Priority Sectors

Workforce Initiatives in San Diego County

November 2015

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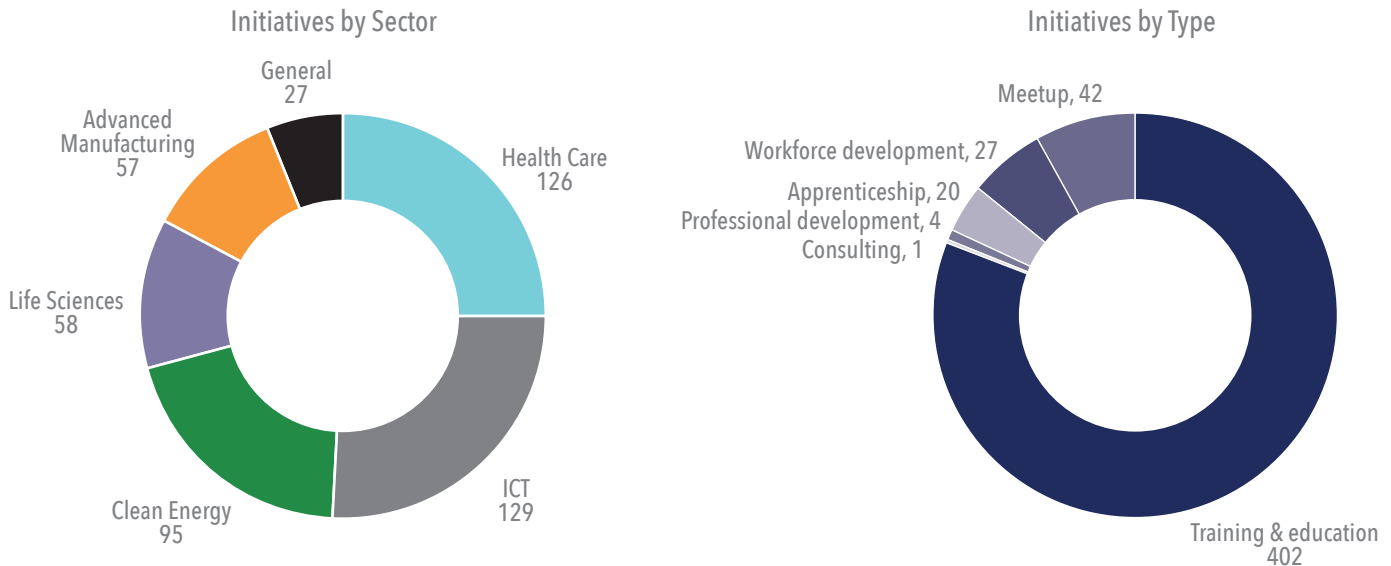
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In 2014, the San Diego Workforce Partnership (SDWP) and the San Diego and Imperial Counties Community Colleges Association (SDICCCA) released Priority Sector reports detailing workforce gaps and challenges in five key industry sectors: Advanced Manufacturing, Clean Energy, Health Care, Information and Communication Technologies (ICT), and Life Sciences. In this follow-up study, SDWP and its partners catalogued nearly 500 workforce-related initiatives that address challenges identified in the five Priority Sectors. The full report analyzes which challenges have been addressed and what still needs to be done in San Diego County to ensure a strong future workforce.

Overview

There are 492 workforce initiatives from 100 organizations that impact one or more of the Priority Sectors.*

*There are some initiatives that cross sectors or types; therefore, the totals may add up to more than 492.

Initiatives by Sector

General 27
Advanced Manufacturing 57
Health Care 126
Life Sciences 58
Clean Energy 95
ICT 129

Initiatives by Type

Meetup, 42
Workforce development, 27
Apprenticeship, 20
Professional development, 4
Consulting, 1
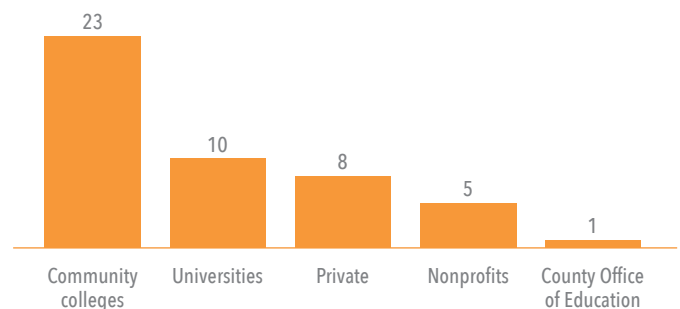Training & education 402

Analysis of Progress in San Diego County

The following sections highlight the recommendations made in the 2014 Priority Sector reports that target workforce issues. Recommendations addressed by initiatives found in this study are checked off. Specific initiatives can be found in the full report at workforce.org/reports.

Advanced Manufacturing

- ☑ Change the public perception of traditional manufacturing to Advanced Manufacturing
- ☑ Foster science, technology, engineering and math (STEM) education in the K–12 system
- ☑ Add internship/work experience requirements to training and education programs
- ☑ Increase the number of public-private partnerships to share resources
- ☑ Expand and develop the talent pipeline
- ☐ Align the workforce system with employers' needs
- ☐ Standardize certifications and create articulation agreements
- ☐ Increase employer knowledge of and access to business assistance programs

To date, there are 57 workforce initiatives in San Diego's Advanced Manufacturing sector. 47 of these initiatives are training and education programs. The figure below shows the breakdown of these programs.

Community colleges	Universities	Private	Nonprofits	County Office of Education
23	10	8	5	1

Clean Energy

- ☑ Increase the amount of on-the-job work experience for students
- ☐ Address the need for strong soft skills
- ☐ Address the need to upskill incumbent workers
- ☐ Address the need for training and education programs that result in professional licensures

For the purpose of this report, the training and education programs serving the Clean Energy sector were grouped into four categories, the breakdown of which is shown in the chart below.

Construction	Electrical	Sustainable energy	Plumbing & HVAC
21	18	15	13
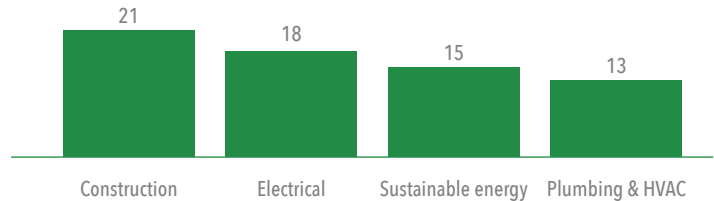
Health Care

- ☑ Provide relevant work experience
- ☐ Enhance completion rates of existing programs
- ☐ Work with employers to ensure training and education programs meet hiring needs
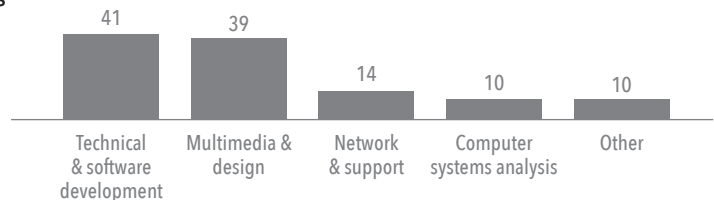- ☐ Address the need for strong soft skills

127 initiatives address the challenges in San Diego's Health Care sector. The figure below shows the breakdown of the training & education programs by type.

Private	Universities	Community colleges	Adult schools	Nonprofits
46	33	18	5	5
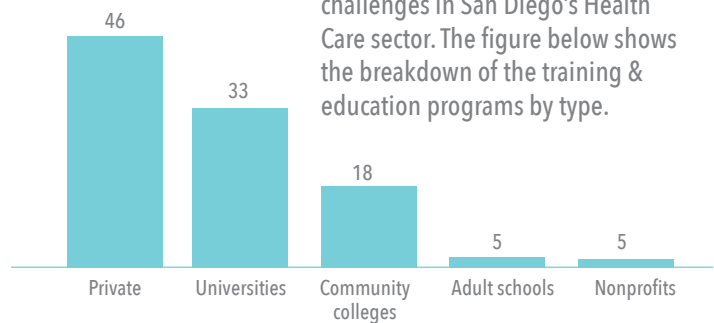
Information & Communication Technologies

- ☑ Engage K–12 students in the ICT sector
- ☐ Provide relevant work experience
- ☐ Prepare students for industry-recognized certifications in training and education programs
- ☐ Address the need for strong soft skills

Of the 129 initiatives that address challenges in the ICT sector, 88% are training and education programs. These programs were assigned to one of the five categories shown in the chart below.

Technical & software development	Multimedia & design	Network & support	Computer systems analysis	Other
41	39	14	10	10

Life Sciences

- ☑ Increase opportunities to obtain work experience
- ☑ Emphasize key areas of skills and expertise in training and education programs
- ☐ Understand what working in the Life Sciences sector entails
- ☐ Invest resources into professional development to improve employee retention rates

The training and education programs that serve Life Sciences cover a variety of topics, though over half focus on biology. The breakdown of programs by degree type is displayed in the chart to the right.

- 6 Associate degree
- 1 Other
- 24 Bachelor's degree or higher
- 19 Certificate program
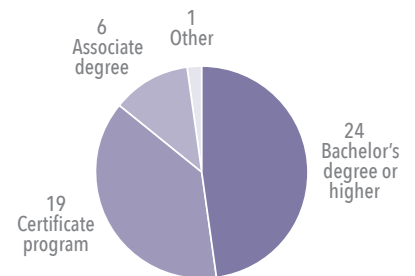
Conclusion

Many initiatives have begun to address these recommendations, but there is still much work to be done.

Common challenges across the Priority Sectors still remain, including the need to:

- → Foster STEM education in the K–12 system
- → Include internship or work experience requirements in training and education programs
- → Improve soft skills (e.g., critical thinking, teamwork and communication) for job seekers
- → Develop training and education programs that result in professional licensures
- → Work with employers to ensure that training programs meet employers' needs

Introduction

In 2014, the San Diego Workforce Partnership (SDWP) collaborated with the San Diego and Imperial Counties Community Colleges Association (SDICCCA) and commissioned labor market reports for San Diego County's five Priority Sectors: Advanced Manufacturing, Clean Energy, Life Sciences, Health Care, and Information and Communication Technologies.

This study identifies existing workforce initiatives that address some of the challenges identified in the 2014 reports and makes further recommendations for areas that still require attention. The resulting research provides a greater understanding of how the region as a whole is currently tackling the skills gap and what can be done to address the remaining workforce challenges.

The research catalogues 492 active workforce initiatives from 100 different organizations that relate to at least one of the Priority Sectors. Within the 492 initiatives, 27 address common challenges found across all sectors. Initiatives identified in this study include training and education programs, meet-up groups, apprenticeships and annual events.

SDWP commissioned the University of California San Diego (UCSD) Extension to collect information and develop a database of workforce-related initiatives. A database of these workforce initiatives can be found at lmi.workforce.org. The research methodology included in-depth interviews, discussions at five advisory councils for each sector, online data mining, and surveys with industry professionals. For more information on the methodology, view Appendix A.

The following sections provide an overview of each Priority Sector, sector-specific initiatives that reflect the recommendations provided in the 2014 reports, and an analysis of challenges that still need to be addressed.

Advanced Manufacturing

Sector Overview

Manufacturing is one of the oldest industries in the United States. It accounts for 10 percent of all establishments, 15 percent of all paid employment, and 22 percent ($13 billion) of annual payroll in San Diego County.[1] However, manufacturing has evolved from its traditional definition of manual production to become "Advanced Manufacturing," where companies use advanced technological processes, equipment and materials to produce goods. The Advanced Manufacturing sector is diverse and crosses numerous industries from aerospace to biotechnology. More than 20 percent of manufacturing companies nationwide have workers with a mean age of 55 years or older who are expected to retire in the next 10 years.[2] In San

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[1] San Diego and Imperial Counties Community Colleges Association (SDICCCA), San Diego Workforce Partnership (SDWP), Centers of Excellence (COE). San Diego East County Economic Development Council (ECEDC) and University of California, San Diego (UCSD) Extension. *Advanced Manufacturing: Labor Market Analysis. San Diego County.* October 2014.
[2] According to a study conducted by the Sloan Center on Aging & Work in 2009, it indicated that 20 percent of manufacturing companies nationwide had a mean age workforce of 55 years or older.

Diego specifically, Advanced Manufacturing employers tend to be small businesses with 82 percent having less than 20 employees. This sector is expected to see a 6 percent job growth, with an expected 4,361 openings each year from 2015 to 2019.[3]

The 2014 Advanced Manufacturing report found a gap in the available supply of workers to meet the demand of workers within the following occupational clusters: production, drafting and technicians, engineering, and computer/software occupations. Of the employers surveyed, 85 percent reported having moderate to serious difficulty finding qualified applicants.[4] The Advanced Manufacturing section of this report identifies initiatives related to production, drafting and technician, and engineering occupations. See the Information and Communication Technologies section on page 23 for initiatives addressing the challenges for the computer/software occupational cluster.

Workforce Initiatives Overview

The 2014 Advanced Manufacturing report identified several workforce challenges that limit the growth of this sector, which include an aging workforce, a limited supply of well-trained workers for current and future demand, and a misconception of manufacturing as a dirty and dangerous industry. To respond to those challenges, the following recommendations were made for San Diego County's workforce and education systems:

- Close the supply gap and expand the Advanced Manufacturing talent pipeline
- Change the public perception of traditional manufacturing to Advanced Manufacturing
- Foster science, technology, engineering and mathematics (STEM) education in the K–12 system
- Add internship/work experience requirements to training and education programs
- Increase the number of public-private partnerships to share resources
- Include critical-thinking and real-world application in training and education programs
- Align the workforce system with industry demand through more employer engagement
- Standardize certifications and create articulation agreements between industry associations and training and education programs
- Increase employer knowledge of and access to business assistance programs

To understand how well the San Diego region is addressing these recommendations, this study identifies 57 workforce initiatives in San Diego's Advanced Manufacturing sector, which consist of training and education programs, apprenticeships and others (Figure 1).[5]

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[3] Economic Modeling Specialists, Int'l. 2015.
[4] SDICCCA, SDWP, COE, ECEDC and UCSD Extension. *Advanced Manufacturing: Labor Market Analysis. San Diego County.* October 2014.
[5] Note: some programs may be counted in more than one category, as they teach multiple types of processes, meaning the total adds up to over 100 percent.

Figure 1. Advanced Manufacturing Workforce Initiatives by Type
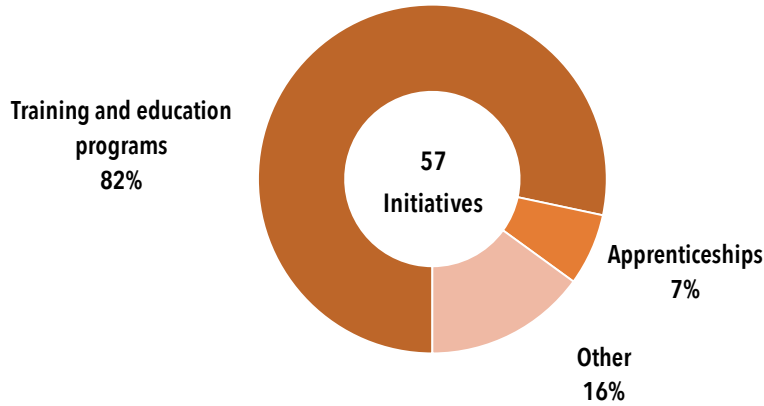
Training and education programs
82%

57 Initiatives

Apprenticeships
7%

Other
16%

The following sections describe which initiatives align with the aforementioned recommendations and how the region can continue to address workforce challenges in this sector.

Close the supply gap and expand the Advanced Manufacturing talent pipeline

The 2014 report recognized a strong need to close the supply gap and prepare for future employment demand in Advanced Manufacturing occupations. Training and education programs respond to this need by developing workers for the sector's talent pipeline. Forty-nine percent of the training and education programs that exist are offered at local community colleges, with 33 of the programs being offered for production occupations (computer-aided design technology, machining and welding). While there are a significant number of students participating in these courses, there is still a notable supply gap in the Advanced Manufacturing sector because existing programs are at capacity, which limits the number of trainees. There is not a sufficient amount of equipment or machinery with which students can be trained. Additional programs have been created by universities, nonprofits and private industry to address this training and education gap (Table 1).

Table 1. Training and Education Program Type by Institution

Program Institution Type	Certificate Programs	Associate Degree	Bachelor's Degree or Higher	Other Programs	Total Number of Programs in San Diego County
County Office of Education	0	0	0	1	1
Community Colleges	13	6	0	4	23
Universities	4	0	6	0	10
Nonprofits	0	0	0	5	5
Private	0	0	0	8	8
TOTAL	17	6	6	18	47

For the purpose of this study, training and education programs are grouped into five topics: computer-aided design, machining, welding, process improvement and engineering. The following illustrates the number of programs in each area (Figure 2).[6]

Figure 2. Training and Education Programs by Topic
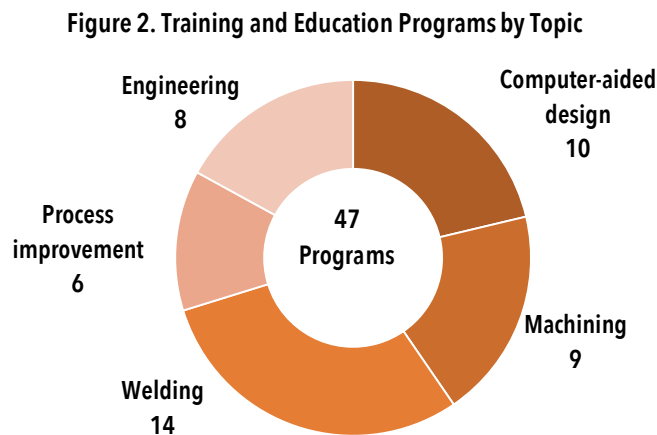
The production occupations (such as assemblers and fabricators, machinists and welders) are in high demand in San Diego County; however, there are not enough classes to meet the demand, resulting in a shortage of trained workers. There are currently nine machining programs in San Diego County. Of these programs, eight are certificate programs and one offers an associate degree. Five of these programs incorporate technologies such as computer-aided design (CAD) and computer numerical control (CNC) to prepare students for careers in machining and machine operating. San Diego also has 14 training and education programs for various welding specializations. Twelve of these programs offer students certificates, and two result in a bachelor's degree or above. There are 10 CAD-specific programs in San Diego, largely offered through community colleges and private businesses. Southwestern College is the only institution to offer a degree in this field. Businesses that sell CAD software often provide training on the software as well.

Process improvement training is relatively new in the Advanced Manufacturing sector. Six of the training and education programs include some type of process improvement, with four programs solely focusing on this topic. These processes include six sigma (the process of creating tools and strategies to limit defects in production) and lean manufacturing (the process of eliminating waste within a company's operations).

In addition to occupations such as welders and machinists, engineering occupations are also important in the production process for Advanced Manufacturing firms; however, there is a significant skills gap in this profession. There are engineering degree programs at both the bachelor's and master's levels yet employers have difficulty finding engineers with production or machining experience. According to Advanced Manufacturing employers, engineers must be able to design a product that can be built by their colleagues. Without production experience, engineers tend to design products that cannot be easily

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[6] Note: some programs may be counted more than once, as they have multiple components to their programs, meaning the total number of training and education programs may add up to more than 47.

manufactured by their production counterparts. Engineers with machining experience are in such high demand that they are constantly being recruited or poached from one company to another.[7]

Change the public perception of traditional manufacturing to Advanced Manufacturing

There is a misconception of the Advanced Manufacturing sector. The general perception is that all jobs are either unskilled labor (dirty and dangerous) or unavailable due to foreign competition and outsourcing.

To address this challenge, two initiatives focus on exposing the general public to the Advanced Manufacturing sector in San Diego County. The San Diego Regional Economic Development Corporation (SDREDC) and San Diego East County Economic Development Council (ECEDC) host a number of tours and panels of manufacturing facilities. SDREDC spearheads San Diego's Manufacturing Day with a number of regional partners; manufacturers throughout the region to open their doors to the public and demonstrate what 21st century manufacturing looks like in San Diego (usually on the first Friday of October). In 2015, more than 45 manufacturers opened their doors for public tours across San Diego County. Showcasing the true nature of the sector to multiple audiences helps change the negative perception of Advanced Manufacturing.

Foster STEM education in the K–12 system

With an aging workforce, companies are interested in developing their future workforce. Advanced Manufacturing professionals reiterated the importance of connecting STEM education in K–12 schools to real-world applications and how those skills can translate into technical careers. Ten programs in the region focus on developing interest in STEM careers in students. One upcoming initiative is a National Science Foundation (NSF) program which aims to explain how STEM can be applied to guitar building classes in schools throughout the nation. This new program has not yet launched. Six San Diego County schools received funding to participate in a five-day guitar-making training, which teaches educators how to engage younger generations in building something they can use. By providing students the opportunity to work with their hands, they may realize their enthusiasm for creating, designing and/or engineering.

Add internship/work experience requirements to training and education programs

Advanced Manufacturing firms prefer that new hires have hands-on working experience with machinery and manufacturing equipment. Although many of the training programs in the region provide students with the "hands-on" work on machines, employers value students that have actual work experience such as an internship or apprenticeship.

To address this, there are three apprenticeship programs that partner with employers to provide students with paid on-the-job experience and classroom training: a machinist apprenticeship through California Apprenticeship Coordinators Association, an apprenticeship program through Solar Turbines and a welding apprenticeship through Associated Builders and Contractors.

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[7] SDICCCA, SDWP, COE, ECEDC and UCSD Extension. *Advanced Manufacturing: Labor Market Analysis. San Diego County.* October 2014.

San Diego County will have more apprenticeship programs specific to Advanced Manufacturing within the next year. Able-Disabled Advocacy was recently awarded $3 million in funding from the U.S. Department of Labor Apprenticeship Grant to kick start a new Advanced Manufacturing apprenticeship program in 2016. Additionally, Workshop for Warriors, a program that recruits and trains veterans for work in manufacturing, has recently been recognized by the Division of Apprenticeship Standards as a registered apprenticeship program.

Increase the number of public-private partnerships to share resources

Interviews with industry experts indicated that public-private partnerships between education and companies produce the most sustainable programs. For example, a program that is solely funded by grants will cease as soon as grant funding can no longer be secured. However, a program that diversifies its funding sources can sustain itself despite grant availability. There is only one program in San Diego County where private companies and training programs shares resources: FabLab (short for Fabrication Laboratory). This is a shared working collaborative for entrepreneurs. This nonprofit is a member-based organization that allows entrepreneurs to use manufacturing equipment and machinery to create innovative products. Within this organization, instructors teach entrepreneurs how to use shared manufacturing equipment, create prototypes, develop their businesses and commercialize their products.

Recommendations

While the aforementioned initiatives align with the recommendations provided in the 2014 Advanced Manufacturing report, the following recommendations still need the region's attention.

Align the workforce system with industry demand through more employer engagement

Advanced Manufacturing programs in San Diego County generally host an advisory council once a year, which allows businesses to provide input on training curriculum. However, this engagement is very limited in nature. Educational institutions and the workforce development system need to include employers on a more regular basis and sustain these relationships. FabLab is an example of how employer engagement can align the training with what is valued by the industry. Aligning the education and workforce development systems also provides more information to job seekers interested in potential Advanced Manufacturing career pathways. Well-informed training/education providers can relay accurate information about career advancement opportunities to their program participants.

Standardize certifications and create articulation agreements

Other industry sectors, such as Clean Energy, have standardized certifications through nationwide industry associations. Standardized certifications provide students with industry-approved credentials to work in their fields. Workers are able to "stack" credentials whenever a new technology comes to market, keeping their skills current in order to move up a career ladder. The Advanced Manufacturing sector would benefit from such standardized certifications because firms are continually affected by changing technologies.

To create portable and industry-recognized credentials, schools and education institutions can have articulation agreements that facilitate students' ability to earn these certifications. Recently, a $13 million California Career Pathways Trust (CCPT) grant was awarded to San Diego County schools to provide

students career pathways in the Advanced Manufacturing, Clean Energy, and Information and Communication Technologies sectors. CCPT aims to coordinate career exploration and work-based learning in high schools and community colleges. It will create clear delineated pathways with articulation of credits and dual enrollments, allowing students to move from high schools to community colleges to four-year programs. This grant is being led by the San Diego County Office of Education and United Way of San Diego in collaboration with 15 school districts, the regional community college system, nonprofits, and industry partners that support economic and workforce development.

Increase employer knowledge of and access to business assistance programs

As previously mentioned, 82 percent of Advanced Manufacturing firms have less than 20 employees. It is the nature of small businesses to focus on the day-to-day operations. Small businesses are often unaware of existing resources that they can leverage. Interviews with businesses uncovered that most employers had little knowledge of public programs such as SDWP's On-the-Job Training program or incentive programs from the city or the state. These resources can help businesses grow and add employment in the region.

Clean Energy

Sector Overview

The Clean Energy sector in San Diego County is made up of mature industries (such as construction) that have been transformed by advances in technology, resulting in new employment opportunities in the region. Clean Energy is typically associated with terms such as "renewable energy," "advanced transportation," "green economy," and other environmentally-friendly economic trends.

This sector has 3,181 establishments and 28,597 workers in San Diego County, with nearly half of Clean Energy firms employing less than five workers. Employment in the Clean Energy sector is continuously growing. Between 2014 and 2015 alone, employment is expected to grow 11.5 percent or 3,285 jobs.[8] Similar to Advanced Manufacturing, this sector is diverse and overlaps with multiple industries and occupations.

Clean Energy firms range from building contractors to financing firms that focus on energy efficiency or home retrofitting. Generally, firms that install and maintain clean energy products have repurposed or reinvented traditional trade professions, such as plumbers and electricians, to require knowledge of clean energy projects or clean technologies (clean tech).

Due to the expansive nature of this sector, nine occupations were studied in the 2014 report to provide a greater understanding of the types of occupations found in Clean Energy:

- Construction or project managers
- Energy auditors
- Photovoltaic designers
- Sales representatives
- Electricians
- Plumbers
- Solar photovoltaic installers
- Weatherization specialists
- Heating, ventilating and air conditioning (HVAC) technicians

This study includes workforce initiatives related to these occupations and/or have some component of Clean Energy.

Workforce Initiatives Overview

The 2014 Clean Energy report identified challenges that both new and experienced workers face when looking for employment in this sector. Employers reported that new workers generally lacked on-the-job training or work experience. Construction workers who lost their jobs for an extended period during and after the Great Recession (2007-2009) typically fell behind in learning new skills, particularly those related to
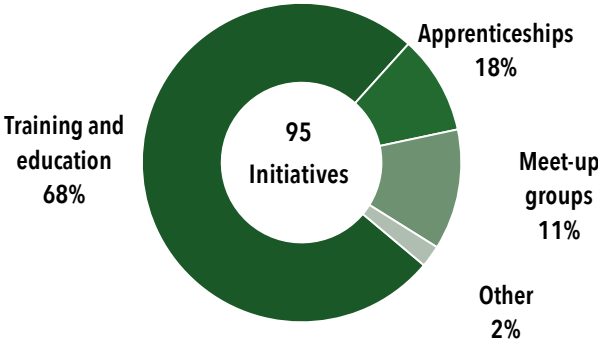
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[8] SDICCCA, SDWP, COE and BW Research Partnership, Inc. (BW Research). *Clean Energy: Labor Market Analysis. San Diego County.* October 2014.

cleantech. In other words, new workers had the cleantech knowledge, but lacked experience, and experienced workers had the experience, but lacked the cleantech knowledge. To respond to those challenges, the following recommendations were made for San Diego County's workforce and education systems:[9]

- Close the supply gap
- Increase the amount of on-the-job work experience for students
- Address the need for strong soft skills
- Address the need to upskill incumbent workers
- Address the need for training and education programs to result in professional licensures

To understand how well the San Diego region is addressing these recommendations, this study identifies 95 workforce initiatives related to the Clean Energy sector: training and education, apprenticeships, meet-up groups and others (Figure 3).[10]

Figure 3. Clean Energy Workforce Initiatives by Type

Training and education programs include public and private education, apprenticeships include programs that have traditionally been found in trade or construction-related occupations, meet-up groups include networking events, and other initiatives include programs such as "Careers in Energy Week" that educate the community about cleantech careers and early stage businesses.[11]

The following sections describe which initiatives align with the aforementioned recommendations and how the region can continue to address workforce challenges in this sector.

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[9] SDICCCA, SDWP, COE and BW Research. *Clean Energy: Labor Market Analysis. San Diego County*. October 2014.
[10] There are more trade-related training programs that exist in the region, however, for the purpose of this report we are only reporting those that have a component of Clean Energy within their curriculum.
[11] Note some programs may be counted twice as they have multiple components to their programs (such as an education/training program that has an apprenticeship component).

Close the supply gap

One method to close the supply gap is to generate more workers, particularly through training and education programs. Most of the projected new job openings in this sector require individuals with less than an associate degree for entry-level and non-entry-level jobs. Sixty-five percent of the training and education programs are offered at the community college level, where the majority of programs offering certificate or academic degrees can be found (Table 2). Many of these public programs work collaboratively with private industry. Conversely, many private and nonprofit programs do not result in students earning a certificate or academic degree. Forty percent of private programs prepare students for industry certification exams.

Table 2. Training and Education Program Type by Institution

Institution Type	Certificate Programs	Associate Degree	Bachelor's Degree or Higher	Other Programs	Total Programs in San Diego County
Community Colleges	19	10	0	2	31
Universities	7	0	0	0	7
Nonprofits /Unions	0	0	0	7	7
Private	1	0	0	19	20
TOTAL	27	10	0	28	65

This study categorizes Clean Energy training and education programs into four subjects: plumbing and heating, ventilation and air conditioning (HVAC), electrical, sustainable energy and construction (Figure 4).[12]

Figure 4. Training and Education Programs by Topic
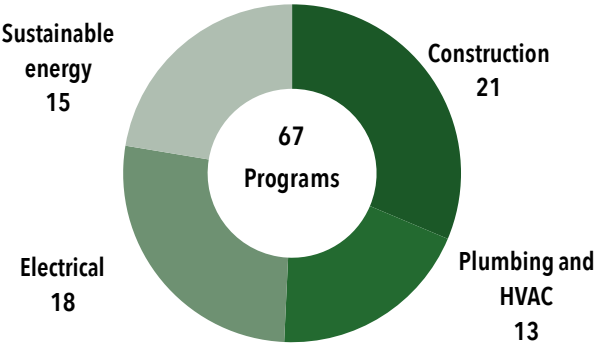
There are 13 plumbing and HVAC training and education programs in San Diego that prepare individuals for professions such as plumbing contractors, HVAC contractors and operating engineers. Of these programs,

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[12] Note some programs may be counted twice as they have multiple components to their programs.

two offer a higher education degree while the remaining 11 are certificates and training courses. San Diego City College offers programs for operating and maintenance that integrates classroom training into apprenticeships. Although these programs do not specifically prepare students for professional licenses and certifications, they do equip students with the fundamental knowledge to take these examinations should they choose to do so. Job seekers intending to work in Clean Energy would benefit from such licensures. According to the 2014 Clean Energy report, 65 percent of employers require and 30 percent prefer workers that have a license or professional certification for plumbers and similar trade professions.[13]

Electrical training and education programs primarily include handling electric equipment, engineering power systems, and designing, installing or selling solar photovoltaic (PV) technologies. San Diego County has two higher education programs with degrees and 16 programs with certificates. In the 2014 report, 71 percent of employers surveyed require electricians to have a professional license or certification, while 20 percent prefer it.[14] Of the 18 electrical programs, 12 prepare students for industry examinations, such as the North American Board of Certified Energy Practitioners (NABCEP) PV Entry Level Exam and Electronics Technician Association International's Associate Electronics Technicians Certificate.

There are 15 programs in San Diego that train individuals in sustainable energy practices such as environmental management, Building Performance Institute (BPI) insulation,[15] and biofuels processes. Of these programs, Southwestern College offers an associate degree in Environmental Management and teaches students about sustainable development and environmental issues. San Diego Gas & Electric commonly hosts workshops at its Energy Innovation Center to teach the public about energy efficient practices and sustainability.

Programs related to construction occupations encompass green building and design (also known as green construction), inspection, supervision and management. There are 21 construction training and education programs in San Diego County, consisting of 14 programs with certificates and 7 higher education programs with degrees. These 21 programs account for 44 percent of Clean Energy training in the construction field. These programs help prepare students for national and state exams such as LEED Certification and Contractor State Licensing. These programs review relevant examination topics, simulate testing environments, and provide practice tests to students. Additional construction programs exist in the region that do not have a specific renewable or sustainable energy component, but were not included in this study.

Increase the amount of on-the-job work experience in training and education programs

Clean Energy firms prefer new hires who have on-the-job work experience. Of the training and education programs in this sector, there are 19 apprenticeship programs that partner with employers to provide students with classroom learning and on-the-job work experience. These programs include apprenticeships for electricians, HVAC, plumbers and sound technicians through private companies, union associations and the State of California's Division of Apprenticeship Standards. Most apprenticeship programs have course requirements and a specified number of hours of work experience that students must meet. Some

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[13] SDICCCA, SDWP, COE and BW Research. *Clean Energy: Labor Market Analysis. San Diego County.* October 2014.
[14] SDICCCA, SDWP, COE and BW Research. *Clean Energy: Labor Market Analysis. San Diego County.* October 2014.
[15] bpi.org

community college programs and formal apprenticeship training programs work in collaboration to provide students the training and hands-on experience they need.

Of the apprenticeship programs available, some are federally approved, state approved, both, or neither. The distinction between these programs is important for job seekers, as there are different requirements for completing training and working on projects. For example, if a job seeker is enrolled in a federally-approved apprenticeship program that is not state-approved, that individual will not be able to work on a state-funded construction project, but can work on a federally-funded project. This does not mean that job seekers will not find employment within their field. It may, however, limit options in terms of seeking employment. Job seekers should research individual apprenticeships to find out if they are federally or state approved (or both or neither). Federally-approved programs are listed on the Department of Labor apprenticeship programs website (www.dol.gov/apprenticeship), and a list of California's state-approved programs are available through the Department of Industrial Relations (www.dir.ca.gov/das).

There are six programs that focus on the electrical aspects of Clean Energy. One program is the Inside Wireman Apprenticeship program which is offered at the San Diego Electrical Training Center through the International Brotherhood of Electrical Workers 569 (IBEW 569). Another is the National Electrical Contractors Association (NECA) which requires apprentices to receive at least 8,000 hours of hands-on training in the electrical industry. The program provides apprentices with classroom learning through Palomar College and rotates students to various contractors so those enrolled can develop skills for various settings. Similarly, other electrician apprenticeships require 4,800 to 8,000 hours of work experience and up to 480 hours of classroom training over a three- to five-year period. All of these training programs equip apprentices with the in-depth knowledge of electrical installation in commercial, industrial and residential settings and prepares them for employment as electricians in the Clean Energy sector.

There are five apprenticeship programs in Clean Energy that focus on HVAC. Sheet metal apprentices must complete 6,500 hours of on-the-job training hours and four years of classroom instruction to become a journeyman in their field. All of these apprenticeship programs train skilled apprentices to make, install and maintain HVAC systems, duct systems, roofs, skylights and many other building products needed by companies in the Clean Energy sector.

Both operation and maintenance apprenticeship programs are offered through San Diego City College. These programs combine classroom learning and require the completion of an apprenticeship through a union association to receive either a certificate of achievement or an associate degree. Through the apprenticeship, individuals attain practical industry knowledge designed to supplement the instructional curriculum.

There are four plumbing apprenticeship programs for the Clean Energy sector in San Diego County. One program is the Associated Builders and Contractors Apprenticeship Training Trust in partnership with San Diego City College which offers a Plumbing Apprenticeship Program and a Pipefitting Apprenticeship Program. Apprentices in both programs must complete over 7,000 on-the-job training hours and four to five years of classroom instruction. These programs train apprentices with the necessary skills to install and repair plumbing and piping systems used in a variety of construction environments.

One manufacturing apprenticeship (also included as part of the Advanced Manufacturing section of this study) is provided through the Solar Turbines Apprenticeship program. Participants learn about industry-specific practices through hands-on training in order to successfully transition from apprentices to

journeymen. Apprentices also take relevant courses at San Diego City College. Students who complete both elements can receive a certificate of achievement.

Recommendations

Although there are initiatives to address some of the challenges discussed in the 2014 Clean Energy report, there are some recommendations that still need attention, particularly those centered around skill development for Clean Energy workers.

Address the need for strong soft skills

Soft skills are just as important as technical skills for Clean Energy careers. Soft skills include timeliness, problem-solving, professionalism and communication. These skills are especially important due to the rigorous acceptance process for apprenticeship programs. Many apprenticeships have a waitlist and an extensive interview process. Prospective trainees have to pass an interview where these communication skills will be critical for acceptance into the program. Soft skills can be developed through work experience or pre-apprenticeship programs such as YouthBuild. YouthBuild programs provide opportunities for low-income youth to learn construction skills through building affordable housing, schools, playgrounds and community centers in their neighborhoods.[16]

Address the need for adaptable, transferable skills

As technology advances, workers must able to adapt accordingly and upgrade their technical knowledge and skills. Trainers and educators need to focus instruction on adaptable and transferable skills. Transferable skills can be used across various companies and industries. Educators can prepare job seekers for apprenticeships by developing their basic knowledge of tools and measurements in addition to soft skills. Specialized training for a specific skill set is most effective when it is a modification of an existing program that builds foundational, adaptable skills. For instance, during the Great Recession (2007-2009) the American Recovery and Reinvestment Act invested funds specifically to train job seekers in solar panel installation. However, these specialized training programs did not provide job seekers with any foundational knowledge, skills or abilities specific to the construction industry in general. While solar installation skills are in demand, companies need individuals that can do more than simply install solar panels.

Address the need to upskill incumbent workers

The 2014 report found that a significant portion of construction workers have remained unemployed since the Great Recession (2007-2009) or have dropped out of the labor force. Construction workers with past experience, but have not been recently working, may not have skills that match current industry requirements. Employers hiring for Clean Energy positions need employees with work experience and relevant skills. Training and education programs need to outreach to incumbent workers or job seekers with experience in the construction industry and provide them with upskilling in current technologies. This will

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[16] youthbuild.org

help decrease the supply gap by developing a talent pipeline of professionals with experience and relevant training.

Address the need for training and education programs to result in professional licensures

According to the surveys conducted in 2014, the majority of Clean Energy employers prefer workers who hold licenses or certifications. Training and education programs should focus on preparing students for industry-recognized credentials. The Clean Energy sector is known for industry standardizations and certifications. For example, Leadership in Energy and Environmental Design (LEED) is a well-known certification that recognizes green buildings with best practices and strategies for energy efficiency. These standardizations provide validation as to how relevant an individual or project is with current trends.

Health Care

Sector Overview

The Health Care sector is comprised of ambulatory health care services, hospitals and nursing, and long-term care. Health Care has the largest employment numbers of the five Priority Sectors. There are approximately 6,500 Health Care companies employing more than 100,000 workers in San Diego County.[17] The profile of Health Care companies differs from a typical San Diego company – only 45 percent of companies have less than 10 employees, while 14 percent employ over 100 workers. From 2015 to 2019 alone there is a projected growth of 13 percent (or 13,500 jobs).

The 2014 Health Care report analyzed twelve occupations:

- Registered nurses
- Medical laboratory technicians
- Licensed vocational nurses
- Health care social workers
- Nursing assistants
- Clinical laboratory scientists
- Medical assistants
- Respiratory therapists
- Home health aides
- Physician assistants
- Medical coders
- Occupational therapy assistants

This study includes workforce initiatives related to these occupations and initiatives that specifically target workforce issues in Health Care.

Workforce Initiatives Overview

The 2014 Health Care study identified recent challenges employers face in developing their workforce to accommodate an influx and variation of customer needs. With an aging population that requires more care and increase in insurance coverage, Health Care companies need to increase their employment numbers. Of the employers surveyed in the 2014 report, 57 percent reported having moderate to serious shortage of qualified job applicants.[18] One-fifth of the existing workforce is 55 years or older. The Health Care employment demand is expected to significantly increase as incumbent workers reach retirement age. To respond to these challenges, the following recommendations were made for San Diego County's workforce and education systems:[19]
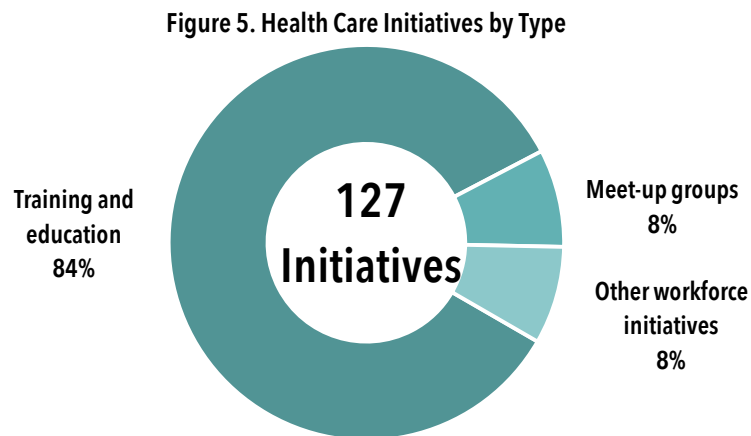
- Close the supply gap

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[17] SDICCCA, SDWP, COE and Probe Research, Inc. *Health Care: Labor Market Analysis. San Diego County*. October 2014.
[18] SDICCCA, SDWP, COE and Probe Research, Inc. *Health Care: Labor Market Analysis. San Diego County*. October 2014.
[19] SDICCCA, SDWP, COE and Probe Research, Inc. *Health Care: Labor Market Analysis. San Diego County*. October 2014.

- Provide relevant work experience
- Enhance completion rates of existing programs
- Work with employers to ensure training and education programs meet hiring needs
- Address the need for strong soft skills

To understand how well the San Diego region is addressing these recommendations, this study identifies 127 workforce initiatives in San Diego's Health Care sector. The majority of the initiatives consist of training and education programs (Figure 5). Other workforce initiatives include professional development programs to prepare students for industry examinations or job shadowing/mentorship programs to provide hands-on experience.

Figure 5. Health Care Initiatives by Type

Training and education
84%

127 Initiatives

Meet-up groups
8%

Other workforce initiatives
8%

The following sections describe which initiatives align with the aforementioned recommendations and how the region can continue to address workforce challenges in this sector.

Close the supply gap

The 2014 report recognized a strong need to close the supply gap and prepare for future employment demand in Health Care occupations. Training and education programs respond to this need by producing workers for the labor market. Universities and private institutions offer the majority of training and education programs for this sector (Table 3).

Table 3. Training and Education Program Type by Institution

Institution Type	Certificate Programs	Associate Degree	Bachelor's Degree or Higher	Other Programs	Total Programs in San Diego County
Adult Schools	5	0	0	0	5
Community Colleges	8	9	1	0	18
Universities	15	0	18	0	33
Nonprofit	0	0	0	5	5
Private	22	4	18	2	46
TOTAL	50	13	37	7	107

Five of San Diego County's public universities collectively have 33 training and education programs that provide a broad range of accreditations, varying from an outpatient coding certificate to a bachelor's degree in nursing.

San Diego County training and education programs are grouped into seven categories: nursing, nursing assistance, respiratory therapy, occupational therapy, behavioral health, administrative and medical assistance, and other (Figure 6).

Figure 6. Training and Education Programs by Topic
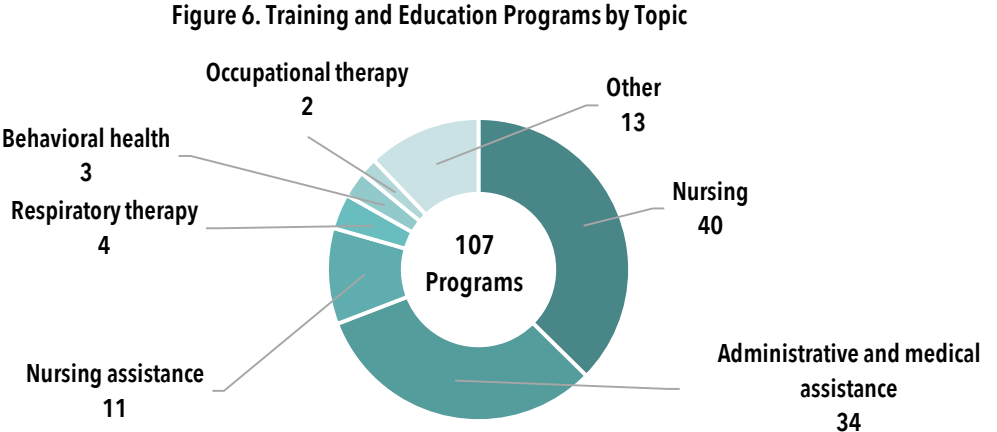
Community colleges commonly offer certificate programs and associate degrees in the Health Care field. However, earlier this year, community colleges started to provide students with the option of transferring credits to a four-year university. In January 2015, Grossmont College announced a partnership with Point Loma Nazarene University (PLNU), allowing students to attain a bachelor's degree in nursing from PLNU by taking classes at Grossmont College. This is an example of how educational institutions in the region are collaborating to produce the supply of workers needed for the industry sector. In the 2014 Health Care report, many employers expressed concern about current nurses who do not have bachelor's degree. A four-year degree will be an industry standard in the next few years yet many nurses still only have an associate degree. PLNU and Grossmont College responded to this need by allowing nurses with their associate degrees to continue their education and obtain bachelor's degrees.

According to the 2014 Health Care report, a significant number of highly-experienced Health Care workers are expected to retire in the near future. Employers are already facing a shortage of nurses and they can expect to lose more nurses due to retirement and other attrition.

There are 40 nursing training and education programs in San Diego County, providing different levels of accreditation. Community colleges and private colleges offer four of these nursing programs that train individuals to become vocational nurses. Completing these programs qualifies students to take the state nursing examination to receive licensure. There are 18 programs at the community colleges, San Diego State University and PLNU that provide technical training for either high school graduates or licensed vocational nurses (LVN) to become registered nurses. Students are eligible to take the state nursing examination upon graduation. Of these 18 programs, 12 award bachelor's degrees in nursing upon program completion.

In addition, 13 programs award master's degrees in nursing, which allow students to specialize in advanced clinical specialties, education or research. The majority of these programs require students to have a

bachelor's degree in nursing. Other programs, such as the University of San Diego, offer a Master's Entry Program in Nursing (MEPN) for individuals without a background in nursing. USD's MEPN program provides students with fundamental knowledge of the field as well as leadership training.[20] A successful graduate of this program is eligible to take the National Licensure Examination to become a licensed registered nurse as well as receive the American Association of Colleges of Nursing Clinical Nurse Leader certification. Three Doctor of Nursing Practice programs in San Diego County prepare students for a career in research and academia.

Administrative and medical assistant occupations are also important for Health Care. There are 34 training and education programs related to this field, including medical billing and coding, general medical assistance, and administration and management. Medical billing and coding programs are primarily offered at vocational schools and community colleges. These occupations compile, process and maintain medical records. According to the 2014 report, medical coders will have to upgrade their skills in order to meet industry standards. Due to the change from the ICD-9 medical coding system to the ICD-10 medical coding system, individuals in these positions will need to ensure they stay current in their training to be relevant in Health Care.

There are also 15 programs in San Diego County that prepare individuals for careers in performing basic laboratory tests and handling instruments in medical settings. The majority of these programs are offered at private colleges and community colleges. There are also 10 programs that focus on administration and management of the Health Care sector, providing curricula on information management, fiscal budgeting, and quality improvement. Of these programs, five award bachelor's degrees or above upon program completion.

There are 11 programs that train individuals to become nursing assistants. These initiatives are offered at adult schools, career colleges and the American Red Cross. Eight of these programs prepare students for careers as nursing assistants and three train students to become home health aides. The majority of programs also provide national examination preparation assistance.

There are four education programs addressing respiratory therapy occupations in San Diego. These programs award associate degrees and are offered at community colleges and private training schools.

There are two training and education programs in San Diego County for occupational therapy. Grossmont College offers an associate degree for occupational therapy assistants that prepares students to pass the National Board of Certification in Occupational Therapy (NBCOT) exam. The University of St. Augustine for Health Sciences offers a two-year Master of Occupational Therapy program and prepares students for the NBCOT licensure exam as well.

There are three programs that offer training in behavioral sciences, with one awarding bachelor's degrees upon program completion. The associate degree program for social work at Cuyamaca College prepares students to transfer into a four-year social work program, as many related careers require at least a bachelor's degree. UC San Diego Extension also offers two certificates in Play Therapy and Alcohol and

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[20] sandiego.edu/nursing/programs/mepn

Drug Abuse Counseling. The play therapy certificate program can also be used to satisfy the instructional requirement of the Association for Play Therapy for individuals to become play therapists.

San Diego County also has 13 other training and education programs for Health Care, ranging from fitness to clinical laboratory research. There are two programs (at California State University San Marcos (CSUSM) and at UCSD Extension), which discuss public health on a domestic and international level. There are also three programs for medical research that result in either a certificate or in a bachelor's degree or above. Other Health Care training and education programs include case management, fitness instruction, lactation consultation, and post-baccalaureate pre-medical programs.

Provide relevant work experience

Employers emphasized the importance of work experience for graduates seeking employment in all 12 occupations highlighted in the 2014 Health Care report. Training and education providers should look at adding an externship or internship component to their curriculum to ensure that students get the on-the-job work experience that employers are looking for when hiring. Twenty-one of the 106 initiatives are externship, mentorship, internship and residency opportunities for students to get additional on-the-job work experience prior to completing their education. One example of an internship is from CSUSM, which requires students to complete an internship for all their nursing programs. Through this program students can enhance their nursing skills in a clinical setting under the direct supervision of a clinical professional. This equips students with the relevant work experience many employers seek and allows them to apply classroom knowledge to a real world setting.

Recommendations

While the aforementioned initiatives align with the recommendations provided in the 2014 Health Care report, the following recommendations still need the region's attention.

Enhance the completion rates of existing programs

There are training and education programs throughout the county with low completion rates. Training and education programs should work to understand why completion rates are low (e.g., students drop out because they get jobs). Understanding the problem will help these programs identify a solution. This may include increasing the capacity of regional programs to increase the number of certified nursing assistants, home health aides, medical laboratory technicians, clinical laboratory scientists and physician assistants.

Work with employers to ensure training and education programs meet hiring needs

Over half of Health Care employers reported experiencing difficulty in hiring workers in the 2014 report, primarily for medical assistants. Employers indicated that while there is a surplus of medical assistants graduating from various programs, many of these programs do not provide the right training or the work experience needed for the profession. In other words, some training and education programs are not providing curricula that meets employers' needs. Whether or not the programs result in professional certifications, educators and trainers should work with employers to ensure that their programs are meeting employers' expectations.

Address the need for strong soft skills

Employers reported a shortage of candidates with the soft skills necessary in today's Health Care environments. Training and education programs should incorporate soft skills such as teamwork, time management, customer service, and basic computer literacy skills into their curriculum in order to be most successful. Customer service is increasingly a desired attribute in workers. Workers without the "bedside manner" to treat patients will need to develop those soft skills in order to remain competitive in the labor force. Hospitals are now competing on customer service for patients looking to change Health Care providers.

Information and Communication Technologies

Sector Overview

The Information and Communication Technologies (ICT) sector has outpaced growth compared to other sectors from 2004 to 2014. There are over 47,000 workers in this sector. From 2015 to 2019, the projected job growth is six percent (or 2,969 jobs).[21] This sector is diverse, crossing multiple industries from computer and electronic product manufacturing to management of companies and enterprises. The 2014 ICT report identified four occupational clusters:

- Multimedia and design
- Analysis
- Technical and software development
- Network and support

Analysts manage and assess the effectiveness of projects. Network & support positions assist users and maintain technological systems within an organization. Technical & software development positions engineer and build new computer programs or services. Multimedia & design professionals graphically create visually appealing and user-friendly experiences.

This study includes workforce initiatives related to these occupations and initiatives that specifically target workforce issues in ICT.

Workforce Initiatives Overview

The 2014 ICT study identified recent challenges employers face in developing their workforce to accommodate an influx and variation of customer needs. The research found that analysts and technical and software development occupation groups had a slight supply gap. Of the employers surveyed, less than 20 percent of employers reported having challenges hiring qualified job applicants with the required educational experience; however over 45 percent of employers reported having challenges recruiting candidates with relevant work experience.[22]

To respond to these challenges, the following recommendations were made for San Diego County's workforce and education systems:[23]

- Close the supply gap
- Engage K-12 students in the ICT sector
- Provide relevant work experience
- Prepare students for industry-recognized certifications in training and education programs
- Address the need for strong soft skills

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[21] Economic Modeling Specialists, Int'l. 2015.
[22] SDICCCA, SDWP, COE and BW Research. *Information and Communication Technologies: Labor Market Analysis. San Diego County.* October 2014.
[23] SDICCCA, SDWP, COE and BW Research. *Information and Communication Technologies: Labor Market Analysis. San Diego County.* October 2014.

To understand how well the San Diego region is addressing these recommendations, this study identifies 129 workforce initiatives in San Diego's ICT sector. These primarily consist of training and education programs, some meet-ups, and one other workforce initiative (Figure 7).
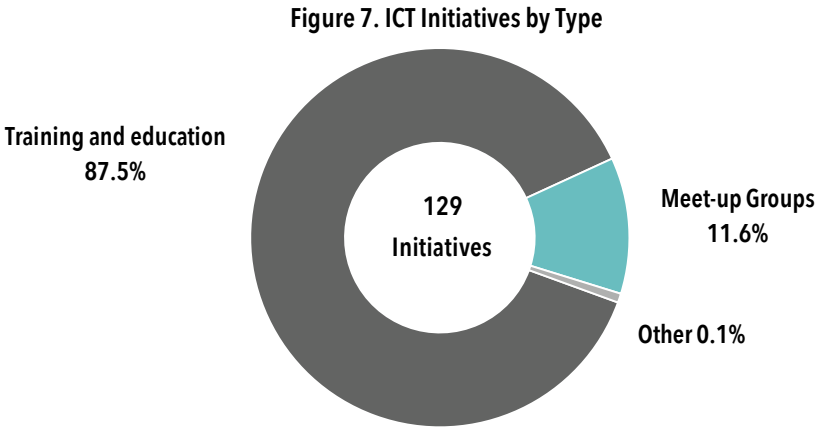
Figure 7. ICT Initiatives by Type

Training and education 87.5%

129 Initiatives

Meet-up Groups 11.6%

Other 0.1%

The following sections describe which initiatives are aligned with the aforementioned recommendations and how well the region is equipped to address workforce challenges in this sector.

Close the supply gap

The 2014 report recognized a strong need to close the supply gap and prepare for future employment demand in ICT occupations. Approximately 87.5 percent of the ICT initiatives are training and education programs (112 programs). Training and education programs respond to this need by producing workers for the labor market. Forty-three percent of the training and education programs that exist are offered at the community college level, followed by 41 percent from private institutions, and 12 percent at the university level (Table 4). Sixty-two percent of the programs lead to an associate degree or higher, while 26 percent lead to a certificate upon completion.

Table 4: Training & Education Program Type by Institution

Institution Type	Certificate Programs	Associate Degree	Bachelor's Degree or higher	Other Programs	Total Programs in San Diego County
High School District	0	0	0	2	2
Community Colleges	26	22	0	0	48
Universities	3	0	10	1	14
Nonprofits	0	0	0	2	2
Private	0	10	28	8	46
TOTAL	29	32	38	13	112

San Diego County training and education programs are in five categories: technical and software development, network and support, multimedia and design, computer systems analysis, and other programs

(Figure 8).[24] The technical and software development programs account for 36 percent of the programs in San Diego County and multimedia and design programs constitute approximately 34 percent.

Figure 8. ICT Training and Education Programs by Topic
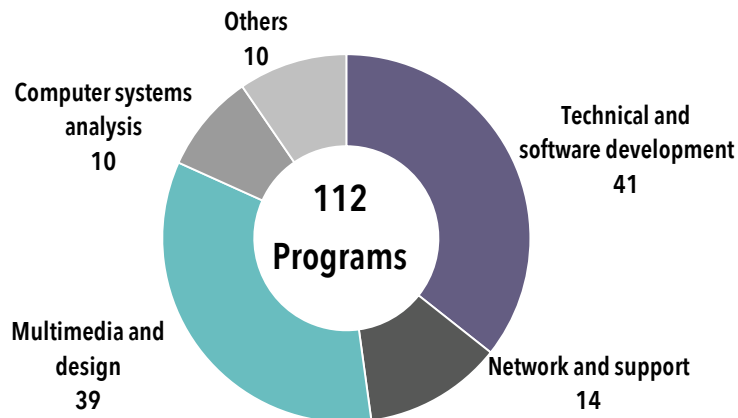
There is a slight undersupply of technical and software development workers such as computer programmers, software developers–applications and software developers–systems software. The programs that serve the technical and software development include training in computer science, computer programming, software development, and information systems. Of the 41 programs in technical and software development, 12 teach students the foundation of computer science theory and application. There are an additional seven master's degree and/or doctoral programs available for those who wish to further develop relevant industry knowledge and skills. There are eight initiatives that train students in computer programming and three that teach how to utilize computer science to design and develop software and mobile applications.

The Multimedia and Design occupation group has an oversupply of graduates in the region.[25] There are 39 multimedia and design training programs in San Diego County. These programs teach students about web development, graphic design, and multimedia design and are offered primarily at community colleges, technical schools and four-year institutions. Some programs, such as the Certificate of Proficiency in Video Game Artist, also train students for specialized fields. Of the 39 programs, 14 award certificates and 13 offer associate degrees. There are an additional 12 bachelor's degree programs available in San Diego County.

Fourteen training and education programs provide opportunities for network and support positions. These occupations range from computer network support specialists to database administrators. Of these programs, six offer students diplomas or certificates and seven award associate degrees. The majority of these programs are available at community colleges and private institutions. Coleman University offers students a bachelor's degree in Network or Cybersecurity and equips students with technical expertise to meet numerous industry demands.

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[24] The total number of training and education programs is 112; however, a few programs fall into multiple categories, and are therefore counted twice, meaning the number of programs listed will add up to more than 112.
[25] SDICCCA, SDWP, COE and BW Research Partnership, Inc. *Information and Communication Technologies: Labor Market Analysis. San Diego County.* October 2014.

The Analysts occupation group has a slight undersupply in the region. There are 10 computer systems analysis programs that are offered at community colleges and four-year institutions. There are two programs that award students associate degrees and four that award bachelor's degrees. An additional four master's-level training and education programs help individuals with relevant foundational knowledge further their expertise.

There are 10 other ICT programs, the majority of which are geared towards students in the K-12 system, including programs that teach coding, computer engineering and robotics. The goal of these types of initiatives is to foster an interest in ICT at an early age. The Youth Coding After-School Club hosted by ThoughtSTEM teaches K-12 students about coding through Minecraft and video game design.

Engage K-12 students in the ICT sector

Getting youth (K-12 students) involved in using ICT knowledge and skill sets is highly recommended. Engaging students in STEM topics in school while relating curriculum to real-world applications can be an incredibly valuable experience. There are 10 programs in the region that focus on getting K-12 students interested in STEM careers with four programs specifically aimed at teaching students ICT skills. ThoughtSTEM offers a number of computer science training courses through after-school programs at certain schools, as well as camps and workshops. By teaching how to code and modify Minecraft, students are introduced to the fundamentals of computer science from an early age. Students who complete these courses are eligible to receive college credit through UCSD's K-12 College Exploration Program. The San Diego Science Alliance also attempts to engage the youth and address San Diego's projected shortage of qualified STEM workers through engineering programs. Students can gain hands-on experience and learn how to program robots, construct and wire remotely-controlled underwater vehicles, and design wind turbines. As the focus on STEM increases, more of these programs are being created to engage students in ICT and other STEM sectors.

Recommendations

While the aforementioned initiatives align with the recommendations provided in the 2014 ICT report, the following recommendations still need the region's attention.

Provide relevant work experience

Forty-five percent of employers reported having challenges recruiting employees with relevant work experience. Giving students hands-on experiences will allow them to demonstrate to employers that they have the practice, knowledge, and capability they seek. Of the programs reviewed, only six had a formal internship component. Training and education programs should encourage (if not require) students to get the relevant work experience through an internship to demonstrate to future employers their ability to work in an office setting. Students can gain valuable experience from troubleshooting, team work, and the ability to apply technical knowledge learned at school to the real world.

Prepare students for industry-recognized certifications in training and education programs

Employers in the ICT sector value specific industry certifications for each occupation. Training and education providers should ensure that they are preparing students in the certifications that employers expect, and that students are properly prepared for the certification exams. Of the ICT training and education programs,

only one mentioned a clear focus on preparing students. This does not mean that other training programs do not prepare students for these certifications; however, it is not at the forefront of their messaging. Job seekers need to understand the importance of taking and passing these industry exams in order to demonstrate their technical competencies and knowledge to employers.

The cost of industry certifications can be a financial burden. During an interview with a staffing agency, one recruiter expressed concern that some job seekers complete educational requirements, but they do not have the financial ability to cover the cost of industry certification exams. Unfortunately, without a certification, recruiters cannot place job seekers with an employer. There is an opportunity to offer subsidies to cover the cost of these exams, which will help job seekers obtain the certifications that they need for employment in ICT.

Address the need for strong soft skills

The technical skills for occupations within the ICT sector are critical for their jobs, but soft skills are just as critical. In ICT, communication, a good attitude and adaptability to change are especially important to be successful in the workplace. This is especially the case as many of the ICT jobs require job seekers to work with non-ICT professionals to troubleshoot problems or create a product. Ensuring that teaching soft skills throughout training and education curricula can facilitate their entry into the ICT workforce.

Life Sciences

Sector Overview

The Life Sciences sector includes professional, scientific and technical industries that involve living organisms. This sector crosses industries, focusing on creating solutions within specific subsectors such as agricultural feedstock and chemicals, drugs and pharmaceuticals, medical devices and equipment, wireless health, research and testing medical laboratories. Employment titles include research associate, medical lab technician, material handler, regulatory affairs specialist, manufacturing technician, lab assistant, and sales representative.

San Diego County has been identified as being one of the top Life Sciences hubs in the nation. There are 1,450 Life Sciences establishments and more than 47,000 workers (3 percent of total workforce in the county).[26] This sector grew by 55 percent between 2005 and 2014,[27] and is projected to grow by more than 9 percent in 2015.[28] In the 2014 Life Sciences report, nine occupations were studied in-depth:

- Lab assistant, technician, or specimen accessioners or processors
- Manufacturing or production technician or assemblers
- Materials handler or supply-chain technicians
- Medical lab technician or clinical lab scientists
- Quality assurance analyst, auditor or specialists
- Quality control associate, assistant or coordinators
- Regulatory affairs specialist or analysts
- Research associate or assistants (preclinical, research and development or clinical)
- Sales representative or business development specialists

This study includes workforce initiatives related to these occupations and initiatives that specifically target workforce issues in Life Sciences.

Workforce Initiatives Overview

The 2014 Life Sciences study identified recent challenges employers face in developing their workforce. Of the employers surveyed, over half indicated at least some difficulty finding qualified job applicants.[29] Contributing to this difficulty, the research found a slight gap in the available supply of entry-level workers to meet the demand of workers within each of these occupations. In addition, 36 percent of online job postings indicate that a bachelor's degree is required–a higher requirement than what is seen nationally.

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[26] Economic Modeling Specialists, Int'l. 2015.
[27] Economic Modeling Specialists, Int'l. 2015.
[28] SDICCCA, SDWP, COE and BW Research. *Life Sciences: Labor Market Analysis. San Diego County.* October 2014.
[29] SDICCCA, SDWP, COE and BW Research. *Life Sciences: Labor Market Analysis. San Diego County.* October 2014.

To respond to these challenges, the following recommendations were made for San Diego County's workforce and education systems: [30]

- Close the skills gap
- Increase opportunities for students to obtain work experience
- Invest resources in professional development to improve employee retention rates
- Emphasize key areas of skill and expertise in training and education programs
- Ensure students have a clear understanding of what working in the Life Sciences sector entails

To understand how well the San Diego region is addressing these recommendations, this study identifies 58 workforce initiatives in San Diego's Life Sciences sector consisting of training and education programs, meet-ups and other workforce initiatives (Figure 9).

Figure 9. Life Sciences Initiatives by Type
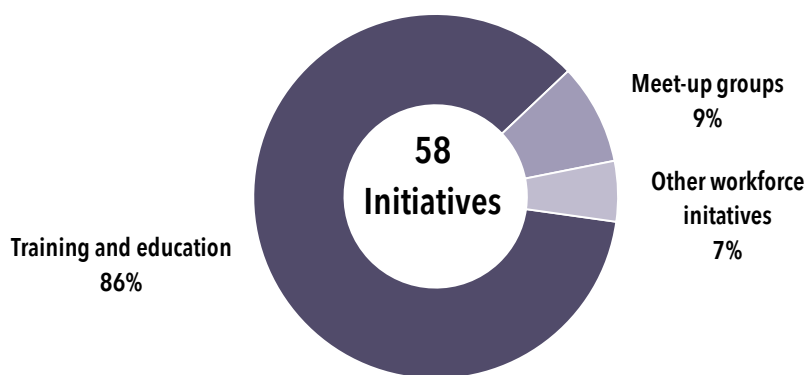
The following sections describe which initiatives are aligned with the aforementioned recommendations and how well the region is equipped to address workforce challenges in this sector.

Close the supply gap

The 2014 report recognized a strong need to close the supply gap and prepare for future employment demand in Life Sciences occupations. Training and education programs respond to this need by producing workers for the labor market. Seventy percent of the training and education programs that exist are offered at the university level, with more than half of these programs offering biology knowledge for Life Sciences occupations. Additional programs have been created by community colleges to give students the biology knowledge and laboratory skills they need for this sector. One association program is available through the San Diego Science Alliance; this program aims to engage women in STEM fields through mentorships and workshops at the high school and college level (Table 5).

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[30] SDICCCA, SDWP, COE and BW Research. *Life Sciences: Labor Market Analysis. San Diego County.* October 2014.

Table 5: Training and Education Program Type by Institution

Institution Type	Certificate Programs	Associate Degree	Bachelor's Degree or Higher	Other Programs	Total Programs in San Diego County
Community Colleges	7	6	1	0	14
Universities	12	0	23	0	35
Industry associations	0	0	0	1	1
TOTAL	19	6	24	1	50

For the purpose of this report, we have grouped training and education programs as teaching five different subjects: biology education, research and development, regulatory compliance, project management and laboratory and technical skills. The following is a breakdown of the Life Sciences training and education programs in San Diego County (Figure 10).[31]

Figure 10: Training and Education Programs by Topic
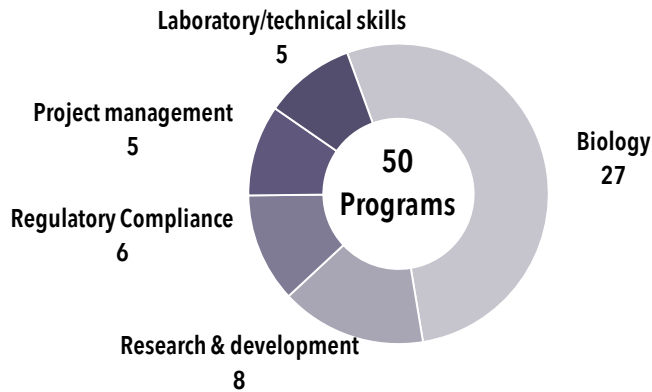
Biology programs account for 54 percent of the region's training and education Life Sciences programs. Although there are many programs focusing on biology, they each have their own focus from biotechnology, applied biology, microbiology, biochemistry, bioengineering to human biology. Community college programs prepare students for entry level lab technician jobs, as well as advancement of students to a university to earn a bachelor's degree.

Research and development programs account for eight of the training and education programs. This occupation group comprises of two higher education degree and six certificate programs. MiraCosta College is in the process of implementing a bachelor's degree in Biomanufacturing to teach students the process of research, development and production in the industry. The programs focus on product discovery and development, clinical trials administration, relevant technology tools, business practices, and reduction of costs, and boosting productivity in laboratories.

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[31] Note: some programs may be counted twice as they have multiple components to their programs; therefore the total may add up to more than 50 programs.

Regulatory compliance occupations are also important for Life Sciences. There are seven programs in San Diego that focus on educating students about federal regulations or clinical regulations relevant to the Life Sciences sector. Of these programs, three are graduate courses and four are certificates.

The project management programs include five training and education programs. The initiatives result in certificates and are offered through UCSD Extension. There are more project management programs throughout the County, however, UCSD programs specifically focus on project management in the Life Sciences sector.

There are four programs focusing on laboratory and technical skills, a key component of Life Sciences. Of these programs, three offer certificates and one offers an associate degree. These programs teach individuals about technologies and procedures necessary for the workplace. MiraCosta College and Miramar College have certificates that specifically focus on teaching these skill sets. Miramar College offers an associate in Science degree in Medical Laboratory Technology. Two of these four programs prepare students for the national examinations to become Medical Laboratory Technicians.

Increase opportunities for students to obtain work experience

One major deficiency in this sector is that the majority of students that graduate with a bachelor's degree quickly realize that they need practical work experience. Employers reported the biggest limitation was hiring individuals with experience. This is especially important for a sector that has a hands-off approach in supervising employees.

Individuals wanting to enter the Life Sciences sector should have practical hands-on experience to enter the workforce. They can do this by completing higher education degrees then gaining the hands-on experience through certificate programs or by completing internships. Work experience is especially important to show employers that job seekers have experience working in a lab. As a supplement to work experience, there are programs that give students the laboratory skills needed to enter the workforce. Programs like Miramar College's Applied Biotechnology certificate provide students with intensive laboratory skills for entry level employment. MiraCosta College has a Certificate in Proficiency in Laboratory Skills that teaches students proper protocol and behavior for working in a laboratory. UCSD Extension has a Clinical Trials Administration Intensive Program certificate that provides students with hands-on work experience.

Although there are no formal internship or apprenticeship programs within this sector, there are programs that have a mentorship component. These programs are geared towards young women in high school interested in STEM and for veterans looking to transition into a career in Life Sciences. There are two workforce initiatives in San Diego that focus on providing assistance to veterans seeking employment in the Life Sciences. The Veteran Career Mentoring Program at the Biocom Institute is a prime example of such. This program pairs veterans with industry professionals who have successfully transitioned from the military to a career in the Life Sciences. Veterans can use this opportunity to learn more about the industry, determine if it is a good fit, and network with professionals. Similarly, the MedTech & BioTech Veterans Program also offers support to transitioning military veterans through industry related training, job skills, and mentorship. Creating additional opportunities for individuals entering the workforce to gain real work experience would be of incredible value.

Emphasize key areas of skill and expertise in training and education programs

Emphasis on key areas of skills and expertise such as quality control, bio-informatics, bio-engineering, and other specific fields can give students a critical advantage to continue growth in the Life Sciences sector. There are 19 training and education programs that have a specialized focus; from a Bachelor's of Science in Bioengineering to a Quality Assurance and Control Certificate. These programs are available at MiraCosta College, National University, Southwestern College and UCSD.

Recommendations

While the aforementioned initiatives align with the recommendations provided the 2014 Life Sciences report, the following recommendations still need the region's attention.

Ensure students have a clear understanding of what working in the Life Sciences sector entails

Most firms recruit for specific projects for a limited term (three to five years). These positions usually do not turn into full-time work. Advancement and promotion within this sector is rare (even within large companies). For individuals to advance, they need to be willing to move companies and/or positions, and attain additional education.

Training and education providers should make sure that their students are aware of the work style in the Life Sciences sector. Because the Life Sciences sector is dependent on the newest technology, the skill sets and knowledge required by a specific company are in a constant state of flux. When companies need to hire someone with a specific skill set and competencies, they rely on Contract Research Organizations (CROs) to find employees on a project-by-project basis. One individual estimated that half to two-thirds of the Life Sciences workforce comes from CROs. Because this sector is so complicated, there is the concept, design, engineering, manufacturing, and regulatory processes that often come into play. Many businesses are moving to a different model that's similar to the defense industry that has multiple contractors.

Invest resources in professional development to improve employee retention

Life Sciences employers emphasized having challenges and difficulty retaining experienced employees. Employers should invest resources into provisional development and offer opportunities for advancement in order to improve employee retention. These opportunities apply to CROs as well, as many of them work on retaining their employees to have a workforce they can rely on.

It is worth noting that some employers we spoke with mentioned that their firms do not worry about retention efforts as their workforce tends to circulate. They expect that their employees will leave for another company to acquire new skills and eventually they will come back. Well-qualified individuals are constantly recruited by other companies and are often moving to acquire new skill sets and knowledge.

Conclusion and Overall Recommendations

The 2014 reports identified a supply gap in each Priority Sector where there were not enough workers to meet employers' job demands. Training and education programs have been identified as initiatives that can produce workers to close the supply gap, but the gap continues to grow in the region due to two main issues. First, training and education programs that are not aligned with employer needs cannot prepare workers adequately for the labor market. Second, as workers retire and leave the labor market, their positions need to be filled with newer workers. Without a dedicated supply of talent, particularly in K–12 education, employers will continue to find difficulty in hiring qualified workers. Employers stressed the need to engage tomorrow's workforce by strengthening local K-12 STEM education. Students can relate curriculum and real world application of STEM topics and can learn how to translate their enthusiasm into future careers. More initiatives could be developed to introduce students to potential careers and to foster interest through STEM education at an early age.

Additionally, while many initiatives identified in this study do tackle workforce challenges in each Priority Sector, job seekers, educators and workforce development professionals still need to be aware that the need for strong soft skills, industry-recognized certifications, and relevant work experience remains strong no many how many initiatives take root in San Diego County.

Address the need for strong soft skills

The 2014 Clean Energy, Health Care and ICT reports identified the need to focus on developing stronger soft skills among the workforce. While technical and specialized training is critical for success in said sectors, the majority of employers reported a shortage of candidates with the necessary soft skills to succeed in the workplace. Training and education programs in the region should incorporate soft skills, such as communication and time management, into their curriculum to better equip employees for the workforce and help them stand out.

Prepare students for industry-recognized certifications in training and education programs

Advanced Manufacturing, Clean Energy, and ICT emphasized the importance of preparing individuals for professional licensures to better secure employment in these three sectors. Training and education initiatives should develop programs to thoroughly prepare students for licensure and certification examinations. This will allow students to understand the significance of certifications, accumulate credentials, and demonstrate their technical knowledge.

Include relevant work experience in training and education programs

All five Priority Sectors highlighted the need for more relevant work experience among job applicants. While many technical education programs incorporate hands-on training during class, employers increasingly value students that have practical work experience. For example, employers in Life Sciences reported that the greatest obstacle was hiring individuals with experience, especially in a sector that has a hands-off approach in supervising employees. Training and education initiatives in San Diego County should incorporate an externship/internship component to their curriculum or encourage students to attain relevant work experience. This will undoubtedly help job applicants become more competitive candidates and will also alleviate the hiring challenges many employers face today.

Appendix A: Methodology

The research design utilized both qualitative and quantitative approaches to identify workforce initiatives as well as the workforce needs for each sector. The research study relied on a combination of online data mining, secondary research, semi-structured interviews, focus groups, surveys and quantitative analysis to elucidate major phases of research described below.

(1) Defining a Workforce Initiative

In the first phase of the project, UCSD Extension worked with SDWP to define the type of workforce initiatives that the research team would identify. The definition of a workforce initiative (those identified in the database) included incorporating any program, event or opportunity in which job seekers may get training, education, apprenticeship, mentorship or exposure to careers in one of the Priority Sectors. To help job seekers distinguish the different types of programs, the type of program was identified as being an education/training program, apprenticeship, meet-up group, or other workforce (e.g., career exposure or job placement) initiative.

The research team made sure to identify initiatives that are clearly related to the identified Priority Sectors. For example, the Clean Energy sector has several similar training programs as the construction sector. A construction initiative was identified as Clean Energy if it encompassed a green component (energy savings, LEED certification, water savings, renewable component, etc.). If a program did not have a green component it was not identified within the Clean Energy sector initiatives.

(2) Workforce Initiatives Database

The research team constructed a large database of San Diego County workforce initiatives in each Priority Sector. In order to capture all the workforce initiatives that exist in San Diego County, the research team mined online databases, performed web searches, and connected with employers and industry experts in the creation of a comprehensive list of initiatives for each sector. Additionally, the research team reached out to programs or groups identified as a workforce initiative to ensure database data was correct and to collect information on any missing elements.

(3) Qualitative Data from Key Stakeholders

3a. Formed Advisory Councils for Each Sector

In order to capture broader themes across the Priority Sector initiatives, the evaluation team convened an advisory council for each sector to discuss employers' attitudes and perceptions of existing initiatives and workforce needs. The advisory councils consisted of employers, workforce agencies and educational providers that evaluated strength, weaknesses, opportunities and threats in their respective sector.

3b. Interviews

The research team conducted semi-structure interviews with industry employers, workforce agencies, industry associations, and training and educational providers across each sector. Through these interviews, the research team gained insight into the sector's overall health, best practices, opportunities and "pain points."

3c. Surveys

The research team was able to reach out to employers, workforce agencies, and training and education providers identified as having a workforce initiative to complete a short survey to ascertain best practices of initiatives in each sector (and to identify those programs that do not work). The survey was sent through *Qualtrics*. Each survey had a common core of items relating to a) identifying what is needed most to grow and improve each sector, b) what can SDWP or similar organizations do to insert themselves to close the skills gap, c) what key workforce initiatives drive each sector and what makes them work, d) what programs do not work and why not. The first two questions identified above were multiple choices, with the latter two questions allowing respondents to type more qualitative, nuanced responses.

Collectively, the utility of the advisory councils, interviews, and surveys enabled a comprehensive and sophisticated understanding of sector initiatives.

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