v ; types	various of net	i levels. vorks; i	. Incluc networ	les k
	Award < 1 academic year	12		35													47
	Associate's degree	75															75
11.1003	Computer and Information System	ems Se	curity/	Inform	nation	Assura	ance										
A program manage the architecture law and reg troubleshoo	that prepares individuals to asset e implementation, auditing, and m e, programming, and systems ana gulations; risk assessment and po oting.	ss the s naintena alysis; n plicy and	security ance o ietworł alysis;	y need f secu king; te contir	ds of c irity de elecon ngency	omput vices, nmunio / planr	ter and syster cations ning; u	d netw ms, an s; cryp ser ac	ork sy id proc tograp cess i	stems cedure ohy; se ssues;	, recones. Incles. Inclescurity	mmen ludes syster tigatio	d sateg instructi n auditi n techn	uard s ion in ing an iques;	colution comput d desig and	s, and ter in; app	licable
	Associate's degree					0	1										1
	Bachelor's degree						0										0
	Master's degree										_	1			11		12
11.1006	Computer Support Specialist			į					·			·					
A program hardware p Internet, so	that prepares individuals to provi problems. Includes instruction in c ftware applications, help desk co	de tech compute ncepts	nnical a er conc and pr	assista cepts, roblen	ance, s inform n solvi	suppor nation ng, an	t, and system d prine	advice ns, net ciples	e to co workir of cus	ompute ng, ope stomer	er use erating servio	rs to h g syste ce.	elp trou ms, co	ublesh mpute	oot sofi r hardw	tware a vare, th	and 1e
	Award < 1 academic year									17						9	26
			T							[

 Associate's degree
 1
 1
 5
 7

 Grand Total
 268
 8
 35
 6
 1
 5
 323
 15
 739
 9
 1,518

Source: National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS) Note: Includes only for-credit completions data for postsecondary institutions in the Austin MSA.

* Virginia College is no longer operating in Austin.

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To understand how fields of study relate to occupations, the NCES and BLS created a crosswalk that matches fields of study and related occupations. In some cases, a field of study matches with many occupations. In other cases, an occupation may be matched with many fields of study. Due to the nature of these relationships, a simple comparison of openings in an occupation and completions in fields of studies related to that occupation can overstate or understate training gaps.

In information technology and computer science, this is particularly true. Figure 16 shows the relationships between the information technology and computer science fields of study and the computer occupations. A dot denotes that the field of study and the occupation are related.

For example, the field of study "computer and information sciences, general" is related to the computer and information research scientists, computer systems analysts, database administrators, network and computer systems administrators, computer network architects, and computer occupations, all other. In other words, a graduate of a program classified as "computer and information sciences, general" could potentially work in any one of the aforementioned occupations. Thus, a narrow comparison of the 805 computer and information sciences completions to only the 191 openings for database administrators would falsely indicate an over-supply of talent.

			COMPUTER AND INFORMATION RESEARCH SCIENTISTS	COMPUTER SYSTEMS ANALYSTS	INFORMATION SECURITY ANALYSTS	COMPUTER PROGRAMMERS	SOFTWARE DEVELOPERS, APPLICATIONS	SOFTWARE DEVELOPERS, SYSTEMS SOFTWARE	WEB DEVELOPERS	DATABASE ADMINISTRATORS	NETWORK AND COMPUTER SYSTEMS ADMINISTRATORS	COMPUTER NETWORK ARCHITECTS	COMPUTER USER SUPPORT SPECIALISTS	COMPUTER NETWORK SUPPORT SPECIALISTS	COMPUTER OCCUPATIONS, ALL OTHER
	ANNUAL OPENING	S (TOTAL=7,782) →	66	1,032	142	316	1,840	821	283	191	528	220	1,060	292	518
		COMPLETIONS													
CIP CODE	CIP DESCRIPTION	(TOTAL=1,518) 🛡		<mark></mark>	ļ			ļ		<mark></mark> .	ļ <mark></mark>	<mark></mark>		ļ	<mark></mark>
11.0101	Computer and Information Sciences, General.	805	•	•						•	•	•			•
11.0103	Information Technology.	29	•	•	٠		٠	٠				•			
11.0201	Computer Programming/Programmer, General.	94				٠	٠	٠	٠		ļ			٠	
11.0202	Computer Programming, Specific Applications.	0				٠	٠	٠			ļ				
11.0401	Information Science/Studies.	128	٠		ļ			٠			ļ				•
11.0701	Computer Science.	279	٠		•	٠	٠	٠	٠					٠	•
11.0801	Web Page, Digital/Multimedia and Information Resources Design.	15							٠						
11.0802	Data Modeling/Warehousing and Database Administration.	0								٠					
11.0901	Computer Systems Networking and Telecommunications.	122		٠	٠							٠		٠	
11.1001	Network and System Administration/Administrator.	0			٠						٠	٠		٠	
11.1002	System, Networking, and LAN/WAN Management/	0			•						l			٠	
11.1003	Computer and Information Systems Security/Information Assurance.	13			٠					٠	٠	٠		٠	
11.1006	Computer Support Specialist.	33			Ì			Ì			Ì		٠	•	

Conversely, computer systems analysts are matched with multiple fields of study–computer and information sciences, general; information technology; and computer systems networking and telecommunications. A comparison of the 1,032 openings for computer systems analysts and the 956 completions in the related fields of study would falsely show that there are roughly enough graduates to fill most of the openings in that occupation.



The comparison of fields of study and computer occupations does, however, show clearly that there are far more openings in computer occupations than there are awards conferred in information technology and computer science fields of study. Over the next five years, it is estimated that there will be 7,782 openings annually. In 2018, only 1,518 awards were conferred in information technology and computer science fields of study. *In other words, there are more than five openings for every one completion.*

Although many of the openings are not entry-level positions, this imbalance coupled with the region's prospective growth provides evidence that the region has a shortage of students completing information technology and computer science programs, particularly in the high-demand areas software development and computer programming.

FIGURE 16. IT AND COMPUTER SCIENCE FIELDS OF STUDY AND RELATED OCCUPATIONS

DENOTES THE FIELD OF STUDY INCLUDES COURSEWORK RELATED TO THE OCCUPATION

			COMPUTER AND INFORMATION RESEARCH SCIENTISTS	COMPUTER SYSTEMS ANALYSTS	INFORMATION SECURITY ANALYSTS	COMPUTER PROGRAMMERS	SOFTWARE DEVELOPERS, APPLICATIONS	SOFTWARE DEVELOPERS, SYSTEMS SOFTWARE	WEB DEVELOPERS	DATABASE ADMINISTRATORS	NETWORK AND COMPUTER SYSTEMS ADMINISTRATORS	COMPUTER NETWORK ARCHITECTS	COMPUTER USER SUPPORT SPECIALISTS	COMPUTER NETWORK SUPPORT SPECIALISTS	COMPUTER OCCUPATIONS, ALL OTHER
	ANNUAL OPENING	S (TOTAL=7,782) →	66	1,032	142	316	1,840	821	283	191	528	220	1,060	292	518
		COMPLETIONS													
CIP CODE	CIP DESCRIPTION	(TOTAL=1,518) 🕊													
CIP CODE 11.0101	CIP DESCRIPTION Computer and Information Sciences, General.	(TOTAL=1,518) ♥ 805	•	•						•	•	•			•
CIP CODE 11.0101 11.0103	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology.	(TOTAL=1,518) ↓ 805 29	•	•	•		•	•		•	•	•			•
CIP CODE 11.0101 11.0103 11.0201	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General.	(TOTAL=1,518) ♥ 805 29 94	•	•	•	•	•	•	•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications.	(TOTAL=1,518) ↓ 805 29 94 0	•	•	•	•	•	•	•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies.	(TOTAL=1,518) ↓ 805 29 94 0 128	•	•	•	•	•	•	•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science.	(TOTAL=1,518) ♥ 805 29 94 0 128 279	•	•	•	•	•	• • •	•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701 11.0801	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science. Web Page, Digital/Multimedia and Information Resources Design.	(TOTAL=1,518) ↓ 805 29 94 0 128 279 15	•	•	•	•	•	•	•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701 11.0801 11.0802	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science. Web Page, Digital/Multimedia and Information Resources Design. Data Modeling/Warehousing and Database Administration.	(TOTAL=1,518) ↓ 805 29 94 0 128 279 15 0	•	•	•	•	•		•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701 11.0801 11.0802 11.0901	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science. Web Page, Digital/Multimedia and Information Resources Design. Data Modeling/Warehousing and Database Administration. Computer Systems Networking and Telecommunications.	(TOTAL=1,518) ↓ 805 29 94 0 128 279 15 0 122		•	•	•	•	•	•	•		•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701 11.0801 11.0802 11.0901 11.1001	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science. Web Page, Digital/Multimedia and Information Resources Design. Data Modeling/Warehousing and Database Administration. Computer Systems Networking and Telecommunications. Network and System Administration/Administrator.	(TOTAL=1,518) ↓ 805 29 94 0 128 279 15 0 122 0		•	•	•	•		•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701 11.0801 11.0802 11.0901 11.1001 11.1002	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science. Web Page, Digital/Multimedia and Information Resources Design. Data Modeling/Warehousing and Database Administration. Computer Systems Networking and Telecommunications. Network and System Administration/Administrator. System, Networking, and LAN/WAN Management/	(TOTAL=1,518) ↓ 805 29 94 0 128 279 15 0 122 0 0 0 0		•	•	•	•		•	•	•	•		•	•
CIP CODE 11.0101 11.0103 11.0201 11.0202 11.0401 11.0701 11.0801 11.0802 11.0901 11.1001 11.1002 11.1003	CIP DESCRIPTION Computer and Information Sciences, General. Information Technology. Computer Programming/Programmer, General. Computer Programming, Specific Applications. Information Science/Studies. Computer Science. Web Page, Digital/Multimedia and Information Resources Design. Data Modeling/Warehousing and Database Administration. Computer Systems Networking and Telecommunications. Network and System Administration/Administrator. System, Networking, and LAN/WAN Management/ Computer and Information Systems Security/Information Assurance.	(TOTAL=1,518) ↓ 805 29 94 0 128 279 15 0 122 0 0 13		•	•	•	•		•	•	•	•		•	•

Source: National Center for Education Statistics, Integrated Postsecondary Education Data System, Emsi 2020.2 – QCEW Employees, Non-QCEW Employees, and Self-Employed. Note: Includes only forcredit completions data for postsecondary institutions in the Austin MSA. CIP is "Classification of Instruction Programs," which is a code system organized by the NCES that facilitates the organization, collection, and reporting of fields of study and program completions among postsecondary institutions in the US.

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NONCREDIT PROGRAMS

Noncredit programs often offer shorter-term training solutions for the acquisition of occupation-specific skills. These programs are not eligible for Pell Grants, but the programs that are offered through a TWC-certified eligible training provider are eligible for other Federal training dollars, including Workforce Innovation and Opportunity Act (WIOA), Trade Adjustment Assistance (TAA), and State training dollars related to certain Texas Health and Human Services Commission (HHSC) programs. Most of these training programs prepare students for one or more industry-recognized credentials.

FIGURE 17. NON-CREDIT INFORMATION TECHNOLOGY AND COMPUTER SCIENCE PROGRAMS ELIGIBLE TRAINING PROVIDERS ONLY

			INDUSTRY CREDENTIAL OR
Full Stack Web Development	Learn the most popular languages for making websites, web apps, games, animations, and mobile applications. In this track you'll learn front-end and back-end web development, some of today's most versatile and sought-after skills.	Austin Coding Academy	CENTRICATE
Wordpress Fundamentals	Learn the fundamentals of this powerful content management system (CMS) and develop the skills to either pursue a career in WordPress development or be a Technical Support Specialist with WP Engine – one of the industry leaders in managed WordPress hosting and the premier WordPress Digital Experience Platform.	Austin Coding Academy	
A + Essentials	Computer Support Specialist	Austin Community College	A+ Certification
A + Practical Application	Computer Programming/Programmer General	Austin Community College	A+ Certification
CMPT 1074 Red Hat Certified Engineer	Computer Systems Analysis/Analyst	Austin Community College	Red Hat Certified Engineer
CMPT 1078 Red Hat Certified System Administrator (RHCSA)	Computer Systems Analysis/Analyst	Austin Community College	Red Hat Certified System Administrator
CPMT 1077 LPIC 1 Linux	Network and System Administration/Administrator	Austin Community College	LPIC 1
INEW 1079 AWS Solutions Architect Associate	Computer Systems Analysis/Analyst	Austin Community College	AWS Certification
INEW 2073 VNwarevSphere Install Configure Manage V6.x	Computer Systems Analysis/Analyst	Austin Community College	VMware Certified Professional
ITCC 9002 Cisco CCNA Series	Computer Support Specialist	Austin Community College	Cisco Networking
ITSX 3039 Certified Ethical Hacker (CEH)	Computer Support Specialist	Austin Community College	Certification
ITSY Security	Computer Systems Analysis/Analyst	Austin Community College	CompTIA Security+

PROGRAM NAME	PROGRAM DESCRIPTION	PROVIDER NAME	INDUSTRY CREDENTIAL OR CERTIFICATE
MCSA: SQL Server Querying Microsoft SQL Server 2012	Data Modeling/Warehousing and Database Administration	Austin Community College	Database
MCSA: SQL Server – Implementing a Data Warehouse with Microsoft SQL Server 2012	Data Modeling/Warehousing and Database Administration	Austin Community College	Database
Network +	Computer Support Specialist	Austin Community College	Network+ Certification
PC Technician Series	Computer Support Specialist	Austin Community College	A+ Certification Network+ Certification
Security Certification Preparation for CISSP CASP SSCO and More	Computer Systems Analysis/Analyst	Austin Community College	Security
Web Software Developer Bootcamp	Computer Software Technology/Technician	Austin Community College	JavaScript Certification
Computer Support Specialist Program	Computer Support Specialist	Consulting Solutions Net	A+ Network +
Internet and Mobile Development Business Optimization Specialist (IMDBOS) Program	Web Page Digital/Multimedia and Information Resources Design	Consulting Solutions Net	Adobe Photoshop
JAVA Programming & SQL Expert Certificate Program	Computer Programming Specific Applications	Consulting Solutions Net	Oracle OCA Java Programmer Cert and SQL Cert
Microsoft Certified IT Professional (MCITP) Administrator Training	Network and System Administration/Administrator	Consulting Solutions Net	Microsoft Certified Solutions Associate (MCSA)
Microsoft Office Specialist with CAPM/PMP Training Program	Administrative Assistant and Secretarial Science General	Consulting Solutions Net	Microsoft Office Specialist in Word PP Excel and CAPM/PMP
Project Management (PMP/CAPM) Certificate w/ Agile Program	Project Management	Consulting Solutions Net	PMI.org PMP
SQL and Project Management Certificate Program	Data Modeling/Warehousing and Database Administration	Consulting Solutions Net	Oracle SQL and PMI.org PMP
SQL/NoSQL/Big Data and Project Management Certificate w/ Agile Program	Data Modeling/Warehousing and Database Administration	Consulting Solutions Net	Oracle SQL and PMI.org PMP
Web Communications Management Program	Web Page Digital/Multimedia and Information Resources Design	Consulting Solutions Net	Adobe Photoshop and PMI.org PMP
Data Analyst	2000 hours of on-the-job-learning is completed in conjunction with 188 hours of classroom training and coaching for performance. Apprentices build their data analyst skills collaborating on projects with peers, earning industry certifications, and building a personal portfolio.	Digital Creative Institute	
Digital Marketer	2000 hours of on-the-job-learning is completed in conjunction with 180 hours of classroom training. Apprentices build their digital marketing skills collaborating on projects with peers, earning industry certifications, and building a personal portfolio.	Digital Creative Institute	

PROGRAM NAME	PROGRAM DESCRIPTION	PROVIDER NAME	INDUSTRY CREDENTIAL OR CERTIFICATE
Project Management and Agile Scrum IT Program	Information Technology	Extellent Professional Development Center	Professional Certifications
Cybersecurity Analytics	Program to become a cybersecurity analyst	Flatiron School	
Data Science	Program to develop student into rounded data scientist	Flatiron School	
Software Engineering	Web Development	Flatiron School	
UX/UI Design	Program to become a user experience or user interface designer	Flatiron School	
Data Science Immersive	Master the tools and techniques to solve real world business problems through Data Science	Galvanize	
Software Engineering Immersive	Course designed to take a beginner developer into a job ready full stack web developer	Galvanize	
Data Analytics	Harness Excel, SQL, and Tableau to drive powerful analysis and insights. Build confidence and credibility to apply this versatile skill set to countless jobs.	General Assembly	
Data Science	Create robust predictive models with statistics and Python programming. Build confidence and credibility to tackle complex machine learning problems on the job	General Assembly	
Data Science Immersive	Python Programming, Machine Learning, and understanding real world data and forecasting business trends	General Assembly	
Digital Marketing	Build confidence and capability to apply modern marketing strategies on the job. Drive growth with multichannel campaigns powered by data and customer insight.	General Assembly	
Front End Web Development	Learn to leverage HTML, CSS, and JavaScript through hands-on projects and real-world scenarios.	General Assembly	
Javascript Development	Learn the fundamentals of object- oriented programming while receiving support from industry experts and a community of peers.	General Assembly	
Product Management	Learn Project Management skills for both startup and enterprise product organizations	General Assembly	
Python Programming	Immersive Course to teach Python Programming Language.	General Assembly	

PROGRAM NAME	PROGRAM DESCRIPTION	PROVIDER NAME	INDUSTRY CREDENTIAL OR CERTIFICATE
React Development	Start building maintainable web applications that can handle constantly changing data at scale. Expand your programming toolkit, and discover why both developers and employers favor this robust JavaScript library.	General Assembly	
Software Engineering Immersive	Coding Bootcamp for Front and Back End Software.	General Assembly	
Software Engineering Immersive (FLEX)	Coding Bootcamp for Front and Back End Software.	General Assembly	
User Experience Design	Translate user wants and needs into intuitive digital experiences that power revenue, loyalty, and product success. Build confidence and credibility to tackle complex design problems on the job.	General Assembly	
User Experience Design Immersive	Learn how to design user interface to help make software successful	General Assembly	
Visual Design	Grasp how effective visual communication — from font pairings to style tiles — helps translate compelling ideas across any team, in any field.	General Assembly	
Network Systems Administrator Professional	Network and System Administration/Administrator	New Horizons Computer Learning Centers of Austin	Cisco Microsoft
Security IT Associate Program	Computer Support Specialist	New Horizons Computer Learning Centers of Austin	MTA Networking MTA Security
Business Analysis	Business Analyst	UT Center for Professional Education	International Institute of Business Analysis
Coding	Computer Programmer	UT Center for Professional Education	
Cyber Academy	Cybersecurity	UT Center for Professional Education	
Data Analytics	Data Analyst / Data Science	UT Center for Professional Education	

Source: Texas Workforce Commission, Eligible Training Providers Database. * Consulting Solutions Net was recently acquired by Goodwill Industries.

APPRENTICESHIP PROGRAMS

Only three apprenticeship programs in IT currently exist in the Austin region. These programs are for information security analysts, digital marketers, and data analyst.

FIGURE 18. REGISTERED APPRENTICESHIP PROGRAMS

OCCUPATION TITLE	SPONSORING ORGANIZATION NAME	CERTIFICATIONS
Information Security Analyst	CyberDefenses	CompTIA A+, CompTIA Network+, CompTIA Security+, Certified Ethical Hacker
Digital Marketer	Digital Creative Institute	Professional Scrum Master, SalesForce pardot, HubSpot marketing software certification, HubSpot inbound sales certification, Tableau, Google AdWords
Data Analyst	Digital Creative Institute	

Source: ARC Research.

Although there are currently few apprenticeship programs, Austin Community College recently announced that it was awarded a grant to expand apprenticeship in IT through its Career ACCelerator program. The new apprenticeship program aims to train 350 apprentices over the next four years. One employer partner is IBM; they have committed to 45 apprentices.

In addition, the Urban Institute is actively promoting the creation of new programs in the Austin area through the Apprenticeship Expansion and Modernization Project. Through this program, the Urban Institute will provide technical assistance to employers who would like to set up an information technology-related apprenticeship program.

K-12 EDUCATION

New legislation (HB3 and HB963) has brought new funding for Technology Application (Tech Apps), which includes computer science, information technology, and web design. It also moves Tech Apps course under Career and Technical Education (CTE). In addition, the Perkins V reauthorization, which was signed into law in 2018, has also hastened a number of changes in the computer science and information technology programs offered by school districts. As a result, school districts are in the process of re-vamping their computer science/information technology-related programs. In the end, these legislative changes should mean more and better programs to support the tech talent pipeline.

DISTRICT NAME	SCHOOL NAME	PROGRAM NAME	CAREER CLUSTER
Austin ISD	Akins High School	Cybersecurity	Information Technology
Austin ISD	Akins High School	Network Systems	Information Technology
Austin ISD	Akins High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Austin ISD	Anderson High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Austin ISD	Crockett High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Austin ISD	LASA High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Austin ISD	Navarro High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Austin ISD	Travis High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Austin ISD	LBJ High School	Web and Digital Media	Science, Technology, Engineering &

FIGURE 19. CAREER & TECHNICAL EDUCATION PROGRAMS AT AUSTIN AREA HIGH SCHOOLS

DISTRICT NAME	SCHOOL NAME	PROGRAM NAME	CAREER CLUSTER
			Mathematics
Del Valle ISD	Del Valle High School	Computer Science	Information Technology
Del Valle ISD	Del Valle High School	Computer Technician	Information Technology
Elgin ISD	Elgin High School	Programming and Software Development	Science, Technology, Engineering & Mathematics
Manor ISD	Manor New Tech High School	Computer Science	Science, Technology, Engineering & Mathematics
Manor ISD	Manor High School	Network Systems/Cybersecurity	Information Technology
Manor ISD	Manor High School	Web Development	Information Technology
Pflugerville ISD	Hendrickson HS	Networking Systems	Information Technology
Pflugerville ISD	Connally	Programming and Software Development	Science, Technology, Engineering & Mathematics
Pflugerville ISD	Hendrickson	Programming and Software Development	Science, Technology, Engineering & Mathematics
Pflugerville ISD	Pflugerville	Programming and Software Development	Science, Technology, Engineering & Mathematics
Pflugerville ISD	Weiss	Programming and Software Development	Science, Technology, Engineering & Mathematics

Source: ARC Research.

In addition to these career and technical education programs, there are a number of other specialized programs related to computer science and information technology careers that are offered at various high schools around the region.

The Pathways in Technology Early College High School (P-TECH) program was introduced in Texas in 2017. This program is an open-enrollment program that provides students with work-based education. The program requires a close partnership with a higher education institution and a business or industry and emphasizes career training. The students who complete a P-TECH program earn not only a high school diploma but also professional or postsecondary credentials. Currently, there are two P-TECH programs (one existing and one in the planning phases) that offer training in computer science and information technology:

- Navarro High School has partnered with ACC and IBM to offer a program that, upon completion, students will graduate with an Associate of Applied Science Degree in either Computer Science or User Experience Design.
- Pflugerville ISD is in the early stages of planning for the launch of their P-TECH program at Connally High School. The program will offer an Associate of Applied Science Degree in Network Systems with a focus on Cybersecurity.

Another program in Austin ISD is **Career Launch**. Similar to P-TECH, Career Launch is a career-focused program that provides students with real-world work experience and opportunities to graduate high school with an associate degree and/or industry certification.

Northeast Early College High School (formerly Reagan High School) is the home of Career Launch: Careers in Technology, which is offered through a partnership with ACC and Dell.

CHALLENGES AND BARRIERS

During the Fall of 2019 and early 2020, employers were engaged to provide input on their experiences in recruiting, developing, and retaining tech talent in the Austin region. Education and training providers provided input on their training programs and how they engage or would like to engage employers in IT and computer science programs. This input validated some of the discoveries from the data analysis and research and provided additional insights into issues these employers and training providers face.

The findings that follow summarize the challenges and barriers that exist in the Austin region's technology-related labor market and the alignment of the tech talent pipeline.

FINDINGS: DEMAND-SIDE

1. Prior to the COVID-19 Crisis, the labor market was extremely tight, and competition was increasing

Over the last five years, the number of technology jobs in the Austin region increased by 32 percent. Many major technology firms, including Apple, Amazon, Facebook, Google, and Oracle have made sizeable investments in Austinregion offices and have announced major expansions. In addition, a number of homegrown success stories, including HomeAway (now Vrbo/Expedia Group), Indeed (now owned by Recruit Co.), Silicon Labs, and NetSpend are continuing to expand. Stalwarts of Austin's tech sector, including Dell and IBM, have also announced rises in headcount. This coupled with the active start-up community means that Austin's tech labor market is stretched thin.

A number of small/medium-sized employers and public sector employers noted that the presence of "brand name" firms heightens the competition for talent and, in some cases, distorts the pay scales. They have had to crystalize their value proposition to mission-driven candidates and get creative in differentiating their benefits and culture.

In almost all cases, employers had to resort to sourcing talent from outside the region and expect that employees will be hired away in one to three years. Austin's lower cost of living in comparison to Silicon Valley and other expensive coastal markets facilitates sourcing talent from these markets. However, the global shortage of technology workers means that the war for tech talent is increasingly competitive.²³

2. Employers express an interest in expanding the diversity of their workforces

The tech industry remains one of the least diverse industries in the country. Workforce diversity in IT is a pronounced challenge in Central Texas. The business case for diversity is strong: not only do companies have access to a larger pool of workers, but the people developing the technology better reflect diverse thought processes and consumer tastes. In a recent study by Deloitte, inclusive companies can generate up to 30 percent higher revenue per employee and are eight times more likely to realize positive business outcomes. Also, workforce diversity can reduce potential bias in Al applications.²⁴

When asked, companies are genuinely interested in recruiting from a larger, more diverse pool of workers. While larger companies have formal diversity and inclusion initiatives, many of the smaller companies seemed to lack the experience, culture, or clear directives to attain and retain diversity. The smaller companies interviewed often seemed more focused on gender diversity, without a broader focus on reaching labor pools that reflect racial, ethnic, and economic diversity. Conversely, some of the region's larger companies do have initiatives underway to increase workforce diversity. These large companies are keenly interested in collaborating to shore up a more diverse labor pool and talent pipeline. Though some of the large employers have partnered on initiatives on an ad-hoc basis, there is not currently a forum or convener that could facilitate this kind of collaboration on a larger scale or on-going basis. Without a local focus or forum, many companies can more easily attain higher levels of diversity by casting a wider net outside of the Central Texas region and recruiting diverse candidates from other regions.

3. Employers in the region show a preference for middle to senior level talent

Job posting analytics for tech occupations show that 80 percent of job openings in the region are for skilled workers who have over two years of relevant experience. Additionally, 90 percent of the job openings require a four-year bachelor's degree.

²³ Korn Ferry estimates that the global talent shortage for technology, media, and telecommunications will reach 4.3 million by 2030.

²⁴ 2020 Technology Industry Outlook. Deloitte Center for Technology, Media, and Telecommunications.

In interviews, many of the public and private sector employers of tech talent shared that they are hiring experienced workers. Even the positions that they consider entry-level require two or three years of experience.

This experience preference and requirement poses a significant barrier for recent graduates of computer science and information technology programs and makes organic growth of the regional talent pool more difficult.

4. Entry and middle skill jobs are competing with off-shore hiring and increased levels of automation

Many of the companies interviewed maintain portions of their technology teams in countries or other regions of the US where labor and cost of living are less expensive or less competitive. They may hire problem-solvers who have a strong set of critical thinking and communication skills in Austin. Jobs that are more execution-oriented with high volume and/or repetitive tasks are often hired off-shore, or in other parts of the country. These jobs are also the ones that have higher automation risk due to the rote nature of the work.

5. Employers want employees who have strong soft skills

Employers often cited the desire for employees who demonstrated strong soft skills, including clear and friendly communication, team-oriented mindsets, and a high level of professionalism. Employees are expected to either interact with customers or participate on work teams that require both knowledge expertise as well as soft skills to ensure success.

Training providers expressed a corresponding challenge with clients that lack soft skills, especially among younger clients or clients who have been out of the workforce for several years. Several training providers were addressing the issue with increasing workshops on basic skills such as interviewing, resume-building, and office etiquette.

6. Companies are beginning to seek qualifications that are less constrained by traditional benchmarks of success

A four-year college degree has historically been the ticket to entry for employment in a tech job. However, hiring managers are increasingly interested in reviewing an applicant's portfolio of work to understand whether a person has the necessary skills to succeed in a job. CompTIA reports in a recent survey that almost half of survey respondents are making changes to their hiring approaches. "Reevaluated hiring criteria e.g. 4-year degree requirement" was one of the top three most frequent changes utilized.²⁵ In fact, about 40 percent of the employers interviewed in this project stated that they were open to hiring candidates without 4-year degrees.

A disconnect still remains a challenge between HR departments, who typically focus on academic credentials to narrow the job candidate pool and select finalists, and hiring managers, who emphasize specific, demonstrated skills and experience. This can present as a more significant challenge at large companies where HR departments provide hiring managers with a shortlist of candidates. However, smaller companies are becoming more comfortable with considering resumes of people who possess the needed skills and attributes, rather than a 4-year college degree.

FINDINGS: SUPPLY-SIDE

1. The Central Texas Workforce has a shortage of computer science and IT graduates from regional postsecondary institutions.

Higher education institutions in Central Texas are not graduating students from computer science and IT programs at the rate required to fill local demand. Currently, there is about one graduate for every five openings. Although not all of these openings are for recent graduates, high placement rates demonstrate that graduates of well-respected programs are in very high demand. Additionally, many graduates of computer science programs at the University of Texas are in such high demand that they leave Central Texas to seek more competitive job offers in the largest US tech hubs. About 36 percent of UT computer graduates leave Texas.²⁶

2. The K-12 efforts in IT/Computer Science are increasing and evolving with recent changes in state and federal legislation.

All of the school districts in Central Texas have begun to offer a pathway in tech careers for students, with classes beginning in middle school. These efforts have been bolstered by new state legislation, House Bills 3 and 963, that

²⁵ Workforce and Learning Trends 2020. CompTIA. January 2020.

²⁶ https://cns.utexas.edu/about/facts/computer-science

allows for Technology Applications to be considered under Career and Technical Education (CTE) and provides increased funding opportunities.

While the bolstered tech curriculums could provide a needed pipeline of students interested in tech careers, the current programs are in the nascent stages as they adjust to meet the new requirements of Perkins V and the new state legislation.

In addition, new P-TECH programs offer more intensive training programs where students who complete the program can obtain up to an associate degree. The two tech-oriented P-TECH programs in the region have been established in the last year or two.

The success of these programs is largely driven by teachers who themselves require ongoing training. Without a strong and dynamic school-based champion, classes can lack the rigor and student interest to be effective.

Some companies understand the value of taking a long-term approach to cultivating their talent pipelines. Apple, Dell, and IBM have developed or are developing deep partnerships with K-12, which include internships, teacher externships, mentorship, and sometimes assistance with curriculum development. This is the type of employer engagement that school districts would like to see more of.

3. Technology training is drawing fewer students than other industries, such as healthcare

Some workforce training programs and educational institutions report difficulty in recruiting students to technology tracks, especially among low and moderate-income workers. Students from these backgrounds have more familiarity and interest in industries such as healthcare. Most of the trainers reported having additional capacity in their technology training programs.

For those programs that are specifically targeted to low and moderate-income workers, recruitment for IT and computer science programs has required a great deal of effort as this pool of workers has a low level of awareness of career in these fields. In addition, the lack of diversity in the sector can discourage some of these workers. One trainer described their clients as having "imposter syndrome" when they visited technology workplaces—they could not see themselves there.

Pipelines for tech talent need to be primed earlier so a diverse pool of students starting in K-12 have more exposure to the opportunities in the technology-related fields.

4. Mid-career adults are showing an interest in building their technology skills to transition careers

Technology training programs across the board reported that a high percentage of their students were mid-career professionals seeking to upskill or to re-tool their skills to transition careers. At Austin Community College, for example, approximately 75 percent of students in their Accelerated Programmer Training already have bachelor's degrees and some work experience. Interest from mid-career adults presents a significant opportunity for tech talent, as these professionals often possess the soft skills and professional experience that companies are seeking.

5. Low- and moderate-income individuals have distinct barriers to technology careers and training

Low and moderate-income individuals may have difficulty accessing the opportunities in the technology industry due to unique barriers, including cost of training and less experience identifying training opportunities.

The cost of technology training among the private trainers interviewed runs from \$10,000-\$15,000, with the exception of Austin FreeNet, which offers both free and sliding scale services, and Capital Idea. Other providers, who are not TWC eligible training providers, offered few or no opportunities for scholarship or subsidy, and Pell Grants do not apply to many of the short-term bootcamp style programs. Most trainers acknowledged the barrier for some individuals and have developed payment plans to assist with cash flow; some boot-camps have created dedicated scholarship funds for students from under-represented populations or have begun to offer Income Share Agreements. Additionally, some entities have developed both full-time and more flexible, part-time tracts, so that students can work while attaining training and certifications. However, the price tag precludes many low and moderate-income individuals from participating.

A bright spot is the increasing number of free online trainings. With proper marketing, this could provide an opportunity for lower-income people to access needed training services.

Another challenge for some people who don't possess a four-year college degree is exposure to the opportunities. For example, University of Texas has the largest technology training programs when combining the Professional Education Program and programs offered through McCombs School of Business. However, an estimated 85% of the students in these programs already possess a four-year bachelor's degree.

6. Technology employers can be difficult to engage

Employer engagement was a difficulty that many trainers and educational institutions encountered. Whether input on their curriculum, speakers in their classroom, or internships for their students, trainers encountered some difficulty developing meaningful relationships with employers of tech talent.

One source of the challenge is that trainers are all doing their own employer engagement, which lacks cohesion. The same people and employers are often are asked to assist. Additionally, the requests for assistance may not be clearly articulated.

Many employers of tech talent were not aware of all of the different programs that are offered or found it difficult to locate the appropriate contact when they did want to engage.

APPENDIX B. CASE STUDIES

The following five case studies from around the country provide a variety of instructive roadmaps for forming an effective Capital Area Technology Workforce Coalition (CATWC) in our region. Each of the geographies, Dallas, Phoenix, Denver, Washington State, and Northern Virginia, took a tailored approach to bridging the gap between the talent needs of their growing technology industry, and the skills of a diverse workforce.

All launched within the last five years, the long-term impact of the initiatives is still being realized. However, they have each made meaningful inroads in aligning and diversifying their talent pipelines. Additionally, a few common themes and lessons have emerged.

First and foremost, engaged employers at the appropriate level of decision-making were deemed paramount to success. When companies relegated participation to administrative staff who didn't have decision-making authority, efforts faltered.

Second, clear and achievable goals helped motivate participants and attract new employers to the initiatives. Rather than setting big, audacious goals, the efforts started with easier wins, in order to prove out the model. This approach to managing expectations resulted in building credibility and buy-in for the initiatives, and has allowed them to learn while they grow.

Lastly, most of the partnerships have been involved in improving educational capacity and program offerings. They did this by working with regional higher education institutions, attracting new nonprofit training providers, and piloting new models of education, such as apprenticeship.

This section ends with a description of four nonprofit initiatives that have achieved meaningful success in significantly increasing the salaries of low-wage workers who may have faced socio-economic barriers to advancement. Through providing both hard skills and soft skills training and providing support to workers as they embark on new careers, these nonprofits have learned key lessons in preparing under-represented populations for high-demand jobs in a variety of sectors, including technology.

These collaborations have achieved win-win scenarios for companies constrained by talent shortages, and for workers that are working below their skill and salary potential. The result can be more prosperous opportunities for all.

APPRENTI, A PROGRAM OF THE WASHINGTON TECHNOLOGY INDUSTRY ASSOCIATION

HISTORY/FORMATION

Apprenti was founded in 2015, under the umbrella of the Washington Technology Industry Association (WTIA), a co-op of 1,000 Washington State tech companies. The program impetus was the dramatic tech talent shortage in the state leading to rising costs of talent acquisition and the disconnect between the qualifications that local tech companies needed and what state training, certificate, and degree programs were producing.

In phases, WTIA convened key stakeholders such as the largest tech employers in the state (including Amazon and Google) to determine the necessary hiring and education requirements for various tech positions with an emphasis on determining which positions need a college degree and which do not ("competency over pedigree"). Separately, WTIA brought together community partners (including the Women's Funding Alliance and National Urban League) to determine barriers to entry in the tech industry in terms of diversity and skills assessment. Out of these conversations, the Apprenti program officially launched in November of 2016 "to create a new talent pipeline for the industry and to help solve the [tech sector] diversity dilemma." The Apprenti apprenticeship program is currently operating in 13 states and 15 markets. Apprenti is working to scale the program nationally.

PARTICIPATING EMPLOYERS

Today, there are 77 participating employers involved across 13 states.

MAIN ACTIVITIES OR INITIATIVES

Apprenti places underrepresented populations such as veterans, women, and minorities in paid apprenticeships in the tech industry, regardless of educational background. The 18-month program combines paid, on-the-job training and education for placement in high-skill tech positions (typically mid-tier jobs). Apprenti takes on a number of critical roles in this process, including:

- Standard holder. Apprenti manages the standards of apprenticeship and assumes the administrative burden of filing all required paperwork with the appropriate federal and state agencies (e.g., GI Bill certification, state agency benefits, unemployment, Department of Labor requirements).
- Attracting diverse talent. Apprenti engages in outreach to potential applicants, conducts online screening assessments and interviews candidates, and then sends screened candidates to be interviewed by participating employers.
- Employer consultant. Apprenti provides mentoring and coaching to participating employers throughout the life cycle of the apprenticeship (e.g., interview training, operationalizing the apprenticeship within the corporate culture of each employer, assistance with internal HR hiring hurdles.
- Manager of affiliate relationships. Of the 15 markets in which the program is operating, Apprenti operates the program directly in eight markets, while a local affiliate operates the program in seven markets (usually the local tech association or chamber of commerce).
- Manager of RFP, funding, and contract processes with local training entities. Apprenti oversees the contracting process, pulls together funding from city, state, and federal levels to subsidize classroom training costs, and ensures that the training meets employers' expectations and needs.

OUTCOMES

- 84% of applicants are from diverse populations. 82% of those placed with employers are from diverse populations (32% women; 54% people of color; 56% veterans; and a subset of 10% people with disabilities).
- Median age is 33 (youngest 18 and oldest 63).
- ▶ 29% of placements were unemployed coming into the program.
- Pre-median salary of \$38k. During apprenticeship earning up to \$54k. After 18-month internship process, retained salary of \$82k.
- Retention rates are the same with a degree and without: 80%.

LESSONS LEARNED

- Across the health care, financial services, and IT fields in Washington State, only 40% of tech jobs were found to require a four-year Computer Science degree or higher, while 60% of tech jobs did not require this degree. However, the apprenticeship pathway doesn't replace internships or the need for college; it is an additional pathway.
- "Competency over pedigree" is a successful recruitment, screening, and employment method.
- The Apprenti model requires a great deal of resources, oversight, and skilled management.
- The main programmatic challenge they have faced is the desire of tech companies to move quickly. Most companies want a shorter apprenticeship period (6 months or less), but the classroom training period is essential. A 1-2-year model is more realistic and successful.
- The greatest challenge, even when a company agrees to participate, is the time to get the employer onboard. The internal dynamics of apprenticeship can be challenging within traditional HR processes. Need buy-in at all levels.
- Direct markets tend to move more quickly than affiliate markets (largely determined by available resources: staffing & financial)
- Non-technical companies tend to adopt quicker than tech companies.
- Key challenge for apprentices is not the work, but the learning-curve associated with adapting to each employer's corporate culture, equipment, and processes. Greater success is achieved when the employer engages with the apprentice in these areas during the training period.

NORTHERN VIRGINIA TECHNOLOGY COUNCIL

HISTORY/FORMATION

The Northern Virginia Technology Council (NVTC), the biggest technology council in the U.S., is the membership and trade association for the Northern Virginia tech community. NVTC has a membership of approximately "1,000 companies from all sectors of the technology industry, as well as service providers, universities, foreign embassies, non-profit organizations and governmental agencies." NVTC's efforts focus on "connecting companies with potential customers and partners, building and accessing the technology workforce, and ensuring a strong environment for innovation and growth."

PARTICIPATING EMPLOYERS

Today, there are \sim 610 participating tech employers. 20+ employers participate in the Tech Talent Employer Collaborative.

MAIN ACTIVITIES OR INITIATIVES

- The Tech Talent Initiative (TTI) was developed in 2017 to respond to the workforce challenges facing area tech companies. 2019 activities included:
 - "...Tech Talent Employer Collaborative (TTEC), which uses the U.S. Chamber of Commerce Foundation's Talent Pipeline Management (TPM) methodology to create a business-driven self-sustaining model that addresses the regional technology workforce gaps, both in skills and capacity." The goal is to decrease the cost of finding the "right" talent. "The TTEC is addressing the development of workforce skills, certifications, and competencies for software development, cybersecurity, data analytics, and network infrastructure."
 - "In partnership with Career Pathways for Individuals with Disabilities (CPID), NVTC helped to support the relatively untapped talent pool of individuals with disabilities and Veterans, addressing recruitment, hiring, and training, assistive technologies, and disability etiquette through social media, email promotions, and speaking opportunities for CPID staff, as well as NVTC staff participation on conference panels and solo speaking engagements highlighting NVTC's original research into employers' skills, competencies and certification requirements."
 - "Talent Ready Initiative, an effort to provide more opportunities and access for individuals who lack a fouryear college degree to gain employment in the IT field. NVTC is playing a strong supporting role on an initiative to develop an employer signaling system that will guide skills development for sub-baccalaureate job opportunities...."
- The Veterans Employment Initiative (VEI), which started in 2013, "provides tools and resources to match Veterans and military spouses with jobs, internships, mentorships and certifications, while also providing support to member companies in their efforts to hire, train and retain qualified Veteran employees." Highlights include:
 - "The VEI online career site www.USTechVets.org (USTV) is powered by Monster.com/Military.com and includes a searchable database of jobs at NVTC and the Consumer Technology Association (CTA) member companies, a skills translator to match military expertise to jobs in the civilian sector and educational resources and tools."
 - "The VEI also provides jobseekers with a personal and professional development program through VETWORKING, which aims to better prepare a job seeker for success in their career transition."
 - "The NVTC Foundation, in partnership with the Northern Virginia Community College Foundation, established four scholarships directed at Veterans and military spouses supporting ... technology-related education credentials...."

OUTCOMES

- The TPM model helped them move into action.
 - > They have identified new sources of talent and are exploring new training models.
- ▶ The Veterans Employment Initiative has placed 17,000 veterans in the past 6 years (2013-2019).

LESSONS LEARNED

- Started with producing valuable research, which has been enhanced with the TPM model.
 - Exploring highest demand positions (Software Development, Cybersecurity, Data Analytics, Networking, Data Center Infrastructure) and the skills requirements in these areas. Found that most employers are fine hiring people without 4-year degrees but can often get higher quality candidates with that filter on.
 - Differentiate between what employers want ideally and what they need.
 - Created job templates and demographic attributes.
- Successful use of the U.S. Chamber of Commerce Foundation's Talent Pipeline Model (TPM), which is employerled and determined. The initial pilot was funded by the US Chamber Foundation. The model's use is ongoing and has produced value-added benefits for members:
 - Talent Flow Analysis was very insightful
 - Talent flow analysis is when they started to lose people. This was the heaviest ask of the employers and where it became so important for the employer buy-in to be very solid.
 - Some untapped wells (previously missing community college and other local institutions).
 - Veterans have security clearance and that is a needed attribute for many employers.
 - Best-practices and knowledge-sharing among the members has been valuable
 - Helped them move into action from just a typical workforce committee
- Recruitment of employer members relied heavily on a strong, working board. Started with software development and cybersecurity, and invited employers.
 - It was critical to have a group of a half dozen really committed employers. Also, have a co-facilitator that is an industry expert (paid position). Members are largely Senior Talent Acquisition leaders that can speak to the requirements and needs of the organization.
- Apprenticeship could be a valuable tool.
 - In January 2020, kicked off the first cohort of the Cybersecurity (includes some software development and some network security) Apprenticeship Program to cultivate more interest in this field. Local community college creates the curriculum.

GREATER PHOENIX CHAMBER OF COMMERCE

HISTORY/FORMATION

The Greater Phoenix Chamber of Commerce became involved in sector-based, local economic development efforts in response to membership requests to "grow and expand" the local economy. These efforts were channeled into a unique initiative developed by the Chamber in 2015 – Phoenix Forward – a "coordinated, strategic approach to economic development that brings the resources of [their] collaborative partnerships with the Arizona Commerce Authority, City of Phoenix and Maricopa County [particularly community colleges] to the front doors of businesses." Targeted sectors include: Advanced Business & Financial Services, Bioscience, Health Care, and Transportation & Logistics. Today, the Greater Phoenix Chamber Foundation, established in 2016, convenes a total of "four employer-led workforce collaboratives" to address local skills gaps in the areas of Construction, Cybersecurity, Financial Services, and Health Care: Hospitals.

PARTICIPATING EMPLOYERS

Today, there are 200+ participating employers across the four target sectors.

MAIN ACTIVITIES OR INITIATIVES

- Utilizing the U.S. Chamber of Commerce Foundation's Talent Pipeline Management (TPM) model, the employerdetermined and employer-led collaboratives across the four sectors focus on:
 - Matching educational training to needed job skills.
 - Providing workplace apprenticeships and internships to train workers in needed roles/positions.
 - Advancing career awareness and opportunities for underrepresented populations in each focus industry.
- The Foundation is currently trying to launch a new sector partnership, the IT collaborative. Efforts are underway to secure funding for the IT workforce collaborative to support and advance the goals of area companies for whom IT is a core function in their businesses. This sector will expand on the current companies participating in the Cybersecurity workforce area and the knowledge gained from this collaborative.

OUTCOMES

- The Cybersecurity sector collaborative is focused on filling the 6,000+ vacant cybersecurity positions in Arizona. 2019 highlights:
 - The Estrella Mountain Community College was designated a "National Center of Academic Excellence (CAE) in Cyber Defense Two-Year Education by the National Security Agency and the Department of Homeland Security."
 - "Launched Apprenti Arizona, an apprenticeship program for mid-level cybersecurity talent."
 - "Formed a joint advisory council with Maricopa County Community College District (MCCCD) to streamline efforts for employers to communicate necessary changes in curriculum."
 - Conducted a competency review for cyber professionals and identified and communicated significant changes in hiring requirements to education and training providers for better talent preparation."
- The Construction sector collaborative is focused on a construction careers awareness campaign to respond to the projected 155,000 construction trade positions that are estimated to be vacant in Arizona through 2022.
 - With nearly \$2 million in construction sector investments, the "Build Your Future Arizona campaign will highlight the value of skilled trades careers, the career entry points, and the diverse range of positions and trajectories available to all individuals."
- The Financial Services sector collaborative "launched the Financial Industry Training (FIT), a month-long program to prepare individuals to pass the initial exam toward licensing, the Securities Industry Essentials Exam (SIE).
 - In addition to exam preparation, FIT participants are introduced to top industry employers and receive support with resume and interview preparation."

- This program is increasing diversity in the financial services sector. Among FIT enrollees, 48% are women; 25% are veterans; and 59% are minorities.
- The Health Care: Hospitals sector collaborative has focused on the need for training in specialty nursing, including operating room, emergency room, ICU, telemetry, oncology, and home health nursing.
 - The Chamber Foundation identified a lack of training programs in these areas and "secured \$5.8 million in funding from the legislature to fund needed infrastructure" at Maricopa Community Colleges to support new programs.

LESSONS LEARNED

- Who you invite to the table is extremely important.
 - The Talent Pipeline Management model emphasizes employers-only, and this has been a key to the Chamber's success in organizing the partnerships.
- It is important to prioritize employers' needs/priorities:
 - Gather data Where they are sourcing their talent and what do they need?
 - Industry sectors may choose an awareness campaign or competency mapping.
- Thus far, the Chamber's efforts have focused on developing new programs, but the Chamber would like to focus in the future on improving the quality of existing training programs as well.
- The "wins" really help galvanize the groups.
 - For example, in the healthcare group, they secured \$6 million in funding to build simulation facilities needed for training. They never would have received this funding were it not for the broader collaborative. More employers are wanting to come to the table after seeing this success.
 - They had similar positive outcomes in financial services. Previously, the sector was not partnering with community colleges. The Chamber created a new training program for women, minorities, and veterans entering into the financial sector. The Chamber collaborated with community colleges to create the program and engaged in initial program recruitment. Today, the program is transitioning to a for-credit institutionalized offering at community colleges.

PATHWAYS TO WORK

HISTORY/FORMATION

Pathways to Work, a collaborative initiative established in 2015 and led by the United Way of Metropolitan Dallas, is a "cross-sector collaboration of funders, employers and training providers working to create innovative solutions for moving entry-level workers into good middle skill jobs and ensure employers have a pipeline of skilled and ready-to-work employees." This regional collaborative is among 32 in the nation that are supported by the National Fund for Workforce Solutions, which brings "together diverse partners to tackle workforce challenges and build stronger communities." The focus on middle skill jobs is due to employer demand, relatively high pay (median hourly wage of \$24.47), and the fact that they require education beyond high school, but not a four-year degree.

PARTICIPATING FUNDERS

Today, there are 73 participating partners.

MAIN ACTIVITIES OR INITIATIVES

Pathways to Work focuses on two sectors, Healthcare and Information Technology. The sector collaboratives have three main objectives and a variety of initiatives under each objective:

- Convene "thought leaders to develop innovative training strategies that move entry-level workers onto middleskill career paths."
 - Advisory Group
 - Funder Forum
 - Healthcare Consortium
 - Tech Industry Partnership
- Invest "resources that help workers build basic and technical skills and wrap-around support so they can secure and retain middle-skill jobs."
 - Apprenti (tech apprenticeship program)
 - Education at Work ("job skills training and educational opportunities to eligible Parkland [Health & Hospital System] employees, allowing them to learn while continuing to work to support their families.")
 - IT Support Training (Per Scholas program)
 - Patient Care Tech (healthcare training programs)
 - Technology Service Corps (NPower, tuition-free training and career transition program for military veterans and spouses)
- Build "capacity of funders, employers, and community workforce programs that results in more workers being able to meet their employment and education goals."
 - Leadership Academy ("strengthens the capacity of Dallas area leaders to think critically about economic challenges and develop sustainable solutions to address those challenges")
 - Workforce Benchmarking ("helps community-based workforce developments programs serving Dallas and Fort Worth use client data to make improvements or drive innovation")
 - Career Pathways Network ("helps local adult literacy programs [develop] tools and resources to help lowliterate adults through bridge programs or career navigation services")

OUTCOMES

Since 2015, Pathways to Work has:

- Invested a total of \$2.9 million.
- Served 911 individuals.
- Supported 733 certifications/degrees earned.

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- Made 577 job placements.
- Engaged 73 partners.

LESSONS LEARNED

- Decide what position/job category you are focused on and let that drive employer engagement (i.e., focus outreach to employers hiring those positions).
- IT work has been difficult because the sector is so vast.
 - Achieved the most traction investing in IT Training programs that include "deep and meaningful employer engagement," such as NPower (training and career transition program targeting veterans and spouses), Per Scholas (tech training program), and Apprenti (tech apprenticeship program).
 - Building important connections between small businesses (<200) and IT training providers.</p>
 - Innovation Lab working with cohort of five companies (JPMorgan Chase, Federal Reserve Bank, Alchemy Technologies, Dallas County Community College District, and Cognizant) around competency/skill-based hiring, rather than requiring a bachelor's degree and on-the-job experience.
 - Partnered with Skillful Initiative to train employers. Participating employers have enjoyed the training but have been a little bit reluctant to put strategies into practice.
- Healthcare partnership has taken off, but the industry association has really served as a foundation.
 - Informally, started planning events together and learning from other industry partnerships. Eventually, a hospital said they wanted an industry partnership, so Pathways to Work started one up using that hospital as the champion.
 - Formally, they fund the industry association. The industry association:
 - Does the convening.
 - Has a contract with deliverables.
 - Focuses on specific jobs and collects all the data from the hospitals.

TECH TALENT DENVER

HISTORY/FORMATION

Tech Talent Denver, a "convening body connecting member companies with strategic talent pipeline efforts", was founded in 2017. The initial working group that became Tech Talent Denver was convened by the Colorado Technology Association (CTA), the state's premier nonprofit tech organization. CTA is a membership association of more than 400 members and a network of 18,000 tech leaders statewide. CTA membership provides "a forum for business development and civic engagement, opportunities for professional development and access to influential thought leaders." The Workforce Division within the City of Denver, Economic Development & Opportunity, assumed a role fairly early on in the process, but was not at the table at the outset. In 2019, two years after Tech Talent Denver's inception, CTA and the City of Denver decided to add on Jefferson and Arapahoe/Douglas Workforce Center) as additional Tech Talent Denver conveners with the goal of tapping into industry crossover and creating a broader reach across the state. Tech Talent Denver is currently organized by these four ongoing conveners and two tech industry co-chairs (serving one-year terms).

PARTICIPATING EMPLOYERS

Today, there are 85 participating employers on the roster; of these, about 45 are active participants.

MAIN ACTIVITIES OR INITIATIVES

Tech Talent Denver is a fairly new initiative. A key initial accomplishment was the formation of the group and getting the sector partnership off the ground. To date, the group's broadest reaching and most successful initiative has been the development of the statewide Tech Talent Colorado webtool – techtalentcolorado.com – funded by the Colorado Workforce Development Council. The webtool connects the tech industry and public partners across the state through free profiles that facilitate "giving and getting talent." Through the profiles, for example, industry leaders can communicate their tech employment needs, and public partners, like community colleges, can inform industry when they are graduating new cohorts of students in particular tech areas.

In February of 2020, the Tech Talent Denver Leadership Team (made up of the four conveners and two industry cochairs) set the group's goals for the year:

- Create a Youth Awareness Campaign to inform area youth about what tech jobs look like in reality. The focus is on educating and familiarizing the largely low-income student population in Denver-area schools about the tech profession and the types of tech jobs available in the city.
 - One idea under consideration is the creation of an industry-led "road show" that would visit area high schools to educate them on tech professions.
 - Another potential component is a one-day job shadowing program where students would rotate through industry partners to learn about the day-to-day activities and responsibilities of area tech positions.
- Develop a Summer Tech Internship for Youth. Though currently in an infancy stage of development, the goal is to create paid summer internship opportunities in the tech industry for area youth. It is unclear if the model will be a single internship or a rotational-style internship where interns spend three weeks at a time at several companies so they can get a sample of various company cultures and tech positions. A subgroup has been created, the Industry Internship Task Force, to develop and formalize the internship program. While the group hopes to launch this summer, it may not be possible. Initially, interns will be paid from participating employers' payrolls; a funding pool may also be developed eventually to help pay for interns at companies that do not have the internal financial resources.

OUTCOMES

Currently, no outcome data are available, but the group hopes to produce a report by the end of the year on the youth initiatives.

LESSONS LEARNED

Tech Talent Denver was among the first tech sector partnerships in the country. The partnership developed organically, rather than following a specific model (however, partnership efforts were guided by the work of the Colorado Workforce Development Council and the Next Generation Sector Partnerships which have focused on disseminating best practices for developing sector partnerships).

In order to maintain momentum, it is essential to have the right industry leaders and conveners at the table. There was a time when it seemed like the Tech Talent Denver initiative might falter, as they did not always have the right members at the table (for example, sometimes industry leaders would send an admin to represent them and this made decision-making and buy-in more difficult). Tech Talent Denver conveners found that it is important to have industry leaders at the table that are change makers with decision-making power, and to make this a clear requirement of membership at the outset.

Try to focus on 1-2 achievable goals at a time and produce some wins; you can get industry to buy in quicker if you don't make the goals too lofty.

Initiatives are laid out by industry leaders, then public partners are pulled in to give input. It is important to sometimes convene the tech industry leaders separately from public/community partners and to then use notes to inform the full group after the meeting. At meetings where both groups are in attendance, industry leaders are typically seated at the front and get to speak first, then public partners may be asked for input.

The Colorado Workforce Development Council has been a key partner in Tech Talent efforts across the state, providing essential resources and support, especially financial resources. In addition to funding the statewide Tech Talent Colorado webtool, the Council has also funded cross-industry trainings for partners from around the state.

NONPROFIT PROGRAMS

CLIMB HIRE, part nonprofit and part cooperative founded in 2019 by social entrepreneur Nitzan Pelman, prepares motivated workers ages 24-33 to become Salesforce Administrators (a highly marketable skill set with an annual salary of \$45-90k). Applicants are typically minimum wage workers in the San Francisco area who hold multiple jobs and have taken college classes, but do not have a four-year degree. Climb Hire's 200-hour training program, incorporating both online learning and evening/weekend class-based learning, allows "Climbers" to continue working while receiving technical and soft skills training (including interview and self-promotion skills), as well as training on building a professional network. Climbers receive a weekly stipend of \$75 upon completing course work/assignments. The program is free upfront. Once Climbers secure a position paying \$45k+, they help fund the next cohort of Climbers by paying \$150/month for four years. In addition, Climber alumni are co-owners in the Climb Hire staffing agency co-op, earning a share in the company's long-term profits. Among the first cohort of 40 Climbers, 100% are people of color from underprivileged communities.

https://climbhire.co/

https://impakter.com/silicon-valley-insider-climb-hire-the-pay-it-forward-job-training-and-professional-network/

I.C.STARS was conceived in 1998. The organization was inspired by co-founder/former teacher Sandee Kastrul's discovery that one of her most talented former students was working for minimum wage as a housekeeper in a local hotel. With programs currently based in Chicago and Milwaukee (with efforts to expand underway), i.c.stars uses project-based learning and an apprenticeship model to train and place candidates ages 18 to 27 in technology positions. Eligible candidates for each cohort of 20 students must have a high school diploma or equivalent, at least six-months prior full-time work experience, and meet the program's needs-based income guidelines. Among applicants, 15-20 percent are "housing unstable" and nearly 15 percent are "justice-involved." The specialized training program takes two years to complete, beginning with a 16-week project-based internship and continuing with a 20-month residency program upon placement at a company. The overall program includes 1,000 hours of hands-on business experience, professional development, and mentoring in both hard and soft skills. During the initial four-month internship period, students receive a small stipend for transportation and food. During the 2-year residency period, students are paid market wages. The program has an 82% initial placement rate, a 99% alumni volunteer rate, and a 300% increase in average 12-month earnings. While the cost of the program for participants is free, the cost of the program for the organization is \$14,000 per person for the four-month intensive and \$2,500 to \$3,000 per year for the residency.

https://www.icstars.org

https://www.stradaeducation.org/uncategorized/innovator-spotlight-i-c-stars-offers-underserved-communities-bridge-totech-jobs/

https://workingnation.com/i-c-stars-creating-stem-job-opportunities-for-lower-income-adults/

PER SCHOLAS is a nonprofit in multiple states that aims to close the employment gap for women, people of color, and disconnected youth, groups that are highly underrepresented in the IT industry. The organization offers training for IT jobs, like IT support and network support, with associated industry certifications, such as CompTIA A+ and CompTIA Network+. Programs last between 10 and 15 weeks and are free. These certifications qualify graduates for middle-skill computer occupations with an average salary of \$20.30/hour. Per Scholas has also created its own digital training platform for additional positions, including Big Data programmer analyst, quality engineering, and data engineering to keep up with local needs. Over their 23-year history, Per Scholas as trained 9,000 individuals. The program has achieved the following outcomes: 85 percent of the students graduate, 80 percent of the graduates find jobs in a training-related field, and graduates earn a starting wage of \$17+.

https://perscholas.org/

https://evidencebasedprograms.org/document/per-scholas-evidence-summary/ https://perscholas.org/assets/press/Per-Scholas-2018-Annual-Update.pdf

SV ACADEMY, founded in 2017 by tech executives Joel Scott & Rahim Fazal, offers candidates a four-week SV Academy Business Development Fellowship leading to an entry-level Sales Development Representative (SDR) role with an employer partner paying an average starting salary of \$79,000. In addition, seventy percent of placed graduates receive promotions within their first year. SV Academy's fellowship is employer-sponsored, so students pay nothing. Given this, fellows must commit to giving their all during the training program and complying with all fellowship rules; accept employment only with an SV Academy employer partner; and upon accepting a position with an SV employer,

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give their all in the role for at least a year and remain an active SV Academy member. After the four-week, online training and development program, candidates must relocate to San Francisco or New York to be placed with one of the 200 employer partners. During the interview process, SV Academy works with candidates to support them as they interview with a number of employer partners to find the best fit. Then, once in their new role, SV Academy provides professional development and regular career coaching support to fellows during their first year on the job, in addition to ongoing networking opportunities. Currently accepting applications for its 33rd cohort, SV Academy has generated more than \$40 million in full-time starting offers for their graduates. Graduates are from diverse and underrepresented populations: 60% of graduates are women, 40% are African American/Latinx, and 70% are first-generation college students.

https://sv.academy

https://www.stradaeducation.org/pathways-with-purpose/strada-furthers-mission-through-sv-academy-investment/ https://www.linkedin.com/company/svacademy/about/