

NOVEMBER 2018



ASSESSMENT OF MIDDLE AND ADVANCED SKILLS

INFORMATION TECHNOLOGY

EL PASO COUNTY, TX

ACKNOWLEDGMENTS

TIP Strategies would like to thank the following individuals and their organizations for participating on the executive committee and in this planning process.

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INTRODUCTION

The Borderplex Alliance's Borderplex 2020 is a regional effort led by business and community leaders that is dedicated to driving economic growth and building quality of talent, industry, and place. A critical piece of this effort focuses on workforce development—specifically, finding a way for lower-wage workers to transition to middle-skill and advanced-skill careers in alignment with the county's target industries. The potential for career advancement via middle-skill occupations—those that require at least a high school diploma but less than a bachelor's degree—is a key strategy in bolstering the competitiveness of the regional workforce. Furthermore, advanced-skill occupations—those that require a 4-year degree or higher—are vital to attracting and retaining industry.

STRATEGIC RECOMMENDATIONS FROM PREVIOUS SKILLS GAP ASSESSMENT

In the 2017 skills gap assessment for the Life Sciences and Advanced Manufacturing sectors, there were a number of strategic recommendations aimed at addressing county workforce challenges. These recommendations are summarized here.

1. Addressing wages
 - 1.1. Raise awareness of the benefits to employers of raising wages.
 - 1.2. Support locally based employers in strengthening company culture to support talent retention and attraction.
2. Transitioning the workforce
 - 2.1. Engage and assist employers in upskilling their workers and formalizing their on-the-job training programs.
 - 2.2. Strengthen the employability skills of the next generation of workers.
3. Leveraging assets for growth
 - 3.1. Convene leadership in the local manufacturing community to create an employer-led association or partnership as a vehicle for industry collaboration and input.
 - 3.2. Continue to cultivate existing business relationships and build new relationships with additional employers.
 - 3.3. Leverage the regional higher education assets and research infrastructure to encourage innovation and entrepreneurial growth.
 - 3.4. Nurture the expansion of manufacturers with a current presence in El Paso and Juárez.
 - 3.5. Work with the Texas Manufacturing Assistance Center (TMAC) at the University of Texas El Paso to build the region's capacity to provide technical assistance to manufacturers.
4. Connecting residents to in-demand jobs
 - 4.1. Enhance career exploration activities for students and their parents with employer participation.
 - 4.2. Provide career counselors, case managers, and career navigators with good information about in-demand careers and resources available to support their efforts.
 - 4.3. Make it easier for employers to connect with workforce training providers and their work-ready clients.
 - 4.4. Help connect employers with educational institutions and students.
 - 4.5. Partner with education and training providers to ensure that educational training programs are well-aligned with industry needs.

The report can be downloaded at borderplexalliance.org/workforce/workforce-skills-assessments

To support these efforts, the Borderplex Alliance, in partnership with Workforce Solutions Borderplex, Microsoft, and the JPMorgan Chase Foundation, hired TIP Strategies to conduct a workforce analysis focused on information technology as a cross-industry function and talent cluster. This study is a continuation of a series of studies that have been completed on business services, advanced logistics, advanced manufacturing, and life sciences.

The assessment that follows focuses on anticipated Informational Technology skills and occupational needs and the educational infrastructure and talent pipeline to support them. The assessment highlights the key findings from the analysis and makes recommendations on how the Borderplex Alliance and its partners can work to improve the alignment of the talent pipeline with the needs of employers in El Paso County. The appendices include the detailed workforce assessment of the information technology (IT) talent cluster and a number of resources that can serve as references for this ongoing effort. Note: this study does not include an assessment of the El Paso area innovation and entrepreneurial ecosystem.

FINDINGS FROM THE WORKFORCE ASSESSMENT

Information technology (IT) involves “the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data.”¹ For the purpose of this study, the information technology talent cluster is the set of occupations that carries out these activities. The cluster consists of 35 different occupations and cuts across almost every industry. Computer and mathematical occupations comprise the bulk of the talent cluster, but it also encompasses data-enabled analysts and data scientists, who are often part of business and financial operations; digital media occupations; and entry-level occupations that are related to information management.

The El Paso County IT talent cluster employs more than 9,000 workers across all industries. The occupation with the largest number of workers in 2017 was computer user support specialists. The next largest occupational groups are business operations specialists (all other) and computer occupations (all other). These are occupational groups that capture new and emerging occupations, such as digital marketing and e-commerce, IT project management, data architect, and business intelligence analyst.

A Growing Talent Cluster with a Positive Outlook

The IT talent cluster grew nearly 7 percent between 2007 and 2017, which was a little more than half the growth rate of the county’s economy overall (14 percent) and less than the US IT talent cluster (12 percent) over the same period. However, over the next 5 years, the growth of the **El Paso County IT talent cluster is expected to accelerate to almost 9 percent**, which is in line for projections for the US IT talent cluster over this time period.

INDUSTRIES THAT USE IT TALENT

The industries in El Paso County that are the top five users of IT talent.

INDUSTRY SECTOR
1. Federal Government
2. Computer Systems Design and Related Svcs
3. Education and Hospitals
4. Data Processing, Hosting, and Related Svcs
5. Business Support Services

The industries in El Paso County that are most dependent on IT talent.

INDUSTRY SECTOR
1. Computer Systems Design and Related Svcs
2. Software Publishers
3. Data Processing, Hosting, and Related Svcs
4. Specialized Design Services
5. Electronic and Precision Equipment Repair and Maintenance

¹ As defined by Merriam-Webster Dictionary. See <https://www.merriam-webster.com/dictionary/information%20technology>.

Currently, the occupations with the most job postings are computer user support specialists, network and computer systems administrators, and the two catchall IT occupations—computer occupations (all other) and business operations specialists (all other). Each occupation encompasses various job titles. Within the job postings, top job titles were data entry clerk, project manager, and system administrator. The average posting duration for IT jobs has been less than 30 days and there are 85 employers competing for these positions. For comparison purposes, in large IT markets, such as the San Francisco Bay Area, New York, or Austin, the posting duration is beyond 30 days with hundreds of employers competing for talent. The longer posting duration can be an indicator of greater hiring difficulty.

A Small but High-Quality, Local Talent Pool; Low Wages Remain a Challenge

In conversations with El Paso County-based employers of IT talent, a number of strengths and challenges were highlighted. Employers highlighted the strong work ethic of workers in the county, in general. In addition, they **ranked the workforce highly for trainability, adaptability, and productivity**. Fort Bliss and Juarez were celebrated as sources of labor. In addition, for those employers who adhere to a national pay scale for recruiting talent, they mentioned that the county's cost of living was a huge advantage.

El Paso County has a combined challenge of a small, IT talent pool and a rapidly growing IT sector. As a result, "poaching" is an issue among local employers. Another related issue is an **experience gap**—within the local IT talent pool, there are not enough experienced workers to manage entry-level talent, which means experienced IT workers must be brought into the market. Furthermore, wages offered for IT positions in El Paso County are often significantly lower than what is offered in other markets around the US. In about half the IT occupations, the El Paso County median hourly wage is more than 20 percent less than the US median hourly wage. Therefore, attracting talent to El Paso County and retaining talent graduating from educational institutions is difficult.

FIGURE 1. COMPARATIVE MEDIAN HOURLY WAGES BY IT OCCUPATIONS

SOC CODE	DESCRIPTION	EL PASO COUNTY MEDIAN	US MEDIAN	RELATIVE TO US MEDIAN (US=1.00)
15-2041	Statisticians	11.79	38.86	0.30
27-1014	Multimedia Artists & Animators	13.17	22.84	0.58
15-2031	Operations Research Analysts	23.47	38.10	0.62
13-1051	Cost Estimators	18.17	29.28	0.62
43-9021	Data Entry Keyers	9.31	14.67	0.63
15-1133	Software Developers, Systems Software	34.35	50.96	0.67
13-2051	Financial Analysts	26.56	39.16	0.68
15-1111	Computer & Info. Research Scientists	38.14	53.76	0.71
15-1121	Computer Systems Analysts	29.42	41.38	0.71
15-1132	Software Developers, Applications	33.97	47.66	0.71
43-9031	Desktop Publishers	15.00	20.85	0.72
15-1122	Information Security Analysts	34.44	44.52	0.77
27-1011	Art Directors	18.54	23.95	0.77
15-1131	Computer Programmers	28.98	37.19	0.78
15-1134	Web Developers	21.81	27.45	0.79
15-1142	Network & Computer Systems Admin.	30.47	38.15	0.80
15-1152	Computer Network Support Specialists	24.61	30.17	0.82

SOC CODE	DESCRIPTION	EL PASO COUNTY MEDIAN	US MEDIAN	RELATIVE TO US MEDIAN (US=1.00)
15-1143	Computer Network Architects	39.46	48.33	0.82
15-1199	Computer Occupations, All Other	33.38	40.72	0.82
43-9011	Computer Operators	16.91	20.59	0.82
15-1141	Database Administrators	33.78	40.72	0.83
15-1151	Computer User Support Specialists	19.83	23.77	0.83
27-1024	Graphic Designers	16.92	20.26	0.84
11-3021	Computer & Info. Systems Managers	55.40	64.78	0.86
13-1161	Market Research Analysts & Mktng. Specialists	26.99	29.92	0.90
27-4032	Film & Video Editors	25.78	28.23	0.91
49-2011	Computer, ATM, & Office Machine Repairers	15.72	16.91	0.93
13-1199	Business Operations Specialists, All Other	33.23	33.40	1.00
27-3042	Technical Writers	32.14	32.29	1.00

Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

Not Enough IT Graduates from El Paso County Educational Institutions to Fill Projected Openings

Over the next 5 years, Emsi, a leading proprietary provider of labor market data, projects the IT talent cluster to have more than 4,700 openings or 950 openings each year. Openings include new positions and replacement jobs. Replacement jobs are open because a worker has left the occupation for reasons including retirement, changing occupations, or dropping out of the labor force. **Of these openings, about 65 percent typically require a bachelor's degree or higher** for entry into the occupations. It is not known how many of the openings will likely require entry-level talent.

The county's educational institutions graduate almost 500 students in IT-related fields of study each year. **Of these graduates, about 41 percent are graduating from a bachelor's degree program or higher.** The University of Texas at El Paso (UTEP) offers 4-year programs and graduate studies. Vista College and El Paso Community College (EPCC) award about 80 percent of the IT degrees that are associate's degrees or less.² In addition, the county's school districts offer career and technical education courses in computer maintenance and computer networking. A number of training providers also offer nondegree programs and industry certificates in IT-related specialties. EPCC and Western Technical College offer customized training solutions and Fab Lab El Paso offers courses, such as full stack development, Ruby on Rails, and social media marketing.

In all, there is a full range of pretraining and retraining/upskilling resources to support the development of the local talent pipeline and a strong university-based computer science program, but **capacity, enrollment, and retention prove challenging**. The available completions data indicate that there are not enough students from IT programs. Furthermore, El Paso County-based employers noted that many computer science graduates from UTEP move out of the county for work. In addition, there are educational programs that are typically outside of IT, such as business administration, finance, and marketing, where IT skills like data science and analytics have become core skills. But these core IT skills have not yet been fully integrated into the educational programs; they often are certificate programs or concentrations rather than required coursework.

² Some of the students graduating from these programs already hold a bachelor's degree.

Rapidly Evolving Skills Pose a Challenge for Traditional Training Providers

The rate of technological change means that IT occupations are constantly evolving. The rise of cloud computing, the widespread adoption of the Internet of Things, and advent of Big Data are heavily influencing workforce demand in the IT sector, particularly in areas such as cloud architecture, data analytics, and cybersecurity. As a result of this rapid pace of change, it is difficult for educational institutions to keep their programs relevant. **There is a need for efficient and highly responsive communications lines between employers of IT talent and training providers.** Employers must be able to identify their common needs and assess the training infrastructure's ability to meet those needs. Educational institutions also need to engage industry more fully to receive the most up-to-date input to ensure continued relevance of their IT programs. In addition to more responsive feedback mechanisms, there is a need for more dynamic and nimble training models in El Paso County that can meet the training needs of employers that cannot be provided through the existing PK-16 education system.

Potential Training Gaps

To understand El Paso County's IT-related occupational and skills needs, the project team examined occupational projections published by Emsi. Job posting analytics from Gartner Talent Neuron were used to provide insights into current skills requirements and hiring environment. In addition, focus groups and interviews with employers of IT talent and other key stakeholders were conducted to infuse an additional layer of qualitative information, and a survey of employers of IT talent collected a more standardized dataset. Finally, a forward-looking set of trends affecting the demand for IT talent were identified. This information was combined to develop a multi-dimensional understanding of occupational and skills needs.

Next, the team compiled an inventory of available training programs and conducted interviews and a focus group with education and training providers. We, then, compared this information to the skills and occupational needs to identify potential training gaps.

Three potential gaps emerged:

- **Integrating IT in the core business curriculum** is essential to arming students with the skills to manage and analyze datasets in ways that provide insights to data-driven organizations. Financial analysts, market research and marketing analysts, and operations research analysts have a common set of skills needs that includes data management and extraction, basic statistics and data analysis, and data visualization and analytics platforms. A course that covers these basic skills should be a required element of any business curriculum.
- **Middle- and advanced-skill occupations related to digital media and interaction design** – web developers, desktop publishers, graphic designers, multimedia artists, film and video editors – also have few program offerings specific to digital media such as Web, mobile, computer graphics, interactive, and other digital arts. The existing programs seem to be oriented toward more traditional media rather than those that support online and mobile digital content.
- **More specialized curricula in software development and DevOps** at the undergraduate level or as continuing education would potentially support a deeper regional expertise in the development of secure software and systems. The majority of the programs that match with software developers and programs are more general computer science programs.

STRATEGIC RECOMMENDATIONS

IT talent is critical to the success of El Paso County's economy. The continued digital transformation of industry and the digitalization of jobs means that the importance of the IT workforce and the digital skills of all workers will only increase in El Paso County.

To strengthen the talent pipeline and grow the IT talent pool, four strategies were identified.

1. Establish a technology council.
2. Strengthen the regional IT talent pipeline and infrastructure.
3. Support employers in sourcing, recruiting, and retaining IT talent.
4. Deliberately build expertise and critical mass in IT.

Strategies and actions for each of these four strategies is presented on the pages that follow. The implementation of each of these strategies will be integral to positioning the El Paso County IT talent cluster for additional growth.

1. Establish a Technology Council

The information technology cluster does not currently have a center of gravity where employers of IT talent convene. There is an active software development Meetup group, and Innovation Frontera provides a nexus for the innovation economy, which is often closely related. However, there is not a formalized forum for mature and established businesses and employers to communicate about their shared needs related to information technology and to collaborate on solutions to their challenges.

In addition, the various information technology education programs have business advisory councils. While these serve as useful mechanisms for input about specific programs, there is not an employer-only conversation focused on IT workforce and other needs.

Technology councils can serve as IT trade organizations. In most communities, the tech councils are active in talent development and recruitment. They also serve as an advocacy organization and often participate in the recruitment of tech talent and employers of IT talent. In addition, it can provide a forum for employers of IT talent to convene, collaborate, and communicate their needs with a unified voice. This forum is an essential component to instilling stronger feedback mechanisms between employers of IT talent and the IT training infrastructure. In every case, tech councils help to anchor the information technology industry and talent cluster.

In Appendix 2, examples of tech councils are highlighted from Tampa Bay, Nashville, Kansas City, and Pittsburgh.

- 1.1. Map roles and responsibilities of El Paso County-based IT initiatives and programs that complement and overlap with a technology council and identify how to best integrate with existing entities.
- 1.2. Identify two or three employer champions who are enthusiastic about the idea and willing to recruit their peers to participate. Ask these champions to be chairs of an initiative to set up a tech council.

IN THEIR OWN WORDS

What trends will have the most disruptive effect on your workforce over the next 3 to 5 years?

1. Network security and cybersecurity
2. Mobile internet, cloud technology
3. Internet of Things

Source: El Paso County Survey of IT Employers (see Appendix).

- 1.3.** With guidance from the champions, decide on how the tech council should be structured. It could be a stand-alone organization or a committee of an existing organization such as the Borderplex Alliance or Innovation Frontera.
- 1.4.** Convene employers of IT talent to identify interested participants and discuss areas of focus. This should be employers only, with the conversation led by the champions and potentially a facilitator. *Note: this could be done using the Next Generation Sector Partnership model. See <http://www.nextgensectorpartnerships.com/>*

2. Strengthen the Regional IT Talent Pipeline and Infrastructure

Although there is a range of IT programs offered in El Paso County, there are not enough students completing the programs and staying in the county after graduation. In addition, the capacity of the existing programs and the program offerings does not seem to be in line with what will likely be demanded. Expanding the range of offerings of both degree programs and certifications programs based on industry demand will improve the pipeline infrastructure. Ensuring the existence of dynamic training models and the appropriate integration of IT skills and digital literacy in existing curricula will also strengthen the pipeline of talent. In addition, a coordinated effort to raise awareness of IT career pathways and local IT jobs can help increase enrollment in the programs. Furthermore, creating opportunities for students to build relationships with local employers can help retain these students after they graduate.

- 2.1.** Through the Technology Council, facilitate a focused discussion on demand for IT talent, current and emerging skills, and competencies for critical occupations common across employers. Once refined, help employers clearly communicate these needs to education and training providers. *Note: the US Chamber of Commerce Foundation Talent Pipeline Management model could be an effective tool. See <https://www.uschamberfoundation.org/talent-pipeline-management>*
- 2.2.** Partner with UTEP, EPCC, and select training providers to ensure that IT programs and certifications have the capacity and curriculum to meet IT demand.
- 2.3.** Refine models for employer-led, rapid-training programs that directly link to emerging, specialized, high-demand skills and jobs. This could be done through the customized training programs offered at EPCC and Western Technical College or through private programs. (See Appendix 2, Case Studies, Rackspace Open Cloud Academy and Per Scholas on page 94 for additional ideas.)
- 2.4.** Advocate for the integration of IT skills, such as data science and analytics as core skills in science, technology, engineering, and math (STEM) and relevant business programs.
- 2.5.** Work with nonprofits in the workforce space to build on efforts to integrate basic digital skills training into other workforce training models and provide training opportunities for populations that are often underrepresented in IT. (See Appendix 2, Case Studies, Goodwill Digital Career Accelerator and Rhode Island Family Literacy Initiative on page 94.)
- 2.6.** Build awareness of career opportunities in information technology through career-exploration events and by exposing high school and college students to IT. Partner with local organizations and initiatives, such as the Success Through Technology Education (STTE) Foundation, Microsoft Philanthropies' Technology Education and Literacy in Schools (TEALS), the Fab Lab, and others to help generate more interest in IT careers.
- 2.7.** Conduct outreach to groups of residents who are traditionally underrepresented in IT, and who might be less mobile than recent college graduates, to encourage promising candidates to enroll in available IT programs. (See Appendix 2, Case Studies, Per Scholas on page 94 for additional ideas.)

3. Support Employers in Sourcing, Recruiting, and Retaining IT Talent

Conversations with employers highlighted their concern about losing good IT employees to other companies in the local market. Poaching is often an issue in markets where the pool of talent is too small relative to the local demand for these skills. To address this issue, employers must overcome their competitive pressures and come together to grow the talent pool, by increasing enrollment in local institutions, by recruiting new talent to the county, and by improving the retention of IT talent in the community. Having a better and more accessible set of tools to help employer source, recruit, and retain IT talent can facilitate this collaboration.

- 3.1.** Encourage employers to move to a competency-based hiring model that removes unnecessary filters or barriers. This could be done through the Technology Council.
- 3.2.** Develop accessible information resources for employers to use with IT recruits that cover topics of interest, including the El Paso regional IT cluster, cost of living, housing, education, economic data, entertainment, and recreation opportunities. These should be in multiple formats—online, presentation, and print.
- 3.3.** Connect with the Transition Assistance Program at Fort Bliss and provide easy pathways for transitioning service members to enter the IT sector.
- 3.4.** Promote the creation of IT-related internships and apprenticeship programs with El Paso County employers of IT talent. Integrate cohort-based training with interns and apprenticeships to infuse employability training and specialized IT skills. *(See Appendix 2, Case Studies, Campus Philly on page 95 for additional ideas.)*
- 3.5.** Organize IT professional networking events and speaker series and invite students at area IT programs to attend.
- 3.6.** Organize talent roadshows to create opportunities for local employers to jointly market to prospective talent pools.

4. Deliberately Build Expertise and Critical Mass in IT

Although it has grown and is expected to continue to grow, the IT talent cluster in El Paso County remains relatively small. However, the cluster and the county have the ingredients that make it ripe for additional growth. The county has a world-class research institution, a handful of employers that anchor the sector, and some key competitive advantages. First, the binational region means access to talent on both sides of the border and a bilingual workforce that can serve Latin American markets. Second, the regional manufacturing sector supports a unique specialization in manufacturing-related IT—the Industrial Internet of Things, cybersecurity related to networked plants and cross-border operations, and analytics of industrial processes and supply chains. Third, Fort Bliss provides a pool of talent and also supports a healthy defense cluster that has created another regional specialization in cybersecurity. Capitalizing on these advantages and addressing key weaknesses can position the cluster for additional success.

- 4.1.** Support the growth of research expertise in UTEP’s four focus areas: development of theory for practical applications, software engineering, interactive systems (human-computer interaction), and computer systems and high-performance computing.
- 4.2.** Continue to enhance the binational innovation ecosystem through Innovation Frontera.
- 4.3.** Encourage and advance the digital transformation of local employers to ensure they maintain or realize a competitive advantage within their own industry.

- 4.4.** Market the Borderplex region as a destination for employers of IT talent, particularly those who can benefit from the binational nature of the IT talent pool.

CONCLUSION

The IT talent cluster in El Paso County is poised for growth. However, the talent pipeline and the supporting infrastructure needs to be strengthened in order to meet the demand projected over the next five years. Program capacity, student completions, and graduate retention in IT-related fields must increase. The number and type of IT training programs must also increase.

The digital transformation of existing firms and the strategic recruitment of new firms offer strong growth prospects for the IT talent cluster in El Paso County. Success in either or both of these areas could significantly influence the trajectory of the county's IT talent cluster and its occupational needs. For this reason, having strong feedback mechanisms and responsive talent pipeline infrastructure is evermore important.

The four strategies recommended in this report provide a blueprint to strengthen the IT talent cluster. At the heart of these strategies is deeper engagement with employers of IT talent. As such, the first implementation priority should be convening the Tech Council. Then, the employers can set the agenda and identify the top one or two priorities to move forward next. Over time, the successful implementation of the four strategies will provide El Paso County with the needed feedback mechanisms and will help to sharpen the alignment of the regional talent pipeline infrastructure.

APPENDIX 1. WORKFORCE ASSESSMENT

This assessment considers information technology (IT) as a cross-industry function or talent cluster in El Paso County, Texas. The definition of the IT talent cluster for this assessment is broad and includes 35 different detailed occupations. Computer and mathematical occupations comprise the bulk of the talent cluster, but it also encompasses data-enabled analysts and data scientists, who are often part of business and financial operations; digital media occupations; and entry-level occupations that are related to information management. It must be noted that occupations related to IT evolve quickly. As a result, occupational titles included in the Standard Occupational Classification (SOC) system, which is used by federal agencies to classify workers into occupational categories for employment data, do not always reflect emerging or new IT occupations.

El Paso County employers who use IT talent represent a wide range of industries, including the public sector, defense-related industries, higher education, consumer products, and financial services. Figure 2 lists representative employers of IT talent in the county.

FIGURE 2. REPRESENTATIVE EMPLOYERS

COMPANY
Transtelco
DXC Technology
Helen of Troy Limited
US Army
City of El Paso
Perspecta (previously Vencore)
Prudential
Conduent
General Dynamics
Raytheon Company
Texas Tech University

Source: TIP research.

Figure 3 provides a snapshot of the IT talent cluster. The IT talent cluster employed 9,464 workers in 2017. From 2007 to 2017, the sector gained 598 jobs, which was an increase of 6.7 percent. Over this same period, the growth rate of the US IT talent cluster was 12 percent.



CLUSTER DEFINITION

SOC	Description
11-3021	Computer & Information Systems Managers
15-1111	Computer & Information Research Scientists
15-1121	Computer Systems Analysts
15-1122	Information Security Analysts
15-1131	Computer Programmers
15-1132	Software Developers, Applications
15-1133	Software Developers, Systems Software
15-1134	Web Developers
15-1141	Database Administrators
15-1142	Network & Computer Systems Administrators
15-1143	Computer Network Architects
15-1151	Computer User Support Specialists
15-1152	Computer Network Support Specialists
15-1199	Computer Occupations, All Other
15-2011	Actuaries
15-2021	Mathematicians
15-2031	Operations Research Analysts
15-2041	Statisticians
15-2091	Mathematical Technicians
15-2099	Mathematical Science Occupations, All Other
13-1051	Cost Estimators
13-1161	Market Research Analysts & Marketing Specialists
13-1199	Business Operations Specialists, All Other
13-2051	Financial Analysts
27-1011	Art Directors
27-1014	Multimedia Artists & Animators
27-1024	Graphic Designers
27-3042	Technical Writers
27-4032	Film & Video Editors
43-9011	Computer Operators
43-9021	Data Entry Keyers
43-9022	Word Processors & Typists
43-9031	Desktop Publishers
43-9111	Statistical Assistants
49-2011	Computer, Auto. Teller, & Office Mach. Repairers

The annual growth rate of the cluster in El Paso County is quite variable in comparison to the rest of the El Paso economy and the US economy overall. However, this is due, in part, to its relatively small size and the presence of a handful of large IT employers in the county. In the next 5 years, IT employment is expected to grow 8.5 percent in both El Paso County and the US.

Figure 4 and Figure 5 demonstrate how the IT talent cluster stretches across industry sectors. The federal government (civilian) is, by far, the largest user of IT talent in El Paso County. This sector employs more than 1,200 IT workers. Computer systems design & related, education & hospitals (local government), data processing and hosting, and business support services employ another 2,200 IT workers. Together, the top five largest users of IT talent employ more than one-third of the total number of IT workers in El Paso County.

The industries that are most dependent on IT talent are those industries where IT workers represent a high percentage of their overall workforces. The most IT talent-dependent industry is computer systems design & related services. In this sector, IT workers represent 59 percent of all their workers. Other IT-dependent industries include the following.

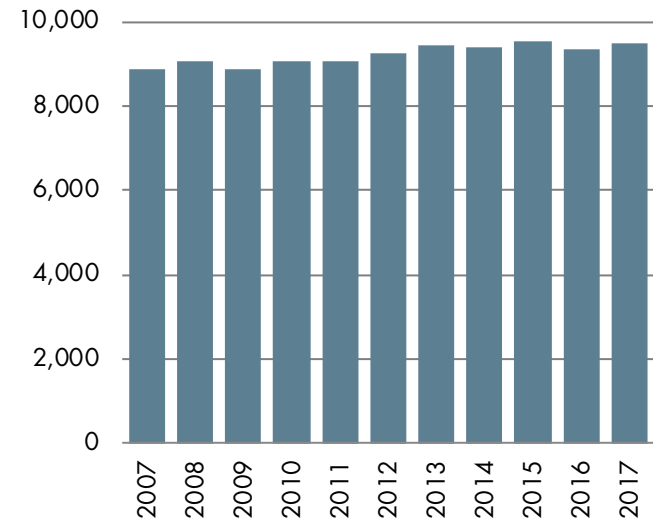
- Software Publishers
- Data Processing, Hosting, and Related Services
- Specialized Design Services
- Electronic and Precision Equipment Repair and Maintenance

IT talent in these industries makes up between 37 and 60 percent of their total workforces. However, IT workers in these industries account for only about 16 percent of the total IT talent cluster. In other words, the industries that are considered “IT” account for a small portion of IT talent cluster employment.

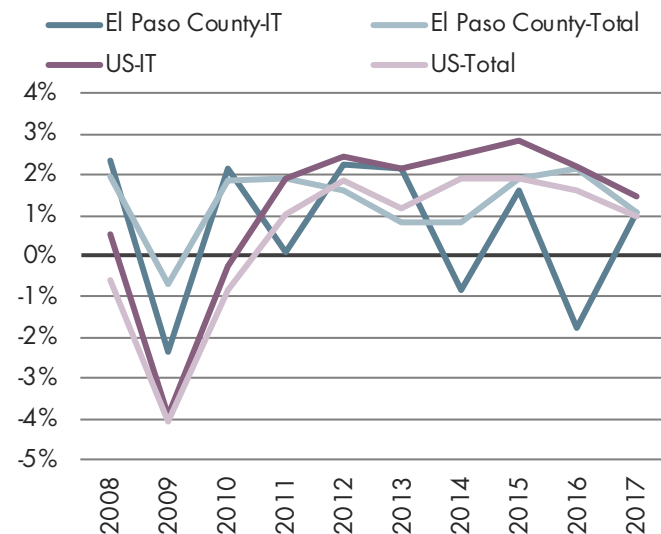
FIGURE 3. IT TALENT CLUSTER SNAPSHOT

EL PASO COUNTY	TOTAL
Number of Jobs 2017	9,464
Percent Change 2007–2017	6.7%
Employment Growth Outlook (2017–2022)	
El Paso County	8.5%
US	8.5%

EMPLOYMENT TRENDS




























PERCENT CHANGE IN EMPLOYMENT FROM YEAR BEFORE



Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

FIGURE 4. BIGGEST USERS OF IT TALENT

IT JOBS IN INDUSTRY AS PERCENT OF ALL JOBS IN IT TALENT CLUSTER

NAICS	Description	IT Jobs in Industry (#)	IT Jobs in Industry as % of Total IT Talent Cluster	IT Jobs as % of Industry
9011	Federal Government, Civilian	1,265		10.0%
5415	Computer Systems Design and Related	767		59.1%
9036	Education and Hospitals (Local Gov't)	599		1.7%
5182	Data Processing, Hosting, and Related	488		46.0%
5614	Business Support Services	391		4.6%
5173	Wired and Wireless Telecomm. Carriers	384		16.5%
9026	Education and Hospitals (State Gov't)	297		4.9%
5613	Employment Services	269		5.1%
9039	Local Gov't (Excl. Education and Hospitals)	254		2.0%
5416	Mgmt., Scientific, & Tech. Consulting Svcs.	233		15.3%
9029	State Gov't (Excl. Education and Hospitals)	196		4.3%
5511	Management of Companies and Enterprises	182		15.0%
4234	Pro. & Comm. Equip. & Supplies Merchant Wholesalers	180		17.1%
5611	Office Administrative Services	153		9.7%
5241	Insurance Carriers	137		14.8%
8112	Electronic & Precision Equipment Repair & Maint.	129		37.2%
5221	Depository Credit Intermediation	127		4.8%
6221	General Medical and Surgical Hospitals	110		1.6%
5413	Architectural, Engineering, and Related Services	104		6.4%
5414	Specialized Design Services	90		37.5%
4431	Electronics and Appliance Stores	90		4.9%
2362	Nonresidential Building Construction	90		3.3%
4236	Household Appliances & Elec. Goods Merchant Whole.	88		6.2%
5412	Accounting, Tax Prep., Bookkeeping, & Payroll Services	81		4.6%
2382	Building Equipment Contractors	81		1.6%

Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

Note: NAICS is the North American Industry Classification System, a federal standard to classify business establishments.

FIGURE 5. MOST DEPENDENT ON IT TALENT
IT JOBS AS PERCENT OF ALL JOBS IN INDUSTRY SECTOR

NAICS	Description	IT Jobs as % of Industry	IT Jobs in Industry (#)	IT Jobs in Industry as % of Total IT Talent Cluster
5415	Computer Systems Design and Related Services	59.1%	767	8.1%
5112	Software Publishers	58.6%	17	0.2%
5182	Data Processing, Hosting, and Related Services	46.0%	488	5.2%
5414	Specialized Design Services	37.5%	90	1.0%
8112	Electronic & Precision Equipment Repair & Maint.	37.2%	129	1.4%
5211	Monetary Authorities-Central Bank	35.7%	<10	0.0%
5191	Other Information Services	30.2%	19	0.2%
3341	Computer & Peripheral Equipment Manufacturing	30.0%	<10	0.0%
5174	Satellite Telecommunications	28.6%	<10	0.0%
5179	Other Telecommunications	22.0%	20	0.2%
4234	Pro. and Comm. Equip. and Supplies Merchant Wholesalers	17.1%	180	1.9%
5173	Wired and Wireless Telecommunications Carriers	16.5%	384	4.1%
5416	Mgmt., Scientific, and Technical Consulting Services	15.3%	233	2.5%
5511	Management of Companies and Enterprises	15.0%	182	1.9%
5241	Insurance Carriers	14.8%	137	1.4%
5239	Other Financial Investment Activities	13.3%	38	0.4%
5417	Scientific Research and Development Services	13.3%	<10	0.1%
3345	Navi., Measuring, Electromedical, & Control Instruments Mfg.	11.8%	33	0.3%
5418	Advertising, Public Relations, and Related Services	11.8%	50	0.5%
5231	Securities & Commodity Contracts Intermediation & Brokerage	11.5%	60	0.6%
5111	Newspaper, Periodical, Book, & Directory Publishers	11.1%	39	0.4%
5152	Cable and Other Subscription Programming	11.1%	<10	0.1%
5259	Other Investment Pools and Funds	11.1%	<10	0.1%
5223	Activities Related to Credit Intermediation	10.4%	32	0.3%
6114	Business Schools and Computer and Mgmt.Training	10.3%	<10	0.1%

Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

JOB POSTING ANALYTICS

Figure 6 and Figure 7 show job posting analytics for the information technology talent cluster by middle-skills and advanced-skills.

This information was collected from online job postings that have been unduplicated, aggregated, and analyzed. For each occupational group, information is presented for the job postings (number of unique postings, number of employers, average number of days posted, and salary range) and the characteristics of postings from January to June 2018 (geographic distribution, top employers, top occupations, top hard skills, and top certifications). This information can be used to better understand which employers were actively hiring and what types of positions they were hiring for.

Note that job posting data is influenced by employers' recruiting practices. As such, one job posting might represent one or more open positions. Furthermore, employers might not post positions online; many openings are filled through staffing agencies or by word-of-mouth and employee referrals. For these reasons, job postings cannot be used as a proxy for the number of openings. In addition, some employers post in markets across the US for positions that are location agnostic, such as remote work or other flexible work arrangements. In these situations, employers might show up as a top employer for a geography even though they do not have a physical location in that area.

The job postings for middle-skill occupations in the information technology talent cluster showed 112 unique job postings from 55 different employers. The average posting duration was 27 days. The range of salaries in these postings was below the national level. The local median salary posted was 69 percent of the national median salary. The employers with the largest number of postings were ADP, the US Army, and Conduent. The most common occupation was computer user support specialists. The most requested skills were technical support and Microsoft Office.

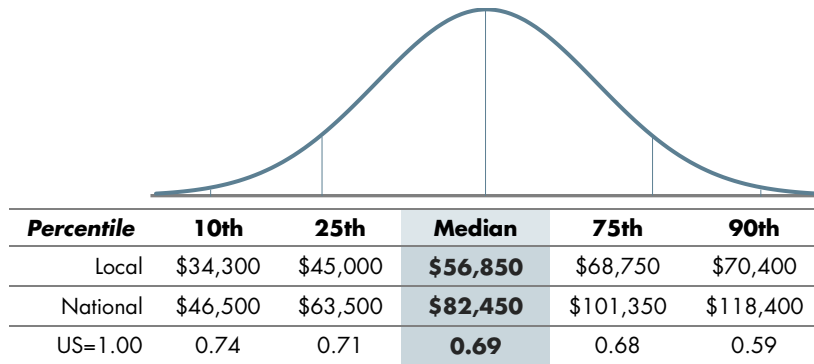
For advanced-skill jobs, there were 321 unique job postings from 85 employers. The average posting duration was 29 days. The salary range for job postings related to advanced-skill IT jobs was below national salary ranges. The local median salary posted was 74 percent of the national median salary. The employers with the largest number of postings were Anthem, DXC Technology, and the US Army. The most common occupations were computer occupations (all other), network & computer systems administrators, and business operations specialists (all other). The most requested skills were structured query language (SQL), enterprise services, and Microsoft SQL server.

FIGURE 6. MIDDLE-SKILL IT OCCUPATIONS
JOB POSTING ANALYTICS

HIRING SCALE



SALARY RANGE

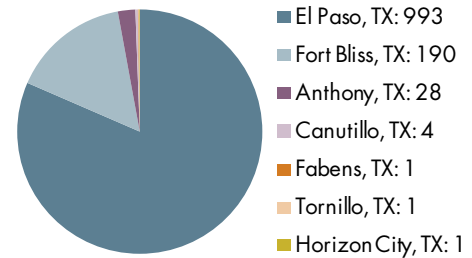


OPENINGS

Current job openings: 112
 Direct employers competing: 55
 Average posting duration: 27

GEOGRAPHIC DISTRIBUTION

Share of postings by city (Jan-Jun 2018)



TOP COUNTS (based on 2,936 postings Jan-Jun 2018)

Employers	# postings
ADP, Inc.	164
US Army	89
Conduent	58
DXC Technology	52
Perspecta (previously Vencore)	30
General Dynamics	25
BCD Travel	25
Hewlett-Packard Company	22
Leidos	22
Anthem, Inc.	19

Occupations	# postings
Computer User Support Specialists	942
Data Entry Keyers	116
Web Developers	115
Computer Operators	29
Computer Network Support Specialists	18
Computer, Auto. Teller, & Office Mach. Repairers	6

Hard Skills	# postings
Technical support	220
Microsoft Office	175
Hypertext markup language	78
Preventive maintenance	77
Enterprise Services	77
Transaction processing	73
Microsoft Windows 7	71
Microsoft Active Directory	67
Java	65
System administration	56

Certifications	# postings
Security Clearance	416
Driver's License	141
DoD 8570 Certification	59
CompTIA Security+	57
Certified Scrum Coach	48
IAT Level 2	43
Top Secret Sensitive Compartmented Info.	33
A+ Certification	32
Occupational Safety & Health Admin. Cert.	27
Cisco Certified Network Associate	23

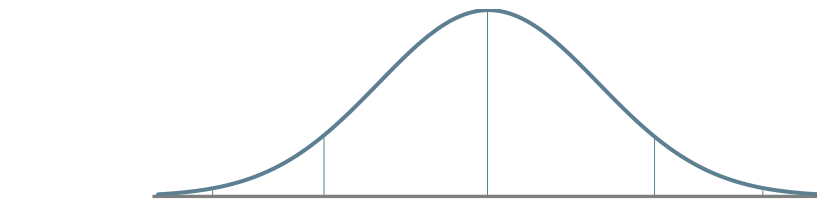
Sources: Gartner TalentNeuron, TIP Strategies.

FIGURE 7. ADVANCED-SKILL IT OCCUPATIONS
JOB POSTING ANALYTICS

HIRING SCALE



SALARY RANGE



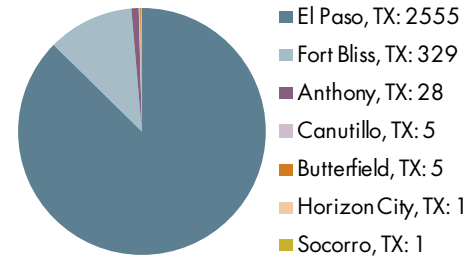
Percentile	10th	25th	Median	75th	90th
Local	\$56,200	\$72,250	\$90,050	\$107,800	\$123,850
National	\$75,400	\$97,450	\$122,000	\$146,500	\$168,550
US=1.00	0.75	0.74	0.74	0.74	0.73

OPENINGS

Current job openings: 321
Direct employers competing: 85
Average posting duration: 29

GEOGRAPHIC DISTRIBUTION

Share of postings by city (Jan–Jun 2018)



TOP COUNTS (based on 2,936 postings Jan–Jun 2018)

Employers		postings	Occupations		postings
Anthem, Inc.		622	Computer Occupations, All Other		475
DXC Technology		273	Network & Computer Systems Administrators		417
US Army		148	Business Operations Specialists, All Other		402
Perspecta (previously Vencore)		95	Computer Systems Analysts		362
General Dynamics		79	Software Developers, Applications		214
Hewlett-Packard Company		69	Info. Security Analysts		190
ADP, Inc.		60	Computer & Info. Systems Managers		167
City of El Paso		59	Computer Programmers		153
BCD Travel		53	Operations Research Analysts		105
Prudential		50	Market Research Analysts & Marketing Specialists		87
Hard Skills		postings	Certifications		postings
Structured Query Language		332	Security Clearance		807
Enterprise Services		260	Certified Scrum Coach		198
Microsoft SQL Server		237	Driver's License		186
Linux		228	Project Management Professional		118
Microsoft Office		220	DoD 8570 Certification		95
UNIX		211	Top Secret Sensitive Compartmented info.		95
Java		197	Certified Info. Systems Security Professional		88
Quality Assurance		182	Cisco Certified Network Associate		78
Relational Database Management System		180	CompTIA Security+		74
Cybersecurity		170	IAT Level 2		56

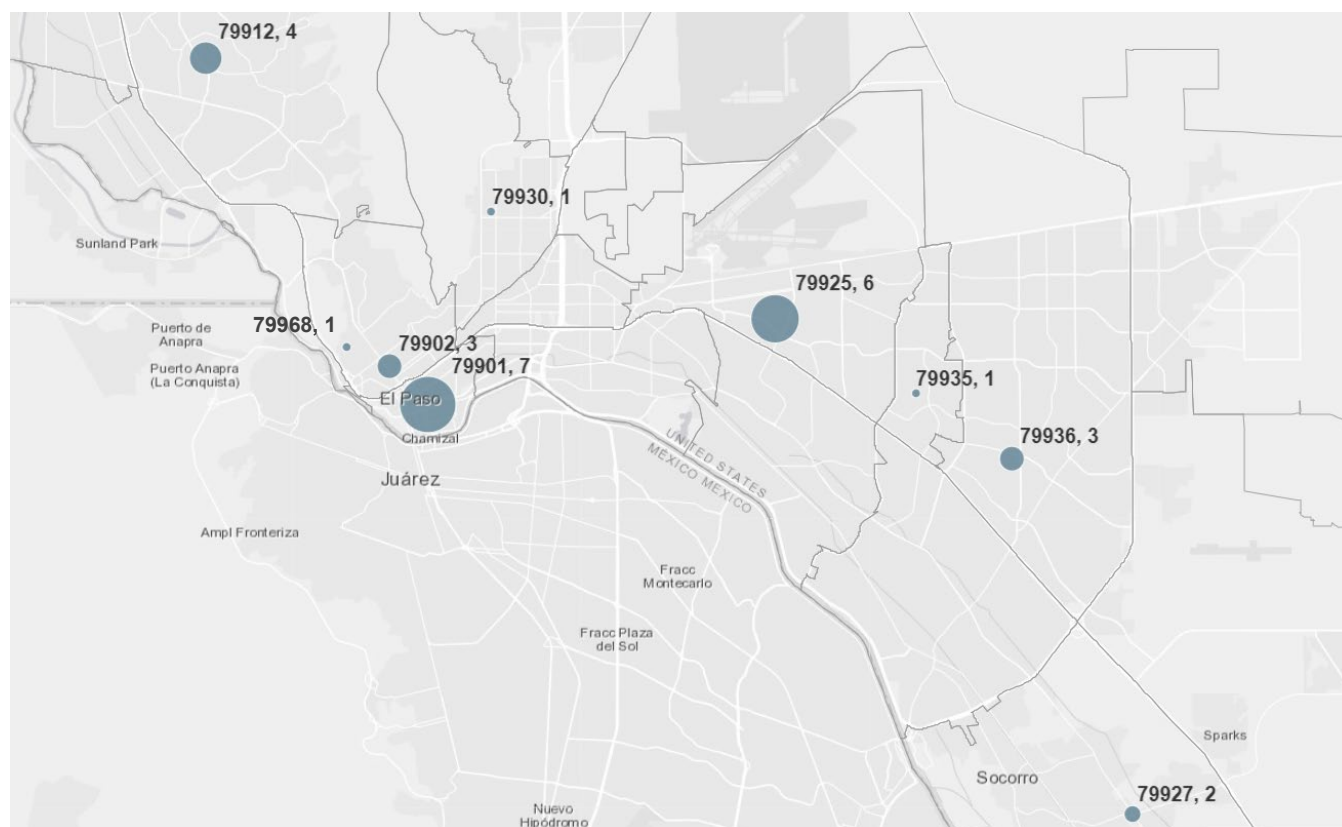
Sources: Gartner TalentNeuron, TIP Strategies.

SURVEY FINDINGS

Between July and December 2018, a survey of employers of IT talent in El Paso County was conducted. Thirty-five individual employers responded to the survey. Altogether, the respondents employ more than 10,000 workers. Of these, between 500 and 600 are IT workers.

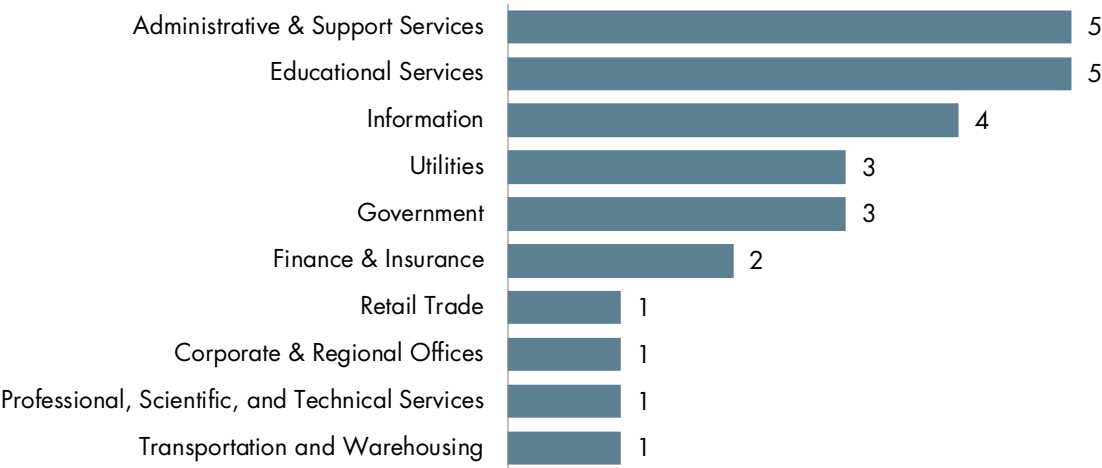
For each of the questions, the distribution of responses is provided and the total number of respondents to the question (N=xx).

FIGURE 8. PLEASE INDICATE THE ZIP CODE OF YOUR MAIN LOCATION.
RESPONSES BY ZIP CODE AND COUNT



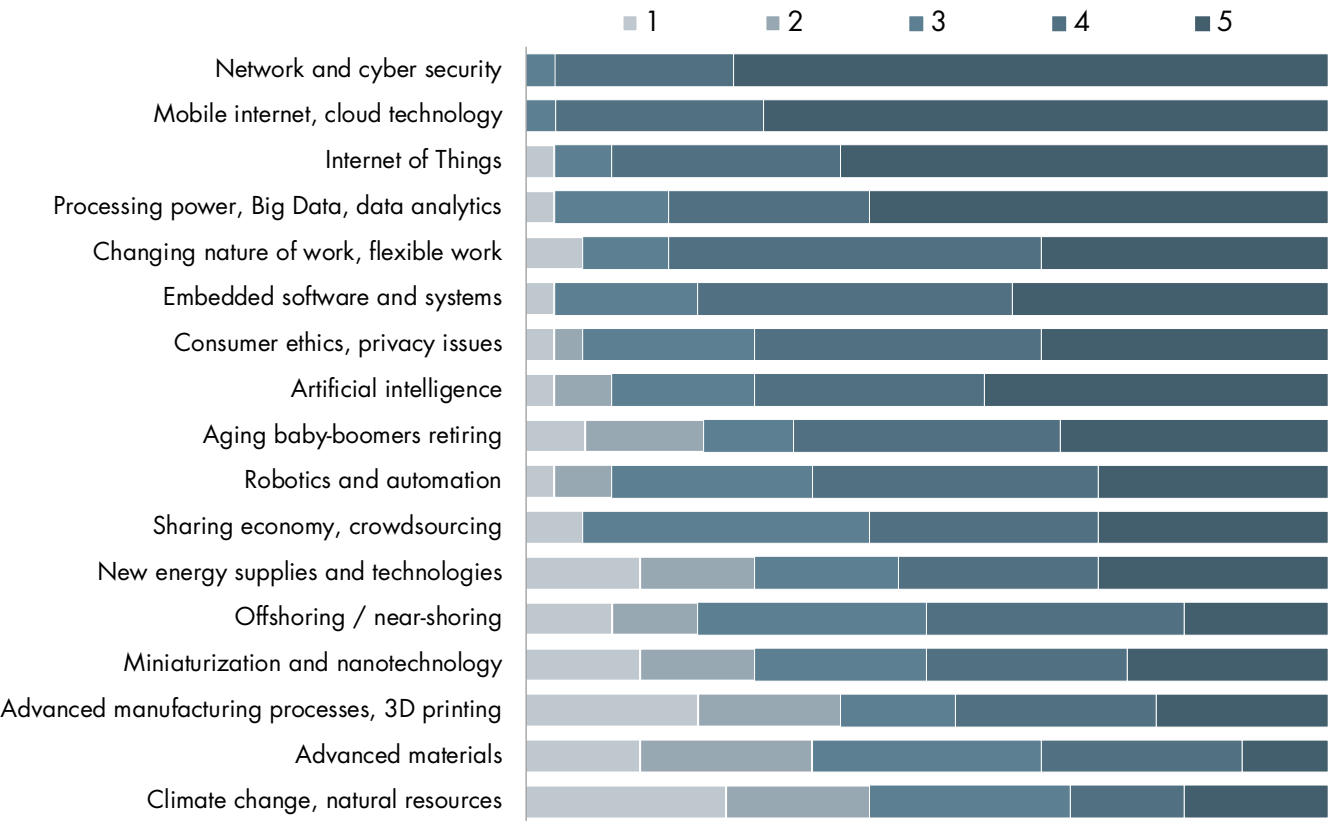
N=28

FIGURE 9. WHICH OF THE FOLLOWING BEST DESCRIBES YOUR INDUSTRY?
RESPONSES BY COUNT



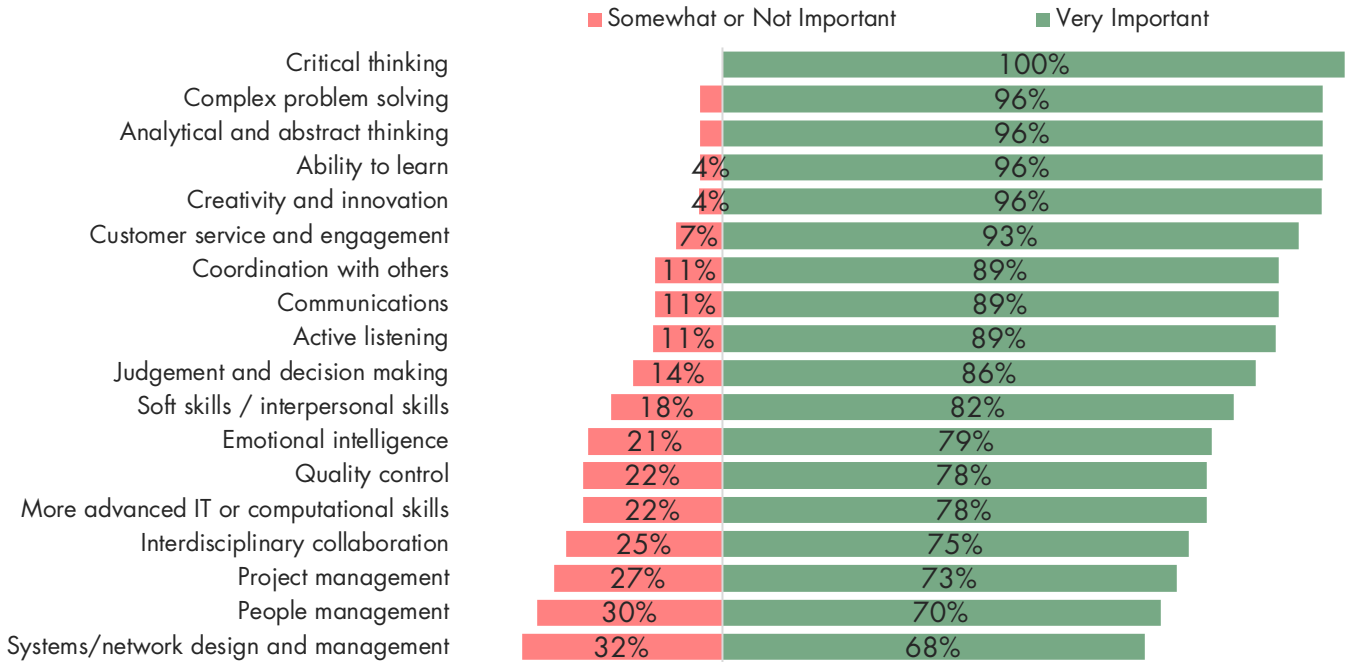
N=29

FIGURE 10. WHAT TRENDS DO YOU BELIEVE WILL HAVE A SIGNIFICANT OR DISRUPTIVE EFFECT ON YOUR WORKFORCE OVER THE NEXT 5 TO 10 YEARS?
RANKED ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (VERY IMPORTANT)



N=28

FIGURE 11. WHAT SKILLS WILL BE MOST IMPORTANT FOR YOUR WORKERS OVER THE NEXT 3 TO 5 YEARS?



N=28

FIGURE 12. SPECIFICALLY, WHAT NEW SKILLS WILL YOUR WORKERS NEED OVER THE NEXT 3 TO 5 YEARS?

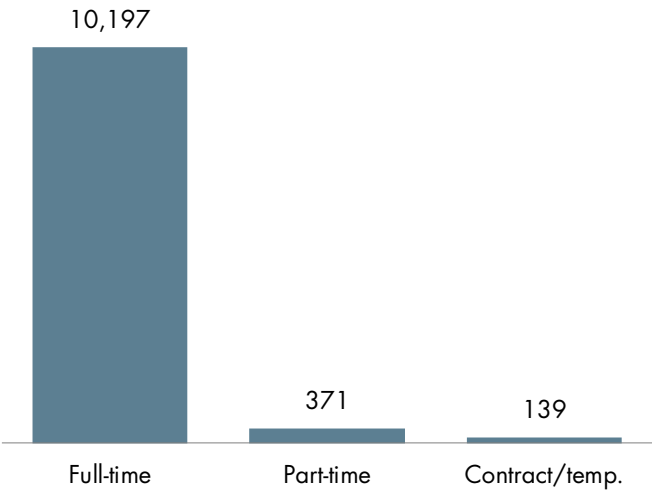
1-2 RESPONSES	3-4 RESPONSES	5+ RESPONSES
<ul style="list-style-type: none">VirtualizationDigital MarketingFinancial SkillsSocial MediaDesign-Based ThinkingE-CommerceTechnical WritingMobile TechnologyCustomer ServiceCritical ThinkingMulti-Lingual	<ul style="list-style-type: none">Software Development/AppsArtificial IntelligenceCybersecurityComputer SkillsCloud TechnologyCertifications	<ul style="list-style-type: none">Data AnalyticsResourcefulnessEmployabilityPeople SkillsManagementAdvanced Technologies

N=21

Respondents represented 10,197 full-time employees, 371 part-time employees, and 139 contract or temporary employees, totaling 10,707 employees.

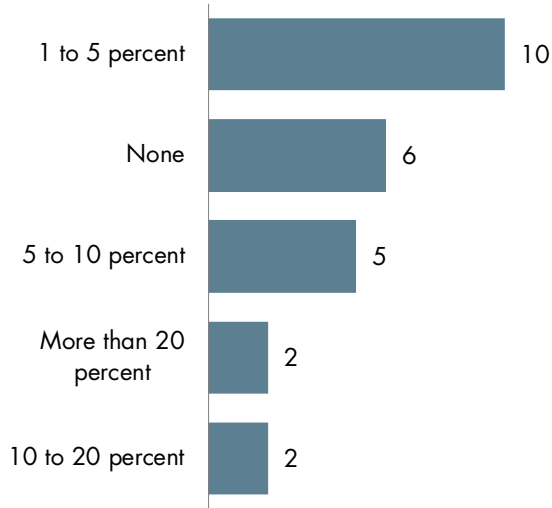
Most respondents had 1 to 5 percent of employees commuting from Mexico. The composition of respondents' employees ranged from having only 1 to 5 percent of total employees as IT workers to more than 20 percent.

FIGURE 13. WHAT IS YOUR FIRM'S CURRENT HEADCOUNT IN EL PASO COUNTY?



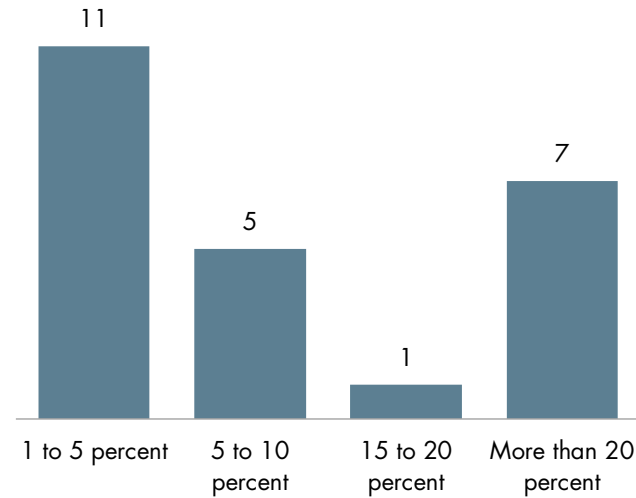
N=25

FIGURE 14. WHAT PERCENTAGE OF YOUR EMPLOYEES COMMUTE FROM MEXICO?



N=25

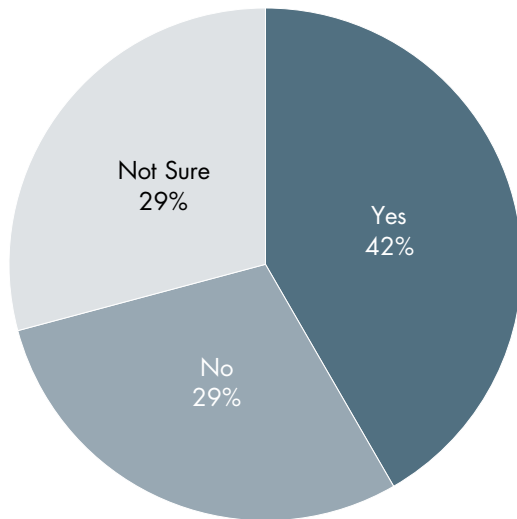
FIGURE 15. WHAT PERCENTAGE OF YOUR EMPLOYEES IN EL PASO COUNTY ARE IT WORKERS?



N=24

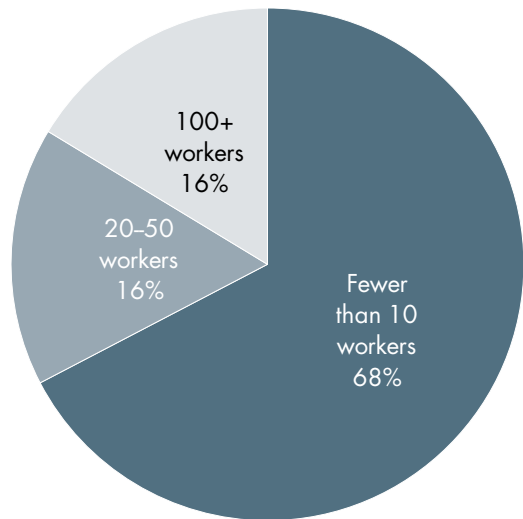
Forty-two percent of respondents reported that they planned to hire additional employees within 2 years. Of those planning to hire employees, most plan to hire fewer than 10 employees. Computer & info. systems managers and network & computer systems administrators were the most needed occupations in the future.

FIGURE 16. DO YOU PLAN TO HIRE ADDITIONAL EMPLOYEES AT YOUR EL PASO LOCATIONS IN THE NEXT 12 TO 24 MONTHS?



N=24

FIGURE 17. IF YOU PLAN TO HIRE IN THE NEXT 12 TO 24 MONTHS, HOW MANY WORKERS DO YOU PLAN TO ADD?



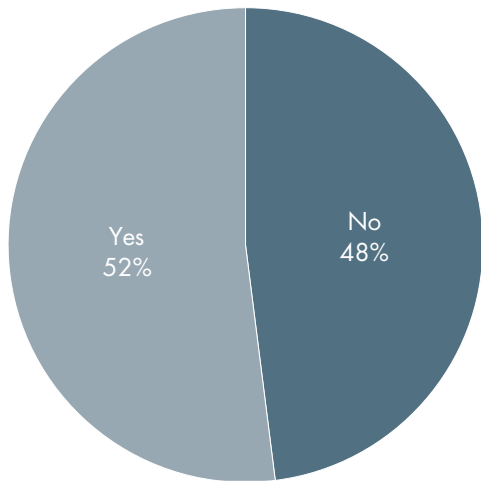
N=6

FIGURE 18. IF YES, WHAT POSITIONS DO YOU EXPECT TO HIRE OVER THE NEXT 12 TO 24 MONTHS?

POSITION	RESPONSES	POSITION	RESPONSES
Computer & Info. Systems Managers	9	Graphic Designers	2
Network & Computer Systems Administrators	7	Film & Video Editors	2
Computer Systems Analysts	6	Computer, Automated Teller, & Office Machine Repairers	2
Database Administrators	5	Actuaries	2
Software Developers, Applications	5	Mathematicians	1
Software Developers, Systems Software	5	Statisticians	1
Business Ops. Specialists, All Other	4	Mathematical Technicians	1
Financial Analysts	4	Mathematical Science Occupations, All Other	1
Information Security Analysts	4	Market Research Analysts & Marketing Specialists	1
Computer Programmers	4	Art Directors	1
Computer User Support Specialists	4	Multimedia Artists & Animators	1
Computer Network Support Specialists	3	Technical Writers	1
Operations Research Analysts	3	Computer Operators	1
Web Developers	3	Data Entry Keyers	1
Computer Occupations, All Other	3	Word Processors & Typists	1
Computer & Info. Research Scientists	2	Desktop Publishers	1
Computer Network Architects	2	Statistical Assistants	1

N=14

FIGURE 19. ARE YOU CURRENTLY HAVING DIFFICULTY FILLING POSITIONS?



N=25

A majority of respondents (52 percent) were having difficulty filling positions. Compared to 46 percent of US employers having difficulty, this rate is comparatively high.

When asked what occupations or skills were most difficult to find, respondents listed managers, software development, and workers with Oracle training.

The most common factors contributing to hiring difficulty are technical/hard skills, experience of applicants, and applicants' salary expectations.

FIGURE 20. WHAT OCCUPATIONS OR SKILLS ARE MOST DIFFICULT TO FIND?

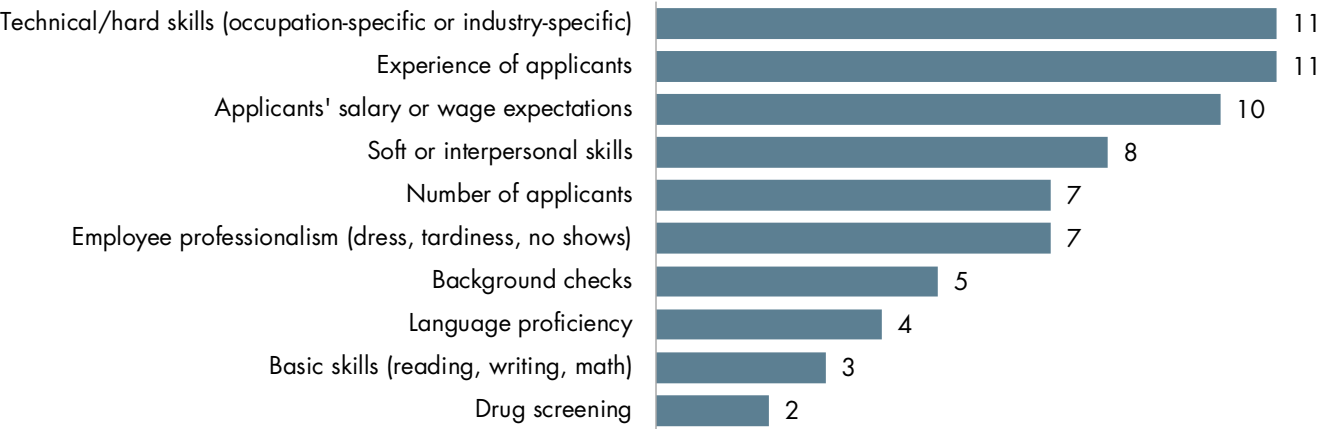
OCCUPATION	RESPONSES	SKILLS	RESPONSES
Manager (Any Industry)	5	Soft Skills	7
Software Development	4	Hard Skills	3
Oracle	3		
Engineers	3		
IT	2		
Business Analyst	2		
System Analyst	1		
Data Scientists	1		
Cybersecurity	1		
Administrative Support	1		
Licensed Securities Brokers	1		

N=7

N=24

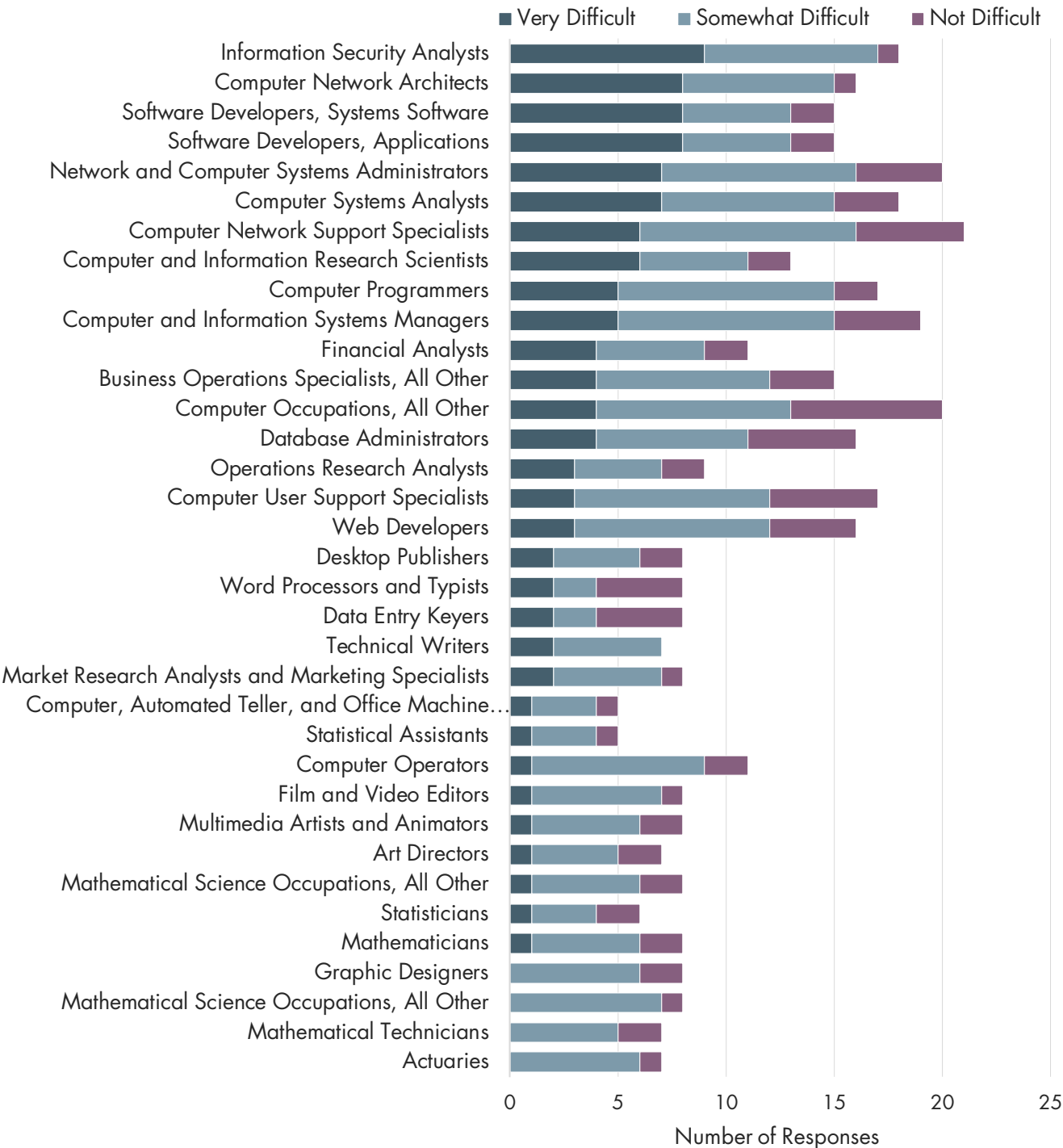
FIGURE 21. WHAT ARE THE FACTORS THAT CONTRIBUTE TO THE HIRING DIFFICULTY?

MOST COMMON FACTORS, BY RESPONSE COUNT



N=24

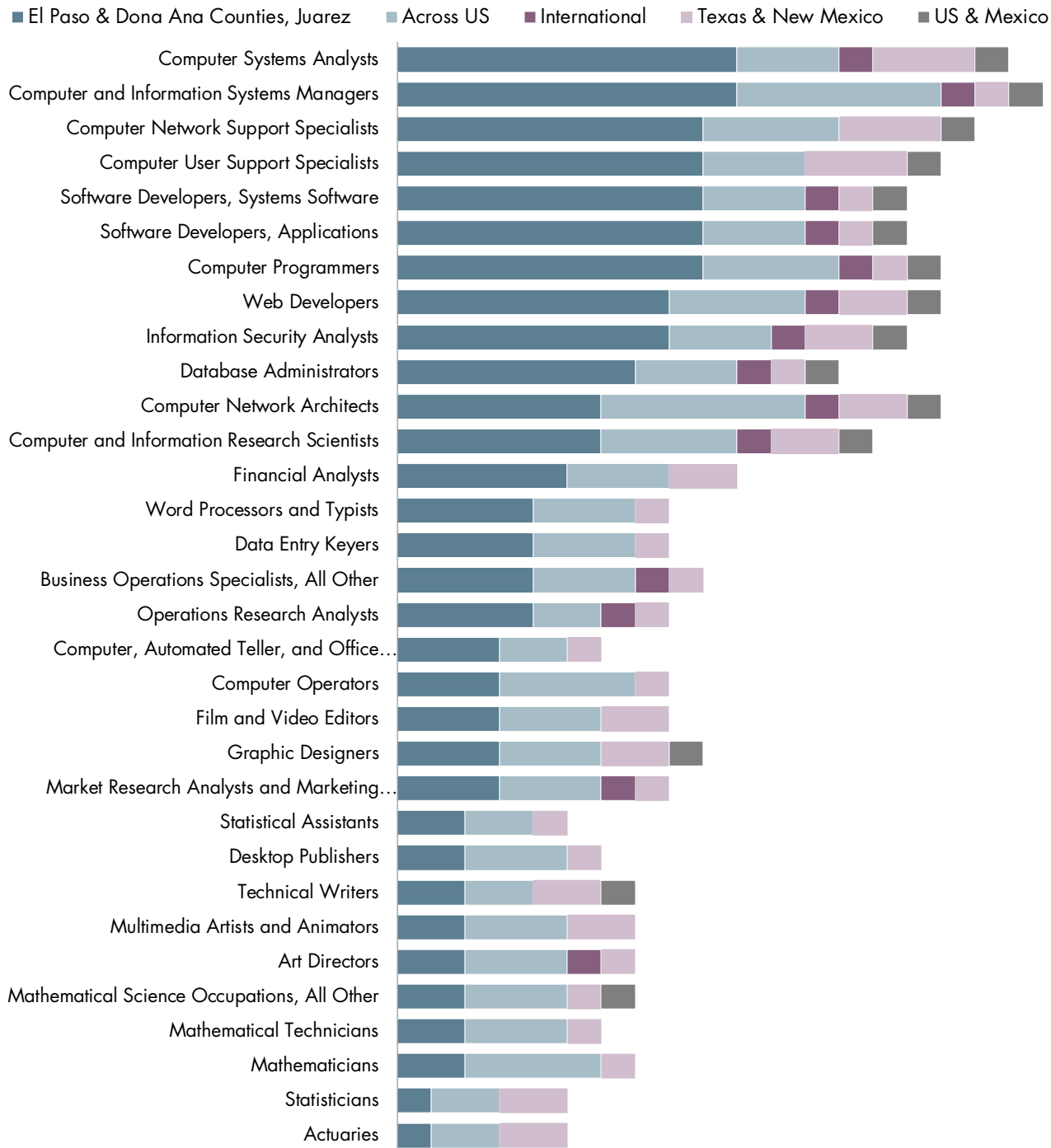
FIGURE 22. PLEASE INDICATE THE HIRING DIFFICULTY FOR POSITIONS IN EACH OF THE FOLLOWING AREAS.
SORTED ON 'VERY DIFFICULT'



N=24

When looking to hire, the region (El Paso and Dona Ana Counties and Juarez) is the most common geography employers recruit from, representing 50 percent of many positions. However, for many positions, respondents indicated that they had to look across the US for candidates.

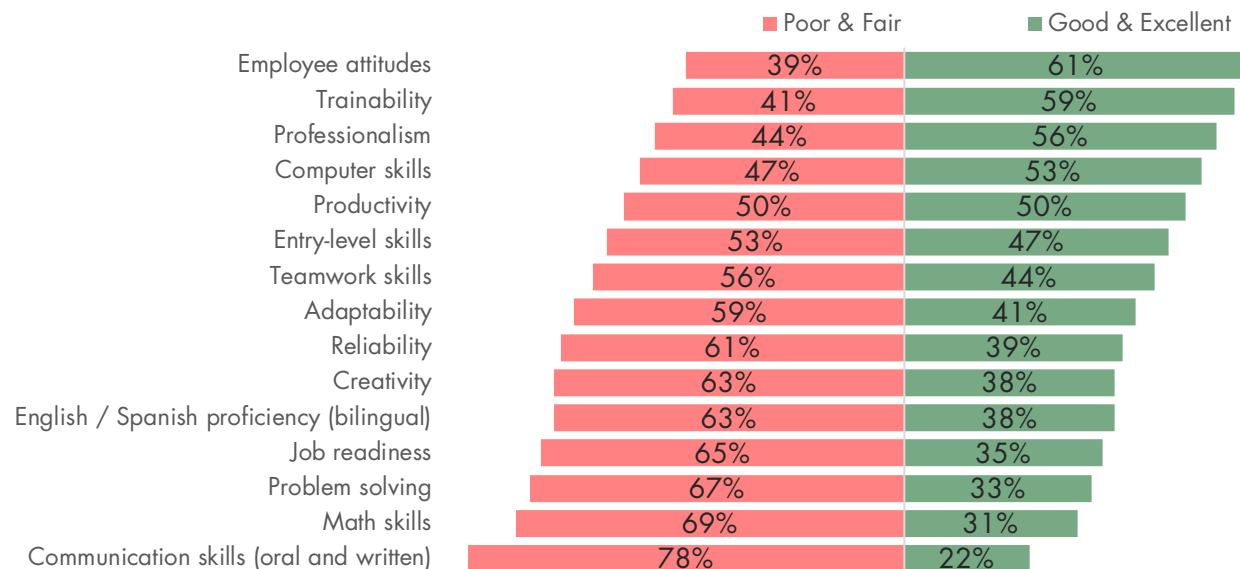
FIGURE 23. WHEN HIRING, PLEASE INDICATE WHERE YOU TYPICALLY RECRUIT WORKERS.
SORTED ON 'EL PASO & DONA ANA COUNTIES, JUAREZ'



N=20

Notably, basic skills such as math and communications skills were ranked the lowest for the county's middle-skill IT workforce. Employee attitudes, professionalism, and trainability were the top rated. Training programs and newspapers were the most effective ways to recruit and hire middle-skill IT workers.

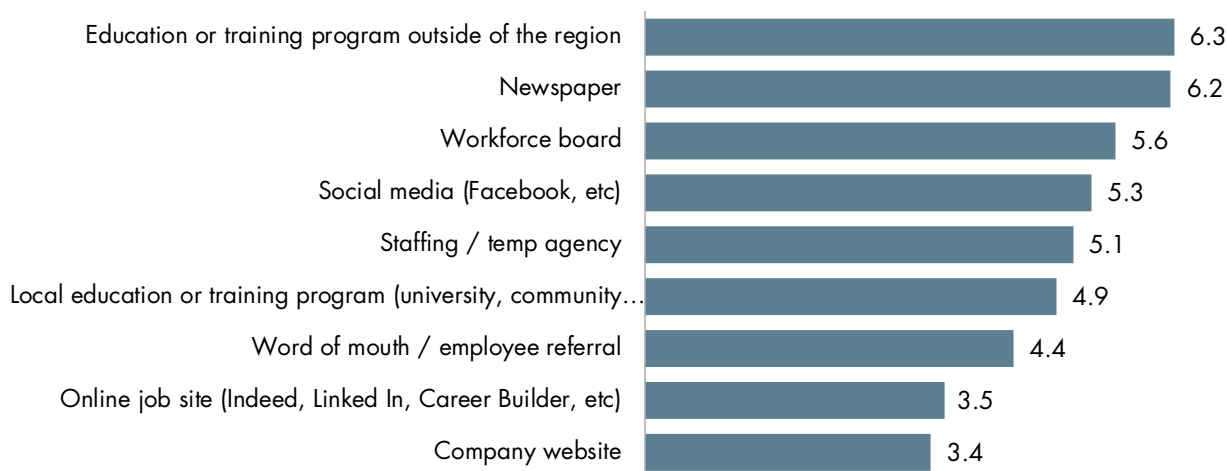
FIGURE 24. HOW WOULD YOU RATE EL PASO COUNTY'S MIDDLE-SKILL IT WORKFORCE?



N=22

FIGURE 25. FOR MIDDLE-SKILL POSITIONS, WHAT IS THE MOST EFFECTIVE APPROACH TO RECRUITING AND HIRING IT WORKERS?

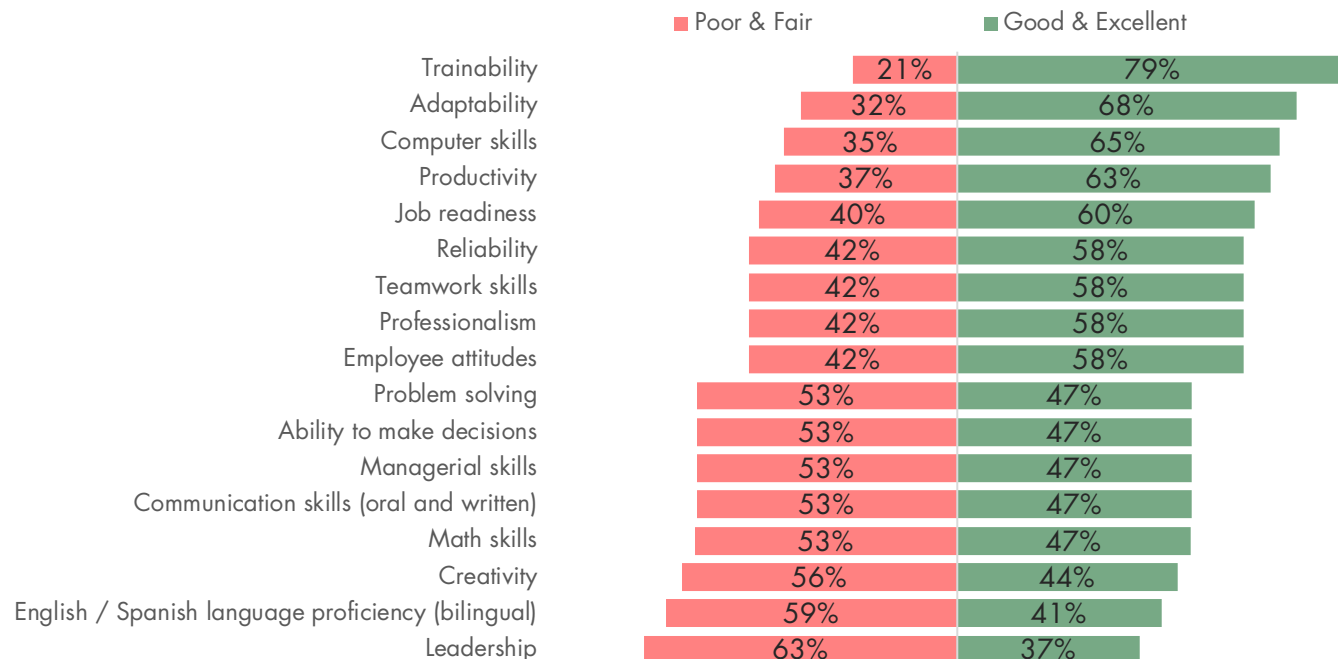
RANKED IN ORDER OF IMPORTANCE, AVERAGE RANK



N=18

English/Spanish proficiency and leadership were the lowest rated for El Paso County's advanced IT workforce, while trainability, productivity, and teamwork skills were the highest rated. Similar to the middle-skill workforce, training programs and newspapers were the most effective way to recruit and hire IT workers.

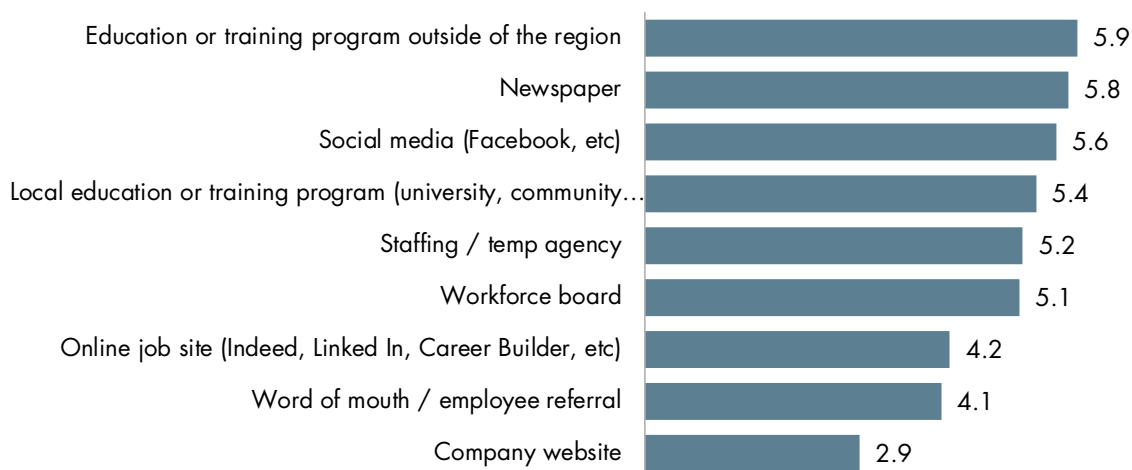
FIGURE 26. HOW WOULD YOU RATE EL PASO COUNTY'S ADVANCED-SKILL IT WORKFORCE?



N=22

FIGURE 27. FOR ADVANCED-SKILL POSITIONS, WHAT IS THE MOST EFFECTIVE APPROACH TO RECRUITING AND HIRING IT WORKERS?

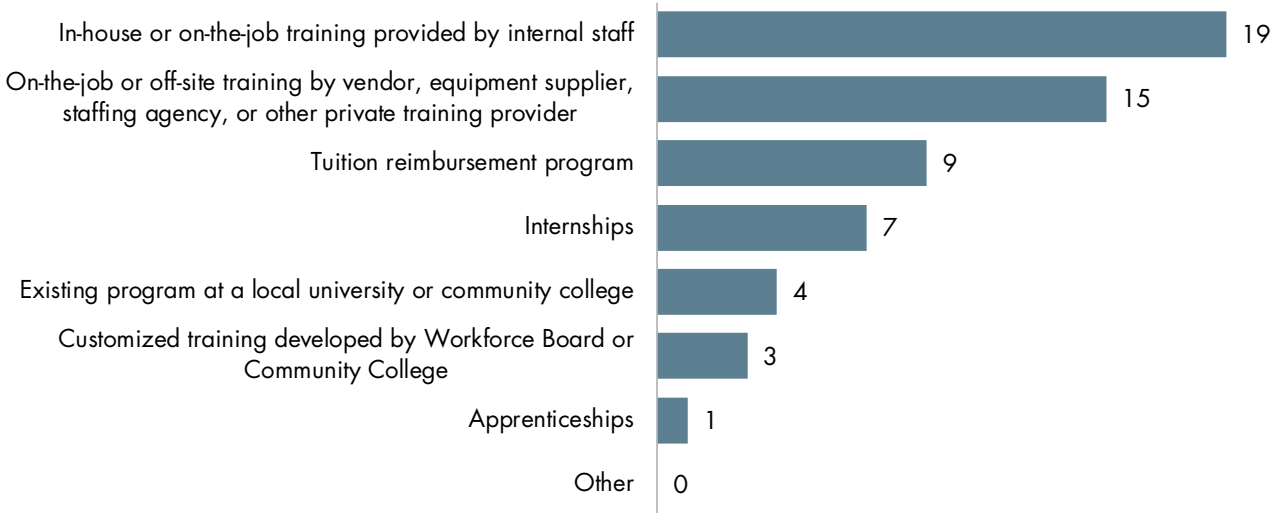
RANKED IN ORDER OF IMPORTANCE, AVERAGE RANK



N=19

In-house or on-the-job training was by far the most common training program already in place for employees. There were no apprenticeships or customized training used by respondents.

FIGURE 28. WHAT TRAINING PROGRAMS DO YOU HAVE IN PLACE FOR YOUR EMPLOYEES?
RESPONSES BY COUNT



N=20

FIGURE 29. WHAT CERTIFICATIONS DO YOU MOST OFTEN REQUIRE OF YOUR IT WORKERS?

1-2 RESPONSES	3-4 RESPONSES	5+ RESPONSES
<ul style="list-style-type: none">• Certified Information Security Manager• Cisco Certified Network Associate• CompTIA Security+• Microsoft Certified Solutions Associate (MCSA)• Microsoft Certified Systems Administrator• Microsoft Certified Technology Specialist• Secret/Top Secret Clearance	<ul style="list-style-type: none">• Cisco Certified Network Administrator (CCNA)• Certified Information Systems Security Professional• Microsoft Certified Solutions Expert (MCSE)• Avaya Certified Specialist• Java• Certified Ethical Hacker• Cisco Certified Network Professional (CCNP)• CompTIA A+• Network+	<ul style="list-style-type: none">• Project Management Professional

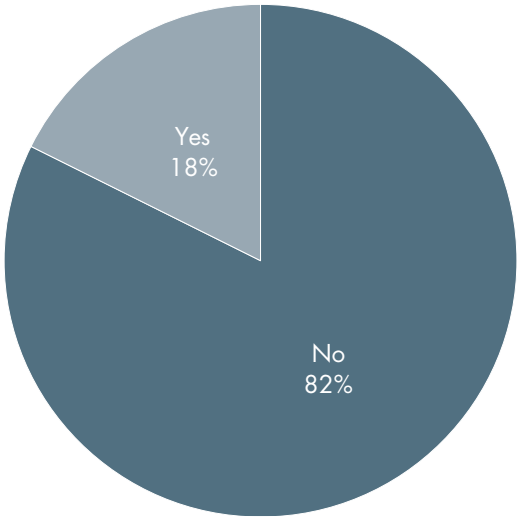
N=13

FIGURE 30. WHAT HARD SKILLS DO YOU MOST OFTEN REQUIRE OF YOUR IT WORKERS?

1-2 RESPONSES	3-4 RESPONSES	5+ RESPONSES
<ul style="list-style-type: none"> • Hypertext markup language • Preventive maintenance • UNIX • Data warehousing • Eclipse • Geometric Dimensioning & Tolerancing (GD&T) 	<ul style="list-style-type: none"> • Agile Software Development • C# • Quality Assurance • Quality control • Data mining • Mainframe • Structured query language 	<ul style="list-style-type: none"> • Information security • Cyber security • Database Administration • Systems Integration • Firewall • Information Management • Java • Microsoft Active Directory • Microsoft SQL Server • Microsoft Windows servers • Network routers • Network Security • C/C++ • Local Area Network • Software design • System administration • Technical support • Enterprise Services • JavaScript • Microsoft .NET Framework • Microsoft Windows • Switches • Web services • Database design • Information assurance • Linux • Microsoft Visual Studio • Systems Development Life Cycle • Wide Area Network

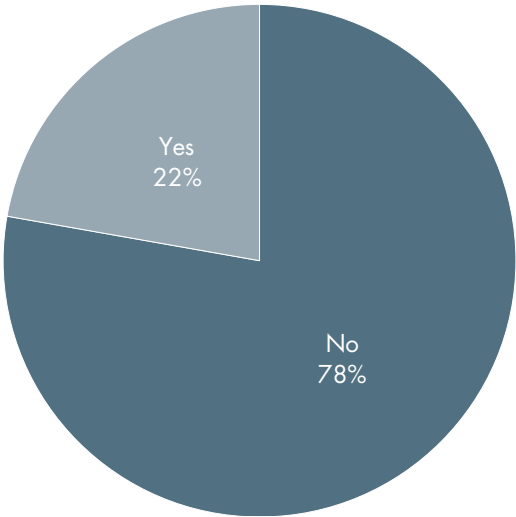
N=18

FIGURE 31. ARE THERE TRAINING PROGRAMS LACKING IN THE AREA THAT ARE CRITICAL TO YOUR TRAINING NEEDS?



N=17

FIGURE 32. DO YOU HAVE AN EFFECTIVE METHOD OF REGULARLY COMMUNICATING YOUR TRAINING OR HIRING NEEDS TO LOCAL TRAINING PROVIDERS?



N=18

TOP OCCUPATIONS

To better assess the specific talent needs of the IT talent cluster, occupations were analyzed by middle-skill and advanced-skill levels. Middle-skill occupations are those that require at least a high school diploma but less than a bachelor's degree. Advanced-skill occupations are those that require a bachelor's degree or more. For each occupation, the expected number of openings, net change, retirement exposure, and comparative wages is examined.

MIDDLE-SKILL

The county is projected to have 1,586 openings in middle-skill IT occupations over the next 5 years. Of the middle-skill occupations, several are expected to have a net positive change in the future, including computer user support specialists; computer, ATM, & office machine repairers; computer network support specialists; and Web developers. For those occupations with sufficient numbers to determine market information, only computer operators has a large percentage of workers above age 55. In El Paso County, earnings for these occupations range from a low of \$9.06/hr. to \$41.39/hr. For El Paso County, all middle-skill occupations in the IT talent cluster pay less than US wages and three occupations are paid less than 80 percent of US wages.

FIGURE 33. DEMAND FACTORS AND DEMOGRAPHICS
KEY OCCUPATIONS

SOC Code	Description	2017 Jobs	Openings 2017-22	Net Change 2017-22	% of the workforce:	
					Age 55+ Yrs.	Age 65+ Yrs.
15-1151	Computer User Support Specialists	1,136	550	121	11%	2%
43-9021	Data Entry Keyers	989	572	-14	13%	4%
49-2011	Computer, ATM, & Office Machine Repairers	301	193	40	13%	Insf. Data
15-1152	Computer Network Support Specialists	270	127	25	11%	Insf. Data
15-1134	Web Developers	159	78	20	Insf. Data	Insf. Data
43-9011	Computer Operators	103	52	-4	17%	Insf. Data
43-9031	Desktop Publishers	25	13	-2	Insf. Data	Insf. Data

FIGURE 34. MIDDLE-SKILL OCCUPATIONS
WITH HOURLY EARNINGS FOR SELECTED PERCENTILES, INCLUDING MEDIAN (50TH)

SOC Code	Description	Regional Hourly Earnings (percentiles)			US Hourly Earnings (percentiles)			Relative to US Median (US=1.00)
		10th	Median	90th	10th	Median	90th	
15-1151	Computer User Support Specialists	\$9.06	\$19.83	\$28.71	\$14.20	\$23.77	\$39.30	0.83
15-1152	Computer Network Support Specialists	\$16.67	\$24.61	\$41.39	\$17.87	\$30.17	\$50.69	0.82
15-1134	Web Developers	\$9.13	\$21.81	\$33.94	\$16.45	\$27.45	\$53.84	0.79
43-9011	Computer Operators	\$11.07	\$16.91	\$21.54	\$11.51	\$20.59	\$31.62	0.82
43-9021	Data Entry Keyers	\$7.86	\$9.31	\$14.62	\$10.06	\$14.67	\$24.44	0.63
43-9031	Desktop Publishers	\$9.13	\$15.00	\$29.32	\$11.45	\$20.85	\$34.15	0.72
49-2011	Computer, ATM, & Office Machine Repairers	\$10.12	\$15.72	\$22.11	\$11.36	\$16.91	\$27.59	0.93

Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

Notes: Insf. Data = not enough people in the market to get data. Figure 34 highlighting = below 80 percent of US median.

ADVANCED-SKILL

The advanced-skill occupations include a range of management, business and operations, computer, and mathematical occupations. Over the next 5 years, these occupations are expected to have 3,197 openings.

The occupation with the largest number of jobs in 2017 (1,659 jobs) and the highest number of openings (902) is business operations specialists (all other). This occupation is a catchall category that includes positions such as security management specialists, who install/maintain security-related electronic systems, in addition to online and social media marketing positions. The occupation with the next largest number of jobs in 2017 (532 jobs) is another catchall category—computer occupations (all other). This category includes quality assurance engineers and testers, systems engineers/architects, Web administrators, geographic information system (GIS) technicians, database architects, data warehousing specialists, business intelligence analysts, project managers, search marketing strategies, video game designers, and document management specialists. The next largest occupations are network and computer systems administrators, market research analysts, and applications software developers. Each of these occupations had 400 to 450 jobs in 2017.

Aside from business operations specialists, the occupations with the next highest number of openings projected for the period from 2017 to 2022 are market research analysts & marketing, cost estimators, and computer occupations (all other). The occupations expected to add the largest number of new positions between 2017 and 2022 are business operations specialists, market research analysts, computer systems analysts, and applications software developers.

Workers in the IT talent cluster in El Paso County are relatively young. Few of the occupations in this cluster are facing the same degree of retirement exposure that is prevalent in many occupations across the US. For those occupations with sufficient numbers to report the age distribution, business operations specialists (all other), cost estimators, and operations research analysts are the only three occupations that have 20 percent or more of workers above age 55.

In El Paso County, earnings for these occupations range from a low of \$9.85 to a high of \$81.25. For El Paso County, advanced-skill occupations in the IT talent cluster pay less than the US median and many occupations are paid less than 80 percent of the US median. Only business operations specialists (all other) and technical writers are on par with the US median.

FIGURE 35. DEMAND FACTORS AND DEMOGRAPHICS
KEY OCCUPATIONS

SOC Code	Description	2017 Jobs	Openings 2017-22	Net Change 2017-22	% of the workforce:	
					Age 55+ Yrs.	Age 65+ Yrs.
13-1199	Business Operations Specialists, All Other	1,659	902	135	20%	5%
15-1199	Computer Occupations, All Other	532	212	31	14%	2%
15-1142	Network & Computer Systems Admin.	451	179	36	10%	Insf. Data
13-1161	Market Research Analysts & Mktng. Specialists	448	309	79	10%	3%
15-1132	Software Developers, Applications	400	186	53	10%	Insf. Data
13-1051	Cost Estimators	372	218	33	26%	12%
15-1121	Computer Systems Analysts	349	180	60	13%	Insf. Data
15-1133	Software Developers, Systems Software	338	138	28	9%	Insf. Data
27-1024	Graphic Designers	321	160	10	13%	5%
13-2051	Financial Analysts	295	165	35	9%	Insf. Data
15-1131	Computer Programmers	292	96	2	14%	Insf. Data
15-1141	Database Administrators	258	101	17	14%	Insf. Data
11-3021	Computer & Info. Systems Managers	185	103	32	15%	Insf. Data
15-1143	Computer Network Architects	147	58	10	10%	Insf. Data
15-2031	Operations Research Analysts	72	42	19	21%	Insf. Data
27-1011	Art Directors	60	27	3	18%	Insf. Data
15-1122	Information Security Analysts	44	23	8	Insf. Data	Insf. Data
15-2041	Statisticians	42	26	9	Insf. Data	Insf. Data
27-3042	Technical Writers	39	22	4	Insf. Data	Insf. Data
27-1014	Multimedia Artists & Animators	32	14	1	Insf. Data	Insf. Data
27-4032	Film & Video Editors	20	12	2	Insf. Data	Insf. Data
15-1111	Computer & Info. Research Scientists	16	5	1	Insf. Data	Insf. Data
15-2011	Actuaries	5	5	7	Insf. Data	Insf. Data
15-2021	Mathematicians	5	5	0	Insf. Data	Insf. Data
15-2091	Mathematical Technicians	5	0	0	Insf. Data	Insf. Data
15-2099	Mathematical Science Occupations, All Other	5	5	0	Insf. Data	Insf. Data
43-9111	Statistical Assistants	5	5	0	Insf. Data	Insf. Data

Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

Note: Insf. Data = not enough people in the market to get data.

FIGURE 36. ADVANCED-SKILL OCCUPATIONS

WITH HOURLY EARNINGS FOR SELECTED PERCENTILES, INCLUDING MEDIAN (50TH)

SOC Code	Description	Regional Hourly Earnings (percentiles)			US Hourly Earnings (percentiles)			Relative to US Median (US=1.00)
		10th	Median	90th	10th	Median	90th	
11-3021	Computer & Info. Systems Managers	\$31.01	\$55.40	\$81.25	\$38.54	\$64.78	\$132.31	0.86
13-1051	Cost Estimators	\$12.44	\$18.17	\$33.21	\$17.24	\$29.28	\$49.25	0.62
13-1161	Market Research Analysts & Mktng. Specialists	\$13.94	\$26.99	\$45.45	\$16.49	\$29.92	\$57.65	0.90
13-1199	Business Operations Specialists, All Other	\$19.85	\$33.23	\$46.02	\$18.33	\$33.40	\$56.80	1.00
13-2051	Financial Analysts	\$16.90	\$26.56	\$44.83	\$24.31	\$39.16	\$78.63	0.68
15-1111	Computer & Info. Research Scientists	\$14.76	\$38.14	\$65.03	\$31.22	\$53.76	\$81.57	0.71
15-1121	Computer Systems Analysts	\$18.61	\$29.42	\$51.32	\$25.63	\$41.38	\$65.71	0.71
15-1122	Information Security Analysts	\$17.72	\$34.44	\$49.67	\$25.85	\$44.52	\$70.81	0.77
15-1131	Computer Programmers	\$15.71	\$28.98	\$47.33	\$22.26	\$37.19	\$61.64	0.78
15-1132	Software Developers, Applications	\$20.25	\$33.97	\$59.84	\$27.68	\$47.66	\$75.39	0.71
15-1133	Software Developers, Systems Software	\$21.46	\$34.35	\$57.09	\$30.63	\$50.96	\$78.14	0.67
15-1141	Database Administrators	\$20.36	\$33.78	\$58.41	\$22.70	\$40.72	\$62.40	0.83
15-1142	Network & Computer Systems Admin.	\$22.79	\$30.47	\$46.25	\$23.54	\$38.15	\$61.21	0.80
15-1143	Computer Network Architects	\$26.12	\$39.46	\$63.98	\$26.83	\$48.33	\$76.01	0.82
15-1199	Computer Occupations, All Other	\$14.69	\$33.38	\$50.77	\$21.62	\$40.72	\$63.78	0.82
15-2011	Actuaries	Insf. Data	Insf. Data	Insf. Data	\$28.32	\$48.37	\$89.54	Insf. Data
15-2021	Mathematicians	Insf. Data	Insf. Data	Insf. Data	\$26.42	\$50.86	\$76.98	Insf. Data
15-2031	Operations Research Analysts	\$14.23	\$23.47	\$52.67	\$20.86	\$38.10	\$63.74	0.62
15-2041	Statisticians	\$9.94	\$11.79	\$42.20	\$22.39	\$38.86	\$62.42	0.30
15-2091	Mathematical Technicians	Insf. Data	Insf. Data	Insf. Data	\$13.94	\$23.92	\$48.33	Insf. Data
15-2099	Mathematical Science Occupations, All Other	Insf. Data	Insf. Data	Insf. Data	\$13.90	\$31.37	\$75.66	Insf. Data
27-1011	Art Directors	\$13.77	\$18.54	\$42.79	\$13.79	\$23.95	\$66.64	0.77
27-1014	Multimedia Artists & Animators	\$9.85	\$13.17	\$31.73	\$10.19	\$22.84	\$49.35	0.58
27-1024	Graphic Designers	\$11.44	\$16.92	\$27.71	\$14.02	\$20.26	\$36.08	0.84
27-3042	Technical Writers	\$22.90	\$32.14	\$50.14	\$20.42	\$32.29	\$52.44	1.00
27-4032	Film & Video Editors	\$12.65	\$25.78	\$41.47	\$14.78	\$28.23	\$66.38	0.91
43-9111	Statistical Assistants	Insf. Data	Insf. Data	Insf. Data	\$14.51	\$22.53	\$33.40	Insf. Data

Source: 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed.

Notes: Insf. Data = not enough people in the market to get data. Figure 36 highlighting = below 80 percent of US median.

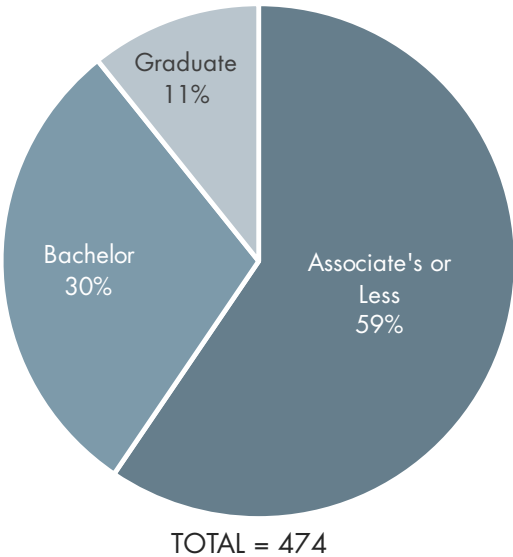
TRAINING NEEDS AND RESOURCES

With the occupational demand of the IT cluster defined, the training needs can be identified. Then, these needs can be examined in the context of the county’s training capacity. The following section evaluates the alignment of the county training capacity with high-demand, middle-skill and advanced-skill occupations.

In 2016, there were nearly 500 graduates of IT-specific programs at educational institutions in El Paso County. Of these, 59 percent were associate’s degrees or less and 41 percent were bachelor’s degrees or higher.

The University of Texas at El Paso awarded all of the bachelor’s degrees or higher. Vista College and El Paso Community College awarded about 80 percent of the IT awards that were associate’s degrees or less. Western Technical College and Brightwood College awarded the remaining degrees. Some of the students earning associate’s degrees or less already have a bachelor degree. However, it is not possible to determine how many students fall into this category.

FIGURE 37. IT DEGREE AWARDS, 2016
BY AWARD LEVEL



Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.
Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

MIDDLE-SKILL

Of the middle-skill occupations, none require an education level beyond an associate’s degree or experience for an entry-level position. The most common training required for competency and used by employers is on-the-job training. Among the seven middle-skill occupations, two require moderate on-the-job training and two require short-term on-the-job training. Computer user support specialists, computer network support specialists, and Web developers require no experience and no training for competency, which means that after initial education, there are entry-level opportunities in these occupations.

FIGURE 38. TOP MIDDLE-SKILL OCCUPATIONS
TYPICAL EDUCATION AND TRAINING

SOC Code	Description	Annual Openings (2017-2022)	Typical requirements for entry into occupation		Training required for competency
			Education	Experience	
15-1151	Computer User Support Specialists	110	Some college, no degree	None	None
15-1152	Computer Network Support Specialists	25	Associate's degree	None	None
15-1134	Web Developers	16	Associate's degree	None	None
43-9011	Computer Operators	10	HS diploma or equiv.	None	Moderate-term OJT
43-9021	Data Entry Keyers	114	HS diploma or equiv.	None	Moderate-term OJT
43-9031	Desktop Publishers	3	Associate's degree	None	Short-term OJT
49-2011	Computer, ATM, & Office Machine Repairers	39	Some college, no degree	None	Short-term OJT

Source: Bureau of Labor Statistics.

Although some of the training for these occupations could be provided on-the-job, El Paso County education institutions offer a range of different degree and nondegree programs that support the development of talent to fill the IT middle-skill occupations. Nondegree programs are more common for these occupations and the local school districts provide related career and technical education. The availability of programs in the county is summarized in Figure 39.

There appears to be one potential gap in training for middle-skill occupations in El Paso County that would require further study:

- **Web developers and desktop publishers** are two occupations that are integral to the web and digital communications pathway. For web developers, the degree programs that are matched with the occupation are not specific to digital media and not design focused. For desktop publishers, there are no related degree programs. While there are some Adobe certifications offered through career & technical education programs at the Canutillo and Socorro Independent School Districts, it is not likely that the coursework is in-depth enough to enter directly into these two occupations. Although the demand for workers in these two occupations in El Paso County is not high compared to some of the other IT occupations, the skills related to these two occupations are frequently requested in employer job postings nationally, and they are part of the high-demand career pathway related to digital media – the web and digital communications pathway.

FIGURE 39. EDUCATIONAL SUMMARY FOR TOP MIDDLE-SKILL OCCUPATIONS
AVAILABILITY OF PROGRAMS IN THE COUNTY

SOC Code	Description	Degree Program	Nondegree (Noncredit, CE, Customized Training)	Career & Technical Education
15-1151	Computer User Support Specialists	•	•	
15-1152	Computer Network Support Specialists	•	•	•
15-1134	Web Developers	•		•
43-9011	Computer Operators		•	
43-9021	Data Entry Keyers	•		
43-9031	Desktop Publishers			•
49-2011	Computer, ATM, & Office Machine Repairers			•

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

Figure 40 shows the fields of study that match each middle-skill occupation. It lists the field of study and the number of completions by institutions. For quick reference, the number of estimated annual openings for each occupation is included as an indicator of demand, and the training required for entry is included as well.

Note that fields of study often match with more than one occupation. In addition, students who complete these programs may not work in training-related occupations or may move to different labor markets. For these reasons, a comparison of the number of annual openings and completions can lead to misleading conclusions related to the magnitude of skills gaps in specific occupations.

Of the middle-skill occupations, three require an associate's degree – web developers, computer network support specialists, and desktop publishers. Although computer science and computer programming training is available at EPCC and matches to web developers, there does not appear to be the specialized digital media and information resource design program that could support both web developers and desktop publishers. For computer network support specialists, there appears to be adequate training capacity in the region to meet the demand for new graduates. Computer user support specialists require some college, and the Vista College Information Technology program is structured to train for this occupation. Computer repairers also require some college, but there are no degree programs offered to support this occupation. Each of the school districts, however, offers training in computer maintenance and/or as computer technicians.

FIGURE 40. EL PASO AREA DEGREE PROGRAMS—MIDDLE-SKILL OCCUPATIONS

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Code	Description							
Total Completions (2016)		13		79	2	120		94
15-1134 Web Developers								
<i>Annual openings for occupation (2017–2022): 15</i>		<i>Training required for entry-level: Associate's degree</i>						
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen.			12				12
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.1004	Web/Multimedia Mgmt. & Webmaster							0
15-1151 Computer User Support Specialists								
<i>Annual openings for occupation (2017–2022): 110</i>		<i>Training required for entry-level: Some college, no degree</i>						
11.0103	Info. Technology ³					120		120
11.1006	Computer Support Specialist							0

³ The information technology field of study is not matched with computer user support specialists on the O*NET CIP-SOC crosswalk, which is the foundation of this analysis. However, TIP determined that the coursework offered at Vista College's information technology program closely aligns with the computer user support specialist occupation. Thus, TIP added this field of study under this occupation.

CIP Code	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
01.0106	Agricultural Business Technology							0
51.0709	Medical Office Computer Specialist/Assistant							0
15-1152 Computer Network Support Specialists								
Annual openings for occupation (2017–2022): 25				Training required for entry-level: Associate's degree				
11.1002	System, Networking, & LAN/WAN Mgmt./Manager			34				34
11.0701	Computer Science			32	2			34
11.0901	Computer Systems Networking & Telecommunications	13						13
11.0201	Computer Programming/Programmer, Gen.			12				12
11.0501	Computer Systems Analysis/Analyst							0
11.1006	Computer Support Specialist							0
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
43-9011 Computer Operators								
Annual openings for occupation (2017–2022): 10				Training required for entry-level: High school diploma or equivalent				
11.0301	Data Processing & Data Processing Technology/Technician							0
43-9021 Data Entry Keyers								
Annual openings for occupation (2017–2022): 114				Training required for entry-level: High school diploma or equivalent				
52.0407	Business/Office Automation/Technology/Data Entry			1				1
10.0305	Graphic & Printing Equipment Operator, Gen. Production							0
11.0601	Data Entry/Microcomputer Apps., Gen.							0
43-9031 Desktop Publishers								
Annual openings for occupation (2017–2022): 2				Training required for entry-level: Associate's degree				
10.0303	Prepress/Desktop Publishing & Digital Imaging Design							0
49-2011 Computer, Automated Teller, & Office Machine Repairers								
Annual openings for occupation (2017–2022): 38				Training required for entry-level: Some college, no degree				
47.0102	Business Machine Repair							0
47.0104	Computer Installation & Repair Technology/Technician							0

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.
Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

Figure 41 and Figure 42 provide summaries of career and technical education programs and nondegree programs offered in the county that support the middle-skill occupations.

FIGURE 41. NONDEGREE PROGRAMS

PROVIDER	PROGRAM NAME
EPCC	Data Support Specialist Certificate
EPCC	Computer Support Technician A+ Certificate
EPCC	Cisco Networking Training Certificate
EPCC	Health Information Networking Certificate
EPCC	Networking and Security Technologies
Academy School of Careers, Inc.	Computer Operator Literacy Program / ESL
Computer Labs	Computer Network Technician
Computer Labs	Computer Operator Technology
Computer Labs	Computer Support Technician
Computer Labs	Intermediate Computer Operator Technology
New Horizons Consumer Learning Center	Healthcare IT Technician Associate
New Horizons Consumer Learning Center	Healthcare IT Technician Professional
New Horizons Consumer Learning Center	Security IT Professional Program
Western Technical College	IT-Computer Support Technician

Sources: Workforce Solutions Borderplex, Eligible Training Providers; El Paso Community College; and TIP research.

FIGURE 42. CAREER AND TECHNICAL EDUCATION PROGRAMS

DISTRICT NAME	PROGRAM NAME	CAREER CLUSTER	INDUSTRY CERT.	ARTICULATION AGREEMENT
EPISD	Computer Maintenance	Information Technology	✗	
Canutillo ISD	Selected Adobe programs*	Information Technology	✗	
SISD	Computer Maintenance	Information Technology	✗	
SISD	Advanced Technology Applications	STEM	✗	Articulations are in development with EPCC and Western Technical College.
SISD	Computer & Network Systems	Information Technology		Students who enter into the Computer & Network Systems series of courses and earn a grade of 85 or better can receive credit at EPCC for the following courses: ITSC 1325 Personal Computer Hardware and ITNW 1325 Fundamentals of Networking Technologies.
CLINT ISD	Computer Maintenance	Information Technology		
CLINT ISD	Computer Technician	Information Technology		

Sources: Workforce Solutions Borderplex, Eligible Training Providers; El Paso Community College; and TIP research.

Note: ISD is an independent school district.

*Not a complete program.

ADVANCED-SKILL

The advanced-skill occupations differ significantly from the middle-skill occupations in that all require at least a bachelor's degree. On-the-job training does not play a big role in these occupations, but certain occupations do require experience for entry. These include computer & information systems managers, database administrators, computer network architects, information security analysts, art directors, and technical writers.

FIGURE 43. TOP ADVANCED-SKILL OCCUPATIONS
TYPICAL EDUCATION AND TRAINING

SOC Code	Description	Annual Openings (2017-2022)	Typical requirements for entry into occupation		Training required for competency
			Education	Experience	
11-3021	Computer & Info. Systems Managers	21	HS diploma or equiv.	5 years+	None
13-1051	Cost Estimators	44	Bachelor's degree	None	None
13-1161	Market Research Analysts & Mktng. Specialists	62	Bachelor's degree	None	None
13-1199	Business Operations Specialists, All Other	180	Bachelor's degree	None	None
13-2051	Financial Analysts	33	Bachelor's degree	None	None
15-1111	Computer & Info. Research Scientists	Insf. Data	Doctoral/prof. degree	None	None
15-1121	Computer Systems Analysts	36	Bachelor's degree	None	None
15-1122	Information Security Analysts	5	Bachelor's degree	< 5 years	None
15-1131	Computer Programmers	19	Bachelor's degree	None	None
15-1132	Software Developers, Applications	37	Bachelor's degree	None	None
15-1133	Software Developers, Systems Software	28	Bachelor's degree	None	None
15-1141	Database Administrators	20	Bachelor's degree	< 5 years	None
15-1142	Network & Computer Systems Admin.	36	Bachelor's degree	None	None
15-1143	Computer Network Architects	12	Bachelor's degree	5 years+	None
15-1199	Computer Occupations, All Other	42	Bachelor's degree	None	None
15-2011	Actuaries	Insf. Data	Bachelor's degree	None	Long-term OJT
15-2021	Mathematicians	Insf. Data	Master's degree	None	None
15-2031	Operations Research Analysts	8	Bachelor's degree	None	None
15-2041	Statisticians	5	Master's degree	None	None
15-2091	Mathematical Technicians	-	Bachelor's degree	None	None
15-2099	Mathematical Science Occupations, All Other	Insf. Data	Bachelor's degree	None	None
27-1011	Art Directors	5	Bachelor's degree	5 years+	None
27-1014	Multimedia Artists & Animators	3	Bachelor's degree	None	Moderate-term OJT
27-1024	Graphic Designers	32	Bachelor's degree	None	None
27-3042	Technical Writers	4	Bachelor's degree	< 5 years	Short-term OJT
27-4032	Film & Video Editors	2	Bachelor's degree	None	None
43-9111	Statistical Assistants	Insf. Data	Bachelor's degree	None	None

Source: Bureau of Labor Statistics.

El Paso County education institutions offer degree programs and several nondegree programs that support the development of talent to fill most of these advanced-skill occupations. A summary of the availability of programs in the county is summarized in Figure 44.

There appears to be four potential gaps in training for middle-skill occupations in El Paso County that would require further study:

- **Integrating IT in the core business curriculum** is essential to arming new graduates with the skills to manage and analyze datasets in ways that provide insights to data-driven organizations. While UTEP's College of Business offers a minor in computer information systems that provides business students with these skills, there are core skills that all business students should have. Financial analysts, market research and marketing analysts, and operations research analysts all need a common set of skills:
 - Data management and extraction including the basics of data structuring and database management as well as Structured query language (SQL)
 - Statistics and statistical software such as SPSS, Stata, and Minitab
 - Data visualization and analytics platforms such as Tableau, Power BI, MicroStrategy, and Cognos
- **Flexible, dynamic training models** for rapid upskilling and/or retraining could better accommodate the rapidly changing needs of IT employers. These models would allow IT workers in the county to keep their skills up-to-date with accessible, short-term training programs that could potentially be developed and offered through a consortium of employers (e.g. a technology council). This type of training model could help the regional IT workers acquire emerging skills such as process automation or the use of cloud technologies and operating within cloud environments (security, administration, networking).
- **More specialized curricula in software development and DevOps** at the undergraduate level or as continuing education would potentially support a deeper regional expertise in the development of secure software and systems. The majority of the programs that match with software developers and programs are more general computer science.
- **The advanced-skill occupations related to digital media and interaction design** – graphic designers, multimedia artists, film and video editors – also have few program offerings specific to digital media such as Web, mobile, computer graphics, interactive, and other digital arts. At UTEP, there are Digital Media Productions and Graphic Design programs offered through the College of Liberal Arts. At EPCC, there is a program in advertising graphics and design. However, these programs seem to be oriented toward more traditional media rather than those that support online and mobile digital content. Common technology skills in these occupations include:
 - Modeling software such as Autodesk or solidThinking
 - Adobe Creative Suite for development, graphic editing & design
 - Web platform development software such Drupal, DHTML/HTML, JavaScript

FIGURE 44. EDUCATIONAL SUMMARY FOR TOP ADVANCED-SKILL OCCUPATIONS
 AVAILABILITY OF PROGRAMS IN THE COUNTY

SOC Code	Description	Degree Program	Nondegree (Noncredit, CE, Customized Training)	Career & Technical Education
11-3021	Computer & Info. Systems Managers	•		
13-1051	Cost Estimators	•		
13-1161	Market Research Analysts & Mktng. Specialists	•		
13-1199	Business Operations Specialists, All Other	No program matches		
13-2051	Financial Analysts	•		
15-1111	Computer & Info. Research Scientists	•		
15-1121	Computer Systems Analysts	•		
15-1122	Information Security Analysts	•	•	
15-1131	Computer Programmers	•	•	
15-1132	Software Developers, Applications	•		
15-1133	Software Developers, Systems Software	•		
15-1141	Database Administrators	•		
15-1142	Network & Computer Systems Admin.	•	•	
15-1143	Computer Network Architects	•		
15-1199	Computer Occupations, All Other	•		
15-2011	Actuaries	•		
15-2021	Mathematicians	•		
15-2031	Operations Research Analysts	No programs offered		
15-2041	Statisticians	•		
15-2091	Mathematical Technicians	•		
15-2099	Mathematical Science Occupations, All Other	•		
27-1011	Art Directors	•		
27-1014	Multimedia Artists & Animators	•		
27-1024	Graphic Designers	•		
27-3042	Technical Writers	•		
27-4032	Film & Video Editors	•		
43-9111	Statistical Assistants	•		

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

Figure 45 shows the fields of study that match each advanced-skill occupation. It lists the field of study and the number of completions by institutions. For quick reference, the number of estimated annual openings for each occupation is included as an indicator of demand, and the training required for entry is included as well.

Note that fields of study often match with more than one occupation. In particular, computer science, computer and information science, and information technology are each assigned to seven or more occupations. In addition, students who complete these programs may not work in training-related occupations or may move to different labor markets. For these reasons, a comparison of the number of annual openings and completions can lead to misleading conclusions related to the magnitude of skills gaps in specific occupations.

Among the advanced-skill IT occupations, all have related degree programs offered in the region with the exception of two. Business operations specialist does not have matching programs as it was not included as part of CIP-SOC Crosswalk developed by O*Net and BLS. This is most likely because it encompasses a group of occupations that require different kinds of training. The two most relevant occupations to the IT talent cluster are security management specialist and online merchants. The other occupations that does not have degree programs is operations research specialist. Operations research and management science are the two programs that match with this occupation but neither are offered in the region.

While there are programs that, for the most part, training for these advanced-skill occupations, the programs with the highest number of completions match with many occupations and they provide more general training rather than specialization in particular areas such as software development, systems analysis, or network administration. There are a growing number of programs that offer opportunities to specialize in cybersecurity. The business and digital media occupations also do not offer IT-focused programs such as data analytics for business or Web/mobile for digital media.

FIGURE 45. EL PASO AREA DEGREE PROGRAMS—ADVANCED-SKILL OCCUPATIONS

CIP Code	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
Total Completions (2016)		20	0	579	833	261	41	1,734
11-3021 Computer & Info. Systems Managers								
<i>Annual openings for occupation (2017–2022): 20</i>				<i>Training required for entry-level: Bachelor's degree</i>				
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
52.1201	Mgmt. Info. Systems, Gen.				52			52
52.0205	Operations Mgmt. & Supervision				38			38
11.0701	Computer Science			32	2			34
11.0401	Info. Science/Studies				5			5
11.1001	Network & System Admin./Administrator							0

CIP Code	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1005	Info. Technology Project Mgmt.							0
52.1206	Info. Resources Mgmt.							0
52.1207	Knowledge Mgmt.							0
13-1051 Cost Estimators								
<i>Annual openings for occupation (2017–2022): 43 Training required for entry-level: Bachelor's degree</i>								
52.0201	Business Admin & Mgmt., Gen.	7		49	220	141	0	417
52.0101	Business/Commerce, Gen.			325	32			357
14.1901	Mechanical Engineering			33	142			175
14.1801	Materials Engineering			2	11			13
14.3601	Mfg. Engineering				10			10
14.3301	Construction Engineering							0
15.1001	Construction Engineering Technology/Technician							0
13-1161 Market Research Analysts & Marketing Specialists								
<i>Annual openings for occupation (2017–2022): 61 Training required for entry-level: Bachelor's degree</i>								
52.1401	Marketing/Marketing Mgmt., Gen.				66			66
19.0203	Consumer Merchandising/Retailing Mgmt.							0
45.0602	Applied Economics							0
52.1402	Marketing Research							0
52.1403	International Marketing							0
13-1199 Business Operations Specialist								
<i>Annual openings for occupation (2017–2022): 180 Training required for entry-level: Bachelor's degree</i>								
<i>No matching fields of study.</i>								
13-2051 Financial Analysts								
<i>Annual openings for occupation (2017–2022): 33 Training required for entry-level: Bachelor's degree</i>								
52.0801	Finance, Gen.				109			109
52.0305	Accounting & Business/Mgmt.			2				2
27.0305	Financial Mathematics							0
52.0304	Accounting & Finance							0
52.0806	International Finance							0
52.0807	Investments & Securities							0
52.0808	Public Finance							0

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Code	Description							
15-1111 Computer & Info. Research Scientists								
Annual openings for occupation (2017–2022): Insf. Data								
Training required for entry-level: Master's degree								
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
11.0701	Computer Science			32	2			34
26.1103	Bioinformatics				6			6
11.0401	Info. Science/Studies				5			5
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0199	Computer & Info. Sciences, Other							0
11.0804	Modeling, Virtual Environments & Simulation							0
51.2706	Medical Informatics							0
15-1121 Computer Systems Analysts								
Annual openings for occupation (2017–2022): 36								
Training required for entry-level: Bachelor's degree								
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
11.0901	Computer Systems Networking & Telecom	13						13
11.0501	Computer Systems Analysis/Analyst							0
15-1122 Info. Security Analysts								
Annual openings for occupation (2017–2022): 4								
Training required for entry-level: Bachelor's degree								
11.0103	Info. Technology					120		120
11.0701	Computer Science			32	2			34
11.1002	System, Networking, & LAN/WAN Mgmt./Manager			34				34
11.0901	Computer Systems Networking & Telecommunications	13						13
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1005	Info. Technology Project Mgmt.							0
43.0116	Cyber/Computer Forensics & Counterterrorism							0

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Code	Description							
15-1131	Computer Programmers							
<i>Annual openings for occupation (2017–2022): 19</i>		<i>Training required for entry-level: Bachelor's degree</i>						
52.1201	Mgmt. Info. Systems, Gen.				52			52
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen.			12				12
11.0202	Computer Programming, Specific Apps.							0
11.0203	Computer Programming, Vendor/Product Cert.							0
11.0299	Computer Programming, Other							0
11.0803	Computer Graphics							0
11.0804	Modeling, Virtual Environments & Simulation							0
15.1204	Computer Software Technology/Technician							0
15-1132	Software Devs., Apps.							
<i>Annual openings for occupation (2017–2022): 37</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0103	Info. Technology					120		120
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen.			12				12
14.0901	Computer Engineering, Gen.				8			8
14.0903	Computer Software Engineering				8			8
26.1103	Bioinformatics				6			6
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0202	Computer Programming, Specific Apps.							0
11.0804	Modeling, Virtual Environments & Simulation							0
15.1204	Computer Software Technology/Technician							0
51.2706	Medical Informatics							0
15-1133	Software Devs., Systems Software							
<i>Annual openings for occupation (2017–2022): 27.6</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0103	Info. Technology					120		120
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen.			12				12
14.0901	Computer Engineering, Gen.				8			8

CIP Code	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
14.0903	Computer Software Engineering				8			8
11.0401	Info. Science/Studies				5			5
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0202	Computer Programming, Specific Apps.							0
15.1204	Computer Software Technology/Technician							0
15-1141 Database Administrators								
<i>Annual openings for occupation (2017–2022): 20 Training required for entry-level: Bachelor's degree</i>								
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0802	Data Modeling/Warehousing & Database Admin.							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
15-1142 Network & Computer Systems Admin.								
<i>Annual openings for occupation (2017–2022): 35 Training required for entry-level: Bachelor's degree</i>								
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
15-1143 Computer Network Architects								
<i>Annual openings for occupation (2017–2022): 11 Training required for entry-level: Bachelor's degree</i>								
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
11.0901	Computer Systems Networking & Telecommunications	13						13
14.0901	Computer Engineering, Gen.				8			8
11.0501	Computer Systems Analysis/Analyst							0
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
14.0999	Computer Engineering, Other							0
15-1199 Computer Occupations, All Other								
<i>Annual openings for occupation (2017–2022): 42 Training required for entry-level: Bachelor's degree</i>								
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0701	Computer Science			32	2			34
26.1103	Bioinformatics				6			6

CIP Code	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
11.0401	Info. Science/Studies				5			5
11.0301	Data Processing & Data Processing Technology/Technician							0
11.1005	Info. Technology Project Mgmt.							0
26.1104	Computational Biology							0
30.0801	Mathematics & Computer Science							0
30.1601	Accounting & Computer Science							0
30.3001	Computational Science							0
30.3101	Human Computer Interaction							0
43.0116	Cyber/Computer Forensics & Counterterrorism							0
51.2706	Medical Informatics							0
15-2011 Actuaries								
Annual openings for occupation (2017–2022): Insf. Data								
Training required for entry-level: Bachelor's degree								
27.0501	Statistics, Gen.				8			8
27.0301	Applied Mathematics, Gen.				1			1
27.0304	Computational & Applied Mathematics							0
27.0502	Mathematical Statistics & Probability							0
27.0503	Mathematics & Statistics							0
27.0599	Statistics, Other							0
52.1304	Actuarial Science							0
15-2021 Mathematicians								
Annual openings for occupation (2017–2022): Insf. Data								
Training required for entry-level: Master's degree								
27.0101	Mathematics, Gen.			14	40			54
27.0301	Applied Mathematics, Gen.				1			1
27.0303	Computational Mathematics							0
27.0304	Computational & Applied Mathematics							0
27.0102	Algebra & Number Theory							0
27.0103	Analysis & Functional Analysis							0
27.0104	Geometry/Geometric Analysis							0
27.0105	Topology & Foundations							0
27.0199	Mathematics, Other							0
27.0305	Financial Mathematics							0
27.0306	Mathematical Biology							0

CIP Code	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
27.0399	Applied Mathematics, Other							0
27.0502	Mathematical Statistics & Probability							0
27.0503	Mathematics & Statistics							0
27.9999	Mathematics & Statistics, Other							0
38.0102	Logic							0
15-2031 Operations Research Analysts								
Annual openings for occupation (2017–2022): 8		Training required for entry-level: Bachelor's degree						
14.3701	Operations Research							0
52.1301	Mgmt. Science							0
15-2041 Statisticians								
Annual openings for occupation (2017–2022): 5		Training required for entry-level: Master's degree						
27.0101	Mathematics, Gen.			14	40			54
27.0501	Statistics, Gen.				8			8
27.0301	Applied Mathematics, Gen.				1			1
26.1102	Biostatistics							0
27.0304	Computational & Applied Mathematics							0
27.0502	Mathematical Statistics & Probability							0
27.0503	Mathematics & Statistics							0
27.0599	Statistics, Other							0
45.0102	Research Methodology & Quantitative Methods							0
52.1302	Business Statistics							0
15-2091 Mathematical Technicians								
Annual openings for occupation (2017–2022): 0		Training required for entry-level: Bachelor's degree						
27.0301	Applied Mathematics, Gen.				1			1
15-2099 Mathematical Science Occupations, All Other								
Annual openings for occupation (2017–2022): Inf.		Training required for entry-level: Bachelor's degree						
Data								
27.0101	Mathematics, Gen.			14	40			54
27.0301	Applied Mathematics, Gen.				1			1
26.1104	Computational Biology							0
27.0303	Computational Mathematics							0
27.0304	Computational & Applied Mathematics							0
27.0305	Financial Mathematics							0
27.0306	Mathematical Biology							0
27.0399	Applied Mathematics, Other							0
27.9999	Mathematics & Statistics, Other							0
30.3001	Computational Science							0

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Code	Description							
27-1011	Art Directors							
<i>Annual openings for occupation (2017–2022): 5</i>		<i>Training required for entry-level: Bachelor's degree</i>						
50.0409	Graphic Design				1			1
50.0102	Digital Arts							0
50.0706	Intermedia/Multimedia							0
27-1014	Multimedia Artists & Animators							
<i>Annual openings for occupation (2017–2022): 2</i>		<i>Training required for entry-level: Bachelor's degree</i>						
50.0708	Painting				2			2
50.0409	Graphic Design				1			1
10.0304	Animation, Interactive Technology, Video Graphics & Special Effects							0
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.0804	Modeling, Virtual Environments & Simulation							0
50.0102	Digital Arts							0
50.0411	Game & Interactive Media Design							0
50.0705	Drawing							0
50.0706	Intermedia/Multimedia							0
27-1024	Graphic Designers							
<i>Annual openings for occupation (2017–2022): 32</i>		<i>Training required for entry-level: Bachelor's degree</i>						
50.0402	Commercial & Advertising Art			23				23
50.0409	Graphic Design				1			1
01.0802	Agricultural Communication/Journalism							0
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.0803	Computer Graphics							0
50.0102	Digital Arts							0
50.0401	Design & Visual Communications, Gen.							0
50.0404	Industrial & Product Design							0
27-3042	Technical Writers							
<i>Annual openings for occupation (2017–2022): 4</i>		<i>Training required for entry-level: Bachelor's degree</i>						
23.1301	Writing, Gen.			26				26
23.1303	Professional, Technical, Business, & Scientific Writing				4			4
09.0908	Technical & Scientific Communication							0
52.0501	Business/Corporate Communications							0

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Code	Description							
27-4032	Film & Video Editors							
<i>Annual openings for occupation (2017–2022): 2</i>		<i>Training required for entry-level: Bachelor's degree</i>						
09.0404	Photojournalism							0
09.0701	Radio & Television							0
10.0105	Communications Technology/Technician							0
10.0202	Radio & Television Broadcasting Technology/Technician							0
10.0299	Audiovisual Communications Technologies/Technicians, Other							0
50.0602	Cinematography & Film/Video Production							0
50.0607	Documentary Production							0
43-9111	Statistical Assistants							
<i>Annual openings for occupation (2017–2022): Inf. Data</i>		<i>Training required for entry-level: Bachelor's degree</i>						
52.0302	Accounting Technology/Technician & Bookkeeping			12				12

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

FIGURE 46. NONDEGREE EDUCATION PROGRAMS

PROVIDER	PROGRAM NAME
EPCC	Entry-Level Computer Programming Certificate
EPCC	Information Technology in Business Certificate
New Horizons Consumer Learning Center	Network Systems Administrator Associate Program
New Horizons Consumer Learning Center	Network Systems Administrator Professional Program
New Horizons Consumer Learning Center	Security IT Associate Program
New Horizons Consumer Learning Center	Security IT Professional Program

Sources: Workforce Solutions Borderplex, Eligible Training Providers; El Paso Community College; and TIP research.

RESOURCES

MICROSOFT TECHSPARK is a “national civic program to introduce digital initiatives designed to foster greater economic opportunity and job creation.”⁴ In March 2018, El Paso was chosen, in addition to five other communities in the US, to participate in TechSpark. TechSpark is specifically geared toward cities outside major metropolitan areas that might need assistance bringing their economies into the twenty-first century. The TechSpark initiative focuses on digital transformation, digital skills and computer science education, career pathways, rural broadband, and support for nonprofits. In El Paso, the TechSpark initiative is working to get more computer science integrated into the K–12 classroom with the **Technology Education and Literacy in Schools (TEALS)** program (see additional information on this page). TEALS is currently active at four high schools. In addition, the TechSpark initiative has created a software developers Meetup group. Finally, the initiative is working with employers on digital transformation. <https://news.microsoft.com/techspark/>

EDUCATIONAL RESOURCES

EL PASO COMMUNITY COLLEGE offers several associate’s degrees and certificates in information technology systems. EPCC has articulation agreements with county 4-year institutions, including UTEP, New Mexico State University (NMSU), and Park University, that allow students to transfer to 4-year programs. In addition, EPCC offers opportunities to retrain or upskill through its workforce training initiatives, customized training, and certificate programs. Students can get associate’s degrees in computer programming, IT in business, networking and security technologies. Certificates are available for entry-level programmers, data support specialists, IT in business, computer support technician A+, Cisco networking, health information networking, and enhanced networking and security technologies. In November 2018, EPCC was designated as a Center of Academic Excellence for cybersecurity by the Department of Homeland Security and the National Security Agency. <http://www.epcc.edu/InstructionalPrograms/Pages/ITS.aspx>

TECHNOLOGY EDUCATION AND LITERACY IN SCHOOLS (TEALS) is a program offered at four EL Paso County high schools. Founded by a former Microsoft engineer, the goal of the organizations is to bring computer science education to every high school to help students compete in today’s competitive economy. The model offers ways for teachers, students, tech workers, and local volunteers to get involved and offers courses in introductory computer science and advanced placement (AP) computer science A (equivalent to a college-level course). TEALS pairs IT professionals with classroom teachers to team teach computer science. After 2 years of a TEALS partnership, teachers are prepared to teach the curriculum on their own.

THE UNIVERSITY OF TEXAS AT EL PASO (UTEP) College of Engineering offers undergraduate and graduate degrees in computer science, electrical and computer engineering with concentrations in secure cyber systems and software engineering. The college also offers a fast-track program that allows qualified students to achieve a master’s degree in 5 years. <https://www.utep.edu/engineering/index.html> The College of Science has four research areas that are focused on development of theory for practical applications, software engineering, interactive systems (human-computer interaction), computer systems and high-performance computing. The College of Science offers bachelor’s degrees in mathematics with a minor in statistics. The college offers graduate degrees in bioinformatics, computational science, mathematical sciences, and statistics. It offers certificates in applied and computational mathematics and applied statistics. <https://www.utep.edu/science/index.html> The College of Business offers a minor in Computer Information Systems. In addition, through its Corporate Academies, it offers certificates in human capital management, enterprise resource planning, and risk management.

⁴ “Microsoft TechSpark: A New Civil Program to Foster Economic Opportunity for All Americans.” See <https://news.microsoft.com/techspark/>.

<https://www.utep.edu/business/index.html>. The Center for Research in Engineering and Technology Education (CREaTE) is focused on creating and innovating the future of engineering, technology, and computer science education with groundbreaking programs, teaching strategies, and research.

UTEP CYBER-SHARE CENTER OF EXCELLENCE is funded by the National Science Foundation and aims to share resources from various disciplines to advance research education through cyberinfrastructure. Bringing together researchers from a variety of backgrounds, the center works to integrate disparate data sources. Cyber-Share conducts research on technologies that support the acquisition, exchange, analysis, and integration of data information knowledge. <http://cybershare.utep.edu/>

UTEP TECH-E PROGRAM is a UTEP and Socorro ISD initiative to create opportunities for and access to science, technology, engineering, arts, and mathematics (STEAM) skills development. Tech-E focuses on current and developing technologies to allow participants an engaging real-world head start in the fields of technology innovation and exploration. www.utep.edu/newsfeed/campus/UTEP-Tech-E-Program-Engages-Young-Students.html

WESTERN TECHNICAL COLLEGE offers customized training programs and associate's degrees in information systems and security. Western Tech is a CompTIA, Cisco, and Microsoft Academy Partner and prepares students to test for professional certifications. Customized training can include hands-on skills training designed for a specific employer or preparation for employees seeking industry certifications. <https://www.westerntech.edu/areas-of-study/information-systems-and-security/>

ENTREPRENEURIAL ECOSYSTEM RESOURCES

Although the organizations below are more oriented towards entrepreneurship and innovation, they are included on this resource list because they contribute to the area's tech culture and digital economy.

El Paso is home to the **HUB OF HUMAN INNOVATION**, a resource for the county's entrepreneurial and innovation economy. The Hub is an incubator and offers a wide-range of services for entrepreneurs, including business model development, mentoring, access to capital, networking, and professional workshops. The organization's goals include enhancing the county's entrepreneurial climate and increasing the number of high-wage jobs.

COWORK OASIS is a coworking space dedicated to helping entrepreneurs succeed. In addition to offering affordable office space, the company offers networking events and workshops that bring in guests who work in the tech industry. CoWork Oasis has a unique point system associated with activities in the space that incentivize members to interact and get involved.

FAB LAB EL PASO is an award-winning maker space. The organization's core belief is that "the tools and resources to actualize creative ideas should be available to as many community members as possible."⁵ Fab Lab offers access to tools like 3D printers, computer numerical control (CNC) machines, and laser cutters. It offers workshops, workforce training, and custom design services. Classes offered in the space include "Girls Who Code" and other high-demand coding languages. The Lab offers STEM field trips to the space from local schools.

Housed in the former US Consulate in Ciudad Juárez, **TECHNOLOGY HUB** is modeled after Silicon Valley campuses and is a certified incubator by Mexico's National Institute of the Entrepreneur. The Technology Hub offers coworking space, events, classes, access to capital, and a maker space. The vision of the organization is to launch

⁵ Fab Lab El Paso. See <https://fablabelpaso.org/mission-statement/>.

“a binational ecosystem that develops innovation leaders and positions the region of Ciudad Juarez, El Paso and New Mexico.”⁶

The **MEDICAL CENTER OF THE AMERICAS (MCA) FOUNDATION** is a 440-acre campus in El Paso. The goal of the foundation is to develop “a growing hub of innovation for the Paso del Norte region’s health care and biomedical industries”⁷ through research, innovation, product development, and incubation of startup companies. MCA is strategically located near UTEP and Texas Tech University Health Sciences Center. The **MCA INNOVATION CENTER** features 20,000 square feet of biomedical and tech incubator space including wet labs, dry labs, lab support, and offices.

1 MILLION CUPS (1MC) is a national program designed to educate, engage, and connect entrepreneurs. Developed by the Kauffman Foundation, 1MC is based on the notion that entrepreneurs discover solutions and network over a million cups of coffee. More than 180 chapters exist in communities across the US, including one in El Paso.

INNOVATION FRONTERA (IF) is a binational, tristate coalition to create prosperity without borders through a fertile entrepreneurial ecosystem. IF hosts an annual leadership summit, bringing together public and private leaders, academia and government, entrepreneurs, and businesspeople to empower the county.

⁶ *TechnologyHUB*. See <http://t-hub.mx/en/sobre-tech-hub>.

⁷ *Medical Center of the Americas Foundation*. See <https://mcamericas.org/about-us>.

CAREER PATHWAYS

WHAT ARE CAREER PATHWAYS?

Career pathways are groups of related occupations within a career cluster that share common skills, knowledge, and interests. The occupations within each career pathway range from entry-level to advanced. These pathways provide an overview of career options for the sector, including potential lines of progression from entry-level positions to more advanced career opportunities. The pathways developed for this work are outlined in this section.

ELEMENTS

Each pathway includes an overview graphic that groups the pathway occupations by the level of training and preparation required: entry-level, intermediate, and advanced. After each overview graphic is a table that presents data on employment and wages, followed by details on education, work experience, and training. These tables are supplemented by occupational profiles that provide alternative job titles, skills, and certifications. Information on available training in the county is then presented. This information includes for-credit degree programs, noncredit offerings, apprenticeships, and career and technical education in fields of study related to each occupation.

SECTOR	PATHWAYS
Information Technology	<ul style="list-style-type: none">• Information & Support Services• Programming & Software Development• Network Systems• Web & Digital Communications

CYBERSECURITY

The protection of information systems and data is an issue that cuts across various career pathways within information technology. To highlight this critical skill set, occupations that have information security responsibilities (including cybersecurity) under the current federal classification system have an asterisk next to the occupational title in the pathway graphic and in the occupational detail tables.

DATA AND METHODOLOGY

The information contained in these pathways is derived from a variety of public and proprietary sources including Emsi, Occupational Information Network (O*NET), and Gartner TalentNeuron. Underpinning this information is the Standard Occupational Classification (SOC) system, a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 867 detailed occupations according to their occupational definition. These codes are updated every 8 to 10 years and, especially for rapidly evolving occupations such as information technology, they might not capture new and emerging occupations and job titles. Gartner TalentNeuron is a source that mines data from online job postings. The online postings are deduplicated, and information from the job postings is mapped to occupation codes. This information includes job titles, salary, location, skills, certifications, and industry. Because the information in the job postings is not standardized and because posting practices vary from firm to firm, there is a high degree of irregularity in the information gleaned from these postings. As such, this information should be used as a beginning point for further discussion with county employers to verify and validate their skills and competency requirements.

GUIDE TO DETAILED OCCUPATIONAL INFORMATION

Job Zones describe the level of education, experience or on-the-job training needed to do the work

1 = no little or no preparation

5 = extensive preparation

Occupation descriptions, reported job titles, entry-level education, required work experience, and training for competency are from O*NET's database which contains information on almost 1,000 occupations across the US economy.

43-9021 DATA ENTRY KEYERS

Operate data entry device, such as keyboard or photo composing perforator. Duties may include verifying data and preparing materials for printing.

Reported job titles: Data Capture Specialist, Data Entry Clerk, Data Entry Machine Operator, Data Entry Operator, Data Entry Specialist, Data Transcriber, Fiscal Assistant, Records Clerk, Typist, Underwriting Support Specialist

Job Zone: 2

- Entry-Level Education: High school diploma or equivalent
- Required Work Experience: None
- Training for Competency: Short-term on-the-job training

Educational Attainment

Share (%) of US workforce

Less than high school	
HS diploma/equivalent	59
Postsecondary certificate	
Some college courses	30
Associate's degree	11
Bachelor's degree	
Advanced degree	

Skills

- Microsoft Office
- 10-key calculators
- Optical scanners
- Transaction processing
- Claims processing administration and management
- Quality control
- Mozilla Firefox
- Bilingual
- Microsoft PowerPoint
- Data processing

Certifications

- Driver's license
- American Society for Testing and Materials
- Health Insurance Portability and Accountability Act—HIPAA
- Security clearance
- OSHA
- HAZMAT
- ICD-10 / ICD-9
- Accredited Purchasing Practitioner
- Society of Quality Assurance

Educational attainment of current workers in each occupation is from the Bureau

Skills and certifications are pulled from job postings analytics for your location via TalentNeuron

PATHWAY: **INFORMATION & SUPPORT SERVICES**

ADVANCED	COMPUTER & INFO. SYSTEMS MANAGERS Median Wage \$55.40 Range \$31.01–\$81.25 2017 Jobs 185 Openings thru 2022 103	ADMINISTRATIVE SERVICES MANAGERS Median Wage \$40.02 Range \$21.15–\$64.73 2017 Jobs 365 Openings thru 2022 196	
INTERMEDIATE	COMPUTER OCCUPATIONS (ALL OTHER)* Median Wage \$33.38 Range \$14.69–\$50.77 2017 Jobs 532 Openings thru 2022 212		
	SUPERVISORS OF OFFICE AND ADMINISTRATIVE Median Wage \$23.37 Range \$14.35–\$38.23 2017 Jobs 3,122 Openings thru 2022 1,873	OPERATIONS RESEARCH ANALYSTS Median Wage \$23.47 Range \$14.23–\$52.67 2017 Jobs 72 Openings thru 2022 42	DATABASE ADMINISTRATORS* Median Wage \$33.78 Range \$20.36–\$58.41 2017 Jobs 258 Openings thru 2022 101
ENTRY-LEVEL	DATA ENTRY KEYERS Median Wage \$9.31 Range \$7.86–\$14.62 2017 Jobs 989 Openings thru 2022 572	COMPUTER USER SUPPORT SPECIALISTS Median Wage \$19.83 Range \$9.06–\$28.71 2017 Jobs 1,136 Openings thru 2022 550	

Sources: Emsi 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed; O*NET; TIP Strategies.

Notes: Numbers are for El Paso County. Range shows hourly wage rates from the 10th to 90th percentiles. Openings are a measure of demand that accounts for net job growth and estimated replacement needs.

Figure 47 shows the fields of study that match each middle-skill occupation. It lists the field of study and the number of completions by institutions. For quick reference, the number of estimated annual openings for each occupation is included as an indicator of demand, and the training required for entry is included as well.

Note that fields of study often match with more than one occupation. In addition, students who complete these programs may not work in training-related occupations or may move to different labor markets. For these reasons, a comparison of the number of annual openings and completions can lead to misleading conclusions related to the magnitude of skills gaps in specific occupations.

FIGURE 47. INFO. AND SUPPORT SERVICES AND RELATED FIELDS, DEGREE PROGRAMS ONLY

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Codes	Description							
Total Completions (2016)		7	0	422	423	363	41	1,256
43-9021 Data Entry Keyers								
<i>Annual Openings for occupation (2017-2022): 114</i>		<i>Training required for entry-level: High school diploma or equivalent</i>						
52.0407	Business/Office Automation/Technology/Data Entry			1				1
10.0305	Graphic & Printing Equipment Operator, Gen. Production							0
11.0601	Data Entry/Microcomputer Apps., Gen.							0
15-1151 Computer User Support Specialists								
<i>Annual Openings for occupation (2017-2022): 110</i>		<i>Training required for entry-level: Some college, no degree</i>						
01.0106	Agricultural Business Technology							0
11.1006	Computer Support Specialist							0
51.0709	Medical Office Computer Specialist/Assistant							0
15-1199 Computer Occupations, All Other								
<i>Annual Openings for occupation (2017-2022): 42</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0701	Computer Science			32	2			34
26.1103	Bioinformatics				6			6
11.0401	Info. Science/Studies				5			5
11.0301	Data Processing & Data Processing Technology/Technician							0
11.1005	Info. Technology Project Mgmt.							0
26.1104	Computational Biology							0
30.0801	Mathematics & Computer Science							0
30.1601	Accounting & Computer Science							0
30.3001	Computational Science							0
30.3101	Human Computer Interaction							0
43.0116	Cyber/Computer Forensics & Counterterrorism							0
51.2706	Medical Informatics							0

		Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
CIP Codes	Description							
43-1011	First-Line Supervisors of Office & Administrative Support Workers							
<i>Annual Openings for occupation (2017-2022): 375</i>		<i>Training required for entry-level: High school diploma or equivalent</i>						
52.0204	Office Mgmt. & Supervision					102		102
01.0106	Agricultural Business Technology							0
51.0705	Medical Office Mgmt./Admin.							0
51.0711	Medical Reception/Receptionist							0
52.0207	Customer Service Mgmt.							0
52.0208	E-Commerce/Electronic Commerce							0
15-2031	Operations Research Analysts							
<i>Annual Openings for occupation (2017-2022): 8</i>		<i>Training required for entry-level: Bachelor's degree</i>						
14.3701	Operations Research							0
52.1301	Mgmt. Science							0
15-1141	Database Admin.							
<i>Annual Openings for occupation (2017-2022): 20</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
52.1201	Mgmt. Info. Systems, Gen.				52			52
52.0205	Operations Mgmt. & Supervision				38			38
11.0701	Computer Science			32	2			34
11.0401	Info. Science/Studies				5			5
11.1006	Computer Support Specialist							0
51.0709	Medical Office Computer Specialist/Assistant							0
11-3021	Computer & Info. Systems Managers							
<i>Annual Openings for occupation (2017-2022): 21</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
52.1201	Mgmt. Info. Systems, Gen.				52			52
52.0205	Operations Mgmt. & Supervision				38			38
11.0701	Computer Science			32	2			34

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
11.0401	Info. Science/Studies				5			5
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1005	Info. Technology Project Mgmt.							0
52.1206	Info. Resources Mgmt.							0
52.1207	Knowledge Mgmt.							0
11-3011 Administrative Services Managers								
<i>Annual Openings for occupation (2017-2022): 39</i>				<i>Training required for entry-level: Bachelor's degree</i>				
52.0201	Business Admin. & Mgmt., Gen.	7		49	220	141	0	417
52.0101	Business/Commerce, Gen.			325	32			357
51.0711	Medical Reception/Receptionist							0
52.0202	Purchasing, Procurement/Acquisitions & Contracts Mgmt.							0

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

OCCUPATIONAL DETAIL: INFORMATION & SUPPORT SERVICES




43-9021 DATA ENTRY KEYERS

Operate data entry device, such as keyboard or photo composing perforator. Duties may include verifying data and preparing materials for printing.

Reported job titles: Data Capture Specialist, Data Entry Clerk, Data Entry Machine Operator, Data Entry Operator, Data Entry Specialist, Data Transcriber, Fiscal Assistant, Records Clerk, Typist, Underwriting Support Specialist

Job Zone: 2

- Entry-Level Education: High school diploma or equivalent
- Required Work Experience: None
- Training for Competency: Short-term on-the-job training

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Microsoft Office • 10-key calculators • Optical scanners 	<ul style="list-style-type: none"> • Driver's license • American Society for Testing and Materials
HS diploma/equivalent  59	<ul style="list-style-type: none"> • Transaction processing • Claims processing administration and management 	<ul style="list-style-type: none"> • Health Insurance Portability and Accountability Act—HIPAA • Security clearance
Postsecondary certificate		
Some college courses  30	<ul style="list-style-type: none"> • Quality control • Mozilla Firefox • Bilingual 	<ul style="list-style-type: none"> • OSHA • HAZMAT • ICD-10 / ICD-9
Associate's degree  11	<ul style="list-style-type: none"> • Microsoft PowerPoint • Data processing 	<ul style="list-style-type: none"> • Accredited Purchasing Practitioner • Society of Quality Assurance
Bachelor's degree		
Advanced degree		






15-1151 COMPUTER USER SUPPORT SPECIALISTS

Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, or via telephone or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail, and operating systems.

Reported job titles: Computer Specialist, Computer Support Specialist, Computer Technician, Desktop Support Technician, Help Desk Analyst, Help Desk Technician, Information Technology Specialist (IT Specialist), Network Technician, Support Specialist, Technical Support Specialist

Job Zone: 3

- Entry-Level Education: Some college, no degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school <1	<ul style="list-style-type: none"> • Technical support • Microsoft Office 	<ul style="list-style-type: none"> • Security clearance • Driver's license
HS diploma/equivalent  22	<ul style="list-style-type: none"> • Microsoft Active Directory • Microsoft Windows 	<ul style="list-style-type: none"> • A+ • Top Secret Sensitive Compartmented Information
Postsecondary certificate  12	<ul style="list-style-type: none"> • Local area network • Ticketing system 	<ul style="list-style-type: none"> • DoD 8570 • Microsoft Certified Systems Engineer
Some college courses  19	<ul style="list-style-type: none"> • Linux • Microsoft PowerPoint 	<ul style="list-style-type: none"> • CompTIA A+ • Microsoft Certified Professional
Associate's degree  14	<ul style="list-style-type: none"> • Structured query language • Preventive maintenance 	<ul style="list-style-type: none"> • Public trust security clearance • Cisco Certified Network Associate
Bachelor's degree  33		
Advanced degree		

15-1199 COMPUTER OCCUPATIONS (ALL OTHER)

Design and develop solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions. Includes software quality assurance engineers and testers, computer systems engineers/architects, Web administrators, geospatial information systems technicians/technologists, database architects, data warehousing specialists, business intelligence analysts, information technology project managers, search marketing strategists, video game designers, document management specialists.

Reported job titles: Not available for "All Other" occupations

Job Zone: N/A

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Quality assurance • Software development • Systems development life cycle • Java • Microsoft Office • Agile Software Development • Scrum agile methodology • Test automation • Structured query language • Amazon Web Services 	<ul style="list-style-type: none"> • Project Management Professional • Security clearance • Project Management Institute • Top Secret Sensitive Compartmented Information • Certified ScrumMaster • Certified Information Systems Security Professional • Rich Media Communication with Adobe Flash Professional CS6 • Telecommunications • Driver's license
Not available for "All Other" occupations		

43-1011 FIRST-LINE SUPERVISORS OF OFFICE AND ADMINISTRATIVE

Directly supervise and coordinate the activities of clerical and administrative support workers.

Reported job titles: Accounting Manager, Accounts Payable Supervisor, Accounts Receivable Manager, Administrative Supervisor, Customer Service Manager, Customer Service Supervisor, Office Coordinator, Office Manager, Office Supervisor, Staff Services Manager

Job Zone: 3

- Entry-Level Education: High school diploma or equivalent
- Required Work Experience: Less than 5 years
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Microsoft Office • Microsoft PowerPoint • Accounts receivable • Accounts payable • Bilingual • Customer relationship management • Technical support • Quality control • Mathematics • Salesforce.com (SFDC) customer relationship management (CRM) 	<ul style="list-style-type: none"> • Driver's license • Associate in Reinsurance • OSHA • Continuing education • Security clearance • Health Insurance Portability and Accountability Act—HIPAA • Certified Service Manager • Nationwide Mortgage Licensing System • First aid • HAZMAT
Less than high school	0	
HS diploma/equivalent	23	
Postsecondary certificate	1	
Some college courses	20	
Associate's degree	10	
Bachelor's degree	45	
Advanced degree	1	



15-2031 OPERATIONS RESEARCH ANALYSTS

Formulate and apply mathematical modeling and other optimizing methods to develop and interpret information that assists management with decision-making, policy formulation, or other managerial functions. May collect and analyze data and develop decision support software, service, or products. May develop and supply optimal time, cost, or logistics networks for program evaluation, review, or implementation.

Reported job titles: Advanced Analytics Associate, Analytical Strategist, Business Analytics Director, Business Insight and Analytics Manager, Decision Analyst, Operations Research Analyst, Operations Research Director, Operations Research Group Manager, Operations Research Manager, Optimization Analyst

Job Zone: 5

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Microsoft Office • Structured query language • Microsoft PowerPoint • Statistical Analysis System • Tableau software • Python • Microsoft Access • Data mining • Enterprise resource planning software 	<ul style="list-style-type: none"> • Security clearance • Top Secret Sensitive Compartmented Information • American Production and Inventory Control Society • Driver's license • Accounting • Six Sigma Green Belt • Certified Public Accountant • Certified Management Accountant • Chartered Financial Analyst • National Committee for Quality Assurance
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses		
Associate's degree		
Bachelor's degree 	30	
Advanced degree 	70	




15-1141 DATABASE ADMINISTRATORS*

Administer, test, and implement computer databases, applying knowledge of database management systems. Coordinate changes to computer databases. May plan, coordinate, and implement security measures to safeguard computer databases.

Reported job titles: Data Architect, Database Administration Manager, Database Administrator (DBA), Database Analyst, Database Coordinator, Database Developer, Database Programmer, Information Systems Manager, Management Information Systems Director (MIS Director), System Administrator

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Microsoft SQL Server • Structured query language • Database administration • Relational database management system • UNIX • Linux • Data warehousing • Database design • Extract, transform, load software • Stored procedures 	<ul style="list-style-type: none"> • Oracle Database 11g Administrator Certified Professional • Security clearance • Top Secret Sensitive Compartmented Information • Oracle Certified Professional • Certified Information Systems Security Professional • Cadastral Mapping Specialist • DoD 8570 • CompTIA Security+ • Microsoft Certified Systems Admin. • IAT Level 2
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses	1	
Associate's degree 	7	
Bachelor's degree 	77	
Advanced degree 	15	

11-3021 COMPUTER & INFORMATION SYSTEMS MANAGERS

Plan, direct, or coordinate activities in such fields as electronic data processing, information systems, systems analysis, and computer programming.

Reported job titles: Application Development Director, Computing Services Director, Data Processing Manager, Information Systems Director (IS Director), Information Systems Manager (IS Manager), Information Systems Supervisor (IS Supervisor), Information Technology Director (IT Director), Information Technology Manager (IT Manager), MIS Director (Management Information Systems Director), Technical Services Manager

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: 5 years or more
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Information security • Microsoft Office • Disaster recovery 	<ul style="list-style-type: none"> • Project Management Professional • Certified Information Systems Security Professional
HS diploma/equivalent 1	<ul style="list-style-type: none"> • Enterprise Services • Information Management 	<ul style="list-style-type: none"> • Security clearance • Certified Information Systems Auditor
Postsecondary certificate 6	<ul style="list-style-type: none"> • Succession planning • Cyber security 	<ul style="list-style-type: none"> • Project Management Institute • Certified Records Manager
Some college courses 26	<ul style="list-style-type: none"> • Training software • Security risk assessment 	<ul style="list-style-type: none"> • Top Secret Sensitive Compartmented Information • Governance, risk, and compliance systems
Associate's degree 2	<ul style="list-style-type: none"> • National Institute of Standards and Technology 	<ul style="list-style-type: none"> • Health Insurance Portability and Accountability Act—HIPAA
Bachelor's degree 48		
Advanced degree 17		

11-3011 ADMINISTRATIVE SERVICES MANAGERS

Plan, direct, or coordinate one or more administrative services of an organization, such as records and information management, mail distribution, facilities planning and maintenance, custodial operations, and other office support services.

Reported job titles: Administrative Coordinator, Administrative Director, Administrative Manager, Administrative Officer, Administrative Specialist, Administrator, Business Administrator, Business Manager, Facilities Manager, Office Manager

Job Zone: 3

- Entry-Level Education: Bachelor's degree
- Required Work Experience: Less than 5 years
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school 0	<ul style="list-style-type: none"> • Microsoft Office • Preventive maintenance 	<ul style="list-style-type: none"> • Driver's license • OSHA
HS diploma/equivalent 34	<ul style="list-style-type: none"> • Blueprints • Quality assurance 	<ul style="list-style-type: none"> • EPA • Security clearance
Postsecondary certificate 13	<ul style="list-style-type: none"> • Work order • Microsoft PowerPoint 	<ul style="list-style-type: none"> • Certified Facility Manager • Continuing education
Some college courses 13	<ul style="list-style-type: none"> • Microsoft SharePoint • Energy management 	<ul style="list-style-type: none"> • Defense Federal Acquisition Regulation Supplement • International Facility Mgmt. Assoc.
Associate's degree 12	<ul style="list-style-type: none"> • Quality control • Health, safety, and environmental 	<ul style="list-style-type: none"> • Certified Healthcare Facility Manager • HAZMAT
Bachelor's degree 24		
Advanced degree 4		

Sources O*NET; Gartner TalentNeuron.

PATHWAY: **PROGRAMMING & SOFTWARE DEVELOPMENT**

ADVANCED	SOFTWARE DEVELOPERS, APPLICATIONS	SOFTWARE DEVELOPERS, SYSTEMS SOFTWARE	COMPUTER & INFO. SYSTEMS MANAGERS
	Median Wage \$33.97 Range \$20.25–\$59.84 2017 Jobs 400 Openings thru 2022 186	Median Wage \$34.35 Range \$21.46–\$57.09 2017 Jobs 338 Openings thru 2022 138	Median Wage \$55.40 Range \$31.01–\$81.25 2017 Jobs 185 Openings thru 2022 103
INTERMEDIATE	STATISTICIANS	COMPUTER SYSTEMS ANALYSTS	COMPUTER PROGRAMMERS
	Median Wage \$11.79 Range \$9.94–\$42.20 2017 Jobs 42 Openings thru 2022 26	Median Wage \$29.42 Range \$18.61–\$51.32 2017 Jobs 349 Openings thru 2022 180	Median Wage \$28.98 Range \$15.71–\$47.33 2017 Jobs 292 Openings thru 2022 96
ENTRY-LEVEL	DATABASE ADMINISTRATORS*	WEB DEVELOPERS	
	Median Wage \$33.78 Range \$20.36–\$58.41 2017 Jobs 258 Openings thru 2022 101	Median Wage \$21.81 Range \$9.13–\$33.94 2017 Jobs 159 Openings thru 2022 78	

Sources: Emsi 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed; O*NET; TIP Strategies.

Notes: Numbers are for El Paso County. Range shows hourly wage rates from the 10th to 90th percentiles. Openings are a measure of demand that accounts for net job growth and estimated replacement needs.

Figure 48 shows the fields of study that match each middle-skill occupation. It lists the field of study and the number of completions by institutions. For quick reference, the number of estimated annual openings for each occupation is included as an indicator of demand, and the training required for entry is included as well.

Note that fields of study often match with more than one occupation. In addition, students who complete these programs may not work in training-related occupations or may move to different labor markets. For these reasons, a comparison of the number of annual openings and completions can lead to misleading conclusions related to the magnitude of skills gaps in specific occupations.

FIGURE 48. PROGRAMMING AND SOFTWARE DEVELOPMENT AND RELATED FIELDS OF STUDY, DEGREE PROGRAMS ONLY

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
Total Completions (2016)		13	0	73	220	120	41	467
15-1134 Web Developers								
<i>Annual Openings for occupation (2017-2022): 16</i>				<i>Training required for entry-level: Associate's degree</i>				
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen.			12				12
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.1004	Web/Multimedia Mgmt. & Webmaster							0
15-1121 Computer Systems Analysts								
<i>Annual Openings for occupation (2017-2022): 36</i>				<i>Training required for entry-level: Bachelor's degree</i>				
11.0101	Computer & Info Sciences, Gen			15	68		41	124
11.0103	Info Technology					120		120
11.0901	Computer Systems Networking & Telecom	13						13
11.0501	Computer Systems Analysis/Analyst							0
15-1131 Computer Programmers								
<i>Annual Openings for occupation (2017-2022): 19</i>				<i>Training required for entry-level: Bachelor's degree</i>				
52.1201	Mgmt Info Systems, Gen				52			52
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen			12				12
11.0202	Computer Programming, Specific Apps.							0
11.0203	Computer Programming, Vendor/Product Cert.							0
11.0299	Computer Programming, Other							0
11.0803	Computer Graphics							0
11.0804	Modeling, Virtual Environments & Simulation							0
15.1204	Computer Software Technology/Technician							0
51.0709	Medical Office Computer Specialist/Assistant							0
15-1141 Database Admin.								
<i>Annual Openings for occupation (2017-2022): 20</i>				<i>Training required for entry-level: Bachelor's degree</i>				
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0802	Data Modeling/Warehousing & Database Admin.							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
15-1132 Software Devs., Apps.								
<i>Annual Openings for occupation (2017-2022): 37</i>				<i>Training required for entry-level: Bachelor's degree</i>				
11.0103	Info Technology					120		120
11.0701	Computer Science			32	2			34

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
11.0201	Computer Programming/Programmer, Gen			12				12
14.0901	Computer Engineering, Gen				8			8
14.0903	Computer Software Engineering				8			8
26.1103	Bioinformatics				6			6
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0202	Computer Programming, Specific Apps.							0
11.0804	Modeling, Virtual Environments & Simulation							0
15.1204	Computer Software Technology/Technician							0
51.2706	Medical Informatics							0
15-1133 Software Devs., Systems Software								
<i>Annual Openings for occupation (2017-2022): 28</i>				<i>Training required for entry-level: Bachelor's degree</i>				
11.0103	Info Technology					120		120
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen			12				12
14.0901	Computer Engineering, Gen				8			8
14.0903	Computer Software Engineering				8			8
11.0401	Info Science/Studies				5			5
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0202	Computer Programming, Specific Apps.							0
15.1204	Computer Software Technology/Technician							0
11-3021 Computer & Info. Systems Managers								
<i>Annual Openings for occupation (2017-2022): 21</i>				<i>Training required for entry-level: Bachelor's degree</i>				
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
52.1201	Mgmt. Info. Systems, Gen.				52			52
52.0205	Operations Mgmt. & Supervision				38			38
11.0701	Computer Science			32	2			34
11.0401	Info. Science/Studies				5			5
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1005	Info. Technology Project Mgmt.							0
52.1206	Info. Resources Mgmt.							0
52.1207	Knowledge Mgmt.							0

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
15-2041	Statisticians							
<i>Annual Openings for occupation (2017-2022): 5</i>				<i>Training required for entry-level: Master's degree</i>				
27.0101	Mathematics, Gen.			14	40			54
27.0301	Applied Mathematics, Gen.				1			1
26.1102	Biostatistics							0

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

OCCUPATIONAL DETAIL: PROGRAMMING & SOFTWARE DEVELOPMENT

15-1134

WEB DEVELOPERS

Design, create, and modify websites. Analyze user needs to implement website content, graphics, performance, and capacity. May integrate websites with other computer applications. May convert written, graphic, audio, and video components to compatible Web formats by using software designed to facilitate the creation of Web and multimedia content.

Reported job titles: Designer, Technology Applications Engineer, Web Architect, Web Design Specialist, Web Designer, Web Developer, Web Development Director, Web Development Instructor, Webmaster

Job Zone: 3

- Entry-Level Education: Associate's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment

Skills

Certifications

Share (%) of US workforce

Less than high school	4
HS diploma/equivalent	8
Postsecondary certificate	17
Some college courses	4
Associate's degree	17
Bachelor's degree	46
Advanced degree	4

- Java
- Cascading Style Sheets
- Hypertext markup language
- Web services
- jQuery
- HTML5
- Structured query language
- Software development
- Extensible markup language
- Graphical user interface design

- Security clearance
- Rich Media Communication with Adobe Flash Professional CS6
- Top Secret Sensitive Compartmented Info.
- Business Process Management (BPM) programming languages
- Oracle Database 11g Administrator Certified Professional
- Certified Customer Service Specialist
- Application Developer
- Driver's license
- Software testing expert
- Certified Marketing Specialist

15-1121

COMPUTER SYSTEMS ANALYSTS

Analyze science, engineering, business, and other data processing problems to implement and improve computer systems. Analyze user requirements, procedures, and problems to automate or improve existing systems and review computer system capabilities, workflow, and scheduling limitations. May analyze or recommend commercially available software.

Reported job titles: Applications Analyst, Business Analyst, Business Systems Analyst, Computer Analyst, Computer Systems Consultant, Information Systems Analyst (ISA), Information Technology Analyst (IT Analyst), System Analyst, Systems Analyst

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment

Skills

Certifications

Share (%) of US workforce

Less than high school	
HS diploma/equivalent	3
Postsecondary certificate	6
Some college courses	4
Associate's degree	29
Bachelor's degree	33
Advanced degree	25

- Structured query language
- Systems development life cycle
- Software development
- Microsoft Office
- Business systems
- Java
- Quality assurance
- Application development
- Microsoft SQL Server
- Requirements gathering

- Security clearance
- Business Process Management (BPM) programming languages
- Top Secret Sensitive Compartmented Info.
- Driver's license
- Project Management Professional
- Certified ScrumMaster
- Oracle Database 11g Administrator Certified Professional
- Project Management Institute
- Enterprise Project Management
- Remotely piloted aircraft

15-1131 COMPUTER PROGRAMMERS

Create, modify, and test the code, forms, and script that allow computer applications to run. Work from specifications drawn up by software developers or other individuals. May assist software developers by analyzing user needs and designing software solutions. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information.

Reported job titles: Analyst Programmer, Application Programmer Analyst, Computer Programmer Analyst, Internet Programmer, Java Developer, Programmer, Programmer Analyst, Web Applications Programmer, Web Programmer

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Structured query language • Software development • Java • Microsoft .NET Framework • C# • Microsoft SQL Server • Python • Application development • Linux • Systems development life cycle 	<ul style="list-style-type: none"> • Security clearance • Oracle Database 11g Administrator Certified Professional • Rich Media Communication with Adobe Flash Professional CS6 • Application Developer • Top Secret Sensitive Compartmented Information • Driver's license • Business Process Management (BPM) programming languages • Remotely piloted aircraft • Software testing expert • American National Standards
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses	3	
Associate's degree	9	
Bachelor's degree	88	
Advanced degree	<1	

15-1141 DATABASE ADMINISTRATORS*

Administer, test, and implement computer databases, applying knowledge of database management systems. Coordinate changes to computer databases. May plan, coordinate, and implement security measures to safeguard computer databases.

Reported job titles: Data Architect, Database Administration Manager, Database Administrator (DBA), Database Analyst, Database Coordinator, Database Developer, Database Programmer, Information Systems Manager, Management Information Systems Director (MIS Director), System Administrator

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Microsoft SQL Server • Structured query language • Database administration • Relational database management system • UNIX • Linux • Data warehousing • Database design • Extract, transform, load software • Stored procedures 	<ul style="list-style-type: none"> • Oracle Database 11g Administrator Certified Professional • Security clearance • Top Secret Sensitive Compartmented Info. • Oracle Certified Professional • Certified Information Systems Security Professional • Cadastral Mapping Specialist • DoD 8570 • CompTIA Security+ • Microsoft Certified Systems Administrator • IAT Level 2
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses	1	
Associate's degree	7	
Bachelor's degree	77	
Advanced degree	15	

15-1132 SOFTWARE DEVELOPERS, APPLICATIONS

Develop, create, and modify general computer applications software or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency. May analyze and design databases within an application area, working individually or coordinating database development as part of a team. May supervise computer programmers.

Reported job titles: Application Developer, Application Integration Engineer, Applications Developer, Computer Consultant, .IT Analyst, Software Architect, Software Developer, Software Development Engineer, Software Engineer, Technical Consultant

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Java • Software development • Python • JavaScript • Linux • Structured query language • Agile Software Development • Amazon Web Services • Systems development life cycle • C# 	<ul style="list-style-type: none"> • Security clearance • Application Developer • Top Secret Sensitive Compartmented Info. • Certified ScrumMaster • Business Process Management (BPM) programming languages • Datacenter • Information assurance management • Oracle Database 11g Administrator Certified Professional • Remotely piloted aircraft • Certified Information Systems Security Professional
Less than high school		
HS diploma/equivalent		
Postsecondary certificate	1	
Some college courses		
Associate's degree	3	
Bachelor's degree	80	
Advanced degree	16	

15-1133 SOFTWARE DEVELOPERS, SYSTEMS SOFTWARE

Research, design, develop, and test operating systems-level software, compilers, and network distribution software for medical, industrial, military, communications, aerospace, business, scientific, and general computing applications. Set operational specifications and formulate and analyze software requirements. May design embedded systems software. Apply principles and techniques of computer science, engineering, and mathematical analysis.

Reported job titles: Developer, Infrastructure Engineer, Network Engineer, Publishing Systems Analyst, Senior Software Engineer, Software Architect, Software Developer, Software Engineer, Systems Coordinator, Systems Engineer

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • C/C++ • Linux • Software development • Python • Embedded software • Embedded systems development • MATLAB • Java • Systems integration • Software design 	<ul style="list-style-type: none"> • Security clearance • Top Secret Sensitive Compartmented Info. • Accreditation Board for Engineering and Technology • FAA testing (DO-178B) • Single Scope Background Investigation • Datacenter • Driver's license • DoD Top Secret • FAA testing (DO-254) • Certified Information Systems Security Professional
Less than high school		
HS diploma/equivalent		
Postsecondary certificate	1	
Some college courses	<1	
Associate's degree	4	
Bachelor's degree	77	
Advanced degree	18	

11-3021 COMPUTER & INFORMATION SYSTEMS MANAGERS

Plan, direct, or coordinate activities in such fields as electronic data processing, information systems, systems analysis, and computer programming.

Reported job titles: Application Development Director, Computing Services Director, Data Processing Manager, Information Systems Director (IS Director), Information Systems Manager (IS Manager), Information Systems Supervisor (IS Supervisor), Information Technology Director (IT Director), Information Technology Manager (IT Manager), MIS Director (Management Information Systems Director), Technical Services Manager

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: 5 years or more
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Information security • Microsoft Office • Disaster recovery • Enterprise Services • Information Management • Succession planning • Cyber security • Training software • Security risk assessment • National Institute of Standards and Technology 	<ul style="list-style-type: none"> • Project Management Professional • Certified Information Systems Security Professional • Certified Information Security Manager • Security clearance • Certified Information Systems Auditor • Project Management Institute • Certified Records Manager • Top Secret Sensitive Compartmented Info. • Governance, risk, and compliance systems • HIPAA
HS diploma/equivalent	1	
Postsecondary certificate	6	
Some college courses	26	
Associate's degree	2	
Bachelor's degree	48	
Advanced degree	17	

15-2041 STATISTICIANS

Develop or apply mathematical or statistical theory and methods to collect, organize, interpret, and summarize numerical data to provide usable information. May specialize in fields such as biostatistics, agricultural statistics, business statistics, or economic statistics. Includes mathematical and survey statisticians.

Reported job titles: Assistant Division Chief for Statistical Program Management, Clinical Statistics Manager, Human Resource Statistician, Private Statistical/Psychometric Consultant, Program Research Specialist, Senior Statistician, Statistical Analyst, Statistician, Statistician (Demographer), Trend Investigator

Job Zone: 5

- Entry-Level Education: Master's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Statistical Analysis System • Statistical methods • Structured query language • Statistical software • Microsoft Office • Python • Machine learning techniques • Data mining • Statistical modeling • Statistical Package for the Social Sciences 	<ul style="list-style-type: none"> • Security clearance • Compliance & Ethics • Public trust security clearance • Driver's license • Continuing education • Top Secret Sensitive Compartmented Info. • ICD-10 / ICD-9 • Six Sigma Green Belt
HS diploma/equivalent		
Postsecondary certificate		
Some college courses		
Associate's degree		
Bachelor's degree	28	
Advanced degree	72	

Sources O*NET; Gartner TalentNeuron.

PATHWAY: **NETWORK SYSTEMS**

ADVANCED	COMPUTER NETWORK ARCHITECTS* Median Wage \$39.46 Range \$26.12–\$63.98 2017 Jobs 147 Openings thru 2022 58	INFORMATION SECURITY ANALYSTS* Median Wage \$34.44 Range \$17.72–\$49.67 2017 Jobs 44 Openings thru 2022 23	COMPUTER & INFO. SYSTEMS MANAGERS Median Wage \$55.40 Range \$31.01–\$81.25 2017 Jobs 185 Openings thru 2022 103
	COMPUTER & INFO. RESEARCH SCIENTISTS Median Wage \$38.14 Range \$14.76–\$65.03 2017 Jobs 16 Openings thru 2022 <10		
INTERMEDIATE	NETWORK & COMPUTER SYSTEMS ADMINISTRATORS* Median Wage \$30.47 Range \$22.79–\$46.25 2017 Jobs 451 Openings thru 2022 179	COMPUTER OCCUPATIONS (ALL OTHER) Median Wage \$33.38 Range \$14.69–\$50.77 2017 Jobs 532 Openings thru 2022 212	COMPUTER SYSTEMS ANALYSTS Median Wage \$29.42 Range \$18.61–\$51.32 2017 Jobs 349 Openings thru 2022 180
ENTRY-LEVEL	COMPUTER USER SUPPORT SPECIALISTS Median Wage \$19.83 Range \$9.06–\$28.71 2017 Jobs 1,136 Openings thru 2022 550	COMPUTER NETWORK SUPPORT SPECIALISTS Median Wage \$24.61 Range \$16.67–\$41.39 2017 Jobs 270 Openings thru 2022 127	

Sources: Emsi 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed; O*NET; TIP Strategies.

Notes: Numbers are for El Paso County. Range shows hourly wage rates from the 10th to 90th percentiles. Openings are a measure of demand that accounts for net job growth and estimated replacement needs.

Figure 49 shows the fields of study that match each middle-skill occupation. It lists the field of study and the number of completions by institutions. For quick reference, the number of estimated annual openings for each occupation is included as an indicator of demand, and the training required for entry is included as well.

Note that fields of study often match with more than one occupation. In addition, students who complete these programs may not work in training-related occupations or may move to different labor markets. For these reasons, a comparison of the number of annual openings and completions can lead to misleading conclusions related to the magnitude of skills gaps in specific occupations.

FIGURE 49. NETWORK SYSTEMS AND RELATED FIELDS OF STUDY, DEGREE PROGRAMS ONLY

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
Total Completions (2016)		13	0	93	185	120	41	452
15-1151	Computer User Support Specialists							
<i>Annual Openings for occupation (2017-2022): 110</i>		<i>Training required for entry-level: Some college, no degree</i>						
01.0106	Agricultural Business Technology							0
11.1006	Computer Support Specialist							0
51.0709	Medical Office Computer Specialist/Assistant							0
15-1152	Computer Network Support Specialists							
<i>Annual Openings for occupation (2017-2022): 25</i>		<i>Training required for entry-level: Associate's degree</i>						
11.0701	Computer Science			32	2			34
11.1002	System, Networking, & LAN/WAN Mgmt./Manager			34				34
11.0901	Computer Systems Networking & Telecommunications	13						13
11.0201	Computer Programming/Programmer, Gen.			12				12
11.0501	Computer Systems Analysis/Analyst							0
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1006	Computer Support Specialist							0
15-1142	Network & Computer Systems Admin.							
<i>Annual Openings for occupation (2017-2022): 36</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0101	Computer & Info Sciences, Gen			15	68		41	124
11.1001	Network & System Admin/Administrator							0
11.1003	Computer & Info Systems Security/Info Assurance							0
15-1199	Computer Occupations, All Other							
<i>Annual Openings for occupation (2017-2022): 42</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0701	Computer Science			32	2			34
26.1103	Bioinformatics				6			6
11.0401	Info. Science/Studies				5			5
11.0301	Data Processing & Data Processing Technology/Technician							0
11.1005	Info. Technology Project Mgmt.							0

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
26.1104	Computational Biology							0
30.0801	Mathematics & Computer Science							0
30.1601	Accounting & Computer Science							0
30.3001	Computational Science							0
30.3101	Human Computer Interaction							0
43.0116	Cyber/Computer Forensics & Counterterrorism							0
51.2706	Medical Informatics							0
15-1121 Computer Systems Analysts								
Annual Openings for occupation (2017-2022): 36				Training required for entry-level: Bachelor's degree				
11.0101	Computer & Info Sciences, Gen			15	68		41	124
11.0103	Info Technology					120		120
11.0901	Computer Systems Networking & Telecom	13						13
11.0501	Computer Systems Analysis/Analyst							0
15-1143 Computer Network Architects								
Annual Openings for occupation (2017-2022): 12				Training required for entry-level: Bachelor's degree				
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
11.0901	Computer Systems Networking & Telecommunications	13						13
14.0901	Computer Engineering, Gen.				8			8
11.0501	Computer Systems Analysis/Analyst							0
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
14.0999	Computer Engineering, Other							0
15-1122 Info. Security Analysts								
Annual Openings for occupation (2017-2022): 5				Training required for entry-level: Bachelor's degree				
11.0103	Info. Technology					120		120
11.0701	Computer Science			32	2			34
11.1002	System, Networking, & LAN/WAN Mgmt./Manager			34				34
11.0901	Computer Systems Networking & Telecommunications	13						13
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1005	Info. Technology Project Mgmt.							0

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
43.0116	Cyber/Computer Forensics & Counterterrorism							0
11-3021	Computer & Info. Systems Managers							
<i>Annual Openings for occupation (2017-2022): 21</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
52.1201	Mgmt. Info. Systems, Gen.				52			52
52.0205	Operations Mgmt. & Supervision				38			38
11.0701	Computer Science			32	2			34
11.0401	Info. Science/Studies				5			5
11.1001	Network & System Admin./Administrator							0
11.1003	Computer & Info. Systems Security/Info. Assurance							0
11.1005	Info. Technology Project Mgmt.							0
52.1206	Info. Resources Mgmt.							0
52.1207	Knowledge Mgmt.							0
15-1111	Computer & Info. Research Scientists							
<i>Annual Openings for occupation (2017-2022): Insf. Data</i>		<i>Training required for entry-level: Master's degree</i>						
11.0101	Computer & Info. Sciences, Gen.			15	68		41	124
11.0103	Info. Technology					120		120
11.0701	Computer Science			32	2			34
26.1103	Bioinformatics				6			6
11.0401	Info. Science/Studies				5			5
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0199	Computer & Info. Sciences, Other							0
11.0804	Modeling, Virtual Environments & Simulation							0
51.2706	Medical Informatics							0

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

OCCUPATIONAL DETAIL: NETWORK SYSTEMS

15-1151 COMPUTER USER SUPPORT SPECIALISTS

Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, or via telephone or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail, and operating systems.

Reported job titles: Computer Specialist, Computer Support Specialist, Computer Technician, Desktop Support Technician, Help Desk Analyst, Help Desk Technician, Information Technology Specialist (IT Specialist), Network Technician, Support Specialist, Technical Support Specialist

Job Zone: 3

- Entry-Level Education: Some college, no degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Technical support • Microsoft Office • Microsoft Active Directory • Microsoft Windows • Local area network • Ticketing system • Linux • Microsoft PowerPoint • Structured query language • Preventive maintenance 	<ul style="list-style-type: none"> • Security clearance • Driver's license • A+ • Top Secret Sensitive Compartmented Information • DoD 8570 • Microsoft Certified Systems Engineer • CompTIA A+ • Microsoft Certified Professional • Public trust security clearance • Cisco Certified Network Associate
Less than high school	<1	
HS diploma/equivalent	22	
Postsecondary certificate	12	
Some college courses	19	
Associate's degree	14	
Bachelor's degree	33	
Advanced degree		

15-1152 COMPUTER NETWORK SUPPORT SPECIALISTS

Analyze, test, troubleshoot, and evaluate existing network systems, such as local area network (LAN), wide area network (WAN), and internet systems or a segment of a network system. Perform network maintenance to ensure minimal interruption.

Reported job titles: Computer Network Specialist, IT Consultant, Network Engineer, Network Specialist, Network Support Specialist, Network Technical Analyst, Network Tech., Personal Computer Network Analyst, Senior IT Assistant, Systems Specialist

Job Zone: 4

- Entry-Level Education: Associate's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Network management • Network routers • Wide area network • Switches • Microsoft Office • Local area network • Technical support • Extension ladders • Modems 	<ul style="list-style-type: none"> • Driver's license • Cisco Certified Network Associate • OSHA • National Electrical Code • Customer Premise Network Installation Qualifications • Cisco Certified Network Professional • Top Secret Sensitive Compartmented Information • Cisco • CompTIA Network+ • Cisco Certified Entry Networking Technician
Less than high school		
HS diploma/equivalent	4	
Postsecondary certificate	10	
Some college courses	14	
Associate's degree	22	
Bachelor's degree	47	
Advanced degree	3	

15-1142 NETWORK AND COMPUTER SYSTEMS ADMINISTRATORS*

Install, configure, and support local area network (LAN), wide area network (WAN), and internet systems or segment of network system. Monitor network to ensure availability to system users. May perform necessary maintenance; monitor and test website performance; assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software; supervise computer user/network support specialists; administer network security measures.

Reported job titles: Info. Analyst, Information Systems (IS) Mgr., IT Specialist, LAN Specialist, LAN Administrator, Network Administrator, Network Coordinator, Network Manager, Network Specialist, Systems Administrator

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Linux • VMware • Microsoft Active Directory • Firewall • UNIX • Technical support • Windows servers • Network routers • Switches • Local area network 	<ul style="list-style-type: none"> • Security clearance • System administrator • Cisco Certified Network Associate • Top Secret Sensitive Compartmented Information • Cisco Certified Network Professional • Microsoft Certified Systems Engineer • DoD 8570 • Driver's license • Datacenter • Microsoft Certified Systems Administrator
Less than high school		
HS diploma/equivalent		
Postsecondary certificate	7	
Some college courses	10	
Associate's degree	20	
Bachelor's degree	52	
Advanced degree	10	

15-1199 COMPUTER OCCUPATIONS (ALL OTHER)

Design and develop solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions. Includes software quality assurance engineers and testers, computer systems engineers/architects, Web administrators, geospatial information systems technicians/technologists, database architects, data warehousing specialists, business intelligence analysts, information technology project managers, search marketing strategists, video game designers, document management specialists.

Reported job titles: Not available for "All Other" occupations

Job Zone: N/A

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Quality assurance • Software development • Systems development life cycle • Java • Microsoft Office • Agile Software Development • Scrum agile methodology • Test automation • Structured query language • Amazon Web Services 	<ul style="list-style-type: none"> • Project Management Professional • Security clearance • Project Management Institute • Top Secret Sensitive Compartmented Information • Certified ScrumMaster • Certified Information Systems Security Professional • Rich Media Communication with Adobe Flash Professional CS6 • Telecommunications • Driver's license • Cloud Architect
Not available for "All Other" occupations		

15-1121 COMPUTER SYSTEMS ANALYST

Analyze science, engineering, business, and other data processing problems to implement and improve computer systems. Analyze user requirements, procedures, and problems to automate or improve existing systems and review computer system capabilities, workflow, and scheduling limitations. May analyze or recommend commercially available software.

Reported job titles: Applications Analyst, Business Analyst, Business Systems Analyst, Computer Analyst, Computer Systems Analyst, Computer Systems Consultant, Information Systems Analyst (ISA), Information Technology Analyst (IT Analyst), System Analyst, Systems Analyst

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Structured query language • Systems development life cycle • Software development • Microsoft Office • Business Systems • Java • Quality assurance • Application development • Microsoft SQL Server • Requirements gathering 	<ul style="list-style-type: none"> • Secret Clearance • Business Process Management (BPM) programming languages • Top Secret Sensitive Compartmented Information • Driver's license • Project Management Professional • Certified ScrumMaster • Oracle Database 11g Administrator Certified Professional • Project Management Institute • Enterprise Project Management • Remotely piloted aircraft
Less than high school		
HS diploma/equivalent	3	
Postsecondary certificate	6	
Some college courses	4	
Associate's degree	29	
Bachelor's degree	33	
Advanced degree	25	

15-1143 COMPUTER NETWORK ARCHITECTS*

Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning. May also design network and computer security measures. May research and recommend network and data communications hardware and software.

Reported job titles: Design Engineer, Network Analyst, Network and Security Engineer, Network Consultant, Network Systems Consultant, Networking Systems and Distributed Systems Engineer, Solutions Architect, Telecommunications Analyst

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: 5 years or more
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Wide area network • Local area network • Network routers • Firewall • Switches • Network design • Voice over Internet Protocol systems • Border Gateway Protocol • Multiprotocol Label Switching • Open Shortest Path First 	<ul style="list-style-type: none"> • Cisco Certified Network Professional • Cisco Certified Network Associate • Cisco Certified Internetwork Expert • Security clearance • Top Secret Sensitive Compartmented Information • Cisco Unified Communications Manager • Datacenter • Driver's license • CISCO Certified Design Professional • National Committee for Quality Assurance
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses	5	
Associate's degree	5	
Bachelor's degree	32	
Advanced degree	59	

15-1122 INFORMATION SECURITY ANALYSTS*

Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses.

Reported job titles: Data Security Admin., Info. Security Officer, Info. Security Specialist/ Analyst, IT Security Analyst, Cyber Defense Analyst, IT Specialist, Network Security Analyst, Systems Analyst, Cybersecurity Engineer, Cybersecurity Specialist,

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: Less than 5 years
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Information security • Cybersecurity • Firewall 	<ul style="list-style-type: none"> • Certified Information Systems Security Professional • Security clearance
HS diploma/equivalent	<ul style="list-style-type: none"> • National Institute of Standards and Technology 	<ul style="list-style-type: none"> • Certified Information Security Manager • Certified Information Systems Auditor
Postsecondary certificate 7	<ul style="list-style-type: none"> • Linux 	<ul style="list-style-type: none"> • Top Secret Sensitive Compartmented Information
Some college courses 2	<ul style="list-style-type: none"> • Network security 	<ul style="list-style-type: none"> • Certified Ethical Hacker
Associate's degree 13	<ul style="list-style-type: none"> • Information assurance 	<ul style="list-style-type: none"> • Information Assurance Management
Bachelor's degree 53	<ul style="list-style-type: none"> • Security information and event management 	<ul style="list-style-type: none"> • Global Information Assurance
Advanced degree 25	<ul style="list-style-type: none"> • UNIX • Application security 	<ul style="list-style-type: none"> • DoD 8570 • SANS

11-3021 COMPUTER AND INFORMATION SYSTEMS MANAGERS

Plan, direct, or coordinate activities in such fields as electronic data processing, information systems, systems analysis, and computer programming.

Reported job titles: Application Development Director, Computing Services Director, Data Processing Manager, Information Systems Director (IS Director), Information Systems Manager (IS Manager), Information Systems Supervisor (IS Supervisor), Information Technology Director (IT Director), Information Technology Manager (IT Manager), MIS Director (Management Information Systems Director), Technical Services Manager

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: 5 years or more
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Information security • Software development 	<ul style="list-style-type: none"> • Project Management Professional • Certified Info. Systems Security Professional
HS diploma/equivalent 1	<ul style="list-style-type: none"> • Microsoft Office 	<ul style="list-style-type: none"> • Certified Information Security Manager
Postsecondary certificate 6	<ul style="list-style-type: none"> • Cybersecurity 	<ul style="list-style-type: none"> • Security clearance
Some college courses 26	<ul style="list-style-type: none"> • Cloud computing 	<ul style="list-style-type: none"> • Certified Information Systems Auditor
Associate's degree 2	<ul style="list-style-type: none"> • Software as a Service 	<ul style="list-style-type: none"> • Project Management Institute
Bachelor's degree 48	<ul style="list-style-type: none"> • Technical support 	<ul style="list-style-type: none"> • Certified Records Manager
Advanced degree 17	<ul style="list-style-type: none"> • Platform as a Service • Microsoft PowerPoint • Quality assurance 	<ul style="list-style-type: none"> • Top Secret Sensitive Compartmented Info. • Governance, risk, and compliance systems • HIPAA

15-1111 COMPUTER AND INFORMATION RESEARCH SCIENTISTS		
Conduct research into fundamental computer and information science as theorists, designers, or inventors. Develop solutions to problems in the field of computer hardware and software.		
Reported job titles: Computer Scientist, Control System Computer Scientist, Scientific Programmer Analyst		
Job Zone: 5		
<ul style="list-style-type: none">Entry-Level Education: Master's degreeRequired Work Experience: NoneTraining for Competency: None		
Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none">Machine learning techniquesPythonData scienceJavaStructured query languageBig DataC/C++HadoopSparkData mining	<ul style="list-style-type: none">Security clearanceTop Secret Sensitive Compartmented InformationDefense Acquisition Workforce Improvement ActA+Accreditation Board for Engineering and TechnologyCI PolyDriver's licensePublic trust security clearanceCertified Information Systems Security Professional
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses		
Associate's degree		
Bachelor's degree	2	
Advanced degree	98	

Sources: O*NET; Gartner TalentNeuron.

PATHWAY: **WEB & DIGITAL COMMUNICATIONS**

ADVANCED	SOFTWARE DEVELOPERS, APPLICATIONS Median Wage \$33.97 Range \$20.25–\$59.84 2017 Jobs 400 Openings thru 2022 186	SOFTWARE DEVELOPERS, SYSTEMS SOFTWARE Median Wage \$34.35 Range \$21.46–\$57.09 2017 Jobs 338 Openings thru 2022 138	ART DIRECTORS Median Wage \$18.54 Range \$13.77–\$42.79 2017 Jobs 60 Openings thru 2022 27
	COMPUTER PROGRAMMERS Median Wage \$28.98 Range \$15.71–\$47.33 2017 Jobs 292 Openings thru 2022 96	GRAPHIC DESIGNERS Median Wage \$16.92 Range \$11.44–\$27.71 2017 Jobs 321 Openings thru 2022 160	MULTIMEDIA ARTISTS & ANIMATORS Median Wage \$13.17 Range \$9.85–\$31.73 2017 Jobs 32 Openings thru 2022 14
	WEB DEVELOPERS Median Wage \$21.81 Range \$9.13–\$33.94 2017 Jobs 159 Openings thru 2022 78	DESKTOP PUBLISHERS Median Wage \$15.00 Range \$9.13–\$29.32 2017 Jobs 25 Openings thru 2022 13	

Sources: Emsi 2018.2—QCEW Employees, Non-QCEW Employees, and Self-Employed; O*NET; TIP Strategies.

Notes: Numbers are for El Paso County. Range shows hourly wage rates from the 10th to 90th percentiles. Openings are a measure of demand that accounts for net job growth and estimated replacement needs.

Figure 50 shows the fields of study that match each middle-skill occupation. It lists the field of study and the number of completions by institutions. For quick reference, the number of estimated annual openings for each occupation is included as an indicator of demand, and the training required for entry is included as well.

Note that fields of study often match with more than one occupation. In addition, students who complete these programs may not work in training-related occupations or may move to different labor markets. For these reasons, a comparison of the number of annual openings and completions can lead to misleading conclusions related to the magnitude of skills gaps in specific occupations.

FIGURE 50. WEB AND DIGITAL COMMUNICATIONS AND RELATED FIELDS OF STUDY, DEGREE PROGRAMS ONLY

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
Total Completions (2016)		0	0	67	76	120	0	263
15-1134 Web Developers								
<i>Annual Openings for occupation (2017-2022): 16</i>		<i>Training required for entry-level: Associate's degree</i>						
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen.			12				12
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.1004	Web/Multimedia Mgmt. & Webmaster							0
43-9031 Desktop Publishers								
<i>Annual Openings for occupation (2017-2022): 3</i>		<i>Training required for entry-level: Associate's degree</i>						
10.0303	Prepress/Desktop Publishing & Digital Imaging Design							0
15-1131 Computer Programmers								
<i>Annual Openings for occupation (2017-2022): 19</i>		<i>Training required for entry-level: Bachelor's degree</i>						
52.1201	Mgmt Info Systems, Gen				52			52
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen			12				12
11.0202	Computer Programming, Specific Apps.							0
11.0203	Computer Programming, Vendor/Product Cert.							0
11.0299	Computer Programming, Other							0
11.0803	Computer Graphics							0
11.0804	Modeling, Virtual Environments & Simulation							0
15.1204	Computer Software Technology/Technician							0
51.0709	Medical Office Computer Specialist/Assistant							0
27-1024 Graphic Designers								
<i>Annual Openings for occupation (2017-2022): 32</i>		<i>Training required for entry-level: Bachelor's degree</i>						
50.0402	Commercial & Advertising Art			23				23
50.0409	Graphic Design				1			1
01.0802	Agricultural Communication/Journalism							0
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.0803	Computer Graphics							0
50.0102	Digital Arts							0
50.0401	Design & Visual Communications, Gen.							0
50.0404	Industrial & Product Design							0

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
27-1014	Multimedia Artists & Animators							
<i>Annual Openings for occupation (2017-2022): 3</i>		<i>Training required for entry-level: Bachelor's degree</i>						
50.0708	Painting				2			2
50.0409	Graphic Design				1			1
10.0304	Animation, Interactive Technology, Video Graphics & Special Effects							0
11.0801	Web Page, Digital/Multimedia & Info. Resources Design							0
11.0804	Modeling, Virtual Environments & Simulation							0
50.0102	Digital Arts							0
50.0411	Game & Interactive Media Design							0
50.0705	Drawing							0
50.0706	Intermedia/Multimedia							0
15-1132	Software Devs., Apps.							
<i>Annual Openings for occupation (2017-2022): 37</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0103	Info Technology					120		120
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen			12				12
14.0901	Computer Engineering, Gen				8			8
14.0903	Computer Software Engineering				8			8
26.1103	Bioinformatics				6			6
11.0102	Artificial Intelligence							0
11.0104	Informatics							0
11.0202	Computer Programming, Specific Apps.							0
11.0804	Modeling, Virtual Environments & Simulation							0
15.1204	Computer Software Technology/Technician							0
51.2706	Medical Informatics							0
15-1133	Software Devs., Systems Software							
<i>Annual Openings for occupation (2017-2022): 28</i>		<i>Training required for entry-level: Bachelor's degree</i>						
11.0103	Info Technology					120		120
11.0701	Computer Science			32	2			34
11.0201	Computer Programming/Programmer, Gen			12				12
14.0901	Computer Engineering, Gen				8			8
14.0903	Computer Software Engineering				8			8
11.0401	Info Science/Studies				5			5
11.0102	Artificial Intelligence							0
11.0104	Informatics							0

CIP Codes	Description	Brightwood College-El Paso	CET-El Paso	El Paso Community College	The University of Texas at El Paso	Vista College	Western Technical College	Total Completions (2016)
11.0202	Computer Programming, Specific Apps.							0
15.1204	Computer Software Technology/Technician							0
27-1011 Art Directors								
<i>Annual Openings for occupation (2017-2022): 5</i>				<i>Training required for entry-level: Bachelor's degree</i>				
50.0409	Graphic Design				1			1
50.0102	Digital Arts							0
50.0706	Intermedia/Multimedia							0

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) and CIP-SOC Crosswalk; TIP research.

Note: IPEDS data include only schools eligible to participate in federal financial aid programs.

OCCUPATIONAL DETAIL: WEB & DIGITAL COMMUNICATIONS

15-1134 WEB DEVELOPERS

Design, create, and modify websites. Analyze user needs to implement website content, graphics, performance, and capacity. May integrate websites with other computer applications. May convert written, graphic, audio, and video components to compatible Web formats by using software designed to facilitate the creation of Web and multimedia content.

Reported job titles: Designer, Technology Applications Engineer, Web Architect, Web Design Specialist, Web Designer, Web Developer, Web Development Director, Web Development Instructor, Webmaster

Job Zone: 3

- Entry-Level Education: Associate's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment

Skills

Certifications

Share (%) of US workforce

Less than high school	4
HS diploma/equivalent	8
Postsecondary certificate	17
Some college courses	4
Associate's degree	17
Bachelor's degree	46
Advanced degree	4

- Java
- Cascading Style Sheets
- Hypertext markup language
- Web services
- jQuery
- HTML5
- Structured query language
- Software development
- Extensible markup language
- Graphical user interface design

- Security clearance
- Rich Media Communication with Adobe Flash Professional CS6
- Top Secret Sensitive Compartmented Info.
- Business Process Management (BPM) programming languages
- Oracle Database 11g Administrator Certified Professional
- Certified Customer Service Specialist
- Application Developer
- Driver's license
- Software testing expert
- Certified Marketing Specialist

43-9031 DESKTOP PUBLISHERS

Format typescript and graphic elements using computer software to produce publication-ready material.

Reported job titles: Advertising Associate, Art Director, Computer Typesetter, Creative Director, Desktop Publishing Specialist, Electronic Console Display Operator, Electronic Imager, Graphic Artist, Mac Operator, Production Manager

Job Zone: 3

- Entry-Level Education: Associate's degree
- Required Work Experience: None
- Training for Competency: Short-term on-the-job training

Educational Attainment

Skills

Certifications

Share (%) of US workforce

Less than high school	
HS diploma/equivalent	2
Postsecondary certificate	18
Some college courses	17
Associate's degree	28
Bachelor's degree	27
Advanced degree	8

- Adobe Photoshop
- Adobe InDesign
- Desktop publishing
- Microsoft Office
- Graphics software
- Design & layout
- Adobe Illustrator
- Microsoft PowerPoint
- Quark
- Adobe FrameMaker

Insufficient Data Available

15-1131 COMPUTER PROGRAMMERS

Create, modify, and test the code, forms, and script that allow computer applications to run. Work from specifications drawn up by software developers or other individuals. May assist software developers by analyzing user needs and designing software solutions. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information.

Reported job titles: Analyst Programmer, Application Programmer Analyst, Computer Programmer, Computer Programmer Analyst, Internet Programmer, Java Developer, Programmer, Programmer Analyst, Web Applications Programmer, Web Programmer

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Structured query language • Software development • Java • Microsoft .NET Framework • C# • Microsoft SQL Server • Python • Application development • Linux • Systems development life cycle 	<ul style="list-style-type: none"> • Security clearance • Oracle Database 11g Administrator Certified Professional • Rich Media Communication with Adobe Flash Professional CS6 • Application Developer • Top Secret Sensitive Compartmented Information • Driver's license • Business Process Management (BPM) programming languages • Remotely piloted aircraft • Software testing expert • American National Standards
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses	3	
Associate's degree	9	
Bachelor's degree	88	
Advanced degree		

27-1024 GRAPHIC DESIGNERS

Design or create graphics to meet specific commercial or promotional needs, such as packaging, displays, or logos. May use a variety of mediums to achieve artistic or decorative effects

Reported job titles: Artist, Creative Director, Creative Manager, Design Director, Designer, Graphic Artist, Graphic Designer, Online Producer, Production Artist, Publications Designer

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Adobe Photoshop • Adobe InDesign • Adobe Creative Suite • Typography • Hypertext markup language • Microsoft Office • Cascading Style Sheets • Adobe Illustrator • Adobe After Effects • Microsoft PowerPoint 	<ul style="list-style-type: none"> • Rich Media Communication with Adobe Flash Professional CS6 • Visual Communication with Adobe Photoshop CS6 • Driver's license • Security clearance • Top Secret Sensitive Compartmented Info. • Continuing education • Accreditation in Public Relations • Accredited Business Communicators • CI Poly • Library Media Science
Less than high school		
HS diploma/equivalent	4	
Postsecondary certificate	8	
Some college courses	8	
Associate's degree	15	
Bachelor's degree	62	
Advanced degree	4	

27-1014 MULTIMEDIA ARTISTS AND ANIMATORS

Create special effects, animation, or other visual images using film, video, computers, or other electronic tools and media for use in products or creations, such as computer games, movies, music videos, and commercials.

Reported job titles: 3D Animator, 3D Artist, Animation Director, Animator, Art Director, Artist, Creative Director, Graphic Artist, Graphic Designer, Illustrator

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Adobe Photoshop • Autodesk Maya • Adobe After Effects 	<ul style="list-style-type: none"> • Security clearance • Rich Media Communication with Adobe Flash Professional CS6
HS diploma/equivalent	<ul style="list-style-type: none"> • Motion graphics 	<ul style="list-style-type: none"> • Top Secret Sensitive Compartmented Info.
Postsecondary certificate 3	<ul style="list-style-type: none"> • 3ds Max 	<ul style="list-style-type: none"> • Driver's license
Some college courses 17	<ul style="list-style-type: none"> • MAXON Cinema 4D 	<ul style="list-style-type: none"> • CI Poly
Associate's degree 19	<ul style="list-style-type: none"> • Pixologic ZBrush 	<ul style="list-style-type: none"> • Accreditation in Public Relations
Bachelor's degree 62	<ul style="list-style-type: none"> • Python 	<ul style="list-style-type: none"> • Visual Communication with Adobe Photoshop CS6
Advanced degree	<ul style="list-style-type: none"> • 3D modeling • Adobe Creative Suite 	<ul style="list-style-type: none"> • Accredited Business Communicators • Library Media Science

15-1132 SOFTWARE DEVELOPERS, APPLICATIONS

Develop, create, and modify general computer applications software or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency. May analyze and design databases within an application area, working individually or coordinating database development as part of a team. May supervise computer programmers.

Reported job titles: Application Developer, Application Integration Engineer, Applications Developer, Computer Consultant, Information Technology Analyst (IT Analyst), Software Architect, Software Developer, Software Development Engineer, Software Engineer, Technical Consultant

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce		
Less than high school	<ul style="list-style-type: none"> • Java 	<ul style="list-style-type: none"> • Security clearance
HS diploma/equivalent	<ul style="list-style-type: none"> • Software development 	<ul style="list-style-type: none"> • Application Developer
Postsecondary certificate 1	<ul style="list-style-type: none"> • Python 	<ul style="list-style-type: none"> • Top Secret Sensitive Compartmented Info.
Some college courses	<ul style="list-style-type: none"> • JavaScript 	<ul style="list-style-type: none"> • Certified ScrumMaster
Associate's degree 3	<ul style="list-style-type: none"> • Linux 	<ul style="list-style-type: none"> • Business Process Management (BPM) programming languages
Bachelor's degree 80	<ul style="list-style-type: none"> • Structured query language 	<ul style="list-style-type: none"> • Datacenter
Advanced degree 16	<ul style="list-style-type: none"> • Agile Software Development • Amazon Web Services • Systems development life cycle • C# 	<ul style="list-style-type: none"> • Information Assurance Management • Oracle Database 11g Administrator Certified Professional • Remotely piloted aircraft • Certified Info. Systems Security Professional

15-1133 SOFTWARE DEVELOPERS, SYSTEMS SOFTWARE

Research, design, develop, and test operating systems-level software, compilers, and network distribution software for medical, industrial, military, communications, aerospace, business, scientific, and general computing applications. Set operational specifications and formulate and analyze software requirements. May design embedded systems software. Apply principles and techniques of computer science, engineering, and mathematical analysis.

Reported job titles: Developer, Infrastructure Engineer, Network Engineer, Publishing Systems Analyst, Senior Software Engineer, Software Architect, Software Developer, Software Engineer, Systems Coordinator, Systems Engineer

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: None
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • C/C++ • Linux • Software development • Python • Embedded software • Embedded systems development • MATLAB • Java • Systems integration • Software design 	<ul style="list-style-type: none"> • Security clearance • Top Secret Sensitive Compartmented Info. • Accreditation Board for Engineering and Technology • FAA testing (DO-178B) • Single Scope Background Investigation • Datacenter • Driver's license • DoD Top Secret • FAA testing (DO-254) • Certified Information Systems Security Professional
Less than high school		
HS diploma/equivalent		
Postsecondary certificate	1	
Some college courses	<1	
Associate's degree	4	
Bachelor's degree	77	
Advanced degree	18	

27-1011 ART DIRECTORS

Formulate design concepts and presentation approaches for visual communications media, such as print, broadcasting, and advertising. Direct workers engaged in art work or layout design.

Reported job titles: Art Director; Art Supervisor; Creative Director; Creative Guru; Design Director; Designer; Director of Creative Services; Consumer Products; Group Art Supervisor; Production Manager; Senior Art Director

Job Zone: 4

- Entry-Level Education: Bachelor's degree
- Required Work Experience: 5 years or more
- Training for Competency: None

Educational Attainment	Skills	Certifications
Share (%) of US workforce	<ul style="list-style-type: none"> • Adobe Photoshop • Art direction • Adobe InDesign • Adobe Creative Suite • Typography • Creative direction • Adobe After Effects • Hypertext markup language • Digital marketing • Digital design 	Few positions require certifications
Less than high school		
HS diploma/equivalent		
Postsecondary certificate		
Some college courses		
Associate's degree	9	
Bachelor's degree	74	
Advanced degree	17	

Sources O*NET; Gartner TalentNeuron.



NEW AND EMERGING OCCUPATIONS

In an effort to make O*NET information more responsive to the changing labor market, a process for identifying, evaluating, and incorporating new and emerging occupations was developed. The focus of the process is on high-growth industries and the new occupations that these industries are creating. Information technology is one of the areas of focus.

This process convenes government, academia, and the private sector to participate in defining a list of new and emerging occupations. An initial list was created in 2006 and then partially incorporated into the 2018 revision of the SOC system.

The occupations related to the key information technology career pathways are listed in Figure 51.

FIGURE 51. NEW AND EMERGING OCCUPATIONS BY PATHWAY

 PATHWAY INFORMATION & SUPPORT SERVICES	
TITLE	DESCRIPTION
Business Intelligence Analysts	Produce financial and market intelligence by querying data repositories and generating periodic reports. Devise methods for identifying data patterns and trends in available information sources.
Database Architects <i>(Added as 15-1243 in 2018 SOC revision)</i>	Design strategies for enterprise database systems and set standards for operations, programming, and security. Design and construct large relational databases. Integrate new systems with existing warehouse structure and refine system performance and functionality.
Data Warehousing Specialists	Design, model, or implement corporate data warehousing activities. Program and configure warehouses of database information and provide support to warehouse users.
Document Management Specialists	Implement and administer enterprise-wide document management procedures for the capture, storage, retrieval, sharing, and destruction of electronic records and documents.
 PATHWAY PROGRAMMING & SOFTWARE DEVELOPMENT	
TITLE	DESCRIPTION
Software Quality Assurance Engineers and Testers <i>(Added as 15-1253 in 2018 SOC revision)</i>	Develop and execute software test plans to identify software problems and their causes.

continued, next page



PATHWAY NETWORK SYSTEMS

TITLE	DESCRIPTION
Computers Systems Engineers/Architects	Design and develop solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions.
Data Warehousing Specialists	Design, model, or implement corporate data warehousing activities. Program and configure warehouses of database information and provide support to warehouse users.
Information Technology Project Managers	Plan, initiate, and manage information technology (IT) projects. Lead and guide the work of technical staff. Serve as liaison between business and technical aspects of projects. Plan project stages and assess business implications for each stage. Monitor progress to assure deadlines, standards, and cost targets are met.
Network Designers	Determine user requirements and design specifications for computer networks. Plan and implement network upgrades.
Security Management Specialists	Conduct security assessments for organizations, and design security systems and processes. May specialize in areas such as physical security, personnel security, and information security. May work in fields such as healthcare, banking, gaming, security engineering, or manufacturing.
Web Administrators	Manage Web environment design, deployment, development, and maintenance activities. Perform testing and quality assurance of websites and Web applications.



PATHWAY WEB & DIGITAL COMMUNICATIONS

TITLE	DESCRIPTION
Web and Digital Interface Designers (Added as 15-1255 in 2018 SOC revision)	Design digital user interfaces or websites. Develop and test layouts, interfaces, functionality, and navigation menus to ensure compatibility and usability across browsers or devices. May use Web framework applications and client-side code and processes. May evaluate Web design following Web and accessibility standards and may analyze Web use metrics and optimize websites for marketability and search engine ranking. May design and test interfaces that facilitate the human-computer interaction and maximize the usability of digital devices, websites, and software with a focus on aesthetics and design. May create graphics used in websites and manage website content and links.
Video Game Designers	Design core features of video games. Specify innovative game and role-play mechanics, story lines, and character biographies. Create and maintain design documentation. Guide and collaborate with production staff to produce games as designed.

Sources: US Department of Labor, O*NET.

TRENDS AFFECTING TALENT

The demand for IT talent is increasing. In the CIO Survey 2018 conducted by Harvey Nash/KPMG, 58 percent of US respondents reported that they plan to expand IT employment at their organization; however, a quarter have no clear, digital, business vision and strategy set up to accomplish this. Technical architecture, Big Data/analytics and artificial intelligence are the top three areas experiencing skill shortages.⁸

US firms look abroad for tech talent as shortage at home continues. More and more multinational corporations are establishing software- and 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. As a result, innovation and related activities are shifting abroad to places where the supply of IT talent is less constrained.⁹

“New collar” jobs and the changing nature of middle-skills jobs. The pace of new skills acquisition in response to technological change makes traditional credentials and years of experience less relevant for IT talent. Continuous learning, hands-on capabilities, hard-skills and soft-skills training, and accomplishments often prove more useful than 4-year degrees. New legislation, such as the New Collar Jobs Act of 2017, demonstrates support for filling the jobs gap through alternate means, including training for adults seeking careers in IT and apprenticeship programs.

Widespread automation in the IT space will continue to accelerate. In the IT sector, DevOps and autonomic platforms are actively automating tasks by applying new technologies to increase IT workers’ abilities to handle complex workloads. The approaches to automation are varied and include robotic process automation, bots, cognitive automation, intelligent automation, and even cognitive agents.¹⁰ This trend creates demand for workers with skills that can manage automation while replacing workers whose functions were repetitive or work-flow driven.

Access to more data brings new challenges. Estimates state that 90 percent of all data in existence was created in the past 2 years. The proliferation of the Internet of Things and data collection devices has created what is called the “insights economy.” Machine learning and artificial intelligence are being used to make sense of vast amounts of data, but how data is collected poses new challenges. First, data privacy and ethical use of data are increasingly among the concerns of individuals and companies. Second, the usefulness of the data being collected is another consideration. Is more data always better? How and why data is being collected will continue to evolve along with new technologies.¹¹

Cybersecurity has risen to the forefront of organizations’ core functions. After years on the periphery, the rise of cloud computing has inadvertently thrust cybersecurity into high demand—a pattern that is likely to continue. While cyber defense will remain important, a greater number of organizations are expected to go on the offensive with penetration testing, external audits, and investment in new security training platforms.¹² The cybersecurity threat landscape requires technological solutions along with defensive and offensive solutions that involve a great deal of specialized talent and involve more traditional participants in the risk management space, including the end user.

⁸ Harvey Nash/KPMG CIO Survey 2018. See <https://home.kpmg.com/au/en/home/insights/2018/06/harvey-nash-kpmg-cio-survey-2018.html>.

⁹ ZDNet. “US Companies Continue to Look Overseas for Tech Talent.” August 2018. See <https://www.zdnet.com/article/u-s-companies-continue-to-look-overseas-for-tech-talent/>.

¹⁰ Deloitte. “IT Unbounded: The Business Potential of IT Transformation. February 2017. See <https://www2.deloitte.com/insights/us/en/focus/tech-trends/2017/it-transformation-business-potential.html>.

¹¹ CompTIA. “IT Industry Outlook 2018.” See <https://www.comptia.org/resources/it-industry-trends-analysis>.

¹² CompTIA. “IT Industry Outlook 2018.”

APPENDIX 2. CASE STUDIES

In this section, programs are profiled from around the US that could have applications in El Paso County. The research focused on three areas: technology councils, upskilling the workforce, and talent attraction and retention.

TECHNOLOGY COUNCILS

1. Tampa Bay Tech

Tampa Bay Tech is Florida's largest technology council and members represent over two million employees in the Tampa Bay area. As the region is experiencing a shortage of tech talent, one of Tampa Bay Tech's primary areas of focus is workforce. Tampa Bay Tech works with local employers, educational institutions, the US military, and workforce entities to coordinate efforts to address tech talent needs. To do this, it focuses on attracting top talent, developing the local workforce, and retaining tech talent. The organization is a partner on over \$5.9 million in workforce grants. <http://tbtf2016.wpengine.com>

2. Nashville Technology Council

Nashville Technology Council (NTC) was originally founded to create better-paying jobs and improved capital investment in technology startups. Today, it is the catalyst for the growth of Middle Tennessee's technology industry. Nashville Technology Council offers opportunities and resources for individuals, businesses, and educators wanting to get more involved in the technology industry. NTC hosts the Analytics Summit and the Nashville IT Symposium every year. Nashville Technology Council has various initiatives that include student outreach, creating career pathways and apprenticeships in high-demand occupations, certification trainings, political advocacy, and promoting Tech Hill Commons, an innovation hub for Nashville's tech ecosystem. Nashville Capital Network is an off-shoot of an early NTC initiative, the Nashville Angel Network. <https://technologycouncil.com/>

3. KC Tech Council

The Kansas City Tech Council has three pillars: workforce development, policy advocacy, and industry access. In addition to meeting employer needs through training and recruitment, the KC Tech Council works with local schools to ensure that students are prepared for the technology industry. The tech council also hosts a variety of events, including Tech CEO Retreat, Tech CEO Speaker Series, and Tech on Tap, that bring tech professionals together and set the stage for a tech-focused environment. The tech council recruits through Chutekc.com, the "digital front doorstep" to Kansas City's technology industry, which includes job postings and quality-of-life information for the city. <https://www.kctechcouncil.com/workforce>

4. Pittsburgh Technology Council

Pittsburgh Technology Council works with tech companies at all growth stages to connect businesses with employees, capital, and advocacy support. PTC's Cyburgh, PA Initiative is a program that brings together education institutes, government, and the private sector to advance Pittsburgh as a leader in cybersecurity. The council's talent services includes employer engagement, a career connector job board, out-of-town recruiting events, custom recruiting services, and job fair services. Pittsburgh Technology Council works with local employers to provide industry-leading health and disabilities insurance options to make Pittsburgh's IT sector competitive nationwide. <http://www.pghtech.org/membership-benefits/how-to-join/talent-services.aspx>

UPSKILLING THE WORKFORCE

1. Per Scholas

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. <https://perscholas.org/>

2. Rackspace Open Cloud Academy

Opened in 2013, the Rackspace Open Cloud Academy is an effort by Rackspace to address the skills gaps in San Antonio, Texas, around cloud computing technology. Using the same principles as Rackspace's internal training, the program is open to the public and utilizes innovative and hands-on learning techniques. The aim of the academy is to give the local workforce a competitive edge in open cloud computing technology, while honing other IT skills, such as cybersecurity, network security, and software development. Since its inception, the academy has graduated 655 individuals with a 98 percent completion rate. The school hosts information sessions twice monthly. Average cost per "track" is \$3,500 and includes 40 hours of classroom training.

<https://opencloudacademy.rackspace.com/>

3. Byte Back

Byte Back is the leading tech training nonprofit in Washington, DC. Byte Back helps unemployed and underemployed residents earn industry-recognized IT certifications and begin careers that pay living wages, in partnership with the Prince George's County Economic Development Corporation Workforce Services Division. Through education classes and career services, Byte Back expands tech opportunities to local residents. Classes are provided at the beginner, intermediate, and advanced levels, earning certifications such as CompTIA IT Fundamentals or Microsoft Office Specialist Certification. Through the Tech Education and Career Help (TECH) DC initiative, Byte Back connects graduates of its programs to regional employers. Additional partners include the Northern Virginia Technology Council, Angarai, PC Retro.com, DC Office of the Chief Technology Officer, International Software Systems, Nucore Vision, Sage Services Group, SoftCon Enterprises, and Science Systems and Applications. <https://byteback.org/>

4. Goodwill Digital Career Accelerator

Funded by a \$10 million grant from Google.org and with the assistance of 1,000 Google volunteers, the new Goodwill initiative will enable more than one million people to receive digital skills training over the next 3 years, including individuals with disabilities and disadvantages, youth, older workers, veterans and military families, and people who are transitioning back into society. Training will include basic skills training and advanced industry credentials. With this investment, a total of 125 local US Goodwill organizations will participate as digital change agents, digital champions, or digital enthusiasts. <http://www.goodwill.org/dca/>

5. Rhode Island Family Literacy Initiative

The Rhode Island Family Literacy Initiative (RIFLI) equips adult immigrants with the literacy skills for upward mobility, engaged citizenship, strong families, and lifelong learning through onsite classes and full access outside the classroom. The organization holds a variety of computer classes for adult English language learners. The classes are

the result of RIFLI's plan to create a one-on-one classroom computing model that "blurs the lines between language/content learning and using technology."¹³ To address different learning levels, RIFLI uses the Northstar Digital Literacy assessment exam for curriculum, working in Microsoft Excel and Word and using social media. At the end of each course, RIFLI staff award digital badges to students. To increase access to technology, RIFLI created a free lending system for devices and Wi-Fi hotspots to underserved learners, in partnership with the public library system. <https://digitalpromise.org/2014/12/22/awareness-assessment-and-access-improving-adult-digital-literacy/>

TALENT ATTRACTION AND RETENTION

1. Campus Philly

Campus Philly began as a Philadelphia city initiative and transformed into a nonprofit that runs with some city support. Campus Philly offers various ways for young people to explore the city, such as discounted tickets to events around town or Campus Philly-specific events. First, focused on getting students to interact with the city, the organization now has an internship component, linking students to internships with local companies. Together, these initiatives help students gain familiarity with the city and buy-in through employment. <https://campusphilly.org/>

2. Come Home Scholarships

Various communities have started using monetary awards to attract residents who have moved away. Often, the focus is on the young, college-educated segment of the population who leaves for better-paying jobs in larger cities. The Community Foundation of St. Clair County, Michigan, is specifically labeling its efforts a "talent retention initiative" and is giving college graduates with a STEAM-related degree up to \$15,000 toward student loans if they move back to St. Clair County. The Community Foundation for Crawford County, Ohio, has a similar approach but differs in that anyone with an associate's, undergraduate, or graduate degree or a completion in a skilled trade is eligible for its \$10,000 scholarship. http://www.stclairfoundation.org/funds/more/reverse_scholarship_fund <https://www.cfcrawford.org/come-home-scholarship>. Additional programs are profiled here: <https://www.washingtonexaminer.com/red-alert-politics/small-towns-are-offering-incentives-for-millennials-to-ditch-the-big-city>

3. Live in Lou

Live in Lou is the landing page promoting Louisville, Kentucky. The website features opportunities to live, work, learn, and play in the city. The "Work" page is a live job postings board and the "Play" page advertises county amenities and attractions. Viewers can connect with City Champs, volunteer, trained ambassadors who answer questions about the city via email and social media. The Employer Toolkit provides resources and data to help employers market Louisville to prospects and future employees. The toolkit includes an inventory of job placement centers, workforce readiness training programs, talent pipeline programs, and community organizations. <https://www.liveinlou.com/>

¹³ Digital Promise. "Awareness, Assessment, and Access: Improving Adult Digital Literacy." December 2014. See <https://digitalpromise.org/2014/12/22/awareness-assessment-and-access-improving-adult-digital-literacy/>.