



SAN DIEGO'S PRIORITY SECTORS

An Update on Labor Force and Training Needs

SAN DIEGO
WORKFORCE
PARTNERSHIP®

NOVEMBER 2017

TABLE OF CONTENTS

INTRODUCTION.....	2
OVERALL TRENDS.....	3
ADVANCED MANUFACTURING.....	6
CLEAN ENERGY	15
HEALTH CARE.....	23
INFORMATION AND COMMUNICATION TECHNOLOGIES	32
LIFE SCIENCES.....	42
APPENDIX A: PRIORITY SECTORS BY NAICS	51
APPENDIX B: METHODOLOGY	68

INTRODUCTION

In 2014, the San Diego Workforce Partnership (SDWP) released a series of Priority Sector reports in collaboration with the San Diego and Imperial Counties Community Colleges Association (SDICCCA). The five Priority Sectors include Advanced Manufacturing, Clean Energy, Health Care, Information and Communication Technologies (ICT), and Life Sciences. SDWP identified and prioritized these sectors for workforce development because of their significant employment growth and self-sufficient wages.

Community partners used the Priority Sector research to bring in more than \$19 million in grants for the San Diego region. Community based organizations, school districts and community colleges received funding to promote career pathways in the Priority Sectors and to implement work-based learning programs such as internships, job shadowing and pre-apprenticeships.¹ Since the release of the research, SDWP completed contracted education programs², entered into Customized Training contracts with employers³, and placed students into internships related to the Priority Sectors⁴.

By focusing efforts on San Diego's Priority Sectors, the public workforce development system and the community colleges can address one of the region's greatest economic challenges—the hourglass economy. San Diego's employment base consists of high-wage earners at the top and low-wage earners at the bottom, with few middle-wage earners in between, resulting in a wage gap.⁵ The region is working together to fuel economic opportunity by helping individuals who are typically underrepresented in the high-growth Priority Sectors acquire the knowledge, skills and abilities needed to thrive in them. As jobs grow and evolve, the workforce development system must improve access to Priority Sectors so that labor shortages do not impede the growth of our regional economy.

This year, SDWP is releasing an update for each of the Priority Sectors in a single report that provides new information and an overview of the changes each sector has experienced since the previous reports were published. This provides information on the labor market and recommendations for employers and educators to ensure growth within each sector in San Diego County. This updated research will help guide the public workforce development system in supporting, developing and evaluating employment and training programs for the Priority Sectors.

¹ sandiegouniontribune.com/news/education/sdut-career-pathways-torlakson-carlsbad-lovely-2015may27-story.html

² workforce.org/news/two-institutions-chosen-contracted-education-priority-sectors

³ workforce.org/news/customized-training-cooks-jobs-first-cohort

⁴ workforce.org/news/connect2careers-praised-brookings-institution-report-youth-summer-jobs-programs

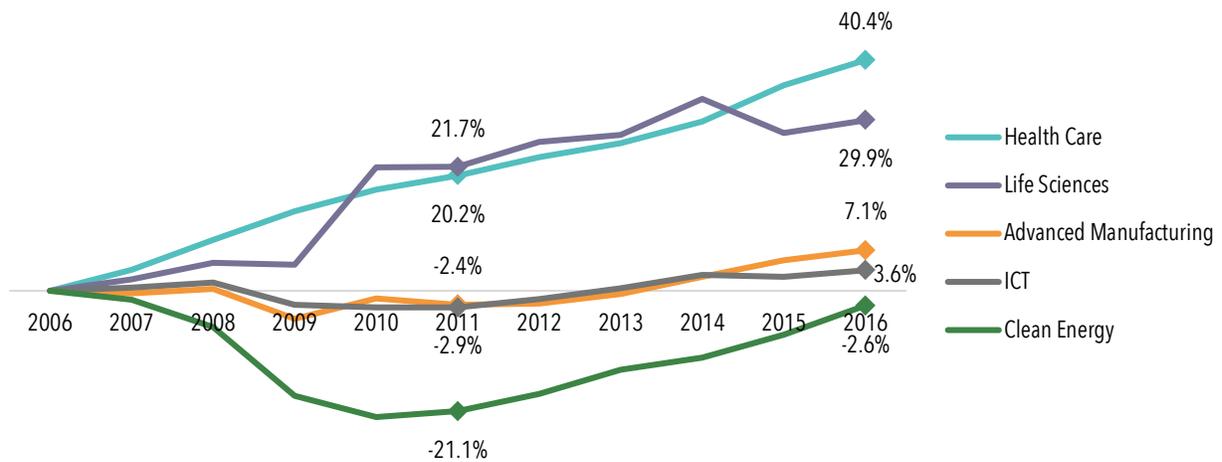
⁵ voiceofsandiego.org/business/inside-the-plan-to-fix-san-diegos-hourglass-economy

OVERALL TRENDS

Despite the diversity of the Priority Sectors, employer interviews and surveys revealed similar trends across all sectors. Many of the responses, highlighted in Tables 1-3 below, have common themes regarding hiring difficulties and importance placed on applicant skill sets. While each Priority Sector has grown in employment in the past ten years, continued growth will depend on employers' ability to find qualified applicants.

Four of the five Priority Sectors have seen net employment growth over the past decade (Figure 1)⁶. Health Care has seen the strongest and most consistent growth, followed by Life Sciences. Advanced Manufacturing and ICT both dropped in employment during the recession, but recovered in the past few years. While Clean Energy is still below 2006 employment numbers, this sector has recovered significantly since the recession (18.5 percent).

Figure 1. Change in Employment Across Priority Sectors, 2006-2016



Employer Survey Results

Employers in each Priority Sector were surveyed to uncover their most significant hiring difficulties (Table 1). A lack of industry-specific knowledge was most often rated as a significant reason for hiring difficulty across Priority Sectors, followed by a small applicant pool and insufficient non-technical skills and certifications.

⁶ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Table 1. Top Three Reasons for Hiring Difficulty by Priority Sector

Advanced Manufacturing	Clean Energy	Health Care	ICT	Life Sciences
Lack of Industry-specific knowledge				
Small applicant pool	Willingness to work	Small applicant pool	Small applicant pool	Small applicant pool
Insufficient non-technical skills	Insufficient non-technical skills	Insufficient non-technical skills	Insufficient certifications	Insufficient certifications

Employers were also asked about the importance of specific skill sets to workers in each field. Table 2 shows the percentage of employers who rated each skill as “very important.”⁷ “Problem solving and critical thinking” and “technical skills” were the most emphasized skill sets in Advanced Manufacturing, Clean Energy and ICT. For Health Care and Life Sciences employers, “social and verbal communication” and “problem solving and critical thinking” were rated highest. Across all five sectors, “educational degrees and certifications” were least likely to be rated as “very important.” This reflects a common sentiment expressed by employers: as long as employees show capacity to learn, communicate and problem-solve, they are willing to train on the job to compensate for educational deficiencies.

Table 2. Percent of Employers Rating Skill as “Very Important” (by Priority Sector)⁸

Advanced Manufacturing	Clean Energy	Health Care	ICT	Life Sciences
Problem solving and critical thinking (73%)	Problem solving and critical thinking (81%)	Social and Verbal communication (89%)	Problem solving and critical thinking (90%)	Problem solving and critical thinking (87%)
Technical skills (61%)	Technical skills (68%)	Problem solving and critical thinking (79%)	Technical skills (81%)	Social and verbal communication (79%)
Social and verbal communication (57%)	Social and verbal communication (68%)	Industry-specific knowledge (69%)	Social and Verbal communication (67%)	Technical skills (68%)
Industry-specific knowledge (48%)	Industry-specific knowledge (67%)	Technical skills (64%)	Industry-specific knowledge (62%)	Industry-specific knowledge (61%)
Educational degrees and certifications (13%)	Educational degrees and certifications (35%)	Educational degrees and certifications (57%)	Educational degrees and certifications (46%)	Educational degrees and certifications (43%)

Further, employers were asked about the difficulty of finding these skill sets in applicants (Table 3). Employers most frequently noted that “industry-specific knowledge” was very difficult to find in all sectors but Health Care. The largest skills gap revealed across the sectors was in “problem solving and critical thinking.” These skills were among the top two “very difficult to find,”⁹ and also in the top two “very important” skills.

⁷ Other choices included “somewhat important” and “not at all important.”

⁸ Advanced Manufacturing n=100; Clean Energy n=57; Health Care n=135; ICT n=110; Life Sciences n=84

⁹ Other choices included “somewhat difficult” and “not at all difficult.”

Table 3. Percent of Employers Rating Skill as “Very Difficult to Find” (by Priority Sector)¹⁰

Advanced Manufacturing	Clean Energy	Health Care	ICT	Life Sciences
Industry-specific knowledge (47%)	Industry-specific knowledge (46%)	Problem solving and critical thinking (30%)	Industry-specific knowledge (26%)	Industry-specific knowledge (32%)
Problem solving and critical thinking (34%)	Problem solving and critical thinking (37%)	Social and verbal communication (24%)	Problem solving and critical thinking (23%)	Problem solving and critical thinking (27%)
Technical skills (32%)	Technical skills (33%)	Industry-specific knowledge (22%)	Social and verbal communication (19%)	Technical skills (25%)
Social and verbal communication (16%)	Educational degrees and certifications (16%)	Technical skills (21%)	Technical skills (17%)	Educational degrees and certifications (16%)
Educational degrees and certifications (8%)	Social and verbal communication (14%)	Educational degrees and certifications (18%)	Educational degrees and certifications (12%)	Social and verbal communication (14%)

While the Priority Sectors experienced job growth in the past 10 years, employers surveyed in each of these sectors still experience hiring difficulties among current job applicants, a finding that remains the same from the SDWP Priority Sector reports released in 2014. Employers still need applicants who have not only technical skills and industry-specific knowledge, but also soft skills such as social and verbal communication skills (e.g., the ability to explain technical ideas to a general audience).

Additionally, there is still a need across the Priority Sectors for employers to partner with training institutions and advise educators on what to include in their curriculum. By providing input ahead of time, employers can help tailor programs for current industry and business needs, which prepares job seekers before they actually apply for a job in the Priority Sectors. Workforce development organizations can help facilitate this employer-trainer relationship across sectors.

While these general trends remain unchanged from 2014, public awareness of the Priority Sectors have increased since the last release of the report series. The following sections explain in more detail how each sector has evolved since SDWP last studied them.

¹⁰ Advanced Manufacturing n=100; Clean Energy n=57; Health Care n=135; ICT n=110; Life Sciences n=84

ADVANCED MANUFACTURING

Over the past three decades, manufacturing output has risen in the United States due to technological advances. These improvements in technology led to the rise of Advanced Manufacturing, which has become a Priority Sector in San Diego County. According to the Bureau of Economic Analysis, the U.S. efficiently and effectively manufactures food, beverages, tobacco products, chemical products and motor vehicles and parts.¹¹ The Advanced Manufacturing sector in San Diego County was defined by the following six industries for this study:

- **Biotechnology & Medical Device Manufacturing (B&MD)** - Firms engaged in the design and manufacturing of biotechnology-related materials, pharmaceuticals, surgical instruments, orthopedic implants, bio-imaging equipment, dental instruments and other related equipment.
- **Defense, Aerospace & Transportation Manufacturing (DATM)** - Firms engaged in the design and manufacturing of explosives, nautical and aeronautical systems, vehicles, aircraft, ships and related transportation equipment.
- **Information and Communication Technologies (ICT) Manufacturing** - Firms engaged in the design and manufacture of computers, computer storage devices, telecommunications equipment, semiconductors and related radio and television communications equipment.
- **Food & Beverage Manufacturing (F&B)** - Firms engaged in the design and manufacturing of all kinds of food and drink, including bakeries, tortillas, breweries and wineries.
- **Support, Design & Research Services for Manufacturing (SD&RS)** - Firms engaged in providing services that could support or assist manufacturers, including engineering services, testing laboratories, industrial design services as well as research and consulting services.
- **Other Manufacturing** - Firms engaged in developing and producing fabric, textiles, apparel, footwear, paper, wood products, building materials, glass and cement products, machinery and related machine shops.

Employment in San Diego County's Advanced Manufacturing Sector

As defined by the industries listed above, San Diego's Advanced Manufacturing sector had a total of 6,190 establishments and 168,157 jobs in 2016 (Table 4)¹². A total of 115 industry employers took the 2017 Advanced Manufacturing survey, which was conducted over the phone and online.

¹¹ pewresearch.org/fact-tank/2017/07/25/most-americans-unaware-that-as-u-s-manufacturing-jobs-have-disappeared-output-has-grown/

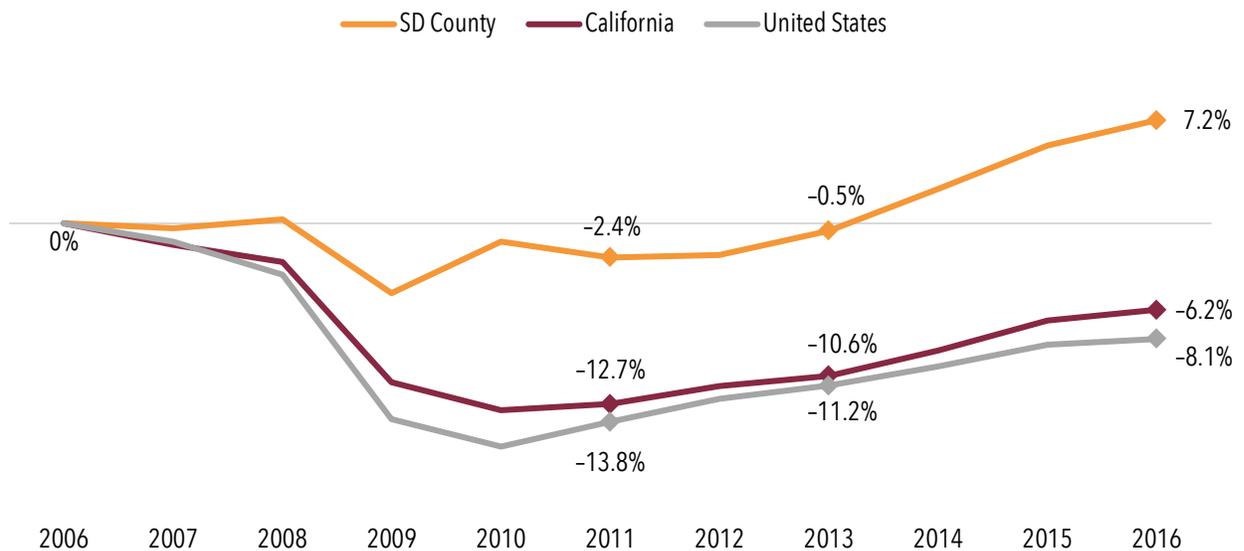
¹² Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker; Burning Glass Labor Insight.

Table 4: Employment in Advanced Manufacturing by Industries

Advanced Manufacturing Industries	2016 Jobs	2006-2016 % Change	2013-2016 % Change
Support, Design & Research Services for Manufacturing	62,523	17%	1%
All Other Manufacturing	37,094	-23%	-1%
Defense, Aerospace & Transportation Manufacturing	26,822	43%	39%
Biotechnology and Medical Device Manufacturing	18,169	66%	17%
ICT Manufacturing	14,625	-25%	-2%
Food & Beverage Manufacturing	8,924	41%	26%
All Industries	168,157	7%	8%

San Diego County employment in this sector returned to pre-recession levels in 2013 (at the time of the last report), and has increased by eight percent since then (Figure 2).¹³ According to the Pew Research Center, manufacturing jobs are declining across the nation due to the automation of jobs;¹⁴ however, unlike California and the United States, San Diego County’s Advanced Manufacturing sector regained and surpassed jobs lost in the recession. The local growth rate in the sector outpaces the state and nation.

Figure 2: Percent Change in Employment in Advanced Manufacturing Sector, 2006-2016

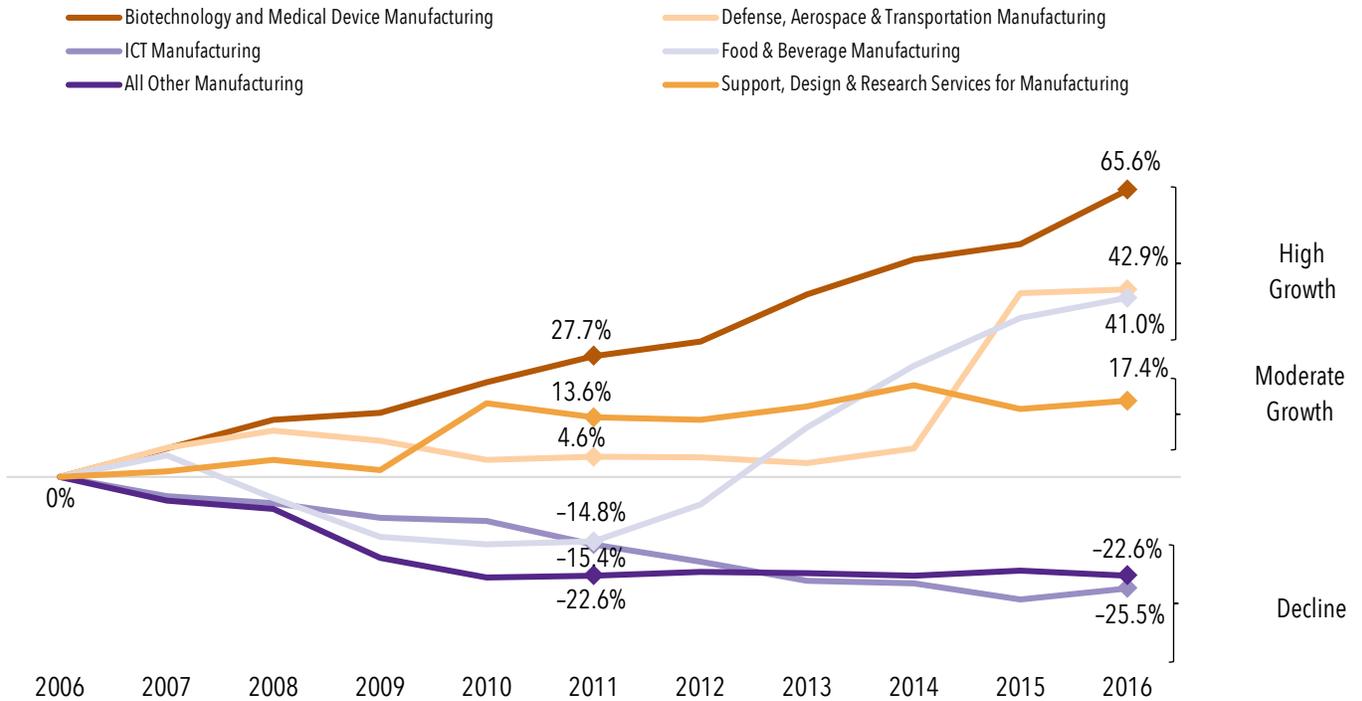


¹³ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

¹⁴ pewresearch.org/fact-tank/2017/07/25/most-americans-unaware-that-as-u-s-manufacturing-jobs-have-disappeared-output-has-grown/

The overall relative growth for Advanced Manufacturing in San Diego County masks a wide range of growth rates within the industries included in this sector. Biotechnology and Medical Device Manufacturing, Defense, Aerospace & Transportation Manufacturing, Food & Beverage Manufacturing, and Support, Design & Research Services all experienced robust growth in employment during the past decade (Figure 3).¹⁵ ICT Manufacturing and Other Manufacturing showed a sizeable decline in the same period.

Figure 3: Change in Employment in San Diego’s Advanced Manufacturing Industries, 2006-2016¹⁶



In addition to industries within the sector, eight occupational clusters with the largest number of jobs in the county were analyzed (Table 5).¹⁷

¹⁵ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

¹⁶ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

¹⁷ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker; Burning Glass Labor Insight.

Table 5: Employment in San Diego’s Advanced Manufacturing Occupational Clusters¹⁸

Advanced Manufacturing Occupational Clusters	Overall Jobs	Jobs in Adv. Manufacturing	2013-2016 Overall % Change	2013-2016 % Change in Industry
Assemblers and fabricators (incl. electronics)*	31,962	10,168	5%	8%
General and Operations Managers	24,343	3,732	6%	5%
Software developers*	17,614	8,628	9%	15%
Laborers and freight, stock, and material movers	17,356	1,657	7%	8%
Electrical or civil engineers*	9,353	6,292	6%	11%
Food processing workers*	8,573	1,946	5%	4%
Metal and plastic workers (incl. machinists)*	7,900	5,996	8%	10%
Inspectors, testers, sorters, samplers and weighers	4,801	3,399	-5%	-8%
All Occupations	121,902	41,818	6%	8%

There is a total of 121,902 jobs in the eight occupational clusters, but these jobs are not employed exclusively in the Advanced Manufacturing sector. Many of these jobs exist in other sectors such as Health Care, Life Sciences, and Aerospace. 41,818 jobs (or 34 percent) of the regional jobs that exist in these occupational clusters are specifically in the Advanced Manufacturing sector. The “inspectors, testers, sorters, samplers and weighers” occupational cluster is the only one to have decreased since 2013, and will likely continue to shrink as improved technologies replace manual labor for these jobs.

Five of the eight Advanced Manufacturing occupational clusters have median hourly earnings above the national average (Table 6).¹⁹ The median hourly earnings for all Advanced Manufacturing occupational clusters in San Diego County is \$20.83, which is 24 percent higher than the national average of \$16.76 for the same occupations, and nine percent higher than the county’s overall median hourly wage of \$19.03.

¹⁸ Asterisk indicates an occupation cluster. Occupations included in each cluster can be found in Appendix A.

¹⁹ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Table 6: Median Hourly Earnings for the Advanced Manufacturing Occupational Clusters, 2016²⁰

Advanced Manufacturing Occupational Clusters	Median Hourly Earnings, San Diego (2016)	Median Hourly Earnings, United States (2016)
Assemblers and fabricators (incl. electronics)*	\$12.54	\$12.75
General and Operations Managers	\$50.27	\$46.99
Software developers*	\$52.22	\$49.00
Laborers and freight, stock, and material movers	\$11.65	\$12.02
Electrical or civil engineers*	\$49.03	\$45.14
Food processing workers*	\$10.72	\$10.86
Metal and plastic workers (incl. machinists)*	\$26.48	\$23.29
Inspectors, testers, sorters, samplers, and weighers	\$19.56	\$17.31
All Occupational Clusters	\$20.83	\$16.76

Employer Assessment

To better understand the labor market for these occupational clusters, 115 online and phone survey responses were collected from hiring managers and human resource professionals in San Diego County. The majority of employer respondents had only one location in San Diego County.

In survey responses, 48 percent of Advanced Manufacturing employers expect an unchanged number in their permanent labor force, while 42 percent predict hiring more permanent employees in the next 12 months (Figure 4). 80 percent expect their temporary employment needs to stay the same, while nine percent expect an increase.

Figure 4: Advanced Manufacturing 12-month Employer Growth Expectations²¹

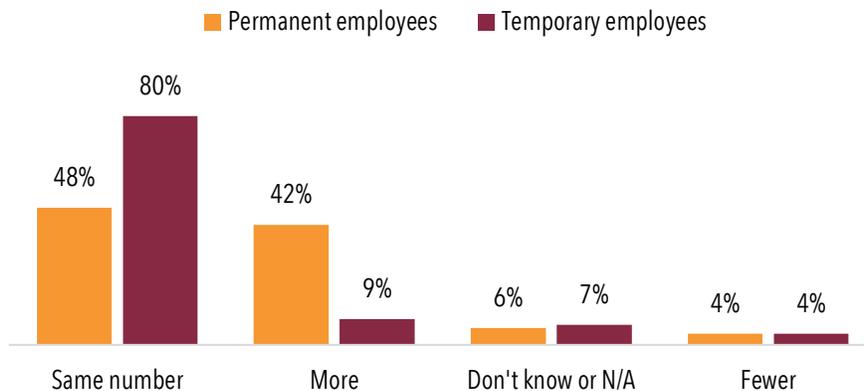


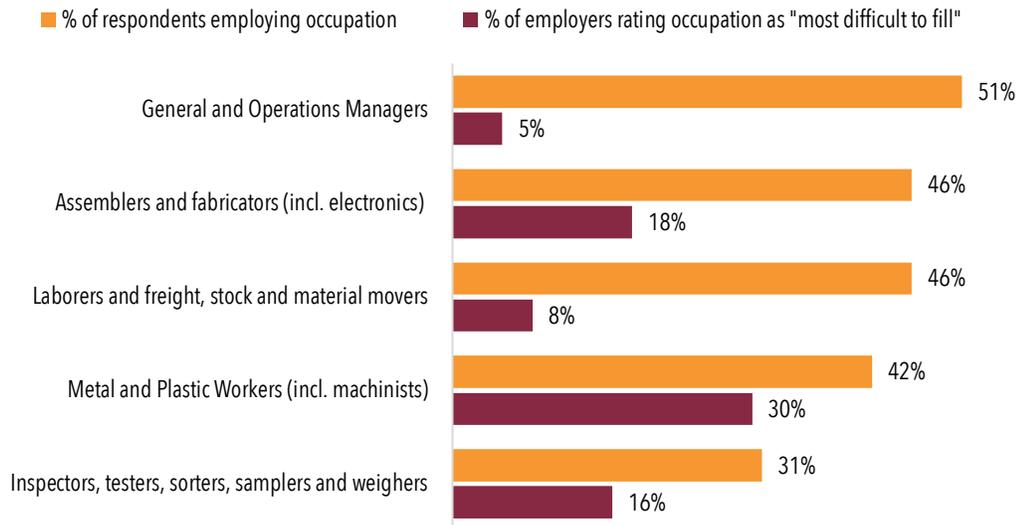
Figure 5 shows the five Advanced Manufacturing clusters most commonly employed by survey respondents, compared to how often they were rated as “most difficult to fill.” While general and

²⁰ Occupations with an asterisk indicate an occupation cluster, for which the median hourly earnings of all occupations in the specific cluster were taken into account.

²¹ Employers responding to question regarding permanent employees n=114; employers responding to question regarding temporary employees n=107

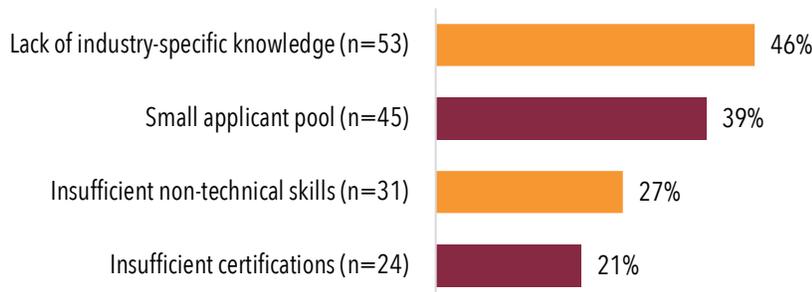
operations managers were most commonly employed, only five percent of employers rated them most difficult to find. Metal and plastic workers, including machinists, were most frequently cited as most difficult to fill.

Figure 5: Advanced Manufacturing Occupations Most Commonly Employed vs. Difficulty to Fill²²



When asked about the two most significant reasons for hiring difficulties, 46 percent of employers cited “lack of industry-specific knowledge” as a top struggle, followed by “small applicant pool” at 39 percent (Figure 6).

Figure 6: Advanced Manufacturing Employer Reasons for Hiring Difficulty²³



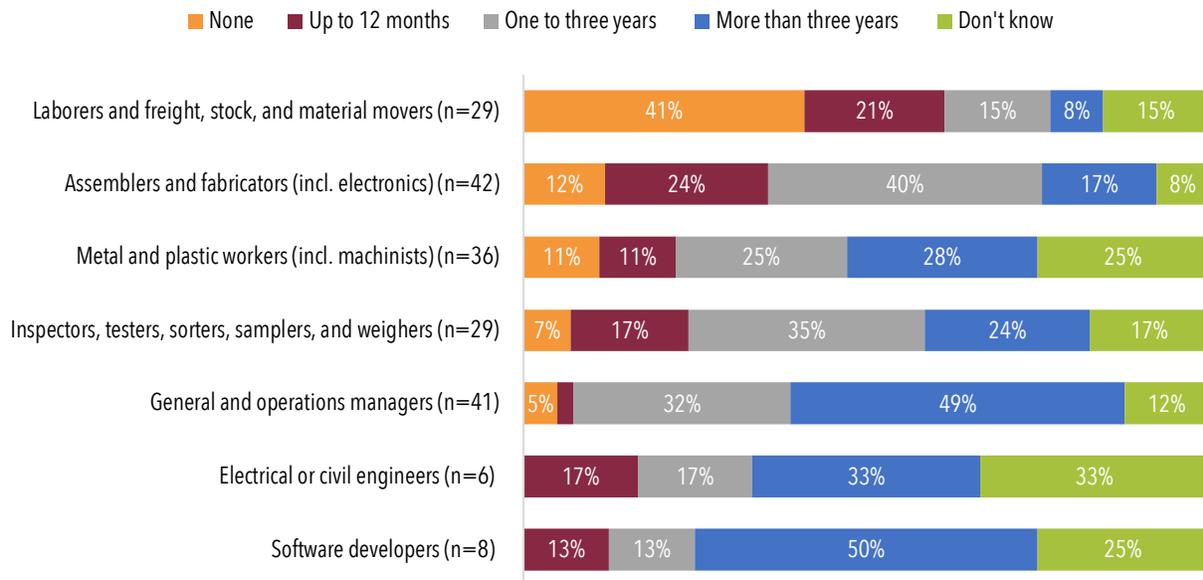
Respondents were also asked about the typical level of experience required for qualified Advanced Manufacturing applicants to possess (Figure 7). Employers seem more willing to train employees for occupations with lower skill requirements — 41 percent of employers were willing to hire laborers with no experience — while they expect more experience from higher-skilled occupations. Many of the skill sets needed in Advanced Manufacturing are necessarily learned on-the-job. This emphasizes the

²² Five highest responses highlighted in the table above.

²³ n=115

importance of incorporating apprenticeships, internships or other work-based experiences into training programs. The more real-world experience program graduates have, the more likely employers are to hire them.

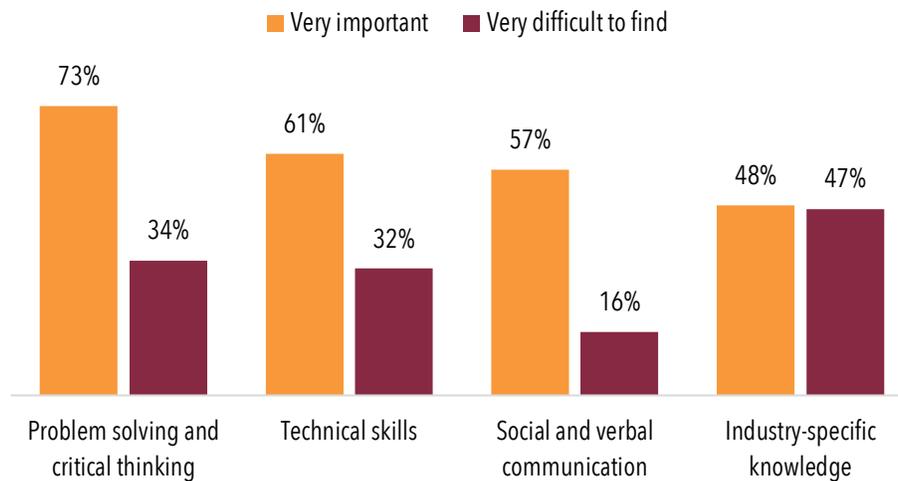
Figure 7: Typical Level of Comparable Work Experience Expected by Advanced Manufacturing Employers²⁴



In addition to experience, employers look for some broad skill sets across occupations. Echoing their desire for employees with work experience, nearly half of employers noted that industry-specific knowledge is both very important and very difficult to find in applicants (Figure 8). While problem solving, technical and communication skills were frequently cited as very important, they were not the most difficult skills sets to find in applicants.

²⁴ Food processing workers excluded from graph because of low number of respondents (n=3).

Figure 8: Percent of Advanced Manufacturing Employers for Whom Skills are Very Important vs. Very Difficult to Find²⁵



Conclusions and Recommendations

1. In the 2014 Advanced Manufacturing report, shifting the public perception of Advanced Manufacturing was a recommendation. Employers have reported that since the previous report, the public perception has been shifting to a more positive light. Since 2012, San Diego County manufacturers have participated in National Manufacturing Day; the number of participating employers has increased from 10 to 60 in 2016, and the number of attendees has grown from 60 in 2012 to 1,000 in 2016.²⁶
2. Employers should seize the opportunity to directly cultivate the talent they are seeking, especially given the number of employers who cited a shortage in workers with industry-specific knowledge. They can use apprenticeships or internships to provide more opportunities to individuals who are interested in working in this sector, but do not have the work experience. Community colleges and other local training providers are well-poised to support the creation of in-house training programs, and the local workforce board has access to funding to help subsidize on-the-job training.
3. Job candidates with hands-on training and experience, particularly with the machines used in Advanced Manufacturing, are valuable for employers in the region. The results of the employer survey reveal that San Diego's Advanced Manufacturing firms are having the most difficulty finding qualified metal and plastic workers, including machinists. However, there are limited facilities in the region that have machines available for training due to the cost and space requirements of machinery used in this sector. In the 2014 report, one of the recommendations

²⁵ n=100

²⁶ industryweek.com/manufacturing-day/san-diego-celebrates-manufacturing-day-all-week

made was to increase hands-on training by leveraging existing facilities and increase the number of evening or night training programs offered.

As of 2017, institutes like San Diego City College and MiraCosta College offer certificates and training classes in the evenings and weekends. There is still room to grow quantity and range of evening/weekend training courses offered by other institutions. This is especially important for people who are currently working during the day, but want to transition into Advanced Manufacturing. For those interested in the sector, but unable to devote the resources needed to take training courses, there are spaces in San Diego where one can try out Advanced Manufacturing tools. Innovation Lab, located at the Central Library in the City of San Diego, provides manufacturing equipment such as 3D printers and scanners, a milling machine, laser cutter, and maker classes and workshops for use by appointment. Fab Lab, located in the City of San Diego as well, also provides a low cost, community oriented production workshop and small-scale fabrication machines for adults and children interested in learning more about Advanced Manufacturing.

4. The 2014 report recommended that education and training programs include curriculum to support the non-technical skills desired by employers (e.g., problem-solving and critical thinking.) Since then, more has been done to incorporate soft skills training in education and training programs. Connect2Careers, or C2C, has a career readiness component that helps train young people in skills to help them succeed in the workplace through hands on training and the use of peer mentors who demonstrate soft skill application. It is also important that job seekers are able to demonstrate to employers that they possess these skills. At the America's Job Center of California (AJCC) locations in San Diego County, job seekers are able to prepare for and take the ACT WorkKeys assessments. Successful completion of these assessments results in National Career Readiness Certificate (NCRC) that signals work-ready skills to employers.

CLEAN ENERGY

This sector is considered the foundation of the “green economy” and has considerable overlap with comparable industry titles such as clean technology and green energy. This sector sits at the intersection of innovative scientific research, energy, transportation and construction, and has spawned the growth of sub-sectors like the solar industry and electric vehicles.

The Clean Energy sector can be defined by the following clusters:²⁷

- **Renewable Energy** - Firms engaged in the generation of electricity from renewable source such as solar, wind, geothermal, biofuels and hydroelectric power.
- **Energy Efficiency** – Firms, including many construction, contracting and manufacturing, that are involved in heating, ventilation and air conditions (HVAC), lighting and weatherization.
- **Alternative Transportation** - Firms engaged in researching, designing, developing and producing vehicles with lower carbon emissions including electric vehicles and hydrogen busses.
- **Greenhouse Gas Accounting & Management** - This is an emerging industry cluster within San Diego’s Clean Energy ecosystem focused on firms quantifying and measuring greenhouse gas emissions and managing those emissions.

This section focuses on the 32 industries that define the first two industry clusters, Renewable Energy and Energy Efficiency.

Employment in San Diego County’s Clean Energy Sector

The Clean Energy sector is an evolving contributor to San Diego’s innovation economy and a substantial employer, providing approximately 107,000 jobs in the county.²⁸

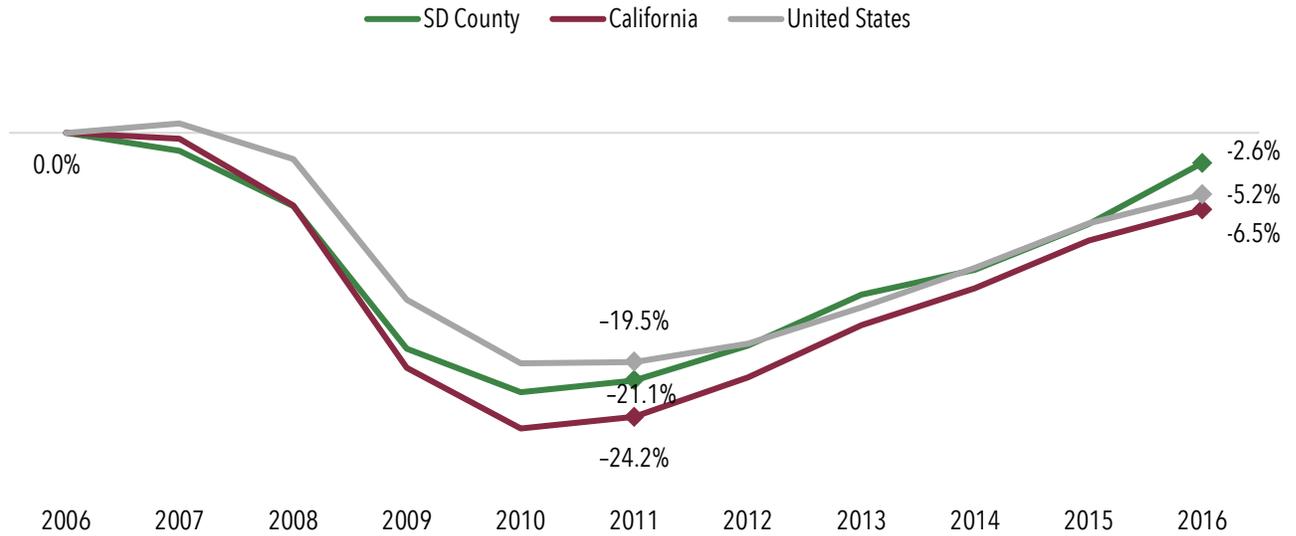
Clean Energy employment in San Diego County fell during the 2007–2009 recession, but has recovered steadily since its lowest point in 2010. While recovering at approximately the same pace, San Diego’s Clean Energy jobs did not fall as sharply as California’s in 2010, and is closer to returning to pre-recession employment levels (Figure 9).²⁹

²⁷ The clusters were based on the research that was done in 2014, but were updated to reflect 2017 North American Industrial Classification System (NAICS) structure.

²⁸ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

²⁹ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Figure 9: Percent Change in Employment in Clean Energy, 2006–2016



For this study, 12 Clean Energy occupations were identified to be the focus of the occupational research (Table 7).³⁰ These 12 occupations were chosen because they are expected to grow and provide immediate employment opportunities in the region, are consistent with standard occupational classifications, and are primarily considered entry-level positions that in most cases require a four-year degree or less as the highest level of formal education.

The Clean Energy occupations with the largest number of jobs in the sector include electricians, construction laborers, civil engineers, and construction managers. The occupations with the highest median hourly earnings are electrical and electronic engineers, civil engineers, construction managers, and construction and building inspectors.

³⁰ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Table 7: Top Clean Energy Occupations Employed in San Diego County

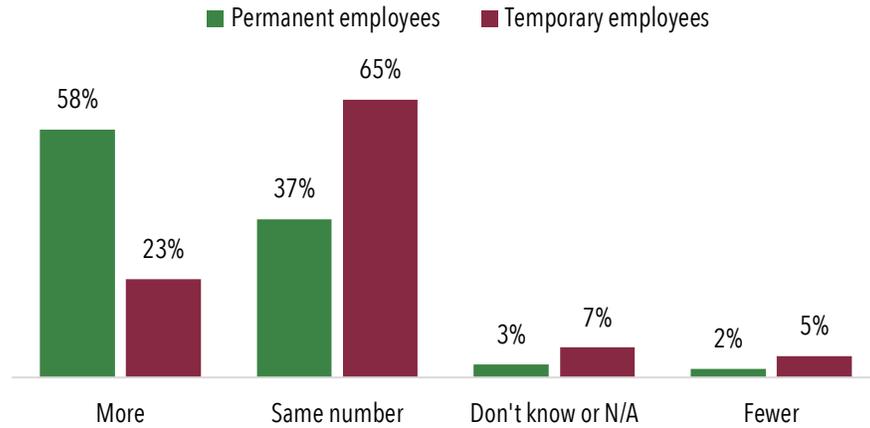
Clean Energy Occupations	Employed in the Clean Energy Industry (2016)	2013-2016 % Change	Median Hourly Earnings (2016)
Electricians	5,046	17%	\$29.72
Construction Laborers	4,726	19%	\$17.03
Civil Engineers	3,514	11%	\$42.66
Construction managers	2,648	16%	\$42.20
HVAC Installers	1,727	28%	\$26.26
Electrical and Electronics Engineers	1,327	15%	\$56.05
Business Operations Specialists, All Other	1,055	4%	\$35.37
Construction and Building Inspectors	436	10%	\$36.61
Paving, Surfacing, and Tamping Equipment Operators	307	17%	\$25.30
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	240	7%	\$31.72
Solar Photovoltaic Installers	101	24%	\$18.53
Wind Turbine Service Technicians	21	24%	\$24.94
Total	21,148	16%	\$30.72

Employer Assessment

A total of 64 respondents completed the Clean Energy employer survey, which was conducted over the phone and online. All respondents are involved in staffing or hiring decisions at their firm, and all companies have one or more locations in San Diego County.

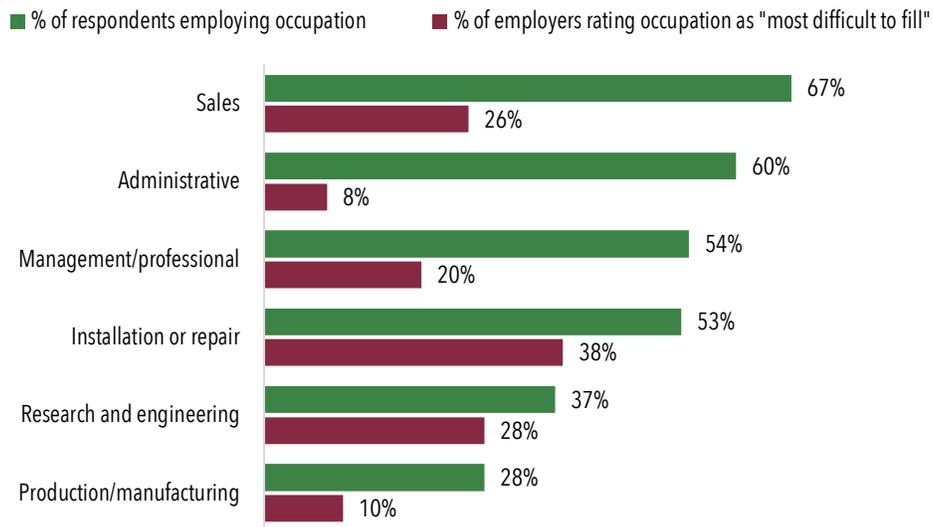
Most Clean Energy employers are either growing or maintaining the current size of their workforce. For permanent workers, 58 percent of surveyed employers expect to add permanent employees over the next 12 months, and 37 percent expect to stay the same. The prevalence of increases in permanent over temporary employees bodes well for job seekers looking for stability.

Figure 10: Clean Energy 12-month Employer Growth Expectations³¹



Looking at occupation types in this sector, employers most frequently have difficulty filling installation and repair positions, which are employed by over half of survey respondents (Figure 11).

Figure 11: Clean Energy Occupations Most Commonly Employed vs. Difficulty to Fill³²

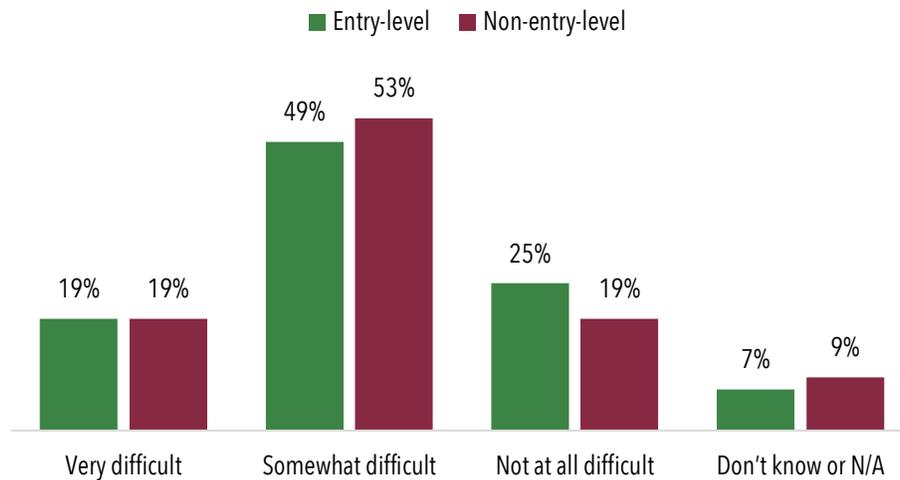


Sixty-eight percent of Clean Energy employers are currently having at least some difficulty finding qualified entry-level job applicants, while 72 percent are struggling with non-entry-level positions (Figure 12). Finding qualified job applicants is a challenge for the region’s Clean Energy employers, but it is particularly challenging for approximately 19 percent of employers who indicated it is very difficult to fill both entry- and non-entry-level positions with qualified applicants.

³¹ Permanent employees n=59; temporary employees n=57

³² Difficult to fill positions n=50; most commonly employed positions n=57

Figure 12: Difficulty Filling Entry-level vs. Non-entry-level Clean Energy Occupations³³



When asked about the two most significant reasons for hiring difficulties, 76 percent of employers cited “lack of industry-specific knowledge” as a top struggle. During the employer interviews, a common skill highlighted by Clean Energy employers and employees is the ability to have a broad knowledge base.

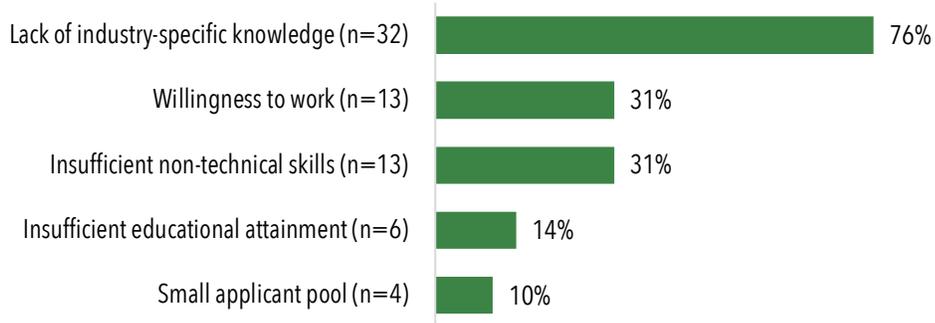
The diverse nature of this sector’s industries makes it increasingly important to have a broader skill set. It would be beneficial, for example, for an engineer to learn about project management and public speaking in addition to possessing the technical skills needed for an engineering role.

Thirty-one percent of employers cited “insufficient non-technical skills” as a top struggle (Figure 13). According to respondents, some of the most important non-technical skills include the ability to translate technical information to be understood by the general population, being able to work in a team and manage difficult interpersonal relationships, and being adaptable and aligned with the company’s core values.

“Willingness to work” included employers who had trouble hiring because applicants were not happy with salary, benefits or difficulty of job. One of the challenges of working in this sector is the limited career advancement due to lack of opportunities, which the exception of engineers.

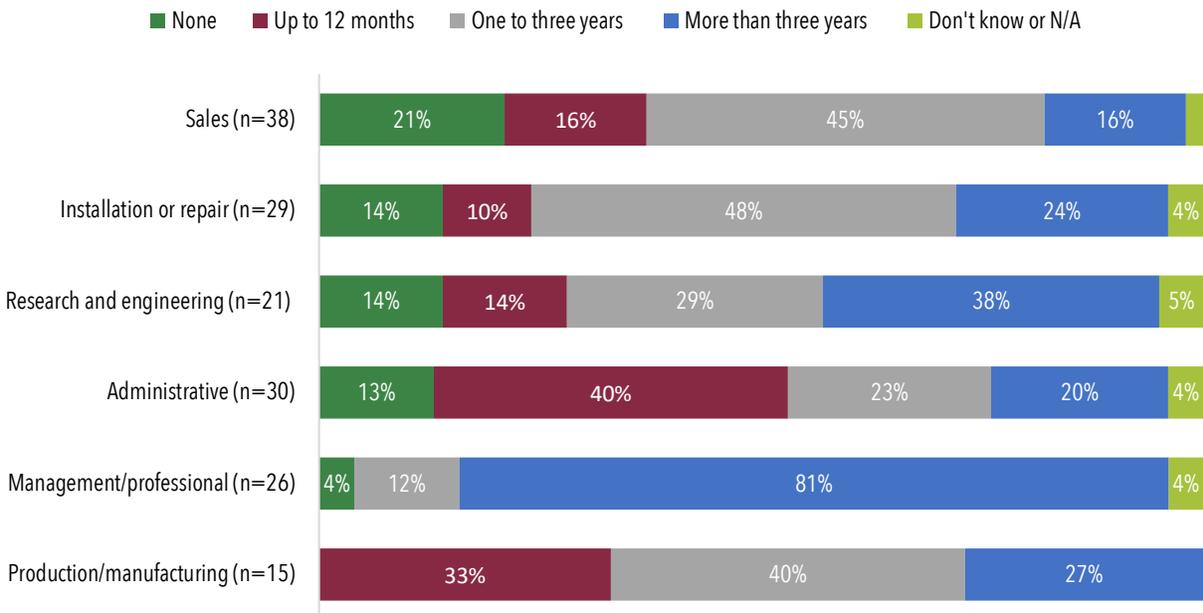
³³ n=57

Figure 13: Clean Energy Employer Reasons for Hiring Difficulty



The majority of employers surveyed expect some previous experience for every type of occupation (Figure 14). Administrative roles are most promising for those who are new to the workforce, as 53 percent of employers expect zero to 12 months of experience. Sales is also a good option, where 21 percent of employers will hire someone with no comparable experience.

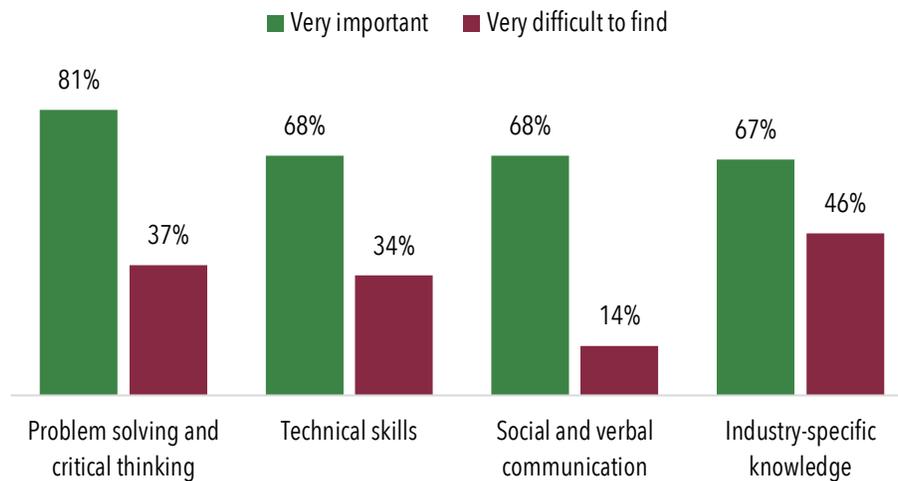
Figure 14: Typical Level of Comparable Work Experience Expected by Clean Energy Employers



When considering broad skill sets across occupations, nearly half of employers noted that industry-specific knowledge is very difficult to find in applicants; 67 percent said it was very important (Figure 15). According to interviews from industry professionals, some of the most important technical skills include a strong foundation of how energy works and is produced, program management skills, and design development knowledge.

Problem-solving and technical skills were frequently cited as very important, and were also very difficult for over a third of employers to find.

Figure 15: Percent of Clean Energy Employers for Whom Skills are Very Important vs. Very Difficult to Find³⁴



Conclusions and Recommendations

1. **Clean energy employers are looking for committed employees with a broad knowledge base who align themselves with the core values of their firms.** The sector is very diverse and it is becoming increasingly important to learn different skills and technologies. Employees who want to succeed in Clean Energy should develop their knowledge and skills around the following areas:
 - a. **Industry-recognized degrees and certifications** - Most employers believe educational degrees and certifications are important to have, and currently there is some level of difficulty finding applicants with such qualifications. The highest-paying Clean Energy occupations typically require a bachelor's degree. For such occupations, a four-year college degree or higher is the most important skill for applicants to have. Industry-recognized certifications are also very important and are oftentimes required to be able to move up in the career ladder. Example of important certifications include: North American Board of Certified Energy Practitioners (NABCEP), Solar PV Installer Certification, and Leadership in Energy and Environmental Design (LEED).
 - b. **Technical Skills** - Industry-specific knowledge, the ability to learn and use new technologies, and program management skills are critical technical skills that employers expect candidates to possess. Interestingly, these are also the skills that are most difficult to find among candidates. Successful employees should use available resources and take courses to strengthen their technical skills.
 - c. **Non-technical skills** - Key non-technical skills that successful Clean Energy employees should acquire include: being able to communicate technical knowledge into terms understood by the general population, the ability to work in a team environment and

³⁴ n=57

manage interpersonal relationships, and being the flexible and adaptable to a changing industry. While technical skill demands differ from job to job, key non-technical skills are similar and transferable across jobs and industries in this sector.

2. The Clean Energy sector encompasses a diverse array of industries reflected in the occupations employed in the sector, such as engineering, construction, sales and renewable energy. Educational programs specific to some Clean Energy occupations are needed to fill the gap between what is currently offered for training and demand. Occupations such as solar photovoltaic installers and wind turbine service technicians currently do not have any programs offered in the region. For college curriculum, this means additional programs, classes and seminars that can better prepare students for a Clean Energy career. For middle and high school teachers, this means learning about new industry trends and careers and educate students on important skills and training opportunities.
3. The Clean Energy sector is difficult to define, as a variety of industries and occupations require “green” or environmentally-minded skills. The workforce development system should partner with industry associations, such as Cleantech San Diego, to expand the number of companies who self-identify as Clean Energy employers. While this body of research considers the Clean Energy sector to include energy generation (renewable energy), large swaths of the construction industry (energy efficiency), pieces of the transportation industry (alternative transportation), and scientific consultants and professional services (greenhouse gas accounting & management), not all businesses in these subsectors consider themselves to be Clean Energy employers. Educating businesses about how their green workforce needs may align with other Clean Energy employers, even if this is not their primary line of business, will strengthen the overall understanding of this sector.

HEALTH CARE

Health Care combines technology and empathy to help the public stay healthy and get well. Employers in this sector can be broken down into three main industry clusters:

- **Ambulatory Health Care Services** - Direct and indirect health care services are provided on an outpatient basis (i.e., patients do not have to be admitted to a hospital). This industry category includes physicians' offices, mental health specialists, chiropractors, family planning centers, medical laboratories, diagnostic imaging centers, ambulance services and other offices.
- **Hospitals** - Includes hospitals providing medical, diagnostics and treatment services to patients.
- **Nursing and Long-term Care Facilities** - Residential care combined with nursing, supervisory, or other types of care.

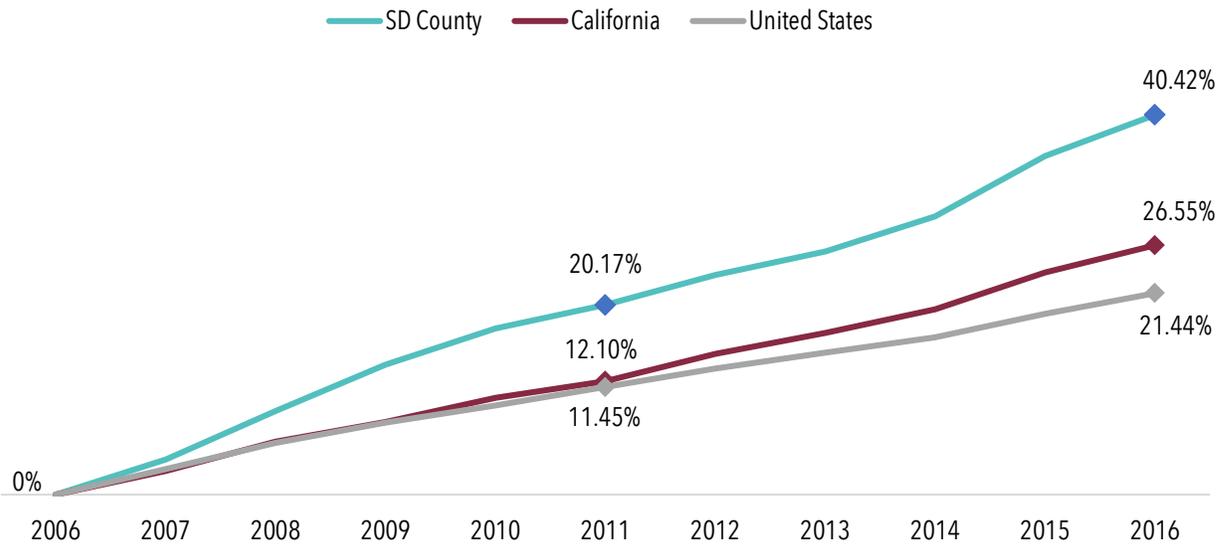
While this sector is one of the most established and mature in the region, it has been experiencing several changes. Where hospitals were once the dominant employer in Health Care, the sector has seen a growing proportion of employment in ambulatory health services and related clinics. Additionally, the demand for Health Care services is accelerating as the Baby Boomer generation ages and not only requires increased care, but also specialized care at home. Further, the sector is sensitive to legislative changes that could influence Health Care service delivery because of the high amount of regulations and requirements in the state of California. All of these factors play a role in the sector's workforce needs.

Employment in San Diego County's Health Care Sector

The Health Care sector in San Diego County currently employs over 121,000 people, has experienced an employment growth of 12 percent since 2013, and has seen long-term growth of 40 percent since 2006 (Figure 16).³⁵ This is considerably higher than the growth rate of California (27 percent) and the nation (21 percent). This sector is known to be "recession-proof," demonstrated by consistent job growth during the 2007–2009 recession.

³⁵ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Figure 16: Percent Change in Health Care Employment in San Diego County, 2006–2016



The employment growth over the last decade is being driven by two of the three industry clusters. While ambulatory services and nursing and long-term care facilities grew 66 percent and 51 percent respectively since 2006, hospitals actually employ 15 percent fewer people in 2016 than in 2006 (Table 8).³⁶

Table 8: Health Care Industries by Employment in San Diego County

Health Care Industries	2016 Jobs	2006–2016 % Change	2013–2016 % Change
Ambulatory health services	74,245	66%	23%
Hospitals	20,694	-15%	-16%
Nursing and long-term care facilities	26,757	51%	12%
Total	121,696	40%	12%

For this study, the 12 key Health Care occupations from the 2014 report were reexamined, and mental health counselors were added to the list. The original selection of these occupations was based on high statewide employment levels, short-term training or technical educational requirements, high number of existing community college programs, and in-demand or successful career pathways.³⁷

The 13 Health Care occupations represent a total of 61,244 jobs, four percent of all jobs in San Diego County (Table 9).³⁸ This accounts for a change of 5,353 jobs since 2013, or 10 percent growth. While all of these occupations have had a net growth over the past decade, respiratory therapists have seen a slight decline since 2013. All other occupations have shown short-term growth.

³⁶ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

³⁷ SDWP, SDICCCA. Health Care: Labor Market Analysis. October 2014.

³⁸ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Table 9: Health Care Employment in Key Occupations, San Diego County

Health Care Occupations	Overall Jobs	2006-2016 % Change	2013-2016 % Change
Registered Nurses	24,135	30%	6%
Nursing Assistants	9,450	48%	10%
Medical Assistants	7,031	52%	18%
Licensed Vocational Nurses	5,337	43%	12%
Home Health Aides	4,416	178%	13%
Medical and Clinical Laboratory Technicians	2,439	62%	11%
Medical Records and Health Information Technicians	2,049	33%	8%
Respiratory Therapists ³⁹	1,481	13%	-1%
Physician Assistants	1,235	63%	22%
Healthcare Social Workers	1,215	111%	15%
Clinical Laboratory Technologists	1,189	34%	3%
Mental Health Counselors	815	26%	11%
Occupational Therapy Assistants	453	92%	24%
Total	61,244	44%	10%

Since 2013, median hourly earnings for Health Care occupations in San Diego County increased by 13 percent (Table 10).⁴⁰ Mental health counselors was the only occupation with a salary below the national average, but is catching up — this occupation saw the highest short-term earnings percent increase (44 percent). Most other occupations also experienced increased median earnings, though occupational therapy assistants recorded a negligible gain and registered nurses showed a slight decrease.

³⁹ In this study, “Respiratory Therapists” represents a combination of respiratory therapists and respiratory therapy technicians.

⁴⁰ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Table 10: Health Care Occupational Clusters Median Hourly Earnings, 2013–2016

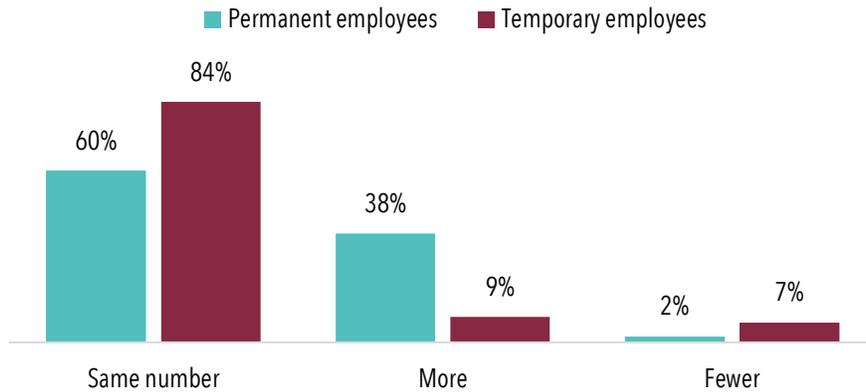
Health Care Occupations	2013 Median Hourly Earnings, San Diego	2016 Median Hourly Earnings, San Diego	% Change (2013–2016)	2016 Median Hourly Earnings, United States
Physician Assistants	\$46.88	\$50.30	7%	\$47.20
Registered Nurses	\$41.53	\$41.09	-1%	\$32.45
Clinical Laboratory Technologists	\$35.47	\$37.10	5%	\$29.09
Healthcare Social Workers	\$28.30	\$34.75	23%	\$25.18
Respiratory Therapists	\$32.24	\$34.56	7%	\$27.47
Occupational Therapy Assistants	\$33.79	\$33.84	0%	\$27.82
Licensed Vocational Nurses	\$23.38	\$25.92	11%	\$20.76
Medical and Clinical Laboratory Technicians	\$20.32	\$22.52	11%	\$18.73
Medical Records and Health Information Technicians	\$18.54	\$19.08	3%	\$17.84
Mental Health Counselors	\$13.15	\$18.93	44%	\$20.13
Medical Assistants	\$16.12	\$16.95	5%	\$14.71
Nursing Assistants	\$13.15	\$13.93	6%	\$12.36
Home Health Aides	\$10.85	\$12.50	15%	\$10.54
Total	\$23.78	\$26.86	13%	\$20.88

Employer Assessment

A total of 135 Health Care employers completed the survey, which was conducted over the phone and web. All respondents are involved in staffing or hiring decisions at their firm, and all companies have one or more locations in San Diego County.

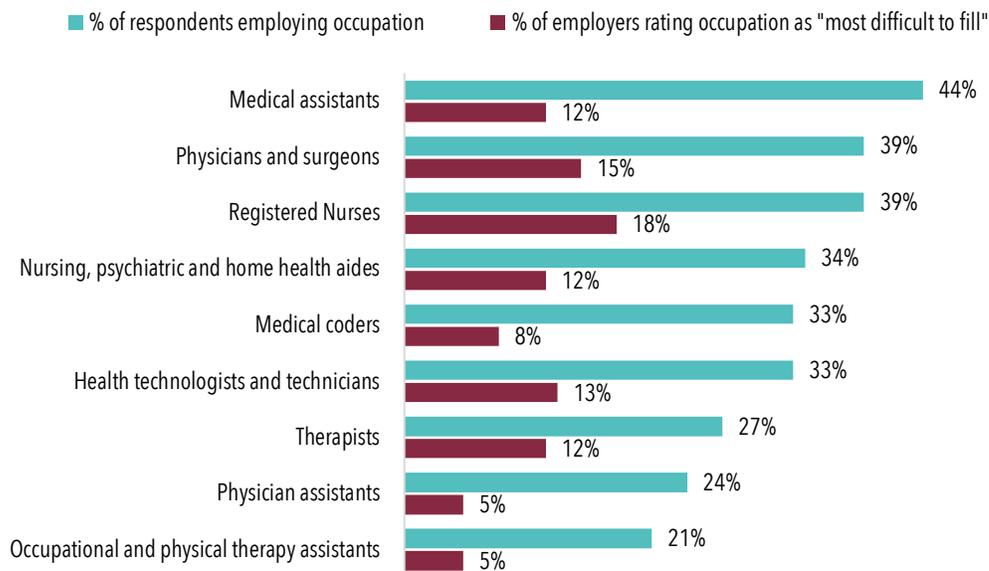
Health Care employers overwhelmingly expect employment to remain the same in the next 12 months (Figure 17). However, 38 percent anticipate increased hiring for permanent positions.

Figure 17: Health Care 12-month Employer Growth Expectations⁴¹



Survey respondents were also asked about hiring challenges and expectations for broader occupational types in this sector. These groups are well-distributed across the sector, with each cluster factoring in for 21 to 44 percent of employers (Figure 18). Notably, employers most frequently chose registered nurses as “most difficult to fill.”

Figure 18: Health Care Occupations Most Commonly Employed vs. Difficulty to Fill⁴²



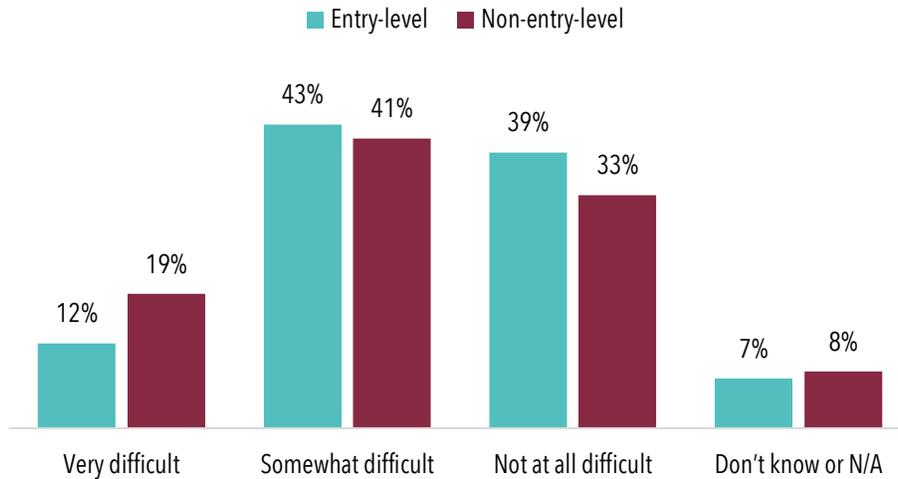
Over half of responding Health Care employers indicated that they are having great or at least some difficulty finding qualified applicants (Figure 19). Employers indicated more difficulty with non-entry-level positions compared to their entry-level counterparts, with 55 percent of Health Care employers

⁴¹ n=135

⁴² n=135

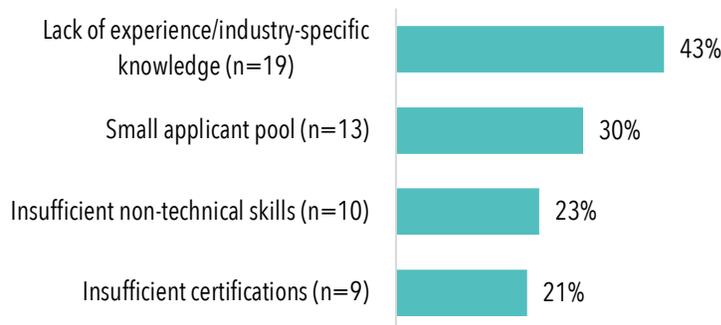
having at least some difficulty finding qualified entry-level job applicants, and 60 percent struggling with non-entry-level positions.

Figure 19: Difficulty Filling Entry-level vs. Non-entry-level Health Care Occupations⁴³



When asked about the two most significant reasons for hiring difficulties, 43 percent of employers cited “lack of experience/industry-specific knowledge” as a top struggle (Figure 20). Part of California’s strict regulations regarding Health Care certification and education is ensuring people who are training to be a professional in the sector have enough lab hours. However, there is limited space in labs for people to train, making it difficult to qualify hours. Paid training programs also have a hard time finding space for participants to find a lab space to get on-the-job training. Of immediate concern is the coming shortage of clinical lab technicians, due to a lack of programs and training. This occupation is critical because doctors rely on these lab techs to run diagnostic tests in the lab for patient diagnosis.

Figure 20: Reasons for Health Care Occupation Hiring Difficulty⁴⁴

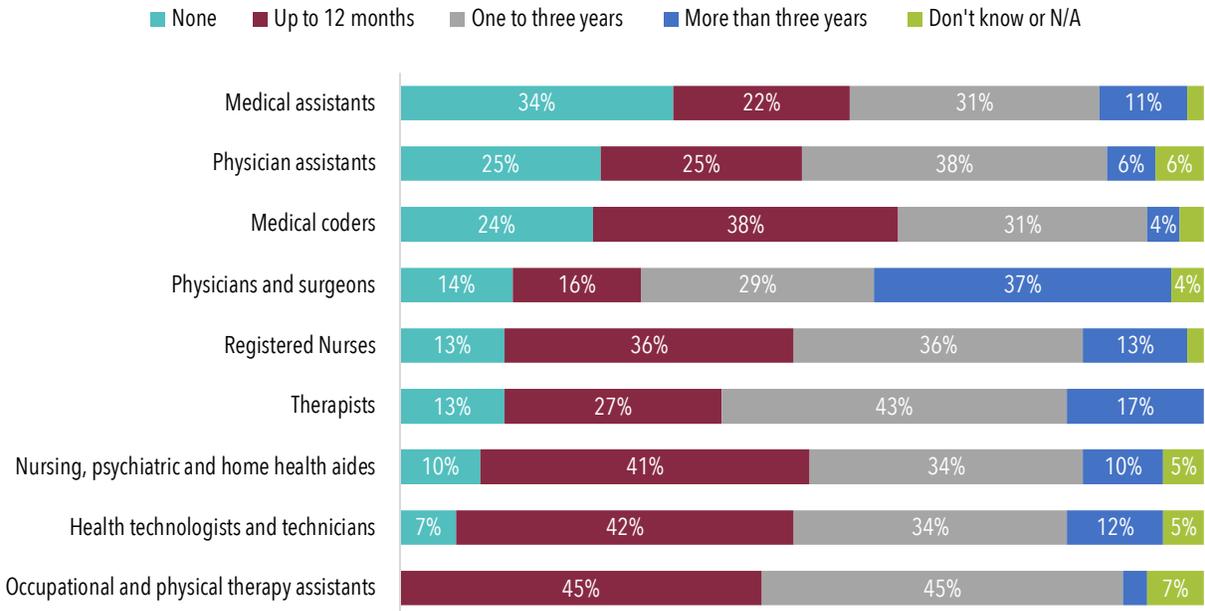


⁴³ n=135

⁴⁴ n=44

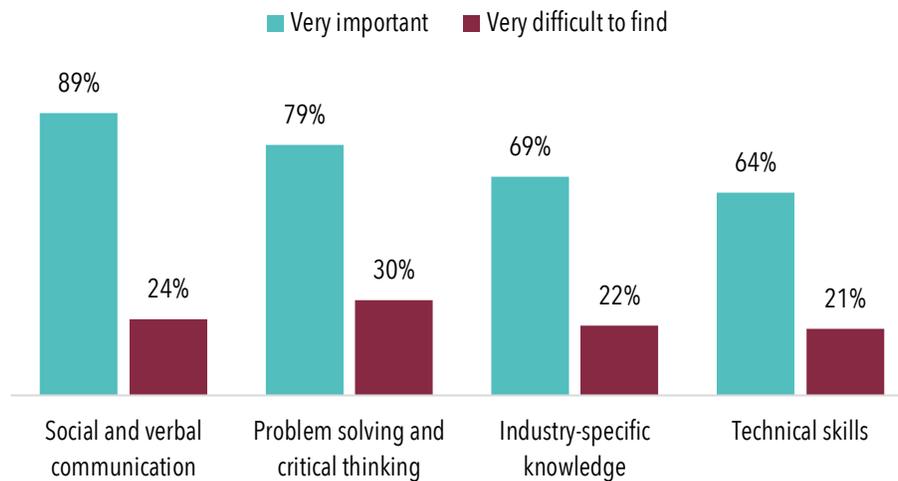
As was the case in Clean Energy, administrative roles are promising for those who are new to the Health Care workforce, as 62 percent of employers expect zero to 12 months of experience for medical coders, and 56 percent for medical assistants (Figure 21). Registered nurses, the most frequently difficult position to fill, is evenly split between employers who will hire applicants with zero to 12 months versus more than a year of experience.

Figure 21: Typical Level of Comparable Work Experience Expected by Health Care Employers



When considering broad skill sets across occupations, the largest emphasis from employers was on social and verbal communication skills (Figure 22). This makes sense for an industry whose main focus is on patient interaction, though about a quarter of employers say this skill is very difficult to find in job applicants. However, 30 percent of employers most often rated problem-solving and critical thinking as “very difficult to find.”

Figure 22: Percent of Health Care Employers for Whom Skills are Very Important vs. Very Difficult to Find⁴⁵



In addition to these skills sets, educational attainment and credentials are very important to be successful in the Health Care sector. There are many federal and state guidelines setting standards for work in this field, and once employees receive the required credentials, they need to keep them current by taking continuing education units.

Conclusions and Recommendations

1. One major challenge that education and training programs face in the Health Care sector are the number of clinical training hours that are required by California. During interviews, educators and trainers shared that with advances in technology, having students use a simulation environment can be just as valuable as being in the actual environment. As in the 2014 Health Care report, the findings regarding clinical training hours remains the same. Advocating for policy change to allow for Health Care sector students to count more simulation environment hours towards their clinical hours may allow for more students to complete their educational requirements to join the workforce.
2. Multiple employees interviewed shared frustrations about knowing which courses and programs qualified as continuing education units to renew their certifications or licenses. Employees mentioned that the California State website frequently changed or was not up-to-date. This can have negative repercussions on employees taking the wrong courses, essentially wasting time, money, and risking losing their credential. Ensuring that the information displayed on the website is up-to-date and allowing for a grace period in which programs that were previously qualified are still eligible for "credit" would be of value to keep the existing workforce employed.
3. There is a transition in Health Care employment, from hospitals being the dominant employer to a growing proportion of Health Care employment found in ambulatory health services and

⁴⁵ n=135

its related clinics. This trend is consistent in regional and national labor market data and was supported by employers during the executive interviews. The transition from hospital employment to ambulatory health services is largely a switch from larger, more structured employers, to smaller businesses.

From a workforce development perspective, this means that opportunities for internal training and professional development will be harder to complete and career pathways will become more complicated, as individuals have fewer opportunities within their current employer. Workforce development for Health Care should consider that professional development opportunities and career pathways are going to require more planning and effort by those that are not employed by hospitals.

4. Health Care is a mature industry that is facing significant changes due to the uncertainty associated with legislation and technology, and the growing demand for services based on the growing population over the age of 65, who are responsible for using the majority of regional Health Care services.

Workforce development planning for the Health Care sector and training for specific occupations and career pathways should understand the impact that these three drivers — technology, legislation and local demographics — will have on the demand for different skills, occupations and career pathways in Health Care.

INFORMATION AND COMMUNICATION TECHNOLOGIES

Information and Communication Technologies (ICT), also referred to as information technology, is the foundation for the region’s innovation economy. Firms in ICT specialize in developing software solutions, analyzing and retrieving large data sets, and manufacturing audio and video equipment, computers, radio and television broadcasting equipment, wireless communication equipment, and other communications-related equipment.

The industries with the highest number of ICT jobs are Professional, Scientific and Technical Services (41 percent), Manufacturing (13 percent), Information (11 percent), and Government (9 percent). Additionally, ICT occupations have the greatest concentration of jobs in the industries: Information (21 percent), Professional, Scientific and Technical Services (14 percent), and Management of Companies and Enterprises (11 percent).⁴⁶

Because this area of expertise can be found across multiple sectors, this analysis focuses on a set of 11 ICT occupations rather than on specific industries. This type of analysis contributes to a better understanding of the foundational skills needed for a successful ICT career in any industry. These 11 occupations include:⁴⁷

- Software Developers, Applications
- Software Developers, Systems Software
- Computer User Support Specialists
- Computer Systems Analysts
- Network and Computer Systems Administrators
- Computer Programmers
- Computer Network Support Specialists
- Graphic Designers
- Web Developers
- Database Administrators
- Information Security Analysts

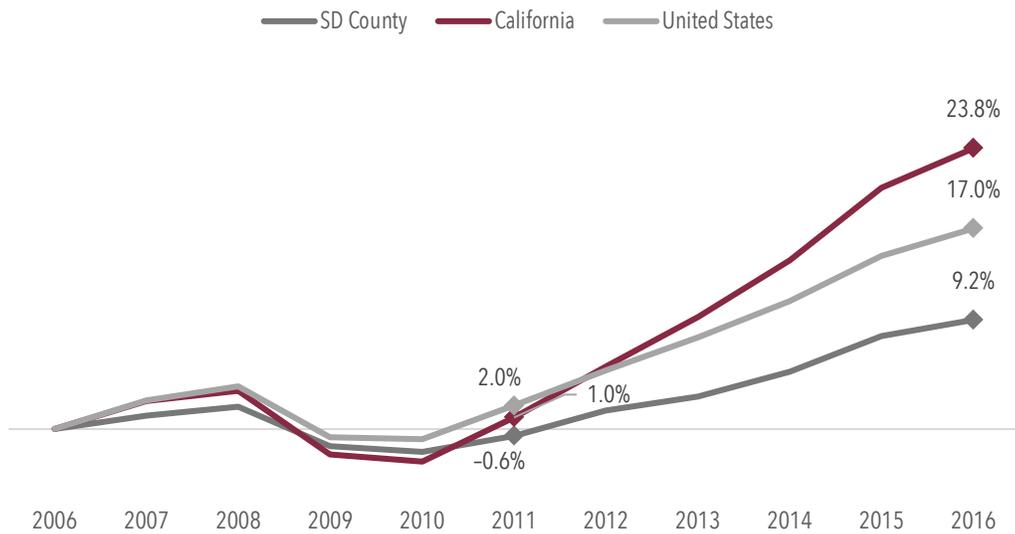
Employment in San Diego County’s ICT Sector

San Diego has a total of 45,354 jobs in the 11 ICT occupations studied in this report. They declined slightly during the 2007–2009 recession, but by 2016 employment was nine percent above 2006 levels (Figure 23).⁴⁸ While both have been increasing steadily, growth for these key ICT jobs has been faster for California as a whole, likely due to growth in large tech hubs like the Bay Area. U.S. job growth is also likely bolstered by growth in larger tech hubs in the nation.

⁴⁶ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

⁴⁷ The eleven occupations are the same as in the 2014 report, except for “computer support specialists–software” which are now “computer user support specialists” (SOC 15-1151) and “computer support specialists–hardware,” which are now “computer network support specialists” (SOC 15-1152). This is the result of a standard occupational classification (SOC) system update.

⁴⁸ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Figure 23: Percent Change in Employment for 11 ICT Occupations, 2006-2016

While employment has shown a net increase for these occupations all together, individual growth rates vary. Software developers (both applications and systems software), computer systems analysts, and web developers have experienced the most aggressive growth over the past decade (Table 11).⁴⁹ These four occupations also account for 55 percent of the jobs in this study. While most of the other occupations have seen low or moderate growth, graphic designers decreased by 14 percent from 2006 to 2016.

Table 11: Key ICT Occupations by Employment in San Diego County

ICT Occupations	Overall Jobs	2006-2016 % Change	2013-2016 % Change
Software Developers, Applications	10,032	17%	8%
Software Developers, Systems Software	7,581	21%	11%
Computer User Support Specialists	6,491	3%	4%
Computer Systems Analysts	5,626	17%	9%
Network and Computer Systems Administrators	3,714	1%	4%
Computer Programmers	3,472	0%	0%
Computer Network Support Specialists	2,347	2%	5%
Graphic Designers	2,312	-14%	1%
Web Developers	1,857	20%	10%
Database Administrators	1,103	2%	5%
Information Security Analysts	819	6%	7%
Total	45,354	9%	6%

⁴⁹ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker; Burning Glass Labor Insight.

These 11 ICT occupations in San Diego County have median hourly earnings of \$41.77, which is 11 percent higher than the national average of \$37.78 for those same occupations, and 77 percent higher than the county's overall average of \$23.60 (Table 12).⁵⁰ Since 2013, median hourly earnings for ICT occupations in San Diego County increased on average by 10 percent. The wages that saw the largest jump were computer user support specialists, web developers, and network and computer systems administrators. The only two occupations with salaries below the national average are computer programmers and graphic designers; the latter is the only occupation to have seen a decrease in hourly earnings since 2013.

Table 12: Median Hourly Earnings for ICT Occupations, 2013–2016

ICT Occupations	2013 Median Hourly Earnings ⁵¹	2016 Median Hourly Earnings	% Change (2013–2016)	2016 National Average
Software Developers, Applications	\$46.74	\$49.04	5%	\$47.24
Software Developers, Systems Software	\$50.76	\$55.40	9%	\$50.76
Computer User Support Specialists	\$21.87	\$26.63	22%	\$23.38
Computer Systems Analysts	\$39.32	\$44.53	13%	\$41.25
Network and Computer Systems Administrators	\$36.45	\$38.93	7%	\$37.41
Computer Programmers	\$37.23	\$38.06	2%	\$38.24
Computer Network Support Specialists	\$28.94	\$34.20	18%	\$29.93
Graphic Designers	\$24.85	\$22.03	-11%	\$22.55
Web Developers	\$27.51	\$33.44	22%	\$31.23
Database Administrators	\$40.35	\$46.00	14%	\$39.29
Information Security Analysts	\$42.33	\$46.32	9%	\$43.33
All ICT Occupations	\$38.09	\$41.77	10%	\$37.78

Employment growth in an occupation is largely reflected by wage growth as well. Jobs that are growing faster are seeing higher wage increases and vice versa, with jobs that are slower growing have less of a wage increase. The most obvious exception to this rule of higher growth tied to higher wages is computer user support specialist, which experienced modest growth from 2013 to 2016 (four percent) but the highest increase in wages (22 percent) of the 11 ICT occupations over the same period.

⁵⁰ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

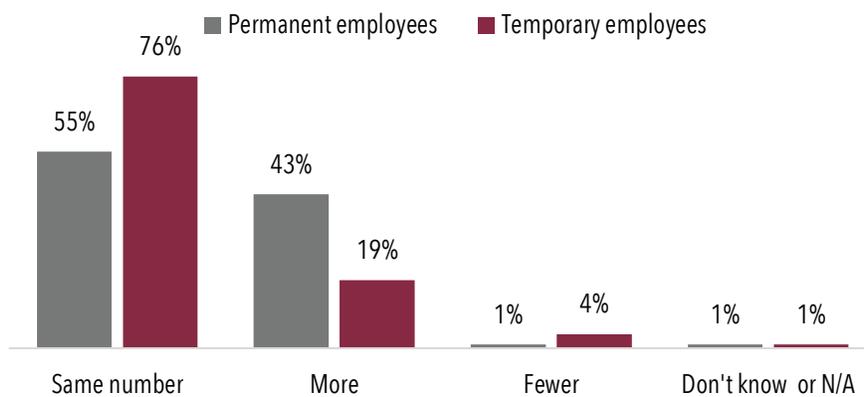
⁵¹ Source: SDWP, SDICCCA. Information & Communications Technologies: Labor Market Analysis. October 2014.

Employer Assessment

A total of 114 ICT employers completed the survey, which was conducted over the phone and online. All respondents are involved in staffing or hiring decisions at their firm, and all companies have one or more locations in San Diego County.

ICT employers overwhelmingly expect employment to remain the same in the next 12 months, with 76 percent of employers expecting to have the same number of temporary employees (Figure 24). However, 43 percent anticipate an increase in permanent positions, and 19 percent anticipate an increase in temporary positions.

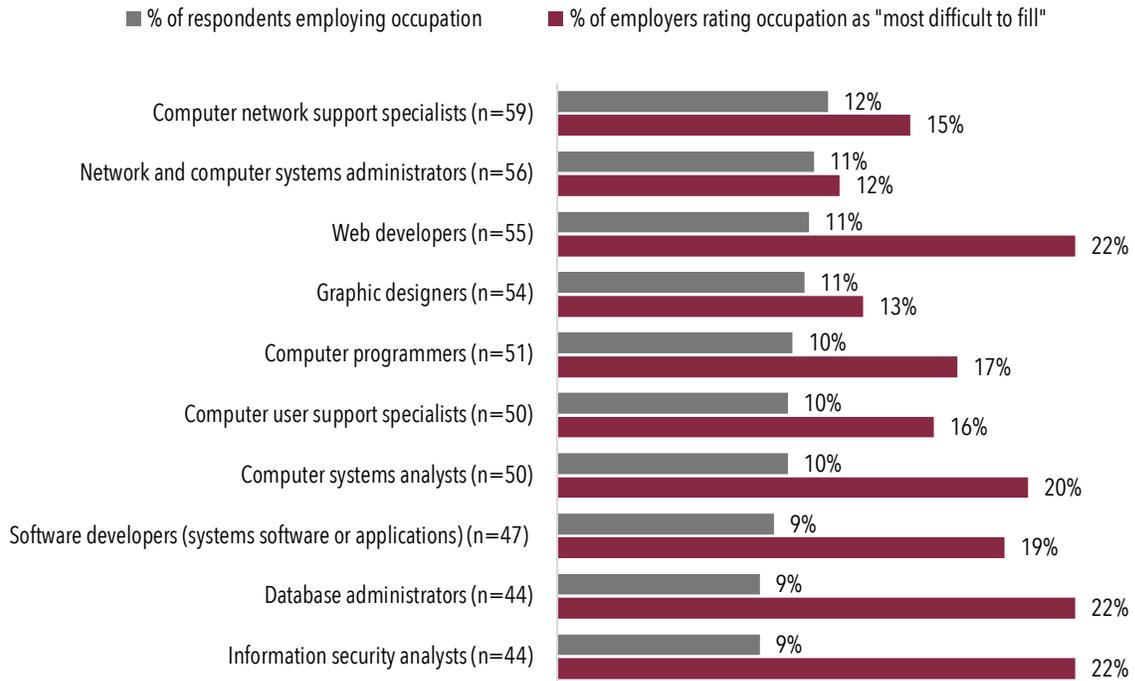
Figure 24: ICT 12-month Employer Growth Expectations⁵²



Survey respondents were also asked about hiring challenges and expectations for the 11 ICT occupations focused on in this report (Figure 25). Notably, web developers, database administrators, and information security analysts stood out as “most difficult to fill” for many employers.

⁵² For permanent employee question, n=111. For temporary employee question, n=108.

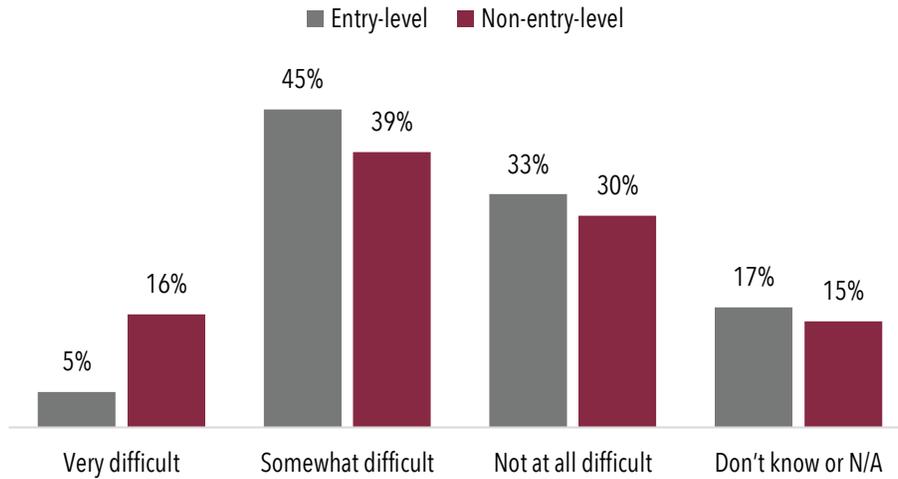
Figure 25: ICT Occupations Most Commonly Employed vs. Difficulty to Fill⁵³



Over half of the San Diego’s ICT employers surveyed indicated that they are having some difficulty finding qualified applicants (Figure 26). Employers indicated more difficulty with entry-level positions compared to their non-entry-level counterparts, with 50 percent of ICT employers having some or great difficulty finding qualified entry-level job applicants, and 55 percent struggling with some or great difficulty in filling non-entry-level positions.

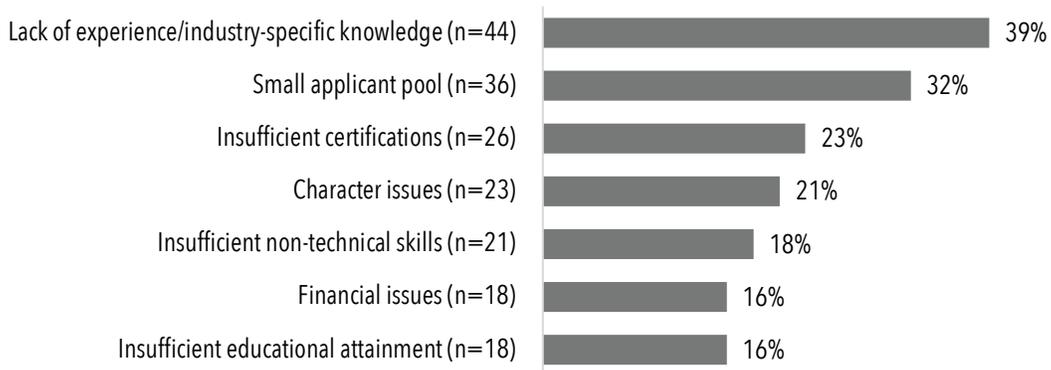
⁵³ For most commonly hired occupations, n=113. For most difficult to fill occupations, n=69; multiple responses allowed.

Figure 26: Difficulty Filling Entry-level vs. Non-entry-level ICT Occupations⁵⁴



When asked about the two most significant reasons for hiring difficulties, 39 percent of employers cited “lack of experience/industry-specific knowledge” as a top struggle, followed by a “small applicant pool” by 32 percent of employers (Figure 27).

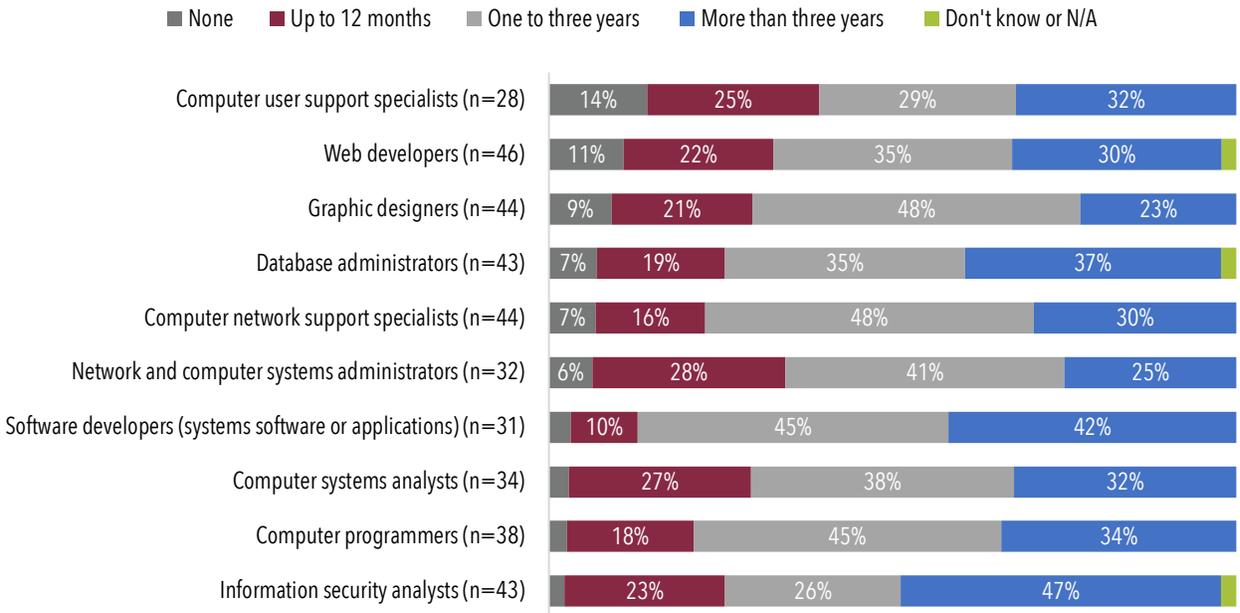
Figure 27: Reasons for ICT Hiring Difficulty



Customer support roles are promising for those who are new to the ICT workforce, as 39 percent of employers expect zero to 12 months of experience for computer user support specialists, and 30 percent for graphic designers (Figure 28). Web developers, database administrators, and information security analysts, the most frequently difficult positions to fill, are overwhelmingly preferred by employers to have one or more years of experience.

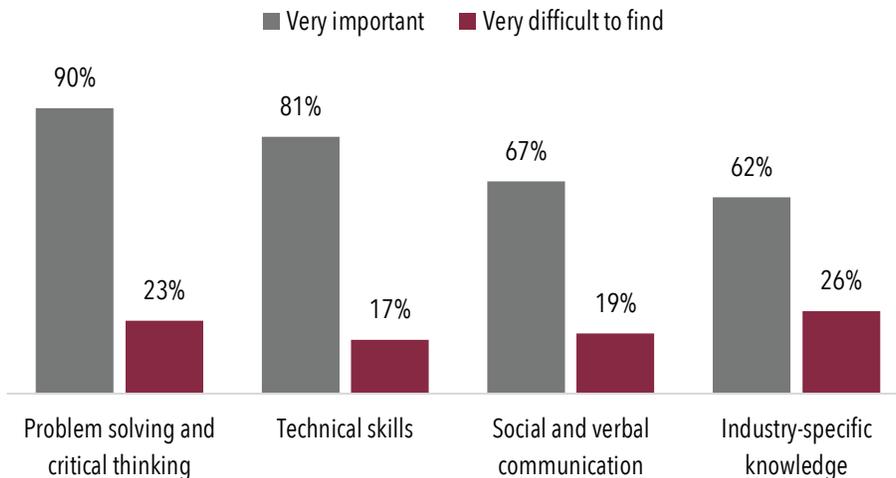
⁵⁴ n=110

Figure 28: Typical Level of Comparable Work Experience Expected by ICT Employers



When considering broad skill sets across occupations, the largest emphasis from employers was on problem-solving and critical thinking skills (Figure 29). This makes sense for industries whose focus is on finding solutions and developing tools to solve problems using technology, though 23 percent of employers say this skill is very difficult to find in job applicants. However, industry-specific knowledge was most often rated as “very difficult to find,” at 26 percent of employers.

Figure 29: Percent of ICT Employers for Whom Skills are Very Important vs. Very Difficult to Find⁵⁵



In addition to these skills sets, educational attainment is important for some of the ICT occupations listed such as software developers, database administrators, and information security analysts. For

⁵⁵ n=110

many ICT occupations, however, having the ability to learn new technologies and attain credentials is more important to be successful in the ICT sector.

Technology is constantly evolving, and employees in this sector need to continually update their skill sets and industry-specific knowledge. By keeping up-to-date with technology in this sector through credentials and continual study, employees can maintain relevancy and be successful in a sector on the cutting edge of technology.

Conclusions and Recommendations

1. In the 2014 ICT report, two of every five ICT jobs⁵⁶ in San Diego County could be found in professional, technical and scientific services. Secondary industries such as manufacturing, information and government accounted for about 10 percent each for ICT occupational employment. This is still largely true, as professional, technical and scientific services employ 41 percent of all ICT occupations, while manufacturing (13 percent) and information (11 percent) and government (9 percent) hover around 10 percent of all ICT occupations.
2. From 2007 to 2013, ICT occupations with higher relative education and work experience requirements, such as software developer/engineer (systems software or applications) or computer systems analyst, grew by over five percent. ICT occupations with relatively lower education and work experience requirements, such as graphic designers and computer support specialists for hardware, declined by over five percent during the same time period. From 2013 to 2016, software and web developers have continued to experience strong growth.

Some of the ICT occupations with relatively lower educational requirements, such as computer user support specialists and graphic designers, grew at a rate below the average for all 11 ICT occupations (6%) between 2013 and 2016. It is worth noting that computer user support specialists saw an increase in their median wages of 22 percent, the largest increase of the 11 ICT occupations, while graphic designers were the only ICT occupation to see a decline in their median wage of 11 percent. This indicates that the demand for graphic designers as a singular position is likely declining, while the computer user support specialist is a position that is likely changing with new skill requirements and expectations.

Graphic designers as an occupation have declined over the last decade (2006 to 2016) and their wages have declined by over 10 percent from 2013 to 2016. Graphic design has slowly evolved into a skill set rather than a single occupational responsibility. While software developers have thrived in San Diego County's ICT economy, computer programmers have seen little to no growth from 2006 to 2016 and their wage increase from 2013 to 2016 is a paltry two percent. Like graphic design, the ability to computer program has slowly evolved into a skill set rather than a single occupational responsibility. At the other of the spectrum, CIS managers are expected to grow much faster than average. According to the Bureau of Labor Statistics, the annual median pay is above \$100,000.

⁵⁶ ICT jobs for this section refers to the 11 ICT occupations that are the focus of this study.

3. A valuable first step in introducing K-12 students to ICT workforce development is through education and exposure to different ICT employment opportunities and the educational and training requirements. Students in middle and high school should be made aware of the different ICT occupations and their related career pathways, as well as the different industries. This can be done through presentations, hand-outs and on-site visits to companies that employ ICT occupations.

Students should also be made aware of the broad range of opportunities in ICT beyond computer programming and software development. Information to educate and expose students to ICT employment opportunities includes:

- a. **Positional responsibilities in ICT** - Names and titles change, but the ability to program in different computer languages, retrieve and analyze data, develop algorithms to automate processes, manage projects and designing and developing graphically attractive and interactive materials are all valuable comprehensive skills for ICT employees.
 - b. **ICT Occupational Pathways & Career Lattices** - ICT occupations can be found across multiple industries like Health Care, Government, and Finance where it supports the mission of the organization by enabling greater efficiency and security. Technology-driven industries like Software, Telecommunications and Cyber Security are focused on product development, the development of new information, and community technologies. Teaching young students about ICT occupations in different career pathways and industries is a valuable component in communicating ICT employment opportunities.
 - c. **Diverse skill sets and backgrounds** - ICT employers are looking for individuals with a broad background with the tools to more effectively communicate with people, develop well-designed data visualizations, and coordinate activities and pull information from increasingly large data sets.
4. **The workforce development pipeline for ICT occupations needs more than academic degrees and educational attainment to support San Diego County businesses.** Workforce development strategies for ICT occupations should be built upon four primary categories, with formal education and academic degrees and/or certifications being just one part of the piece. These four categories are:
 - a. **Education** - A strong foundation in mathematics, logic and information technology systems is valuable as ICT employees must continually learn and adapt new applications, programming languages and hardware. Specific degrees and certifications can be valuable in communicating to employers an applicant's areas of expertise, which is especially important depending on the occupation. Certifications in particular are useful at communicating the tools and software a potential employee is fluent in.
 - b. **Technical skills & experience** - Some education can assist in the development of technical skills, but employers indicated that hands-on, industry specific experience and

expertise is the most cited reason for why employers were having difficulty finding qualified ICT applicants. Any ICT job-seeker should understand the technical skills and certification qualifications specific to the position they are applying for, as well as some understanding of the industry they are interested in working in.

- c. **Career navigation and continuous learning** - The skills and employment environment for ICT occupations is often in a state of churn, with new technologies require new skills. Employees often finding themselves needing to keep up with the changes in the technology environment. Depending on the career pathway and industry, it could still be necessary to accept new employment opportunities to advance in a career pathway. Potential and current ICT workers should be well versed in career navigation and the ability to continually learn new aspects of the evolving technologies they are engaged in, which can be shown through acquiring certifications.
- d. **Communication and relevant nontechnical skills** - The ability to communicate effectively, especially the ability to communicate technical information to a general audience, is a critical skill too often underemphasized among ICT employees. These communication skills along with the ability to understand the culture of a given industry and organization is a valuable skillset to develop among current and future ICT workers.

LIFE SCIENCES

The Life Sciences sector is a foundational contributor to San Diego’s innovation economy and an important employer in the region — with more than 80 research institutions, San Diego is ranked as one of the top five Life Science hubs in the nation.⁵⁷ This sector, also referred to as biotechnology, sits at the intersection of innovative scientific research, technology and healthcare and has spawned the growth of sub-sectors like genomics and proteomics. For this study, the Life Sciences sector was defined by the following primary and secondary industry clusters:⁵⁸

Primary Industry Clusters

- **Research, Testing & Medical Laboratories** - Firms engaged in the discovery, development and commercialization of new drugs or cell therapies as well as service providers that support clinical trials and research and laboratory support services.
- **Pharmaceuticals** - Firms that produce biopharmaceuticals, vaccines and cell culture media.
- **Biomedical or Medical Devices** - Firms engaged in developing and producing surgical instruments, orthopedic implants, bio-imaging equipment, dental instruments and other related healthcare equipment.
- **M-Health or Wireless Health** - Emerging cluster within San Diego’s life sciences ecosystem focused on the development of mobile healthcare devices and services, such as wearable glucose monitors or web-based fitness applications.

Secondary Industry Clusters

- **Agricultural & Industrial Biotechnology** - Firms that use biochemistry and biotechnology to develop products engaged in agriculture, bio-fuels, biodegradable materials and new bio-based products for industrial processes.
- **Bioscience-Related Distribution & Trade** - Firms specializing in the logistics and distribution of medical devices, drug distribution and agriculture-related chemicals.

Employment in San Diego County’s Life Sciences Sector

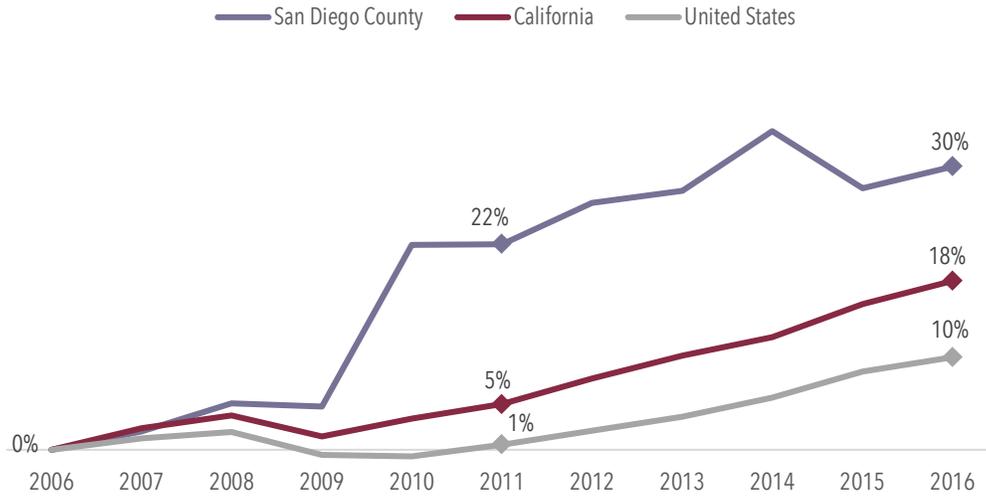
The Life Sciences sector in San Diego County saw a decline in employment from 2014 to 2015, but otherwise experienced strong continued employment growth from 2006 through 2016. San Diego has added 30 percent more jobs in this sector since 2006, compared to 18 percent in California and ten percent in the U.S. (Figure 30).⁵⁹

⁵⁷ Cited from the California Life Sciences Industry 2018 Report, published by California Life Sciences Association and PricewaterhouseCoopers.

⁵⁸ The industry clusters were based on the research that was done in the 2014 SDWP report on this sector, but was updated to reflect 2017 NAICS structure.

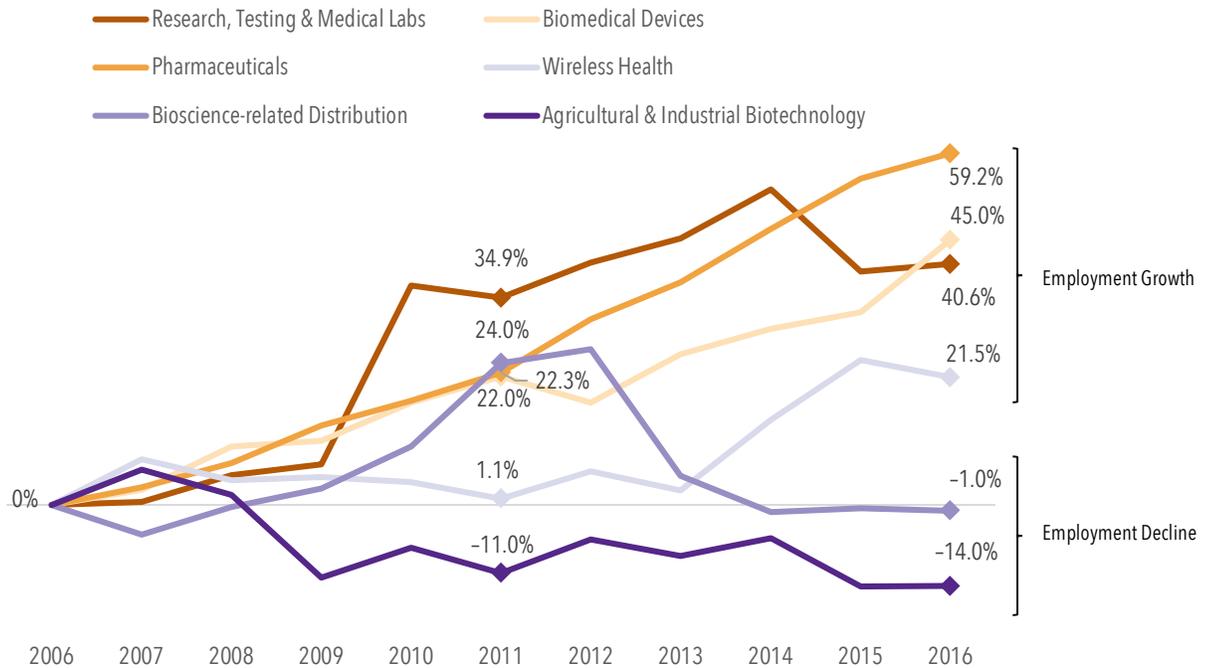
⁵⁹ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

Figure 30: Life Sciences Employment Change, 2006–2016



Four of the six Life Science industries experienced employment growth in San Diego County from 2006 to 2016 (Figure 31).⁶⁰ Pharmaceuticals has the highest growth (59 percent), and maintained a steady expansion compared to the other industries in the sector. Agricultural & Industrial Biotechnology had the most pronounced decline with 14 percent fewer jobs from 2006 to 2016.

Figure 31: Employment Change in Life Science Industries, 2006–2016



⁶⁰ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

While employment in Bioscience-related Distribution also decreased by one percent, the industries with falling employment only account for eight percent of Life Sciences jobs. The primary Life Sciences industries account for 92 percent of jobs in this sector. Research, Testing & Medical Labs has the largest percentage (58 percent), along with the highest average earnings per job (\$170,298) and the highest number of business establishments (990) (Table 13).⁶¹ While Research, Testing & Medical Labs is the dominant Life Sciences industry in San Diego County, it still experienced a four percent decline in employment from 2013 to 2016 (Figure 31).

Table 13: Life Sciences Employment and Business Establishments in San Diego County, 2016

Life Sciences Industries	Overall Jobs	Total Establishments	Life Sciences-related jobs	Avg. Earnings Per Job
Research, Testing, and Medical Laboratories	39,696	990	37,801	\$170,298
Biomedical Devices	11,192	250	8,812	\$121,917
Pharmaceuticals	6,921	98	6,921	\$144,980
Wireless Health	5,929	278	5,929	\$164,883
Bioscience-related Distribution	4,179	322	3,867	\$138,016
Agricultural & Industrial Biotechnology	7,362	385	1,343	\$41,817
Total	75,279	2,323	64,673	\$145,993

The San Diego Life Sciences sector employs a variety of occupations with average earnings per job of \$145,993, 31 percent above the national average of \$111,548 for this industry cluster.⁶² The occupations listed in Table 14 represent some of the most frequently employed Life Sciences occupations in San Diego County.⁶³ While most expanded aggressively from 2006 to 2016, growth in the past three years occurred at a slower rate; in some cases, jobs even decreased. Most notable are inspectors, testers, sorters, samplers and weighers. As seen in other related sectors, this occupation is increasingly being handled by automation, decreasing the number of people needed. As lower skilled positions disappear, people who were previously employed in these occupations need to be retrained for middle-skill jobs.⁶⁴

⁶¹ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

⁶² Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

⁶³ Source: QCEW Employees & Non-QCEW Employees - EMSI 2017.2 Class of Worker.

⁶⁴ See 2015 SDWP Middle-skill Jobs report for more information.

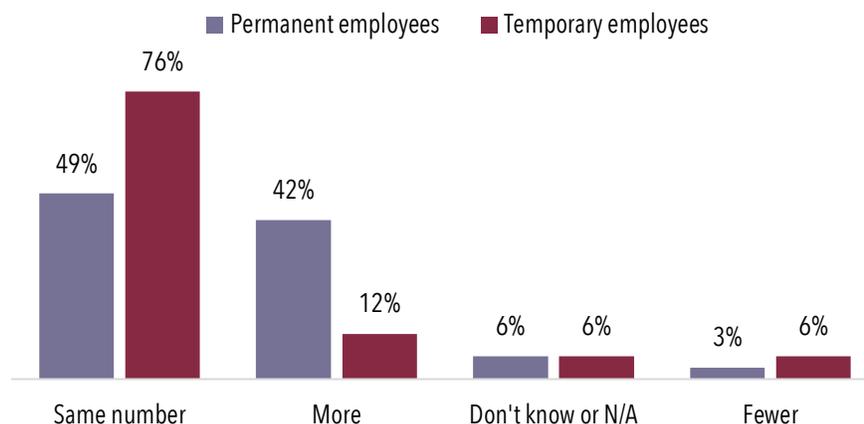
Table 14: Top Life Sciences Occupations in San Diego County

Life Sciences Occupations	2016 Jobs	% Change 2006-2016	% Change 2013-2016	Median Hourly Earnings
Medical scientists	2,540	49%	12%	\$48.69
Software developers, Applications	2,252	31%	9%	\$49.04
Biological technicians	2,028	48%	7%	\$22.51
Software developers, Systems Software	1,941	40%	14%	\$55.40
General and operations managers	1,596	32%	0%	\$50.27
Inspectors, testers, sorters, samplers, and weighers	1,118	1%	-33%	\$19.56
Customer Service representatives	1,058	31%	5%	\$17.78
Secretaries and administrative assistants	943	19%	-7%	\$18.34

Employer Assessment

A total of 85 respondents completed the 2017 Life Sciences employer survey, which was conducted over the phone and online. All respondents are involved in staffing or hiring decisions at their firm and all companies have one or more locations in San Diego County.

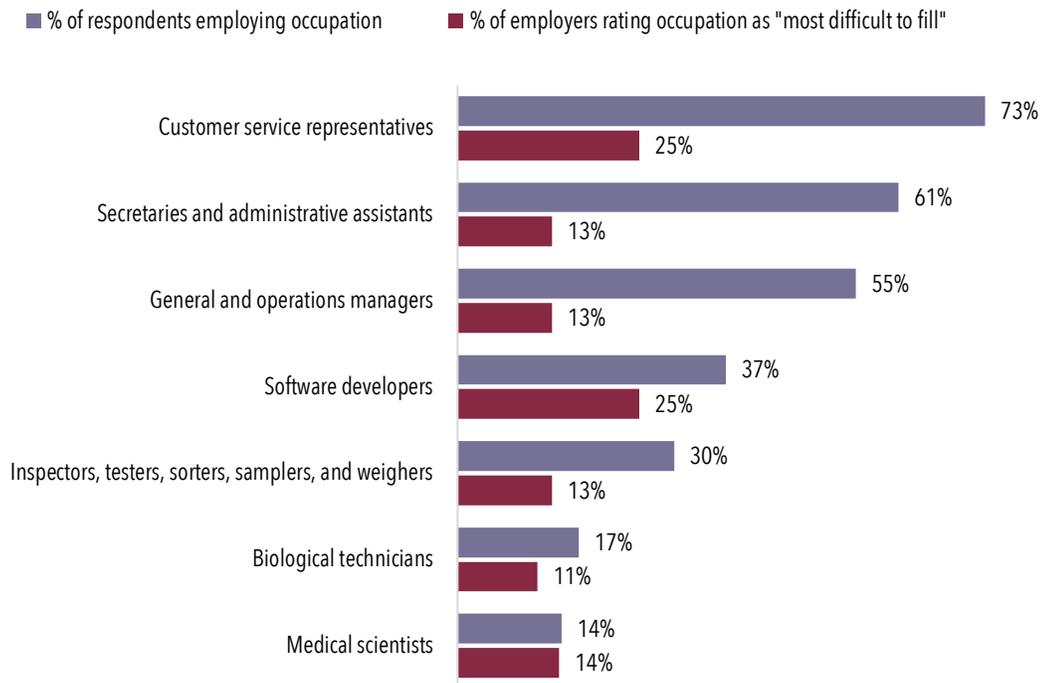
The majority of San Diego County's Life Science employers expect to add employees or remain stable over the next 12 months, with only three percent predicting contraction of permanent employees and six percent temporary (Figure 32). The highest potential for growth lies with the 42 percent of employers who predict adding permanent employees over the next 12 months.

Figure 32: Life Sciences 12-month Employer Growth Expectations⁶⁵

Survey respondents were also asked about hiring challenges and expectations for occupations in this sector (Figure 33). Notably, employers most frequently chose software developers and customer service representatives as "most difficult to fill."

⁶⁵ Permanent employees n=76; temporary employees n=84

Figure 33: Life Sciences Occupations Most Commonly Employed vs. Difficulty to Fill⁶⁶

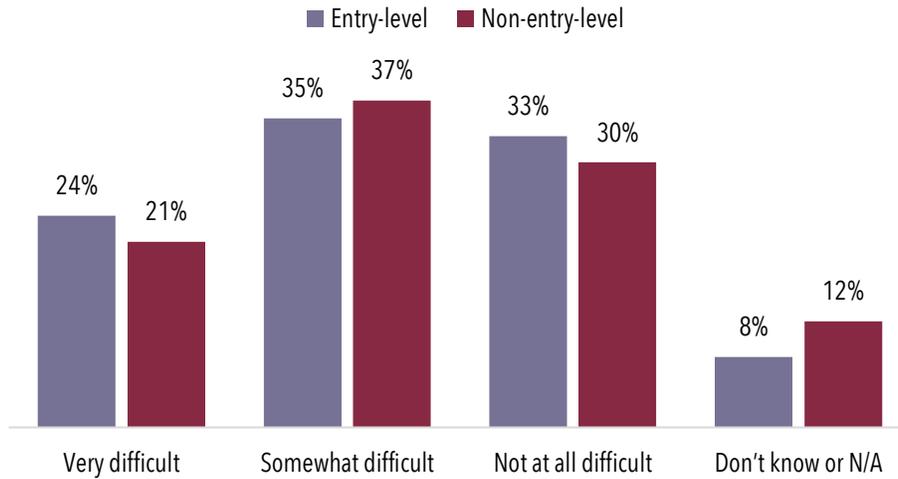


Nearly three out of five Life Sciences employers are currently having at least some difficulty finding qualified entry- and non-entry-level job applicants (59 percent entry and 58 percent non-entry, Figure 34). These numbers are higher than they were in 2014, when 41 percent of employers struggled to find entry-level workers and 57 percent had challenges finding experienced workers.⁶⁷ The proportion that found recruitment “somewhat difficult” at both entry and non-entry-level remained about the same over time, but there was a higher percentage of employers who found it “very difficult” to recruit talent.

⁶⁶ Most commonly employed n=84; Difficulty to fill n=56

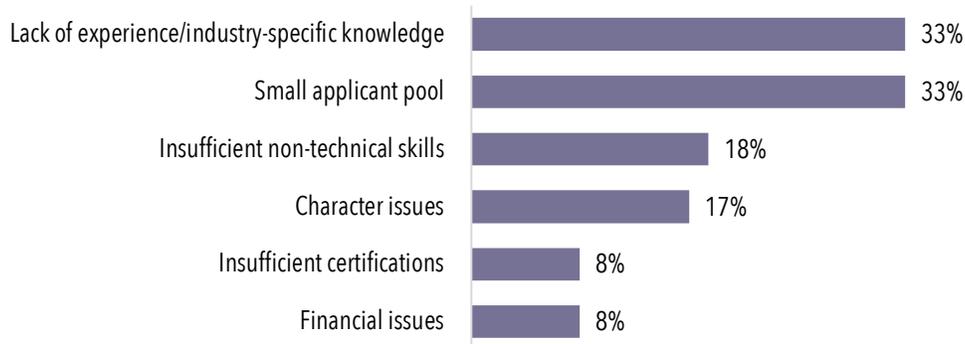
⁶⁷ SDWP & SDICCCA, Life Sciences: Labor Market Analysis, October 2014.

Figure 34: Difficulty Filling Entry-level vs. Non-entry-level Life Sciences Occupations⁶⁸



When asked about the two most significant reasons for hiring difficulties, 33 percent of employers cited “lack of experience/industry-specific knowledge” or “small applicant pool” as a top struggle (Figure 35).

Figure 35: Reasons for Life Sciences Hiring Difficulty⁶⁹

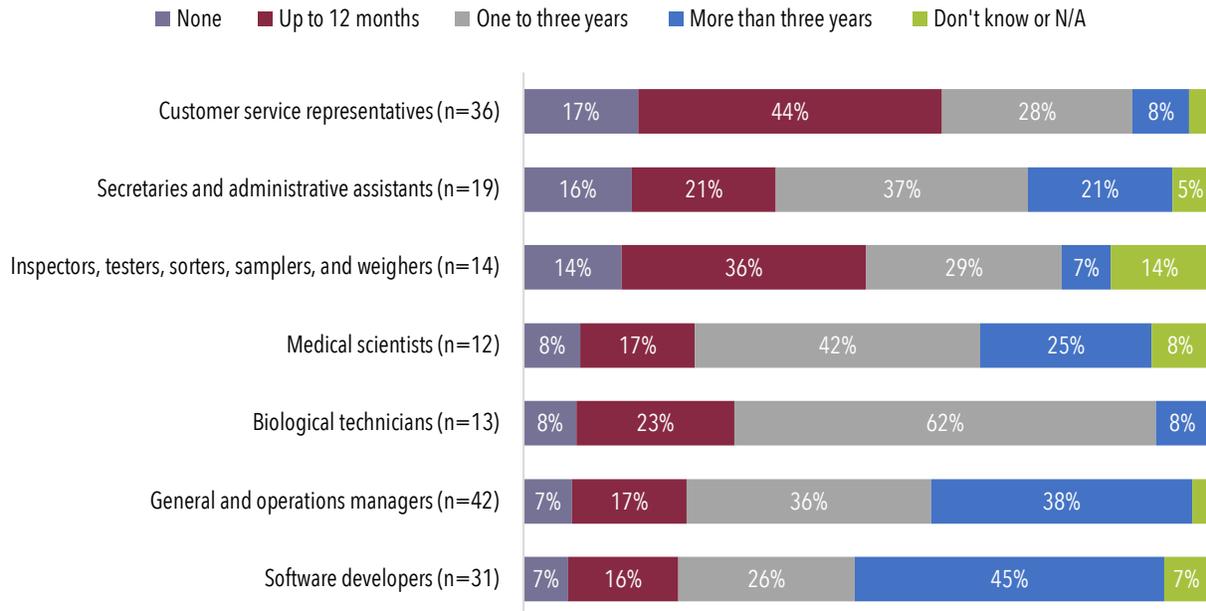


The first three occupations in Figure 36 are the best options for entry-level workers. While the majority of employers prefer applicants with experience, there is more room for learning on the job.

⁶⁸ n=84

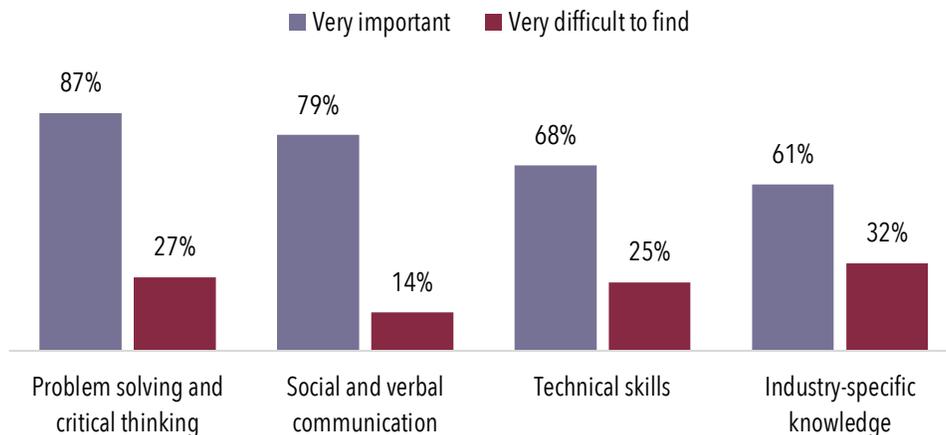
⁶⁹ n=12; question regarding hiring difficulty was administered via web survey, accounting for the small sample size.

Figure 36: Typical Level of Comparable Work Experience Expected by Life Sciences Employers



When considering broad skill sets across occupations, the largest emphasis from employers was on problem-solving and critical thinking skills (Figure 37). This makes sense for a highly investigative and scientific sector, but 27 percent of employers say this skill is very difficult to find in job applicants. Industry-specific knowledge was most often rated as “very difficult to find,” with 32 percent of employers giving this rating.

Figure 37: Percent of Life Sciences Employers for Whom Skills are Very Important vs. Very Difficult to Find⁷⁰



⁷⁰ n=114

In addition to these skills sets, obtaining advanced degrees can be important for advancing in the scientific Life Sciences career pathways.

Conclusions and Recommendations

1. Life Sciences employers have high expectations for their employees, particularly those that want to grow a sustainable career pathway within the sector. Those individuals wanting to work and progress in the Life Sciences sector must develop strengths in each of the following areas:
 - a. **Technical skills and industry experience** – Life Science employers emphasized the importance of critical thinking skills, industry-specific knowledge and technical skills that often need to be developed in a hands-on, practical setting. Technical skills emphasize the ability to work in a lab, becoming proficient with software and applications that process and analyze data, and developing a deeper technical understanding of areas such as bioinformatics, genomics and proteomics.
 - b. **Formal education (degrees & certifications)** – Many entry-level jobs in the sector require a four-year degree, although there are technical and support positions where a four-year degree is not required. However, several current Life Science employees in San Diego indicated that an advanced degree, beyond a four-year degree, is often needed to progress to the next position along a career pathway in Life Sciences and typically provides current employees more opportunities in the next phase of their Life Sciences career.
 - c. **Non-technical skills** – Life Science employers emphasized the ability to communicate effectively to a diverse audience, especially when conveying technical information. They also emphasized the ability to work as part of a team and solve problems that arise during project development. Employers also talked about the ability to adapt and change within a dynamic environment as foundational keys to succeeding in this sector.
 - d. **Career navigation** – Occupation and position titles will continue to change in Life Sciences. Anyone currently or interested in working in Life Sciences needs to understand that this is a dynamic and continuously changing sector, driving a culture of innovation but also one of ever-changing occupational responsibilities. Current and future employees in this sector should stay aware of changes in their industry, and be ready to find and change occupations as they network and update their resume for the next employment opportunity.

Workforce development strategies and investments for Life Sciences, including career pathways, student education and exposure, and incumbent worker training should be built around developing and strengthening these four key components.

2. Expand opportunities to introduce and educate students, job-seekers and even incumbent workers to the industries, technical skills and employment opportunities in Life Sciences. For high school students and their teachers, this builds upon the success of programs like the Life

Sciences Summer Institute, which exposes high school students to the employment opportunities in Life Sciences while educating high school teachers on the latest industry trends and training opportunities. For college students and incumbent workers, this could include seminars on career pathways in specific Life Science industries or introductory courses to the technical skills related to employment opportunities in emerging Life Science industries. For example, this type of seminar or introductory course could look like:

- a. **Seminar on Quality Assurance and Quality Control Career Pathways in the Pharmaceutical Industry** – This seminar would introduce current college students, job seekers and incumbent workers to the employment opportunities in quality assurance and quality control career pathways within San Diego’s pharmaceutical industry. The seminar should be developed in consultation with industry employers and associations, and should include a description of expected technical and non-technical skills as well as typical educational requirements for both entry-level and non-entry-level positions. The seminar could also provide insights into Life Science employers’ preferred recruiting and hiring methods.
- b. **Seminar on Sales and Marketing positions and Relevant Career Pathways in the Biomedical and Medical Devices Industry** – This seminar would introduce current college students, job seekers and incumbent workers to the employment opportunities in sales and marketing positions within San Diego’s biomedical and medical devices industry. The seminar should be developed in consultation with industry employers and associations. Coursework should include descriptions of technical and non-technical skills that are expected by employers as well as the typical educational requirements for both entry-level and further along the career pathway. The seminar could also provide insights into employers’ preferred recruiting and hiring methods.
- c. **Introduction to Data, Statistics and Bioinformatics in Research, Testing & Medical Laboratories** – This brief introductory course would provide job seekers and incumbent workers a distilled introduction into the mathematical foundations behind data science and bioinformatics. It would also expose them to some of the key software and programming languages currently being used by San Diego’s leading Life Sciences firms.

APPENDIX A: PRIORITY SECTORS BY NAICS

ADVANCED MANUFACTURING

NAICS	Description
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
311211	Flour Milling
311212	Rice Milling
311213	Malt Manufacturing
311221	Wet Corn Milling
311224	Soybean and Other Oilseed Processing
311225	Fats and Oils Refining and Blending
311230	Breakfast Cereal Manufacturing
311313	Beet Sugar Manufacturing
311314	Cane Sugar Manufacturing
311340	Nonchocolate Confectionery Manufacturing
311351	Chocolate and Confectionery Manufacturing from Cacao Beans
311352	Confectionery Manufacturing from Purchased Chocolate
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
311421	Fruit and Vegetable Canning
311422	Specialty Canning
311423	Dried and Dehydrated Food Manufacturing
311511	Fluid Milk Manufacturing
311512	Creamery Butter Manufacturing
311513	Cheese Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311710	Seafood Product Preparation and Packaging
311811	Retail Bakeries
311812	Commercial Bakeries
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311821	Cookie and Cracker Manufacturing
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour

NAICS	Description
311830	Tortilla Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311919	Other Snack Food Manufacturing
311920	Coffee and Tea Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
312111	Soft Drink Manufacturing
312112	Bottled Water Manufacturing
312113	Ice Manufacturing
312120	Breweries
312130	Wineries
312140	Distilleries
312230	Tobacco Manufacturing
313110	Fiber, Yarn, and Thread Mills
313210	Broadwoven Fabric Mills
313220	Narrow Fabric Mills and Schiffli Machine Embroidery
313230	Nonwoven Fabric Mills
313240	Knit Fabric Mills
313310	Textile and Fabric Finishing Mills
313320	Fabric Coating Mills
314110	Carpet and Rug Mills
314120	Curtain and Linen Mills
314910	Textile Bag and Canvas Mills
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills
314999	All Other Miscellaneous Textile Product Mills
315110	Hosiery and Sock Mills
315190	Other Apparel Knitting Mills
315210	Cut and Sew Apparel Contractors
315220	Men's and Boys' Cut and Sew Apparel Manufacturing
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing
315280	Other Cut and Sew Apparel Manufacturing
315990	Apparel Accessories and Other Apparel Manufacturing
316110	Leather and Hide Tanning and Finishing
316210	Footwear Manufacturing
316992	Women's Handbag and Purse Manufacturing
316998	All Other Leather Good and Allied Product Manufacturing

NAICS	Description
321113	Sawmills
321114	Wood Preservation
321211	Hardwood Veneer and Plywood Manufacturing
321212	Softwood Veneer and Plywood Manufacturing
321213	Engineered Wood Member (except Truss) Manufacturing
321214	Truss Manufacturing
321219	Reconstituted Wood Product Manufacturing
321911	Wood Window and Door Manufacturing
321912	Cut Stock, Resawing Lumber, and Planing
321918	Other Millwork (including Flooring)
321920	Wood Container and Pallet Manufacturing
321991	Manufactured Home (Mobile Home) Manufacturing
321992	Prefabricated Wood Building Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing
322110	Pulp Mills
322121	Paper (except Newsprint) Mills
322122	Newsprint Mills
322130	Paperboard Mills
322211	Corrugated and Solid Fiber Box Manufacturing
322212	Folding Paperboard Box Manufacturing
322219	Other Paperboard Container Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
322230	Stationery Product Manufacturing
322291	Sanitary Paper Product Manufacturing
322299	All Other Converted Paper Product Manufacturing
323111	Commercial Printing (except Screen and Books)
323113	Commercial Screen Printing
323117	Books Printing
323120	Support Activities for Printing
324110	Petroleum Refineries
324121	Asphalt Paving Mixture and Block Manufacturing
324122	Asphalt Shingle and Coating Materials Manufacturing
324191	Petroleum Lubricating Oil and Grease Manufacturing
324199	All Other Petroleum and Coal Products Manufacturing
325110	Petrochemical Manufacturing
325120	Industrial Gas Manufacturing
325130	Synthetic Dye and Pigment Manufacturing
325180	Other Basic Inorganic Chemical Manufacturing
325193	Ethyl Alcohol Manufacturing

NAICS	Description
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing
325212	Synthetic Rubber Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325620	Toilet Preparation Manufacturing
325910	Printing Ink Manufacturing
325920	Explosives Manufacturing
325991	Custom Compounding of Purchased Resins
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326160	Plastics Bottle Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326199	All Other Plastics Product Manufacturing

NAICS	Description
326211	Tire Manufacturing (except Retreading)
326212	Tire Retreading
326220	Rubber and Plastics Hoses and Belting Manufacturing
326291	Rubber Product Manufacturing for Mechanical Use
326299	All Other Rubber Product Manufacturing
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing
327120	Clay Building Material and Refractories Manufacturing
327211	Flat Glass Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing
327213	Glass Container Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
327310	Cement Manufacturing
327320	Ready-Mix Concrete Manufacturing
327331	Concrete Block and Brick Manufacturing
327332	Concrete Pipe Manufacturing
327390	Other Concrete Product Manufacturing
327410	Lime Manufacturing
327420	Gypsum Product Manufacturing
327910	Abrasive Product Manufacturing
327991	Cut Stone and Stone Product Manufacturing
327992	Ground or Treated Mineral and Earth Manufacturing
327993	Mineral Wool Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
331110	Iron and Steel Mills and Ferroalloy Manufacturing
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
331313	Alumina Refining and Primary Aluminum Production
331314	Secondary Smelting and Alloying of Aluminum
331315	Aluminum Sheet, Plate, and Foil Manufacturing
331318	Other Aluminum Rolling, Drawing, and Extruding
331410	Nonferrous Metal (except Aluminum) Smelting and Refining
331420	Copper Rolling, Drawing, Extruding, and Alloying
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
331511	Iron Foundries
331512	Steel Investment Foundries
331513	Steel Foundries (except Investment)

NAICS	Description
331523	Nonferrous Metal Die-Casting Foundries
331524	Aluminum Foundries (except Die-Casting)
331529	Other Nonferrous Metal Foundries (except Die-Casting)
332111	Iron and Steel Forging
332112	Nonferrous Forging
332114	Custom Roll Forming
332117	Powder Metallurgy Part Manufacturing
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332311	Prefabricated Metal Building and Component Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332431	Metal Can Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332613	Spring Manufacturing
332618	Other Fabricated Wire Product Manufacturing
332710	Machine Shops
332721	Precision Turned Product Manufacturing
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332811	Metal Heat Treating
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
332911	Industrial Valve Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
332991	Ball and Roller Bearing Manufacturing
332992	Small Arms Ammunition Manufacturing
332993	Ammunition (except Small Arms) Manufacturing
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing

NAICS	Description
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333120	Construction Machinery Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
333241	Food Product Machinery Manufacturing
333242	Semiconductor Machinery Manufacturing
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing
333244	Printing Machinery and Equipment Manufacturing
333249	Other Industrial Machinery Manufacturing
333314	Optical Instrument and Lens Manufacturing
333316	Photographic and Photocopying Equipment Manufacturing
333318	Other Commercial and Service Industry Machinery Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333517	Machine Tool Manufacturing
333519	Rolling Mill and Other Metalworking Machinery Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
333911	Pump and Pumping Equipment Manufacturing
333912	Air and Gas Compressor Manufacturing
333913	Measuring and Dispensing Pump Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333991	Power-Driven Handtool Manufacturing

NAICS	Description
333992	Welding and Soldering Equipment Manufacturing
333993	Packaging Machinery Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
333997	Scale and Balance Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
334613	Blank Magnetic and Optical Recording Media Manufacturing
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing
335110	Electric Lamp Bulb and Part Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing

NAICS	Description
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335129	Other Lighting Equipment Manufacturing
335210	Small Electrical Appliance Manufacturing
335221	Household Cooking Appliance Manufacturing
335222	Household Refrigerator and Home Freezer Manufacturing
335224	Household Laundry Equipment Manufacturing
335228	Other Major Household Appliance Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
335911	Storage Battery Manufacturing
335912	Primary Battery Manufacturing
335921	Fiber Optic Cable Manufacturing
335929	Other Communication and Energy Wire Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335932	Noncurrent-Carrying Wiring Device Manufacturing
335991	Carbon and Graphite Product Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
336111	Automobile Manufacturing
336112	Light Truck and Utility Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336212	Truck Trailer Manufacturing
336213	Motor Home Manufacturing
336214	Travel Trailer and Camper Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336390	Other Motor Vehicle Parts Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing

NAICS	Description
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
336510	Railroad Rolling Stock Manufacturing
336611	Ship Building and Repairing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
336999	All Other Transportation Equipment Manufacturing
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337121	Upholstered Household Furniture Manufacturing
337122	Nonupholstered Wood Household Furniture Manufacturing
337124	Metal Household Furniture Manufacturing
337125	Household Furniture (except Wood and Metal) Manufacturing
337127	Institutional Furniture Manufacturing
337211	Wood Office Furniture Manufacturing
337212	Custom Architectural Woodwork and Millwork Manufacturing
337214	Office Furniture (except Wood) Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing
337910	Mattress Manufacturing
337920	Blind and Shade Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
339910	Jewelry and Silverware Manufacturing
339920	Sporting and Athletic Goods Manufacturing
339930	Doll, Toy, and Game Manufacturing
339940	Office Supplies (except Paper) Manufacturing
339950	Sign Manufacturing
339991	Gasket, Packing, and Sealing Device Manufacturing
339992	Musical Instrument Manufacturing
339993	Fastener, Button, Needle, and Pin Manufacturing
339994	Broom, Brush, and Mop Manufacturing
339995	Burial Casket Manufacturing
339999	All Other Miscellaneous Manufacturing
541330	Engineering Services

NAICS	Description
541380	Testing Laboratories
541420	Industrial Design Services
541511	Custom Computer Programming Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541711	Research and Development in Biotechnology
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)

SOC	Occupational Clusters
51-2092	Assemblers and Fabricators (incl. electronics)
51-2022	
43-5081	
51-9198	General and Operations Managers
11-1021	
15-1132	Software Developers
15-1133	
53-7062	Laborers and freight, stock, and material movers
17-2071	
17-2051	Electrical and civil engineers
51-3011	
53-7064	
51-4041	Food Processing Workers
51-1011	
51-9061	Metal and plastic workers (incl. machinists)
	Inspectors, Testers, Sorters, Samplers, and Weighers

CLEAN ENERGY

NAICS	Description
221118	Other Electric Power Generation
236115	New Single-Family Housing Construction (except For-Sale Builders)
236117	New Housing For-Sale Builders
236118	Residential Remodelers
236210	Industrial Building Construction
236220	Commercial and Institutional Building Construction
237130	Power and Communication Line and Related Structures Construction
237210	Land Subdivision
237990	Other Heavy and Civil Engineering Construction
238150	Glass and Glazing Contractors
238160	Roofing Contractors
238170	Siding Contractors
238190	Other Foundation, Structure, and Building Exterior Contractors
238210	Electrical Contractors and Other Wiring Installation Contractors
238220	Plumbing, Heating, and Air-Conditioning Contractors
238290	Other Building Equipment Contractors
238310	Drywall and Insulation Contractors
238990	All Other Specialty Trade Contractors
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers
444190	Other Building Material Dealers
531311	Residential Property Managers
531312	Nonresidential Property Managers
541310	Architectural Services
541320	Landscape Architectural Services
541330	Engineering Services
541370	Surveying and Mapping (except Geophysical) Services
541410	Interior Design Services
541420	Industrial Design Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541690	Other Scientific and Technical Consulting Services
541711	Research and Development in Biotechnology

HEALTH CARE

NAICS	Description
621111	Offices of Physicians (except Mental Health Specialists)
621112	Offices of Physicians, Mental Health Specialists
621210	Offices of Dentists
621310	Offices of Chiropractors
621320	Offices of Optometrists
621330	Offices of Mental Health Practitioners (except Physicians)
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists
621391	Offices of Podiatrists
621399	Offices of All Other Miscellaneous Health Practitioners
621410	Family Planning Centers
621420	Outpatient Mental Health and Substance Abuse Centers
621491	HMO Medical Centers
621492	Kidney Dialysis Centers
621493	Freestanding Ambulatory Surgical and Emergency Centers
621498	All Other Outpatient Care Centers
621511	Medical Laboratories
621512	Diagnostic Imaging Centers
621610	Home Health Care Services
621910	Ambulance Services
621991	Blood and Organ Banks
621999	All Other Miscellaneous Ambulatory Health Care Services
622110	General Medical and Surgical Hospitals
622210	Psychiatric and Substance Abuse Hospitals
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals
623110	Nursing Care Facilities (Skilled Nursing Facilities)
623210	Residential Intellectual and Developmental Disability Facilities
623220	Residential Mental Health and Substance Abuse Facilities
623311	Continuing Care Retirement Communities
623312	Assisted Living Facilities for the Elderly
623990	Other Residential Care Facilities

INFORMATION AND COMMUNICATION TECHNOLOGIES

NAICS	Description
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
334613	Blank Magnetic and Optical Recording Media Manufacturing
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing
511110	Newspaper Publishers
511120	Periodical Publishers
511130	Book Publishers
511140	Directory and Mailing List Publishers
511191	Greeting Card Publishers
511199	All Other Publishers
511210	Software Publishers
512110	Motion Picture and Video Production
512120	Motion Picture and Video Distribution
512131	Motion Picture Theaters (except Drive-Ins)
512132	Drive-In Motion Picture Theaters

NAICS	Description
512191	Teleproduction and Other Postproduction Services
512199	Other Motion Picture and Video Industries
512210	Record Production
512220	Integrated Record Production/Distribution
512230	Music Publishers
512240	Sound Recording Studios
512290	Other Sound Recording Industries
515111	Radio Networks
515112	Radio Stations
515120	Television Broadcasting
515210	Cable and Other Subscription Programming
517110	Wired Telecommunications Carriers
517210	Wireless Telecommunications Carriers (except Satellite)
517410	Satellite Telecommunications
517911	Telecommunications Resellers
517919	All Other Telecommunications
518210	Data Processing, Hosting, and Related Services
519110	News Syndicates
519120	Libraries and Archives
519130	Internet Publishing and Broadcasting and Web Search Portals
519190	All Other Information Services
541110	Offices of Lawyers
541191	Title Abstract and Settlement Offices
541199	All Other Legal Services
541211	Offices of Certified Public Accountants
541213	Tax Preparation Services
541214	Payroll Services
541219	Other Accounting Services
541310	Architectural Services
541320	Landscape Architectural Services
541330	Engineering Services
541340	Drafting Services
541350	Building Inspection Services
541360	Geophysical Surveying and Mapping Services
541370	Surveying and Mapping (except Geophysical) Services
541380	Testing Laboratories
541410	Interior Design Services
541420	Industrial Design Services
541430	Graphic Design Services

NAICS	Description
541490	Other Specialized Design Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services
541611	Administrative Management and General Management Consulting Services
541612	Human Resources Consulting Services
541613	Marketing Consulting Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541618	Other Management Consulting Services
541620	Environmental Consulting Services
541690	Other Scientific and Technical Consulting Services
541711	Research and Development in Biotechnology
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
541720	Research and Development in the Social Sciences and Humanities
541810	Advertising Agencies
541820	Public Relations Agencies
541830	Media Buying Agencies
541840	Media Representatives
541850	Outdoor Advertising
541860	Direct Mail Advertising
541870	Advertising Material Distribution Services
541890	Other Services Related to Advertising
541910	Marketing Research and Public Opinion Polling
541921	Photography Studios, Portrait
541922	Commercial Photography
541930	Translation and Interpretation Services
541940	Veterinary Services
541990	All Other Professional, Scientific, and Technical Services
551111	Offices of Bank Holding Companies
551112	Offices of Other Holding Companies
551114	Corporate, Subsidiary, and Regional Managing Offices

LIFE SCIENCES

NAICS	Description
111000	Crop Production
113210	Forest Nurseries and Gathering of Forest Products
311221	Wet Corn Milling
311224	Soybean and Other Oilseed Processing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
333314	Optical Instrument and Lens Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
424210	Drugs and Druggists' Sundries Merchant Wholesalers
424910	Farm Supplies Merchant Wholesalers
511210	Software Publishers
518210	Data Processing, Hosting, and Related Services
541380	Testing Laboratories
541711	Research and Development in Biotechnology
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
621511	Medical Laboratories

APPENDIX B: METHODOLOGY

Data compiled for this report were drawn from both primary and secondary data sources. The following tables provide an overview of the survey methodology used by BW Research for each of the Priority Sectors. UC San Diego Extension also completed qualitative executive interviews with several with industry employers and regional stakeholders.

Advanced Manufacturing	Description
Method	Telephone and Web Survey of Advanced Manufacturing Businesses in San Diego County
Number of Participants	115 Advanced Manufacturing Businesses in San Diego County
Survey Field Dates	Web & Telephone Survey: May 17 – June 15, 2017
Survey Universe	6,096 Businesses in San Diego County
Survey Margin of Error	The margin of error for questions answered by all 115 Advanced Manufacturing Businesses was +/- 9.05 at the 95% level of confidence

Clean Energy	Description
Method	Telephone and Web Survey of Clean Energy Businesses in San Diego County
Number of Participants	56 Employers in San Diego County
Survey Field Dates	Web & Telephone Survey: May 17 – June 15, 2017
Survey Universe	1,943 Businesses in San Diego County
Survey Margin of Error	The margin of error for questions answered by all 56 Health Care Employers was +/- 12.91 at the 95% level of confidence

Health Care	Description
Method	Telephone and Web Survey of Health Care Businesses in San Diego County
Number of Participants	135 Employers in San Diego County
Survey Field Dates	Web & Telephone Survey: May 17 – June 15, 2017
Survey Universe	7,376 Businesses in San Diego County

Survey Margin of Error	The margin of error for questions answered by all 135 Health Care Employers was +/- 8.36 at the 95% level of confidence
------------------------	---

ICT	Description
Method	Telephone and Web Survey of ICT Businesses in San Diego County
Number of Participants	114 ICT Employers in San Diego County
Survey Field Dates	Web & Telephone Survey: May 12 – June 21, 2017
Survey Universe	69,817 Businesses in San Diego County
Survey Margin of Error	The margin of error for questions answered by all 114 ICT Businesses was +/- 9.05% at the 95% level of confidence

Life Sciences	Description
Method	Telephone and Web Survey of Life Science Businesses in San Diego County
Number of Participants	85 Life Science Businesses in San Diego County
Survey Field Dates	Web & Telephone Survey: May 12 – June 21, 2017
Survey Universe	2,324 Businesses in San Diego County
Survey Margin of Error	The margin of error for questions answered by all 85 Life Science Businesses was +/- 10.44 at the 95% level of confidence

SURVEY DESIGN

For the Clean Energy, ICT, and Life Science sectors, BW Research Partnership worked closely with the San Diego Workforce Partnership to develop survey instruments that met the objectives of the research studies. For the Health Care and Advanced Manufacturing sectors, BW Research Partnership worked closely with UC San Diego Extension and the San Diego Workforce Partnership to develop survey instruments that met the research objectives of the study.

In developing the survey instruments, BW Research utilized techniques to overcome known biases in survey research and minimize potential sources of measurement error within the survey.

SAMPLING METHOD

ADVANCED MANUFACTURING

A database of 3,423 San Diego firms in an Advanced Manufacturing related industry was developed. Survey links were also distributed to 2,771 known contacts through industry groups, etc.

CLEAN ENERGY

A database of 1,943 San Diego County firms with Clean Energy employment was developed from previous work and databases from BW Research Partnership. The list of firms was supplemented with industry lists provided by partners to the research or from publically available information, such as BLS NAICS industries and InfoUSA businesses.

HEALTH CARE

A database of 2,964 San Diego firms in Health Care industries was developed for the research study. Survey links were also distributed to additional known firms through industry groups, etc.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

A database of 2,544 San Diego County firms with ICT employment was determined through an industry staffing pattern. Survey links were also distributed to additional known firms through industry groups, web panels, etc.

LIFE SCIENCES

A database of 1,286 San Diego firms in a Life Science related industry was developed. Initially there were 60 known firms and 1,226 unknown firms. Survey links were also distributed to additional known firms through industry groups, etc.

DATA COLLECTION

Prior to beginning data collection, BW Research conducted interviewer training and pre-tested the survey instruments to ensure that all words and questions were easily understood by the respondents. The data collection period was May 12th through June 21st, 2017.

INDUSTRY SURVEY METHODOLOGY

Economic Modeling Specialists, International (EMSI) Data

Emsi industry data have various sources depending on the class of worker selected.

1. For QCEW Employees, Emsi primarily uses the QCEW (Quarterly Census of Employment and Wages), with supplemental estimates from County Business Patterns.
2. Non-QCEW employees data are based on a number of sources including QCEW, Current Employment Statistics, County Business Patterns, BEA State and Local Personal Income reports, the National Industry-Occupation Employment Matrix (NIOEM), the American Community Survey, and Railroad Retirement Board statistics.

3. Self-Employed and Extended Proprietor classes of worker data are primarily based on the American Community Survey, Nonemployer Statistics, and BEA State and Local Personal Income Reports. Projections for QCEW and Non-QCEW Employees are informed by NIOEM and long-term industry projections published by individual states. EMSI data is also pulled from the California Labor Market Information Department.

ACKNOWLEDGMENTS

This report resulted from a regional collaboration in San Diego County. The San Diego Workforce Partnership (SDWP) would like to acknowledge the advisory groups and representatives from companies, initiatives, and programs in San Diego County who participated in surveys, interviews, and focus groups for the report. This study could not have been produced without their support.

RESEARCH PARTNERS

- Josh Williams, Ryan Young, Carlota Santos and Sarah Lehmann — BW Research
- Josh Shapiro, Gladys Selfridge, Gina Carton — UC San Diego Extension
- Tina Ngo Bartel — Center of Excellence for Labor Market Research, San Diego-Imperial

SDWP STAFF CONTRIBUTORS

- Sarah Burns, Henar Hellow



3910 University Ave., 4th Floor
San Diego, CA 92105
P / 619.228.2900 W / workforce.org

