

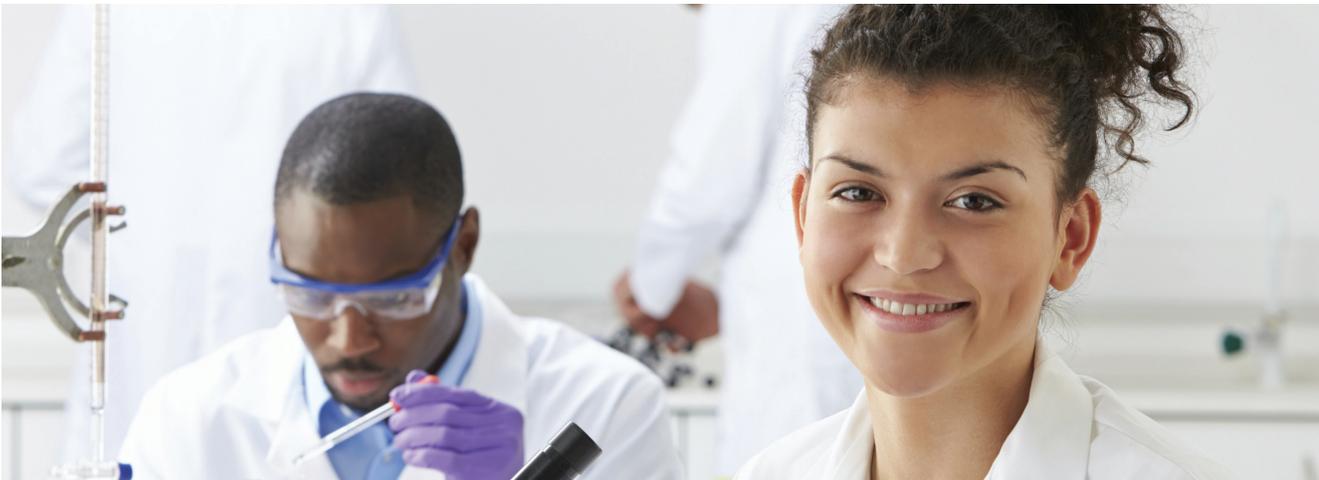
NOVEMBER 2015



SAN DIEGO COUNTY

MIDDLE-SKILL JOBS

Gaps and Opportunities



SAN DIEGO
**WORKFORCE
PARTNERSHIP**[®]

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About Us

San Diego Workforce Partnership

SDWP is the local Workforce Development Board, designated by the City and County of San Diego and governed by a community-led, business-majority board. SDWP's mission is to empower job seekers to meet the current and future workforce needs of employers in San Diego County, by aligning businesses, educators, labor organizations, public agencies and community-based organizations to invest funding and braid resources in programs that provide comprehensive job seeker and employer services. At the nexus where industry, education and economic development systems meet, SDWP facilitates discussion on how the three can work together to create a strong regional workforce. SDWP identifies local skills gaps and steward funding towards program design and innovative workforce development strategies that will close the gap and help thousands of San Diego youth, adults and businesses.

San Diego Regional Economic Development Corporation

EDC supports local companies, implements programs to help retain businesses and advocates for policies that enhance the region's economic competitiveness. EDC leads efforts to bring new investment and new companies to the region. EDC collaborates with industry associations and partners to approach regional issues in a cohesive way. EDC, a nonprofit corporation funded by more than 150 companies and public partners committed to enhancing regional prosperity, markets and highlights the region's incredible talent and quality of life to keep them here. The strength of private sector support enables the organization to provide services free of charge. This network of partners makes EDC effective in spurring job growth across critical sectors within San Diego's economy.

About the Sponsor

JPMorgan Chase & Co.'s Commitment to New Skills at Work

JPMorgan Chase & Co. knows that helping people gain the skills they need to compete in the labor market is a powerful strategy for expanding access to opportunity and promoting economic growth. Around the world, there are signs of renewed economic expansion, yet millions of aspiring workers are unemployed and an unprecedented share of the workforce is underemployed. At the same time, many employers are struggling to fill vacancies — especially for technical and skilled positions — that require more education and training than a high school diploma, but not a four-year college degree. To help address this gap, JPMorgan Chase & Co. developed New Skills at Work, a five-year, \$250 million global initiative to build employer-led talent-development systems. Through New Skills at Work, JPMorgan Chase & Co. is helping to address the lack of data that business, education and policy makers need to help close the skills gap. This report from SDWP and EDC will provide data-driven solutions to address the mismatch between employer needs and the skills of job seekers.

Executive Summary

Despite the gradual economic recovery and growing number of jobs available in San Diego County, employers still have difficulty finding qualified workers to fill highly-technical positions in the region. These jobs are typically defined as “middle-skill” because they require an associate degree or less; however, only skilled labor with extensive training can fill these positions.

The general definition of a middle-skill or **skilled job** is a position that requires at least a high school diploma, but less than a four-year degree. Jobs that fall within this definition are projected to have **more than 20,000 annual job openings between 2015 and 2019**. Additionally, the median hourly wage for these jobs is \$20.20. With over 38 percent of households earning below the self-sufficient wage of \$13.09 per hour and over 80,000 people unemployed each month, San Diego needs to fill these positions and close the skills gap.

Through its New Skills at Work (NSAW) initiative, JPMorgan Chase & Co. supported local research and commissioned the San Diego Regional Economic Development Corporation and the San Diego Workforce Partnership to identify opportunities and challenges in San Diego’s skilled jobs. This study assesses the opportunities and challenges in developing a workforce for skilled jobs, and provides recommendations to address the increasing skills gap through public-private partnerships. The research focuses on three of San Diego’s Priority Sectors: **Advanced Manufacturing, Health Care, and Information and Communication Technologies (ICT)**. These are some of San Diego’s largest growing sectors over the next five to ten years for self-sufficient, skilled jobs.

CHALLENGES

- > Between 2004 and 2014, 16 percent or 350,000 San Diegans ages 25 and older did not have a high school diploma.
- > Educational attainment has remained relatively unchanged since 2004, yet San Diego employers expect more education and technical expertise from the workforce.
- > 42 percent of the adult population is at or nearing retirement. Employers will have difficulty filling the knowledge, skills and abilities (KSA) gaps left by a retiring workforce.
- > Employers consistently report a lack of soft skills, such as communication and problem solving, in workers.

OPPORTUNITIES

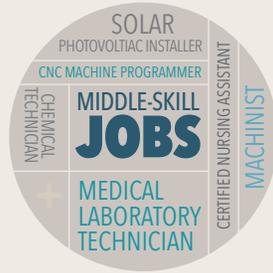
- > Currently, there are 603,535 middle-skill jobs in San Diego, accounting for 37 percent of all employment in San Diego County.
- > 526,759 of these jobs pay the self-sufficient hourly wage of \$13.09 or higher and have opportunities for career advancement.
- > Middle-skill jobs are projected to add more than 24,000 positions over the next five years.
- > Advanced Manufacturing has the largest number of skilled jobs in San Diego and employs 13 percent of San Diego’s workers.
- > Health Care employs more than 100,000 people and is considered “recession-proof.” Health Care grew 11 percent while overall San Diego employment declined 6 percent during the Great Recession (2007–2009).
- > ICT employs more than 42,000 workers and is projected to add 1,600 jobs over the next five years.

RECOMMENDATIONS

- > Industry- or employer-driven curriculum, programs and training will be key in closing the middle-skill jobs gap.
- > The workforce development system will need to focus more on internships and apprenticeships where hands-on training will help develop workers’ knowledge, skills and abilities for middle-skill jobs.
- > Employers would benefit from participating in high school and higher education curriculum development. Past public-private partnerships have been shown to generate workers with strong “foundational skills” such as mathematics, and will increase availability of talent as well as employee retention.
- > Policymakers have the ability to pave the way for more productive collaboration between educators and employers by implementing effective interventions and removing regulatory and legal barriers.

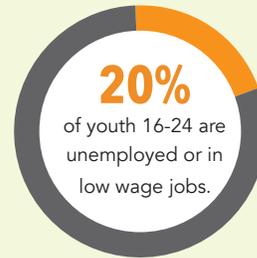
WHAT ARE MIDDLE-SKILL JOBS?

Middle-skill jobs are job opportunities that require an educational attainment of less than a four-year degree, but more training than a high school diploma.



WHAT DOES THE SAN DIEGO SKILLS GAP LOOK LIKE?

Despite growth in middle-skill jobs, 80,000 people remain unemployed each month. The labor force is increasing with a **4%** growth in San Diego's working age population since 2010.



WHY FOCUS ON MIDDLE-SKILL JOBS IN SAN DIEGO COUNTY?

Middle-skill occupations represent **37%** of all jobs in the San Diego region.



Middle-skill jobs are expected to grow **4%**.



603,535 San Diegos are employed in middle-skill jobs.



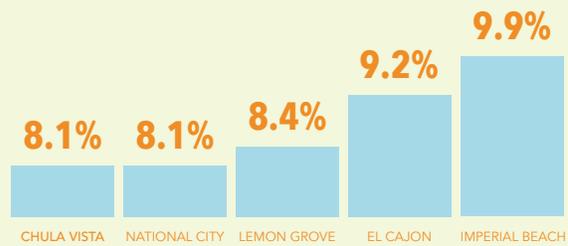
20,565+ middle-skill jobs openings are projected to be available every year through 2019.



The median hourly wage for these workers is **\$20.20** versus the San Diego median hourly living wage of \$13.09.

An estimated **35%** of San Diegos ages 25 and older lack the post-secondary credentials to fill middle-skill job openings.

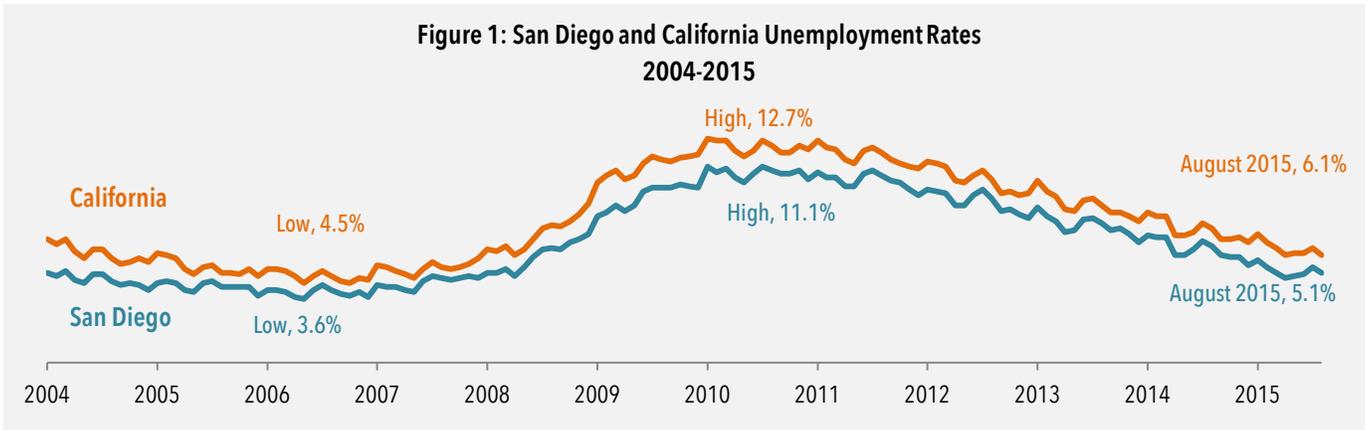
Unemployment rates remain high in San Diego's socioeconomically disadvantaged cities.



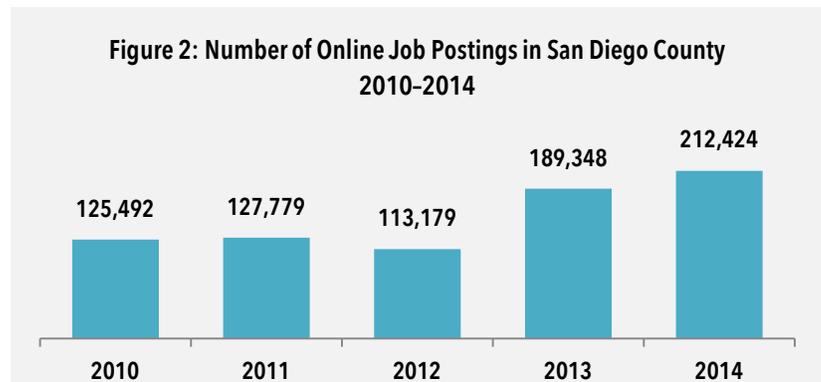
Advanced Manufacturing, Health Care, and Information and Communication Technologies make up **50%** of San Diego's job postings and are expected to grow 10% over the next five years.

Introduction

San Diego employers currently experience significant difficulty finding qualified workers to fill an increasingly large demand for middle-skill labor. Middle-skill jobs require a high school degree and post-secondary or technical training, but not a four-year college degree. At the same time, there are thousands of unemployed and underemployed regional residents who are in need of high-quality jobs, but do not have the appropriate skill sets to meet employers' needs. "Underemployed" are people who are working part-time, but would prefer working full-time or are employed in positions that underutilize their skills. In 2015, the unemployment rate in San Diego County remained above pre-recession (before 2007) levels, hovering between 5 and 6 percent in 2015 with more than 80,000 people unemployed each month (Figure 1).¹



This "skills gap" between the available labor market supply and employer demand for qualified workers threatens San Diego's recovering economy and limits the economic opportunities for millions of San Diegans. The region faces a jobs gap generated by employer demand for skills that are unmet by the current labor market. Unemployment still hovers between 5 and 6 percent despite more than 100,000 jobs being posted online in San Diego County annually between 2010 and 2014 (Figure 2).²



Regional stakeholders agree that it is crucial for San Diego's workforce development system to close the middle-skill jobs gap and ensure that every business in the region has "access to a skilled workforce and every job seeker has access to meaningful employment."³ Through its *New Skills at Work* (NSAW) initiative, JPMorgan Chase & Co. supported local research and commissioned the EDC and SDWP to identify opportunities and challenges in San Diego's middle-skill economy.

This study focuses on three of San Diego's Priority Sectors with the greatest employment growth in skilled jobs: Advanced Manufacturing, Health Care and ICT.⁴ It concludes with detailed recommendations for public-private partnerships that will produce a qualified labor supply to meet employer demand for skilled jobs.

¹ California Employment Development Department (EDD). March 2015.

² Labor Insight/Jobs. Burning Glass Technologies. Number of online job postings. San Diego County. 2010-2014.

³ workforce.org/mission

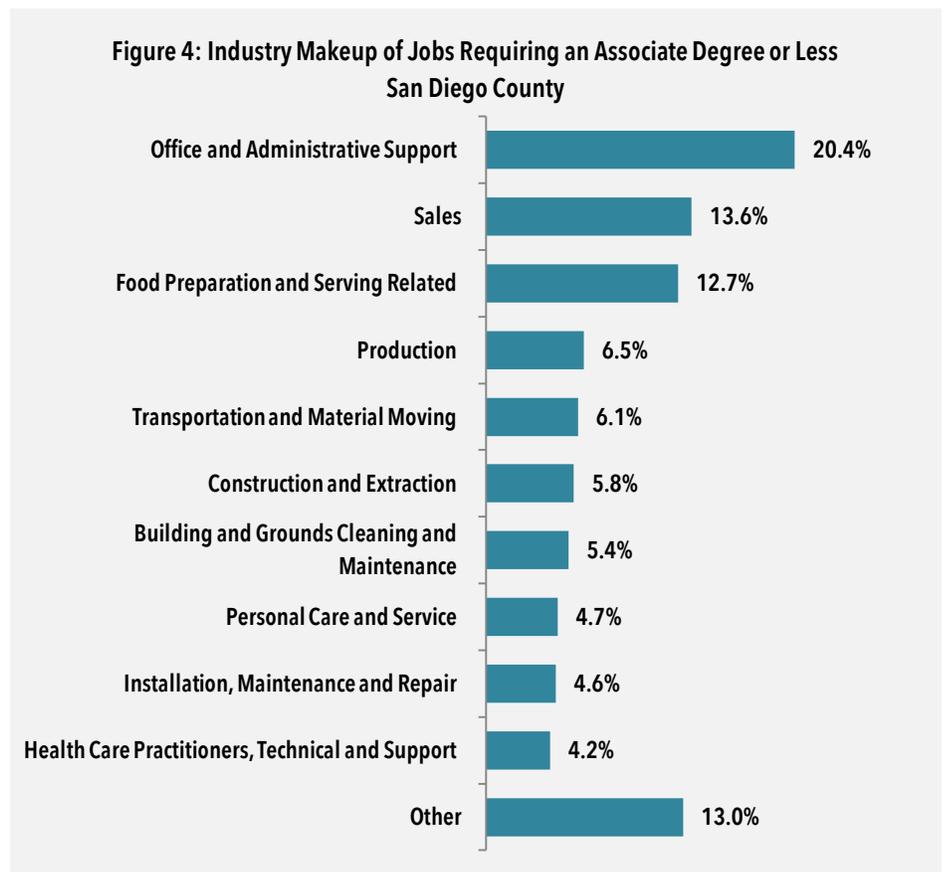
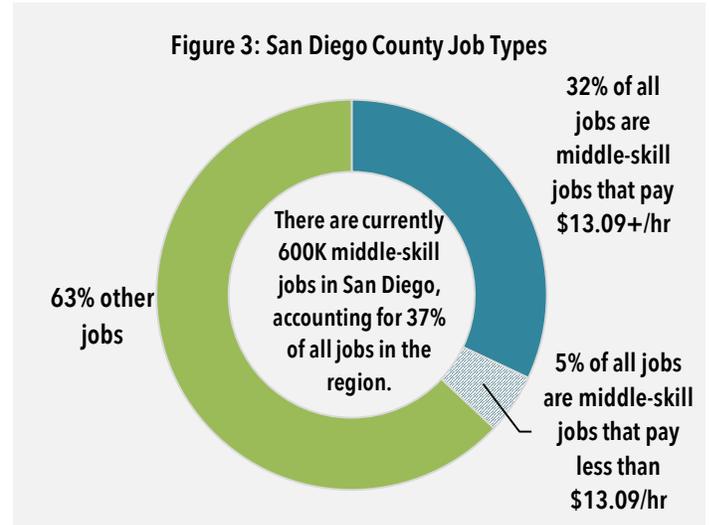
⁴ San Diego's Priority Sectors include Advanced Manufacturing, Life Sciences, Health Care, Clean Energy, and Information and Communication Technologies.

Overview of San Diego County's Middle-Skill Economy

Middle-skill jobs comprise the largest segment of the San Diego labor market, with 37 percent of all jobs requiring more than a high school diploma but less than an associate degree. These middle-skill jobs are projected to increase by more than 24,000 positions over the next five years — a growth rate of 4 percent.⁵ However, San Diego's economy faces challenges of income disparity. Earnings are inconsistent, paying anywhere from minimum wage to very high wages. The Self-Sufficiency Standard indicates that San Diego residents must make at least \$13.09 per hour to live independently, without public or private assistance.⁶ Middle-skill jobs that pay more than \$13.09 per hour make up 32 percent of all jobs in the region (Figure 3).⁷

Considering San Diego's tourist destination appeal, it is not surprising that one of the top three industries with jobs requiring an associate degree or less is food preparation and serving (Figure 4). However, many food preparation and serving-related occupations do not pay wages that allow employees to live self-sufficiently in San Diego. Instead, the median wage for these jobs is \$9.95 an hour.⁸

Of the 603,535 middle-skill jobs currently in San Diego, 526,759 of them pay the self-sufficient wage and have opportunities for career advancement.⁹ To target skilled jobs that are growing and pay a self-sufficient wage, this study focuses on San Diego's Advanced Manufacturing, Health Care and ICT sectors.



⁵ Economic Modeling Specialists, International (EMSI). November 2015. Numbers reflect the most recent year (2014) in which data is available.

⁶ Self-Sufficiency Standard developed by Insight Center for Community Economic Development and adopted for San Diego by Center on Policy Initiatives: onlinecpi.org/making_ends_meet.

⁷ EMSI. November 2015.

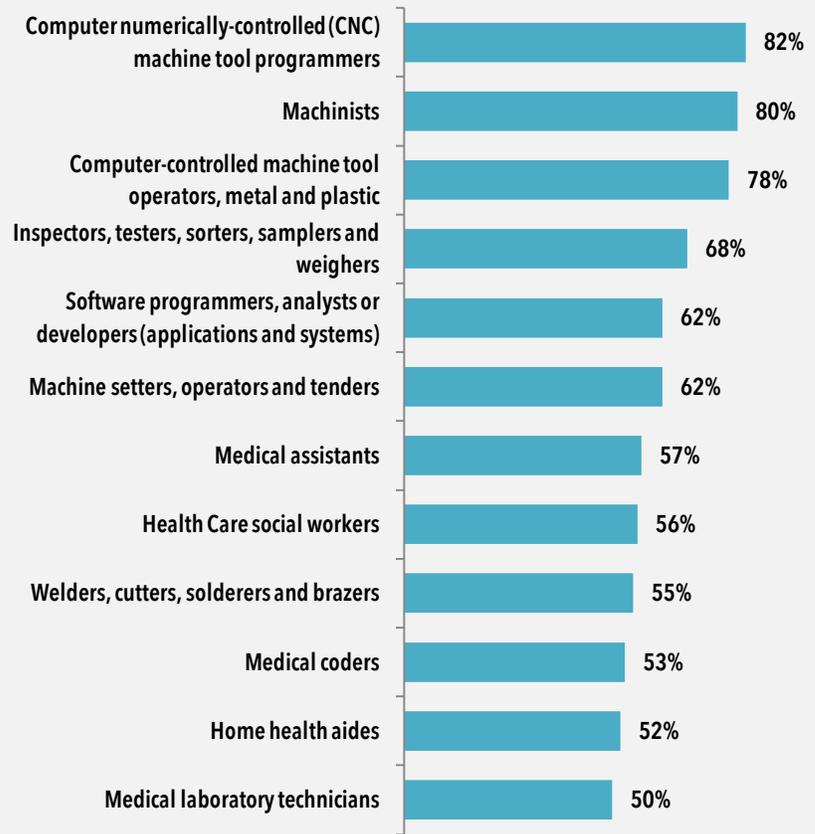
⁸ EMSI. January 2015.

⁹ Insight Center for Community Economic Development. January 2015.

Challenges

Although there are opportunities for skilled jobs in San Diego, recent studies reveal that San Diego’s employers have difficulty hiring qualified workers for their job openings (Figure 5).¹⁰ One method for determining whether the region is adequately supplying qualified workers is to identify difficulty in filling specific occupations. Hiring difficulties indicate that the region is not producing enough workers who possess the requisite skill sets for these occupations or, alternatively, that qualified workers are unaware of the opportunities available to them. In fact, employers indicated that more than 800 jobs were left unfilled in San Diego for machinists and welders in 2014, and reported that this trend will continue until they can find workers with the appropriate skills.¹¹ In addition to these issues, limited educational attainment, disparities in unemployment, a retiring workforce, declining soft skills, and information gaps all present challenges in filling San Diego’s skills gap.

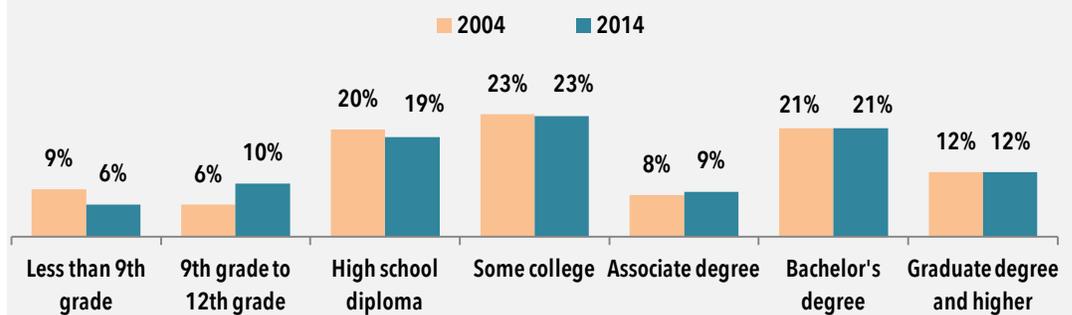
Figure 5: Percent of Employers with Difficulty Hiring Workers by Occupation



Limited Educational Attainment

While the number of San Diego workers with a bachelor’s degree or higher remained stable between 2004 and 2014, more than 350,000 people ages 25 and above (16.4 percent of the population) currently do not have a high school diploma — a 1 percent increase from 2004.

Figure 6: Highest Level of Educational Attainment in San Diego (Percentage of Adult Population, Ages 25+)



Additionally, the region will need more workers for the 45,000+ middle-skill jobs projected to be added each year over the next five years, requiring an associate degree or less; however, only 9 percent of people have an associate

¹⁰ San Diego and Imperial Counties Community Colleges Association (SDICCCA), SDWP, Centers of Excellence (COE). October 2014.

¹¹ SDICCCA, SDWP and COE. October 2014.

degree (Figure 6).¹² Educational attainment has remained relatively unchanged since 2004, yet San Diego employers expect higher levels of education and more technical expertise from the workforce.¹³

Disparities in Unemployment Rates

Overall economic growth has not improved the persistent disparities in unemployment rates among cities and neighborhoods in San Diego County (Figure 7).¹⁴

Additionally, the unemployment rate remains significantly higher for minority populations in San Diego County, with the Native Hawaiian/Pacific Islander and the Black/African American populations seeing the highest unemployment rates (Figure 8).¹⁵ The Hispanic/Latino population, the largest minority group in San Diego County, also has a significantly higher unemployment rate than the general population (5.1 percent in August 2015).

Youth (ages 16–24) have the highest unemployment rates of any age group in San Diego County (Figure 9).¹⁶ Internships or employment not only allows youth to learn about self-sufficiency and finances, but also to apply classroom knowledge to real-world situations that will occur in adulthood. Valuable soft skills that employers find lacking in the younger generation can be gained through work experience. These skills include written and oral communication, critical thinking, problem-solving, teamwork and time management.

Figure 7: Unemployment Rates by San Diego Cities, 2014

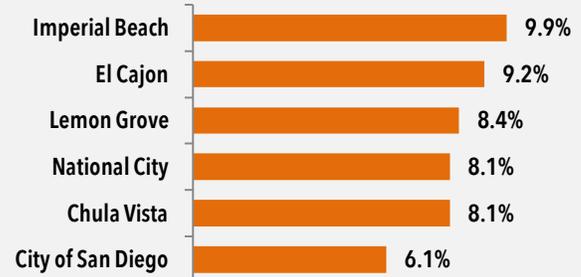


Figure 8: Unemployment Rates by Ethnicity

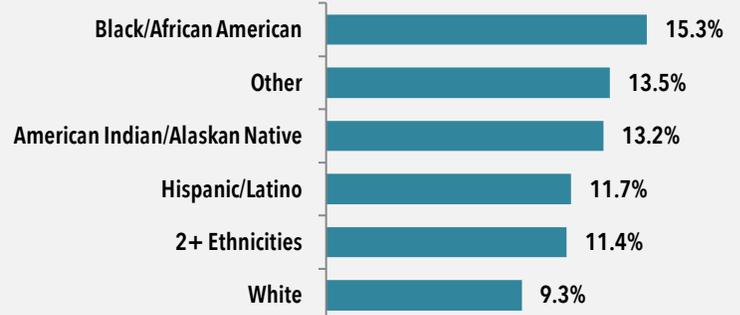
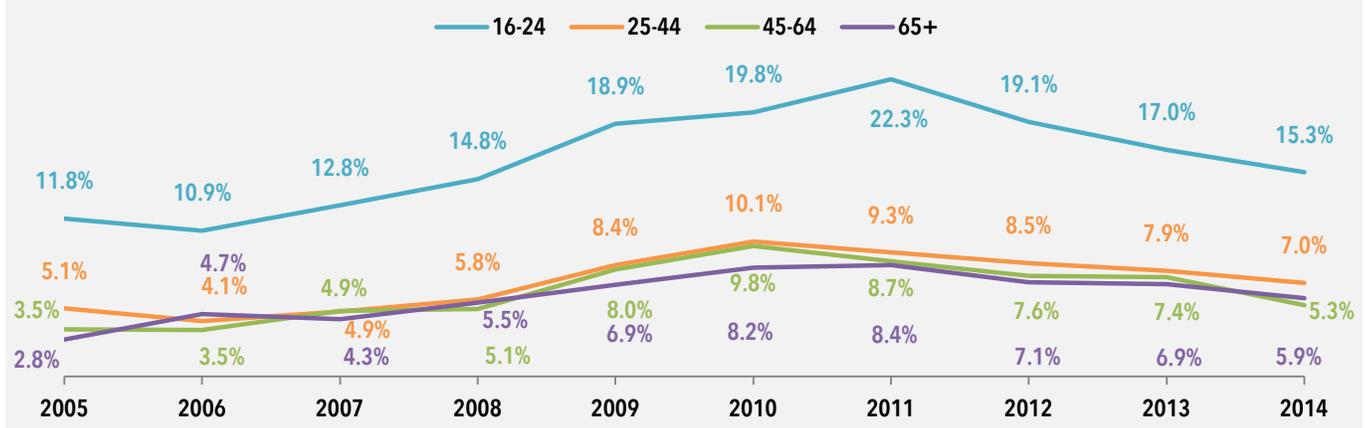


Figure 9: Unemployment Rate by Age



¹² EMSI. January 2015.

¹³ U.S. Census Bureau. American Census Survey (ACS). January 2015.

¹⁴ EDD. Labor Market Data. San Diego County and Census Designated Places. 2014.

¹⁵ Unemployment rates for ethnic populations come from the U.S. Census Bureau. ACS. 5-Year Estimates. 2013. San Diego County unemployment rate comes from the EDD. August 2015.

¹⁶ U.S. Census Bureau. ACS. 1-Year Estimates. September 2015.

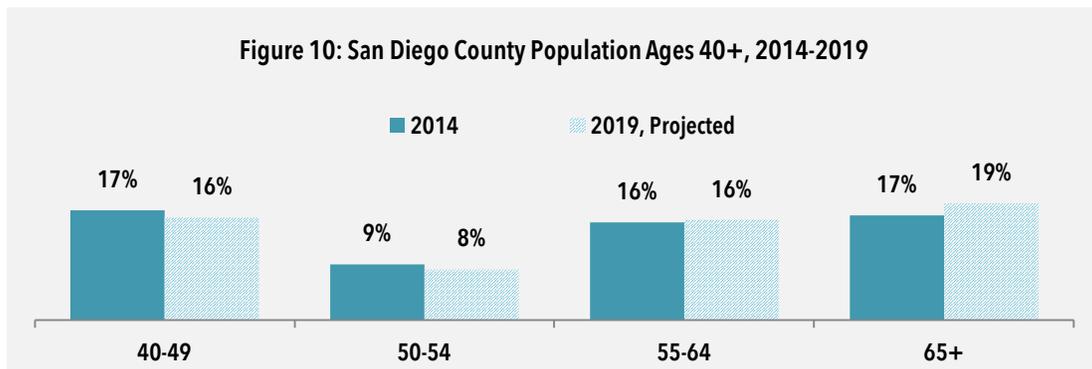
Youth Unemployment

The unemployment rate for youth (ages 16–24) in San Diego County is much higher than that of any other age group. This is significant because developing a talent pipeline of skilled workers is vital for the region’s economy. The San Diego Workforce Partnership’s CONNECT2Careers¹ (C2C) summer youth internship program helps address this gap. C2C targets San Diego’s ongoing skills gap by providing work experiences that prepare young adults for in-demand jobs. By aligning the career aspirations and educational backgrounds of young adults with businesses committed to developing our emerging workforce, C2C creates a positive experience for both employers and youth. In 2014, C2C successfully placed 334 youth into summer jobs with 176 employers.

¹c2csd.org

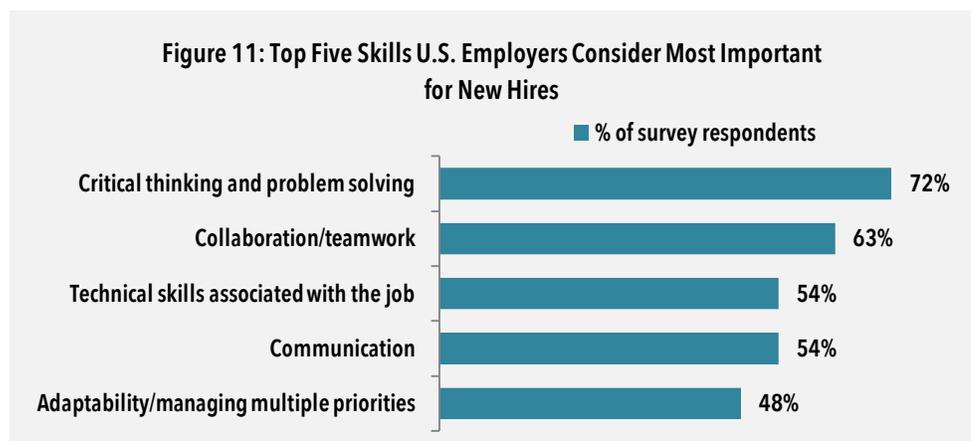
Retiring Workforce

People ages 65 and older in San Diego increased from 17 percent to 19 percent between 2014 and 2019 (Figure 10).¹⁷ As longevity increases in San Diego, this trend is expected to continue over the next 15 years, with a 30 percent surge in the elderly population.¹⁸ As the working-age population retires, the knowledge, skills and abilities (KSA) and institutional knowledge developed over the years leave the workforce with them. Employers will have difficulty filling the KSA gaps left by a retiring workforce.



Soft Skills Deficit

Employers across San Diego overwhelmingly reported having difficulty in hiring workers with soft skills.¹⁹ This “soft skills deficit” is not unique to the region. Employers across the U.S. report that job applicants lack critical thinking, teamwork, adaptability, effective communication and problem-solving skills (Figure 11).²⁰ Similarly, approximately 72 percent of San Diego employers



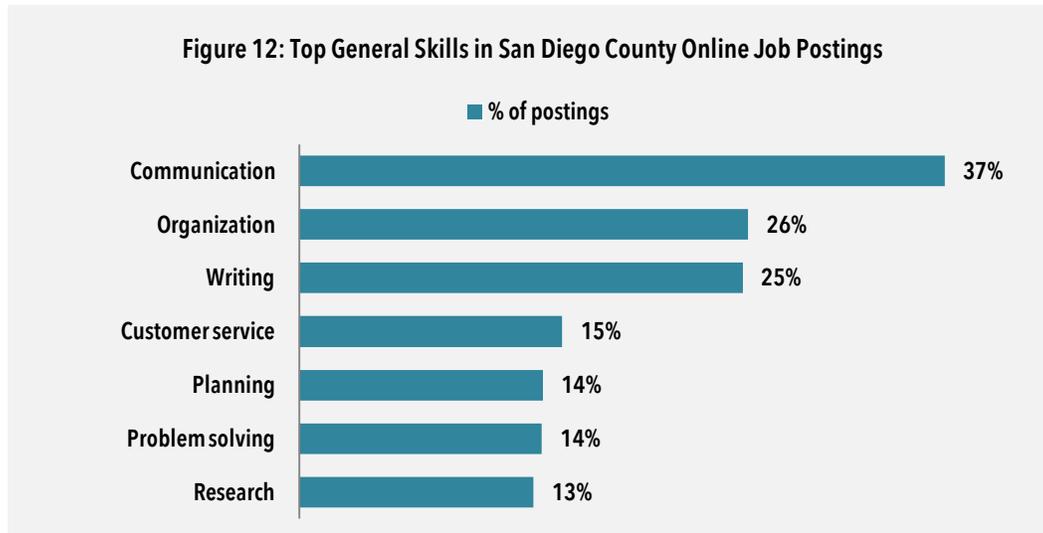
¹⁷ EMSI. January 2015. 2014 is the most recent year of population data available.

¹⁸ kpbs.org/news/2014/jan/29/san-diego-county-not-ready-aging-population-jacob-

¹⁹ SDICCCA, SDWP and COE. October 2014.

²⁰ Adopted from The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

indicated challenges in hiring new applicants with critical thinking and problem-solving skills, and more than 50 percent had difficulty finding applicants who satisfied the employers' requirements for written and oral communication skills.²¹ Additionally, in 768,222 job announcements posted online in San Diego between 2010 and 2014, employers explicitly listed *communication* (37 percent of postings) and *organization* (26 percent of postings) as desired skills (Figure 12).²²



Information Gaps

Local training providers may be unable to address specific skills needed by employers due to a lack of information and communication between educational institutions and industry. Without a strong connection to industry, training curriculum cannot be accurately developed to meet employers' standards. Additionally, students and job seekers are often unaware of how their education and career choices may impact their long-term job growth potential.²³ Employers may request advanced degrees in a job posting without necessarily requiring them, leading many students to obtain unnecessary education. This is a key problem for schools that were set up to emphasize college-readiness without focusing on career-readiness.²⁴

²¹ SDICCCA, SDWP and COE. October 2014.

²² Labor Insight/Jobs. Burning Glass Technologies. Number of online job postings. San Diego County. 2010-2014.

²³ Joshua Write. "Rethinking Blue-Collar Jobs: USA TODAY Explores a 'New Middle' with EMSI Data." EMSI. 2014.

²⁴ "Bridge the Gap: Rebuilding America's Middle Skills." Accenture, Burning Glass, Harvard Business School. 2014.

Opportunities in Skilled Jobs

San Diego is driven by a high-tech economy that requires a skilled workforce in all jobs. Employers increasingly need workers with specialized, technical training in positions that do not require a four-year degree. While these positions are typically considered “middle-skilled” due to educational requirements at or below an associate degree, these jobs actually require highly technical skills, making them higher-paying, “skilled jobs.”

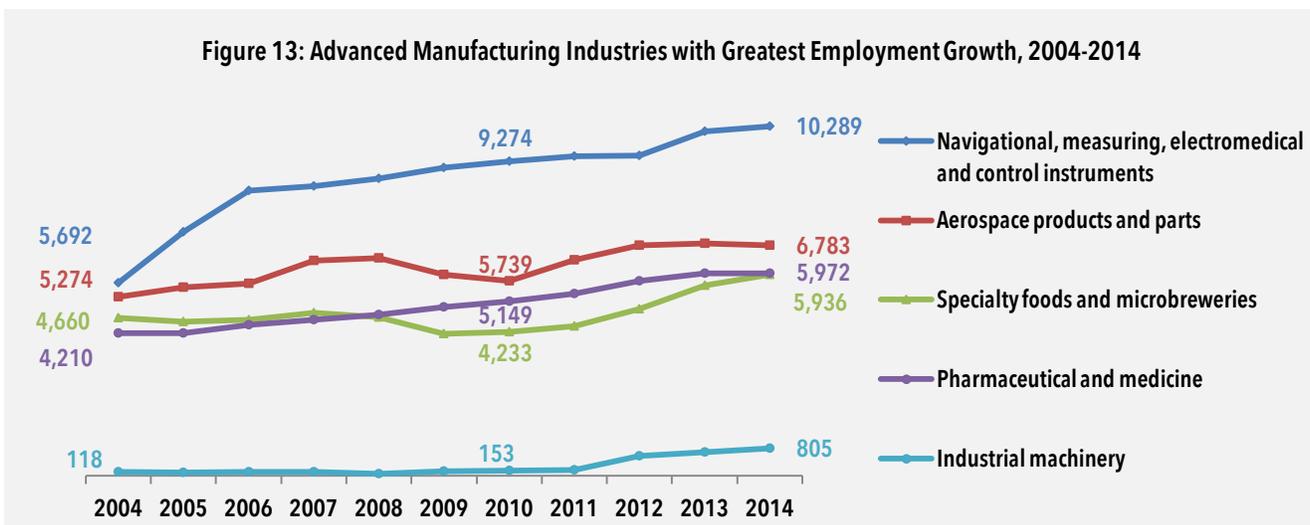
Advanced Manufacturing

The Advanced Manufacturing sector is a new way of producing goods with an emphasis on customization and scalability using advanced technologies for industries such as maritime, robotics, aerospace, biotechnology, sports and more.²⁵ This sector has the most number of high-paying middle-skill jobs in San Diego’s economy and employs 198,258 workers, which equates to 13 percent of all employment in San Diego.²⁶ In 2012, the sector accounted for 10 percent of all establishments, 15 percent of all paid employment and 22 percent (\$13 billion) of annual payroll in San Diego County.²⁷ Advanced Manufacturing’s gross regional product (GRP) amounted to nearly 23 percent of the San Diego’s GRP annually between 2007 and 2012.²⁸ The sector is projected to add 8,944 jobs to San Diego between 2014 and 2019 (5 percent growth),²⁹ and will continue to grow due to federal, state and local government initiatives.

Manufacturing jobs that were traditionally considered to be dirty, dark and dangerous are now associated with robotics, computers, innovative technologies and new materials. Advanced Manufacturing jobs require skills developed from both classroom learning and on-the-job training. The number of traditional manufacturing jobs is declining, while those that use advanced technologies for production are growing. The top five manufacturing industries that added employment to San Diego between 2010 and 2014 are:

- Navigational, measuring, electromedical and control instruments (11 percent growth)
- Aerospace products and parts (18 percent growth)
- Specialty foods and microbreweries (40 percent growth)
- Pharmaceutical and medicine (16 percent growth)
- Industrial machinery (427 percent growth)³⁰

Figure 13 indicates the growth of these industries within the Advanced Manufacturing sector over the past 10 years.



²⁵ SDICCCA, SDWP and COE, San Diego East County Economic Development Council and University of California, San Diego Extension. *Advanced Manufacturing: Labor Market Analysis. San Diego County.* October 2014.

²⁶ EMSI. January 2015.

²⁷ censtats.census.gov/cgi-bin/msanaic/msasect.pl

²⁸ U.S. Bureau of Economic Analysis, Regional Data: Gross Regional Product and Personal Income. October 2014.

²⁹ EMSI. January 2015.

³⁰ EMSI. January 2015.

The U.S. Bureau of Labor Statistics (BLS) projects that Advanced Manufacturing will grow 5 percent in employment by 2019; however, economic projections underrepresent the significant number of jobs developed by recent market trends and government investments. On average, a typical occupation in the Advanced Manufacturing sector earns a median wage of \$28.30 per hour.³¹ Median hourly earnings can range anywhere from \$19.32 for machinists to \$28.14 for CNC machine tool programmers, with both occupations requiring just a high school diploma (Table 1). While the occupations listed in Table 1 typically require a high school diploma, job seekers who also have relevant on-the-job or technical training are more competitive to employers.

Table 1: Advanced Manufacturing Skilled Jobs

Occupation	2014 Jobs	Average Annual Job Openings	Median Hourly Earnings	Typical Entry Level Education	Typical On-the-Job Training (OJT)
Machinists	4,423	130	\$19.32	High school diploma or equivalent	Long-term OJT
Industrial machinery mechanics	1,312	72	\$25.82	High school diploma or equivalent	Long-term OJT
Computer-controlled machine tool operators, metal and plastic	1,039	41	\$19.92	High school diploma or equivalent	Moderate OJT
Aircraft structure, surfaces, rigging and systems assemblers	808	32	\$31.38	High school diploma or equivalent	Moderate OJT
Computer numerically-controlled (CNC) machine tool programmers, metal and plastic	252	13	\$28.14	High school diploma or equivalent	Long-term OJT

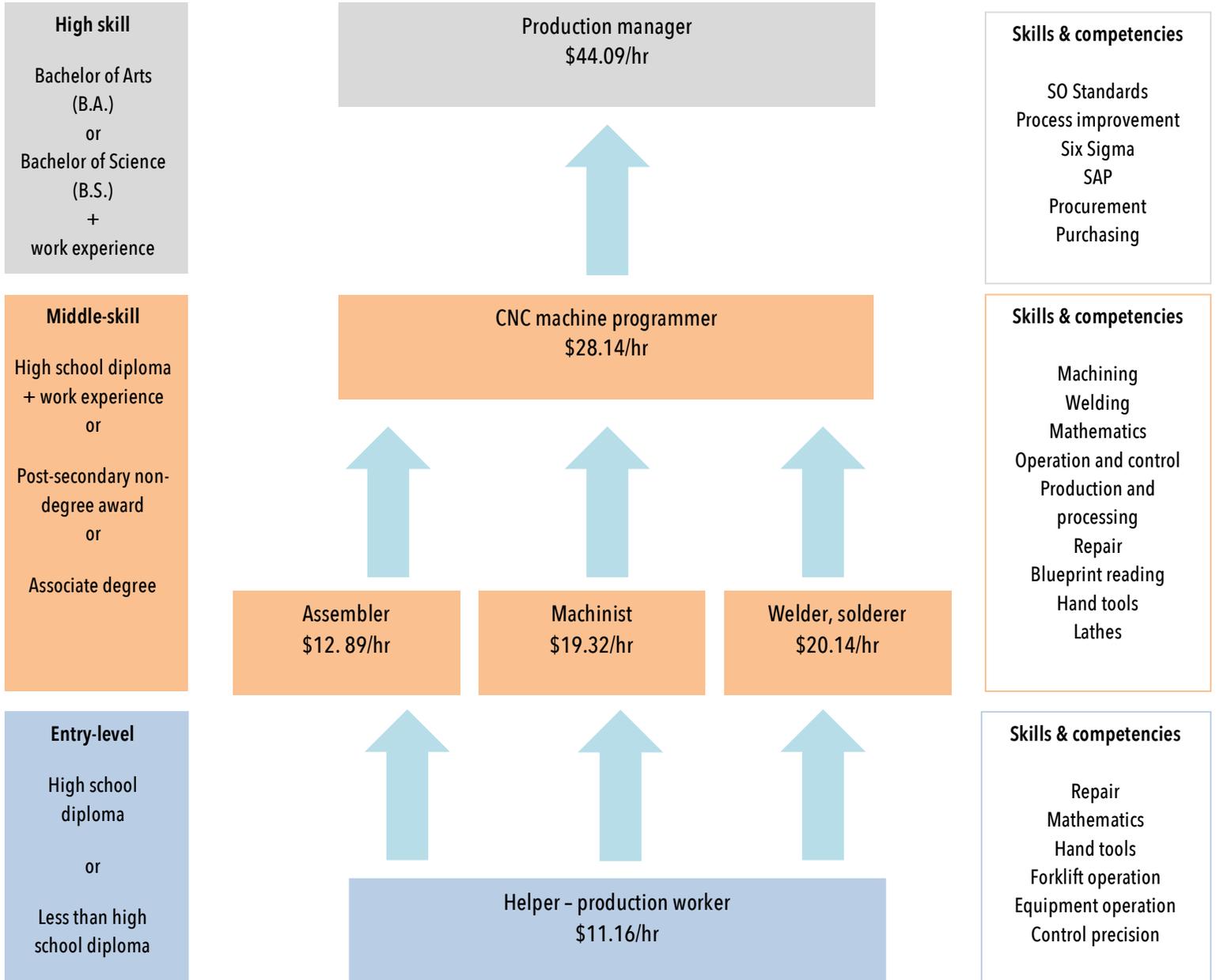
Career Pathways

Clear ladders of progression from entry-level to middle-skill jobs (and more advanced positions) exist in Advanced Manufacturing, Health Care, and Information and Communication Technologies. In the following sections, career pathways or career ladders are available for select occupations in each industry sector. Industry partnerships can adapt the model by identifying the priority position, mapping the progressive vertical steps of responsibility and salary, and aligning each step with any required certifications or credentials. With career pathways, employers can articulate the trajectory for career advancement, translate the career progression to education and training providers, and communicate these opportunities to job seekers to inform them of the career possibilities in these sectors.

³¹ EMSI. January 2015.



Advanced Manufacturing Career Pathways



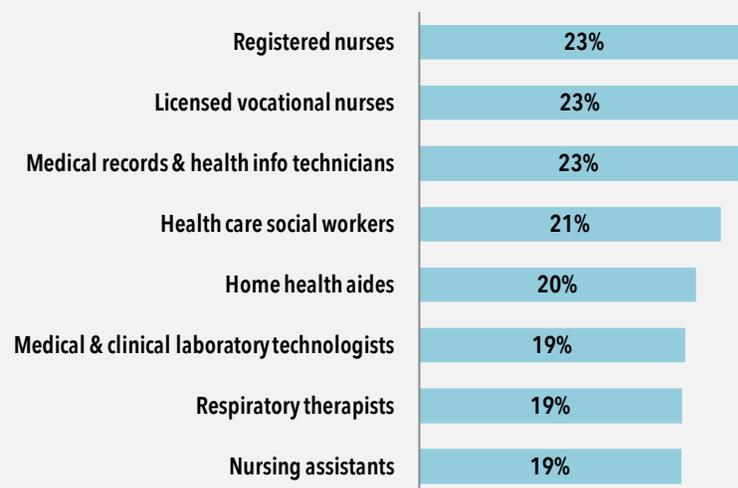
*Wages listed are the reported median hourly wages for San Diego County. Education listed is the reported educational attainment for each type of occupation. (EMSI, January 2015.)

Health Care

Comprising three subsectors (ambulatory health care services, nursing and residential care facilities, and hospitals), the Health Care sector helps diagnose and administer care to the general population. San Diego County houses 6,500 establishments that employ more than 100,000 people in Health Care, providing over \$5.7 billion in wages annually and contributing more than \$9.3 billion to San Diego’s GRP. During the Great Recession, Health Care grew 9 percent (faster than any other sector in San Diego except educational services) while overall San Diego employment declined 6 percent.³² Additionally, the sector is expected to add 15,482 jobs (13 percent) to the region over the next five years.

Similar to other industry sectors, Health Care faces challenges of attrition due to an aging workforce. Employment demand is high and the current workforce is due to retire. Nursing alone is expected to increase 8 percent (2,000 jobs) by 2019 with more than 800 annual openings each year.³³ Overall, 20 percent of workers in key positions in San Diego, such as registered nurses and licensed vocational nurses, are eligible to retire in the near future (Figure 14).³⁴

Figure 14: Percent of Workers in Key Health Care Occupations Age 55+, 2014



As demand for health care services increases, the ability to maintain high-quality care is essential for the region’s economy and requires the development of a competent labor force. Workers must be prepared for in-demand occupations, such as primary care, technical, dental and administrative positions, many of which require an associate degree, post-secondary non-degree or vocational training. Nursing and medical assistants made up the largest number of skilled jobs in 2014 and are expected to add the most number of skilled jobs in San Diego by 2019 (Table 2). Particularly in demand are workers who not only have evidence-based, critical-thinking and technological skills, but also the “human touch” or good “bedside manner” necessary in a service-oriented environment.³⁵

Table 2: Health Care Skilled Jobs

Occupation	2014 Jobs	Average Annual Job Openings	Median Hourly Earnings	Typical Entry Level Education
Nursing assistants	8,912	507	\$13.25	Post-secondary non-degree award
Medical assistants	7,426	313	\$16.62	Post-secondary non-degree award
Licensed vocational nurses	5,474	300	\$23.31	Post-secondary non-degree award
Medical records and health information technicians	1,513	77	\$17.26	Post-secondary non-degree award
Respiratory therapists	910	31	\$30.57	Associate degree

³² sandiegobusiness.org/sites/default/files/Industry_Healthcare.pdf

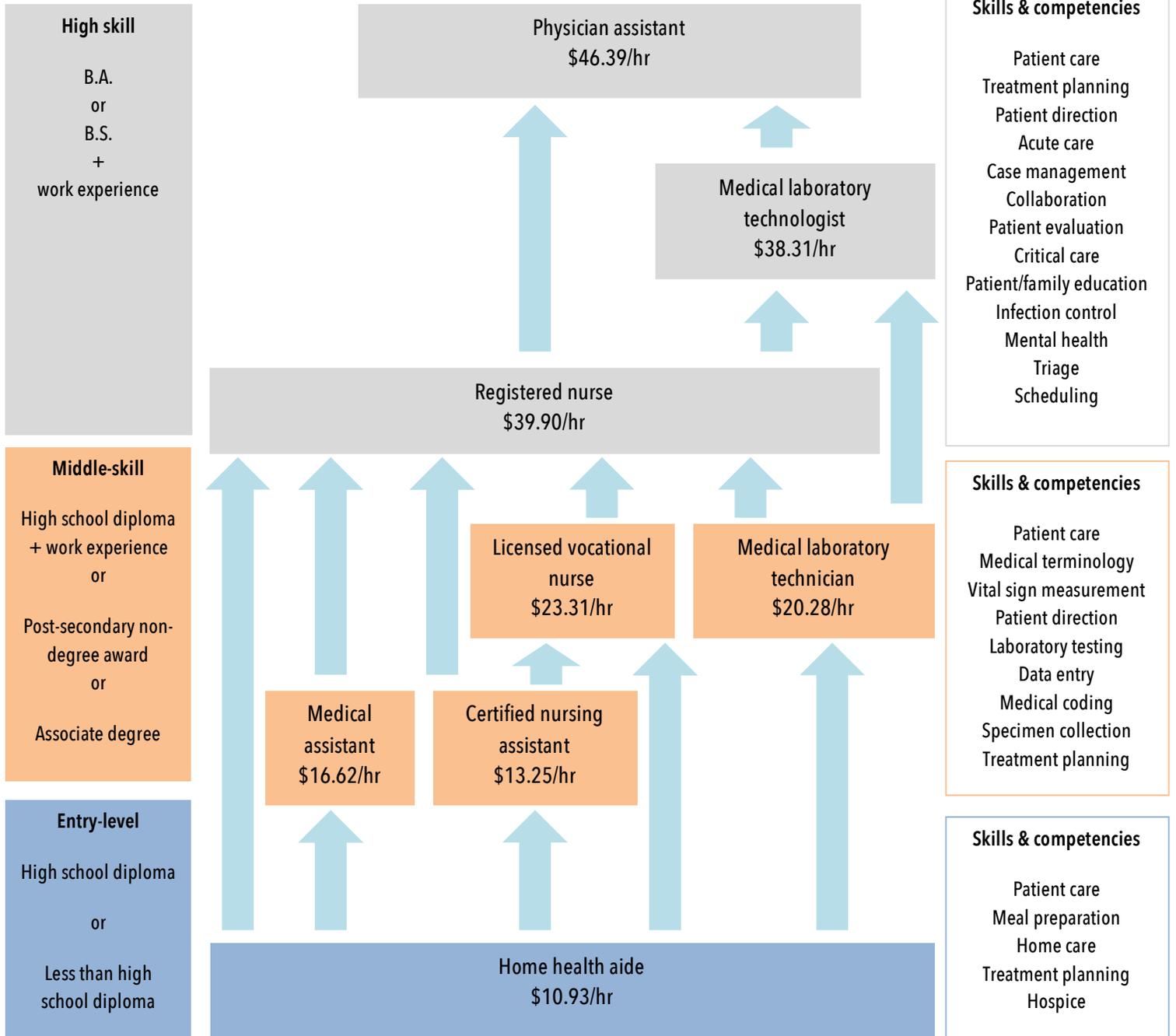
³³ EMSI. January 2015.

³⁴ SDICCCA, SDWP and COE. *Health Care: Labor Market Analysis. San Diego County.* October 2014.

³⁵ coecc.net/documents/dwm_health_sector_CA_12.pdf



Health Care Career Pathways

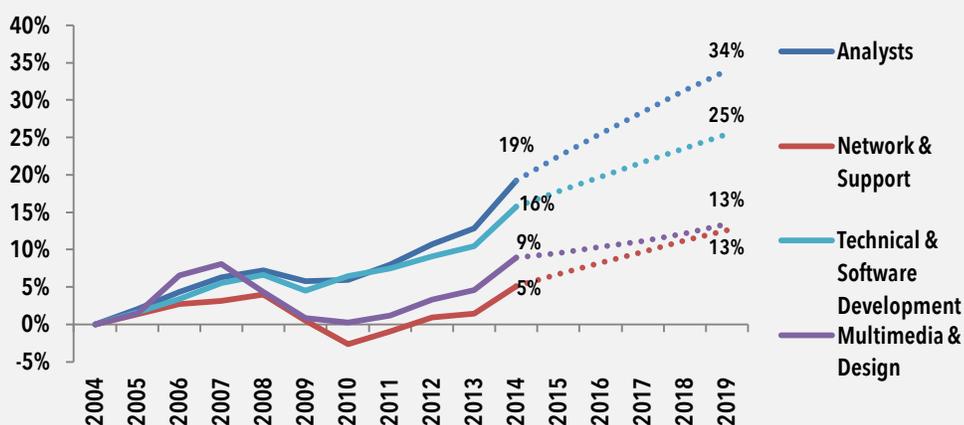


*Wages listed are the reported median hourly wages for San Diego County. Education listed is the reported educational attainment for each type of occupation. (EMSI, January 2015)

Information and Communication Technologies

The Information and Communication Technologies (ICT) sector encompasses computer, software, networking, telecommunications, internet, programming and information system technologies.³⁶ ICT occupations are found across all industries in four overarching segments: analysts, network and support, technical and software development, and multimedia and design. Although ICT employment took a hit during the Great Recession, these occupations are now growing rapidly in San Diego County (Figure 15). For instance, analyst positions grew 16 percent between 2004 and 2014, and are projected to grow 34 percent by 2019. Currently, ICT employs more than 42,000 workers (nearly three percent of all San Diego employment) in high wage positions that work with hardware and software services. Between 2004 and 2014, overall ICT employment grew 9.7 percent, and software alone contributed approximately \$9.8 billion to San Diego's economy.³⁷

Figure 15: Employment Growth Rate by ICT Segment, 2004-2019



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.

ICT has some of the hardest-to-fill jobs. Many applicants may have the required education, but lack the desired technical skills that would make them more effective in the field.³⁸ These technical skills include knowledge of programming languages (e.g., JAVA, SQL, C++), debugging and technical writing, to name a few. More than 50 percent of the region's ICT employers reported having little difficulty in finding workers with the required educational attainment, but more difficulty in finding workers with the necessary technical skills, indicating that there are opportunities for workers to build work experience and meet these employer expectations.³⁹ Table 3 shows the types of skilled ICT occupations in San Diego.

Table 3: ICT Skilled Jobs

Occupation	2014 Jobs	Average Annual Job Openings	Median Hourly Earnings	Typical Entry Level Education	Typical On-the-Job Training (OJT)
Office clerks, general	3,410	1,008	\$13.97	High school diploma or equivalent	Short-term OJT
Computer user support specialists	2,036	265	\$23.19	Some college, no degree	Moderate OJT
Web developers	1,163	97	\$26.50	Associate degree	Short-term OJT
Computer network support specialists	650	56	\$34.31	Associate degree	Short-term OJT
Surveying and mapping technicians	361	15	\$26.04	High school diploma or equivalent	Moderate OJT

³⁶ coeccc.net/documents/dwm_sector_ict_13.pdf

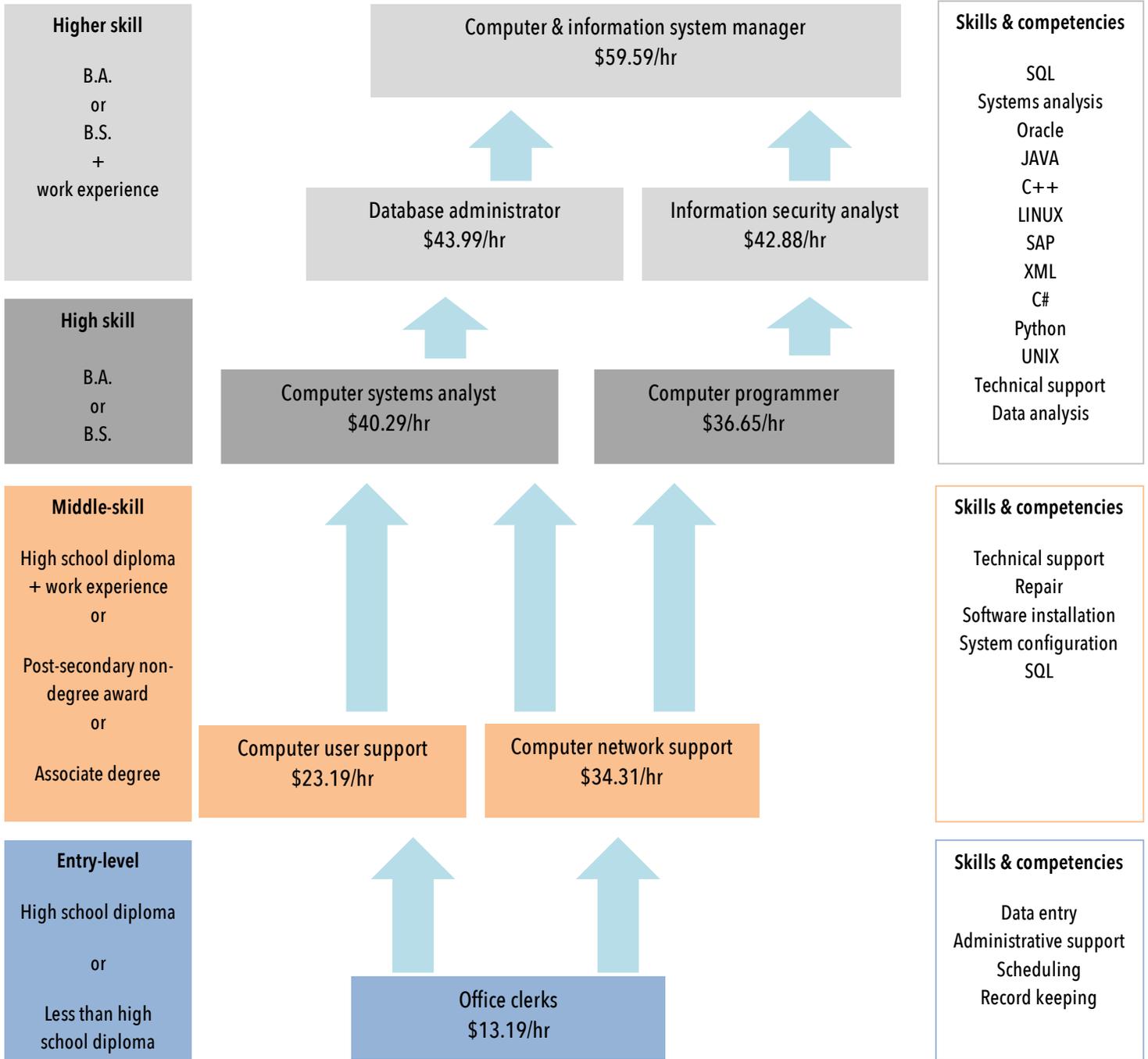
³⁷ sandiegobusiness.org/industry/communications

³⁸ "Bridge the Gap: Rebuilding America's Middle Skills." Accenture, Burning Glass, Harvard Business School. 2014.

³⁹ SDICCCA, SDWP and COE. *Information and Communications Technologies: Labor Market Analysis. San Diego County.* October 2014.



Information and Communication Technologies Career Pathways



*Wages listed are the reported median hourly wages for San Diego County. Education listed is the reported educational attainment for each type of occupation. (EMSI, January 2015)

Conclusion and Recommendations

Jobs requiring less than a four-year degree but more than a high school diploma with technical training in today's labor market are high-paying and highly-skilled professions. The increasing demand for skilled workers creates a gap that the region must work together to close.

All regional stakeholders must recognize that establishing effective, substantial and productive partnerships will take time and effort. Employers, workforce development professionals, educational institutions and policymakers all play a significant role in closing the skilled jobs gap. Based on research, there appears to be a handful of key elements for successful public-private partnerships:

- A local or regional, common challenge that calls for collective action
- Shared mission and goals (clear metrics that determine success for the collaboration)
- Value for all partners
- Strong leadership, particularly at the senior administrative level on all sides
- Shared governance and accountability mechanisms⁴⁰

The common factor across all recommendations below is to develop public-private partnerships with training providers and industry employers. Areas across the nation experiencing skill shortages are currently taking this approach and San Diego would be remiss if the region did not focus on employer-driven initiatives. Industry-driven curriculum, programs and training will be key to closing the skills gap in San Diego and the nation as a whole.

Creating Public-Private Partnerships

Public-private partnerships with industry are key in developing a skilled workforce in San Diego County. ^① As it stands now, the labor market supply does not meet employer demand for required skills. Workforce organizations must directly engage and collaborate with employers to match the skills of the regional labor force to industry needs. Community colleges and other higher educational institutions should be receptive to local businesses seeking to develop effective partnerships which, if successful, could lead to higher student enrollment and quicker job placements for graduates. Starting as early as the 1940s, universities worked with companies to create new programs to develop the scientific and technical talent that was not readily available in the labor market. Weyerhaeuser, one of the world's largest timber and wood-product companies, created a foundation in 1948 to offer fellowships in forestry, chemistry and industrial relations for students at six U.S. universities.⁴¹ These partnerships are key to better aligning curriculum with local employer requirements, which allows educators to better position graduates for valuable careers.

^① Linked Learning Initiative and Task Force on Workforce from JPMorgan Chase & Co.

In 2013, JPMorgan Chase & Co. awarded the Foundation for California Community Colleges¹ (FCCC) a \$1.2M statewide grant to pilot a Linked Learning initiative, developed between FCCC and the Linked Learning Alliance.² Linked Learning transforms education by integrating academics with real-world work experience. Since then, JPMorgan Chase & Co. invested \$250,000 in 2014 for the LaunchPath Work-Based Learning Employer Engagement project,³ an innovative approach in connecting employers, educators and students to help close the skills gap and strengthen the workforce.

In 2015, with the help of its private company partners, FCCC launched its Task Force on Workforce, Job Creation and a Strong Economy. Since its inception, the Task Force released a report with 25 recommendations to prepare more students for existing high value jobs and promote job creation with workforce training in key industry sectors. These recommendations enhance career technical education and workforce training to meet the demands of the economy and the labor market.

¹ foundationccc.org

² linkedlearning.org

³ launchpath.com

⁴ doingwhatmatters.cccco.edu

⁴⁰ The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

⁴¹ The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

Similarly, employers can play a more involved role in the education system. If employers want to obtain workers with the appropriate skill sets, they will want to be involved with curriculum developed in both high school and higher educational institutions. Research has shown that employers have incentives for investing time and resources in education; employers participating in public-private partnerships throughout the nation reported a few advantages:

- Generating workers with strong “foundational skills” such as applied mathematics
- Retaining talent and employee loyalty through employer-sponsored professional development opportunities
- Developing specific skills based on curriculum influenced by the employer
- Increasing productivity due to improved employee skills⁴²

Promoting Regional Collaboration and Sector-Based Strategies for Workforce Development

San Diego is part of a greater regional economy, with various industries conducting business throughout California. San Diego’s institutions cannot develop career pathways or training programs without consulting regional partners across Southern California and the entire state as a whole. Recent developments in San Diego have encouraged sector-based strategies that reach beyond county lines. ② San Diego County is part of a regional consortium called the Advanced Manufacturing Partnership of Southern California (AMP SoCal) made up of partners from Los Angeles, Orange, Riverside and San Diego counties. This consortium was designated as an official Manufacturing Community in the federal government’s Investing in Manufacturing Communities Partnership (IMCP). This designation allows San Diego and its regional partners to access federal funding for workforce and economic development in Advanced Manufacturing, which will generate more jobs in Southern California.⁴³

② Doing What MATTERS for Jobs and the Economy

Through the California Community Colleges Chancellor’s Office, the Division of Workforce and Economic Development collaborates with employers, organized labor and local communities to address California’s skills and jobs gap with the Doing What MATTERS for Jobs and the Economy initiative.¹ Doing What MATTERS focuses on regional and statewide collaboration. “Sector Navigators” coordinate industry-specific community college programs and other workforce development resources throughout California to reduce the duplication of efforts and independent decision-making. As part of Doing What MATTERS, the California Community Colleges developed the Los Angeles and Orange County Regional Consortium (LAOCRC), which crosses county lines, to align programs and curriculum to business and industry needs. The goal of LAOCRC is to integrate the community colleges more closely with the two regions’ Career Technical Education (CTE) in kindergarten through 12 grade (K–12) and the Common Core State Standards (CCSS) to define clear career and college pathways.² The goal of Doing What MATTERS is to develop the workforce using a regional focus. The end result is a skilled workforce that is qualified and meets industries’ job requirements throughout California and the nation.

¹ doingwhatmatters.cccco.edu

² laocrc.org

Developing Career Pathways Driven by Employer Demand

To develop a talent pipeline or a supply of workers knowledgeable and skilled for growing industries, educators and businesses will need to collaborate in all levels of education. As the Common Core State Standards (CCSS) are rolled out in the local schools, employers could take advantage of the opportunity to work closely with the educational system to ensure the new curriculum is meeting their needs. CCSS are intended to address many of these fundamental skill deficits experienced by San Diego companies.⁴⁴ The standards for high school students, for example, place a greater emphasis on career-readiness and delineate high school pathways designed to equip students with the skills necessary to succeed in college and the workplace. Common Core exams require students to apply knowledge through “performance tasks” or questions designed to assess complex skills⁴⁵ such as reasoning and problem-solving, as opposed to standard multiple-choice exams.⁴⁶ The need for soft skills is also addressed through Common Core

⁴² The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

⁴³ eda.gov/challenges/imcp

⁴⁴ corestandards.org

⁴⁵ pewtrusts.org/en/research-and-analysis/blogs/stateline/2014/01/24/states-reconsider-common-core-tests

⁴⁶ usnews.com/news/politics/articles/2015/02/16/ear-buds-computers-needed-for-new-standardized-tests

subjects intended to integrate skills critical to real world applications including problem-solving, collaboration, communication and critical-thinking.

A “pathways-based approach” differentiates careers that have the potential for growth and can lead to higher-paid positions. Career lattices or ladders are one way to show students how a combination of education and work experience can help them move both up and across a career pathway. As a national example of this approach, in 2005, utilities across the country pooled resources to address workforce-training issues and created the Center for Energy Workforce Development (CEWD). CEWD initially focused on disseminating and sharing information about the range of possible career tracks that they had to offer. Since then, CEWD evolved to primarily partner with higher educational institutions such as the community colleges to map out new pathways to jobs.⁴⁷ Similar examples can be found in San Diego’s own community colleges that are closely aligned to employers’ career tracks.

③ Health Workforce Initiative

Through the California Community College Economic and Workforce Development program, the Health Workforce Initiative¹ (HWI) serves California’s Health Care industry sector with innovative business solutions. HWI identifies the workforce needs of the sector and develops solutions through assessment (analysis, planning and development), implementation, and evaluation of training programs for health-related fields. Programs include education and training that meet the needs of employers, which is determined by researching the supply and demand for skills. HWI promotes the creation of career pathways and stackable credentials (a sequence of credentials that can be accumulated over time to build up an individual’s qualifications), which generates student success and employment in open jobs.

¹ca-hwi.org

While there are career pathways in each industry sector — similar to the career pathways previously demonstrated in Advanced Manufacturing, Health Care and ICT — there are also career pathways across industries that can be mapped out for occupations with transferable skills. Figure 16 shows a sample “career lattice” that have some occupations employed across multiple sectors.④

Figure 16: Sample Cross-Sector Career Lattice

	Health Care	ICT	Advanced Manufacturing
Upper-level	Registered nurse	Software developer, applications	
Mid-level	Medical laboratory tech	CNC programmer	
Entry-level	Medical records & health information technician		Machinist

⁴⁷ The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

④ Rady Children's Hospital Foundation

In 2014, JPMorgan Chase & Co. awarded Rady Children's Hospital Foundation (RCHF) with a \$50,000 grant for FACES for the Future (FACES), a three-year comprehensive health careers pathway program that prepares at-risk students for careers offering livable wages and upward mobility. FACES is committed to inspiring youth to lead through innovative approaches to youth development, health careers preparation and wellness. FACES serves 133 disadvantaged youth in grades 10-12 in the City Heights area of San Diego. FACES students participate in core academic classes as well as Health Care Essentials and Project Lead the Way – curricula tailored to prepare students for further study and careers in health care. Real world experiences are integrated through a progressive job shadowing and rotation program, in community health settings for juniors, and in Rady Children's Hospital for seniors. After-school workshops and skills clinics reinforce the academic curriculum and community and hospital experiences, and focus on goal setting, leadership development and personal/professional growth. FACES integrates all components of the linked learning philosophy to build knowledge, skills and confidence in students.

¹helpsdkids.org

A pathways-based approach allows businesses to invest in developing a talent supply, strengthening their access to a qualified labor pool, while also providing workers with the chance to pursue a higher standard of living.⁴⁸ Education and training providers, in partnership with community-based organizations and other groups, should develop customized career pathways based on the needs of each sector to help job seekers leverage transferable skills.^⑤

⑤ California Career Pathways Trust

In July 2014, California's legislature and Governor signed the California Education Code, sections 53010 through 53016 into law, creating the California Career Pathways Trust (CCPT). Up to \$250 million was made available in the form of one-time competitive grants.¹ Grants were available for programs that fund specialists in work-based learning, establish regional collaborative relationships and partnerships with business entities, develop and integrate standards-based academics with career-relevant and industry-themed pathways in regional economic sectors, provide articulated pathways to post-secondary education and more. CCPT awarded the San Diego County College and Career Readiness Consortium more than \$13 million over two years. With the San Diego County Office of Education as the fiscal agent, the new consortium brings together 15 school districts, the regional community college system, nonprofits and industry partners to build a resilient and innovative workforce for the economy.

¹cde.ca.gov

Incorporating Hands-On Work Experience

The workforce development system as a whole will need to focus more on internships and apprenticeship programs, which provide hands-on work experience. ^⑥ Policymakers need to work with businesses to ramp up awareness and promote technical education through scholarships, toolkits or other incentives for these types of programs.⁴⁹ There is currently a lack of internship and apprenticeship programs for skilled jobs in the U.S., with only 41 percent of companies (and 29 percent of small companies) offering training for skilled jobs.⁵⁰ Such programs can be used effectively to transition participants into full-time roles if educators and employers work closely together. ^⑦ Regional businesses facing an impending demographic transition will need the support and collaboration of policymakers, workforce development professionals and other local businesses to forecast regional skill requirements. Companies, particularly small businesses (which make up 95 percent of businesses in San Diego), may find it advantageous to collaborate with local educational institutions over national ones. Localizing partnerships allows businesses to customize programs so that workers are trained for key industries, which may differ from other regions.

⁴⁸ "Bridge the Gap: Rebuilding America's Middle Skills." Accenture, Burning Glass, Harvard Business School. 2014.

⁴⁹ "Bridge the Gap: Rebuilding America's Middle Skills." Accenture, Burning Glass, Harvard Business School. 2014..

⁵⁰ "Bridge the Gap: Rebuilding America's Middle Skills." Accenture, Burning Glass, Harvard Business School. 2014..

⑥ Thinkabit Lab

As a high-tech company, Qualcomm employs more engineers than any other occupation. Conscious of the need to increase the availability of talented and diverse science, technology, engineering and math (STEM) professionals, the company created the Qualcomm® Thinkabit Lab™.¹ Thinkabit provides a “makerspace environment” where students from all cultural and socio-economic backgrounds have the opportunity to engage in hands-on experiences in engineering and gain exposure to various careers associated with an engineering company. The classroom is equal parts engineering lab and art studio, with classes are led by Qualcomm engineers and STEM teachers as the students create, code, collaborate and present robotic creations. The Thinkabit lab hosts field trips for San Diego middle school students three times per week – an expected 3,000+ students per school year.

¹thinkabitlab.com

⑦ Workshops for Warriors

Advanced Manufacturing firms are struggling to find workers with the skill sets needed to fill open positions. Additionally, veterans transitioning to civilian life often are a perfect fit for manufacturing jobs with compatible skills gained in the military. Workshops for Warriors assists the transition of veterans into civilian life through training, mentoring and job placement.¹ Training consists of classroom education, as well as vocational training and practical, hands-on work experience. A complete program lasts 16 months and leads to advanced training in welding or machining. Participants receive certifications in welding (American Welding Society), computer-numerically controlled (CNC)/computer-aided manufacturing (CAM), CNC (Immerse to Learn), CSW (Solidworks) and waterjet (Flow) as well as others from the National Institute of Metalworking Skills. Training is provided at no cost to the veterans, and Workshops for Warriors has a 100 percent placement rate for graduates, leading to annual entry-level jobs that earn \$50,000 or higher. Workshops for Warriors is a STEM education center, and is certified to provide instruction by the manufacturing industry’s leading accreditation bodies.

¹workshopsforwarriors.org

Promoting Skilled Jobs Awareness

Policymakers have the ability to pave the way for more productive collaboration between educators and employers by promoting awareness about skilled jobs and the sectors in which these jobs can be found such as Advanced Manufacturing, ICT and Health Care. The lack of middle-skill labor is also associated with an image problem, which has led many students to pursue college degrees as opposed to vocational training.⁵¹ Policymakers, workforce development professionals, educators and other community leaders can help by promoting opportunities in “skilled” jobs or “middle-skill” jobs. For instance, negative perceptions of manufacturing as dirty or dangerous and trade occupations as low-skill are still prevalent, yet many of these occupations are in the high-tech industries such as biotechnology, clean energy and robotics. ⑧

⑧ Manufacturing Day

Each year, manufacturing firms of all sizes across the country celebrate modern-day Advanced Manufacturing. This day is meant to inspire the next generation of manufacturers to learn about the innovations in manufacturing including robotics and precision manufacturing.¹ Locally, the San Diego Regional Economic Development Corporation promotes a number of events to celebrate San Diego’s Advanced Manufacturing sector. In 2014, 17 events were held in San Diego County at some of the top manufacturing companies including Illumina, Northrop Grumman, Solar Turbines and many more companies and educational institutions. Raising awareness of the sector allows adult and youth job seekers to explore the wide-range of jobs available in this diverse sector.

¹mfgday.com

⁵¹ “Bridge the Gap: Rebuilding America’s Middle Skills.” Accenture, Burning Glass, Harvard Business School. 2014..

Closing the Soft Skills Gap

Closing the skilled jobs gap does not end with technical training. San Diego employers increasingly report having difficulty in finding workers at all levels that are technically qualified for a position *and* have the necessary workplace skills to collaborate in teams, communicate effectively and solve problems proactively.⁵² Incorporating work-readiness training into or prior to technical training will address the “soft skills” shortage that employers face today. ⑨

⑨ Junior Achievement of San Diego County

Financial literacy, work-readiness and entrepreneurship are often overlooked in education and workforce development; however, these are some of the most essential skills in determining success. Junior Achievement of San Diego County is working to address part of the information gap by training K-12 students in these topics, showing how decisions about career and financial goals are interrelated.¹ A new program, the Mission Fed JA Finance Park, gives students the opportunity to see how financial decisions affect their futures. By simulating real-life events from getting a mortgage to buying a car, this project-based learning allows students to make decisions for important life events and, along the way, gain the information and tools they need to prepare for the future.

¹jasandiego.org

⁵² SDICCCA, SDWP and COE. 2014.

Appendix A - Methodology

San Diego's Middle-Skill Jobs: Gaps and Opportunities was conducted by SDWP and EDC, and was commissioned by JPMorgan Chase & Co. This study analyzed qualitative and quantitative data from local research, interviews with San Diego County employers, more than 700,000 online job postings between 2010 and 2014 and employment data.

The study began with a literature review of the available secondary resources regarding San Diego's labor market. An extensive list of research from various San Diego organizations can be found at workforce.org/external-reports. In-person interviews were conducted with six local employment placement agencies to verify the secondary research. The research team reviewed online job postings from the Burning Glass database, *Labor Insight/Jobs* between 2010 and 2014 for San Diego. *Labor Insight/Jobs* is a specialized program that collects listings from online job boards or websites, compiles them in one database and de-duplicates the same posting from multiple sites. Economic Modeling Specialists, International (EMSI) compiled the employment data used in this research in its *Analyst* database. *Analyst* collects data from over 90 sources such as the U.S. Census Bureau American Community Survey (ACS) and the U.S. Bureau of Labor Statistics (BLS). ACS provides the demographic data for San Diego County and BLS provides employment and wage data. This study analyzes EMSI and ACS data available as of November 2015.

The Priority Sectors in this report were defined by North American Industry Classification System (NAICS) codes,⁵³ and occupations were defined by Standard Occupational Classification (SOC) codes. SOC and NAICS are coding standards used by federal agencies to collect and disseminate employment data related to industries and occupations. Occupations listed in Figure 4 are two-digit codes, while all other occupations in the report are five-digit codes:

(SOC: 51-4041) Machinists	(29-2071) Medical records and health information technicians
(51-4011) Computer-controlled machine tool operators, metal and plastic	(31-2011) Respiratory therapists
(51-2011) Aircraft structure, surfaces, rigging and systems assemblers	(47-2111) Electricians
(49-9041) Industrial machinery mechanics	(13-1199) Business operations specialists, all other (Energy auditors) ⁵⁴
(51-4012) Computer numerically controlled (CNC) machine tool programmers, metal and plastic	(47-4099) Construction and related workers, all other (Weatherization specialists)
(51-9061) Inspectors, testers, sorters, samplers and weighers	(47-2231) Solar photovoltaic installers
(41-3099 & 41-4012) Sales representatives or business development specialists ⁵⁵	(49-9021) Heating, air conditioning and refrigeration mechanics and installers
(29-2012) Medical and clinical laboratory technicians	(15-1152) Computer user support specialists
(19-4099) Life, physical and social science technicians, all other	(15-1134) Web developers
(19-4031) Chemical technicians	(15-1151) Computer network support specialists
(31-1014) Nursing assistants	(17-3031) Surveying and mapping technicians
(31-9092) Medical assistants	(43-9199) Office and administrative support workers ⁵⁶
(29-2061) Licensed practical and vocational nurses	

Data Limitations

It should be noted that there are certain limitations to the data used in this study. Employment projections from the BLS are based on historical trends and do not involve changes in market demand or legislation that might support additional employment. Therefore, employer responses to surveys were included to assist in gauging labor supply and employer demand. Additionally, while the Burning Glass *Labor Insight/Jobs* database collects online job postings and de-duplicates similar job postings, some duplication may still occur.

⁵³ workforce.org/reports

⁵⁴ Data provided in the report were derived inverse staffing patterns of 13-1199 in Clean Energy industries.

⁵⁵ Defined by SOC codes 41-3099 (sales representatives, services, all other) and 41-4012 (sales representatives, wholesale and manufacturing, except technical and scientific products). Data provided in the report come from 41-3099.

⁵⁶ Data provided in the report were derived by inverse staffing patterns of 43-9199 in professional, scientific and technical services.

Appendix B – Occupations Referenced in the Text

Occupations listed in the Advanced Manufacturing, Health Care and ICT sections were derived from the Standard Occupational Classification (SOC) system used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data. All workers are classified into one of 840 detailed occupations according to their occupational definition.⁵⁷

SOC Code	Occupation	Description
11-3021	Computer and information systems managers	Plan, direct or coordinate activities in such fields as electronic data processing, information systems, systems analysis and computer programming.
11-3051	Industrial production managers	Plan, direct or coordinate the work activities and resources necessary for manufacturing products in accordance with cost, quality and quantity specifications.
15-1121	Computer systems analysts	Analyze science, engineering, business and other data processing problems to implement and improve computer systems. Analyze user requirements, procedures and problems to automate or improve existing systems and review computer system capabilities, workflow and scheduling limitations. May analyze or recommend commercially available software.
15-1122	Information security analysts	Plan, implement, upgrade or monitor security measures for the protection of computer networks and information. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses.
15-1131	Computer programmers	Create, modify and test the code, forms, and script that allow computer applications to run. Work from specifications drawn up by software developers or other individuals. May assist software developers by analyzing user needs and designing software solutions. May develop and write computer programs to store, locate and retrieve specific documents, data and information.
15-1134	Web developers	Design, create and modify websites. Analyze user needs to implement website content, graphics, performance and capacity. May integrate websites with other computer applications. May convert written, graphic, audio and video components to compatible web formats by using software designed to facilitate the creation of web and multimedia content.
15-1141	Database administrators	Administer, test and implement computer databases, applying knowledge of database management systems. Coordinate changes to computer databases. May plan, coordinate and implement security measures to safeguard computer databases.
15-1151	Computer user support specialists	Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, or via telephone or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail and operating systems.
15-1152	Computer network support specialists	Analyze, test, troubleshoot and evaluate existing network systems, such as local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Perform network maintenance to ensure networks operate correctly with minimal interruption.
17-3031	Surveying and mapping technicians	Perform surveying and mapping duties, usually under the direction of an engineer, surveyor, cartographer, or photogrammetrist to obtain data used for construction, mapmaking, boundary location, mining or other purposes. May calculate mapmaking information and create maps from source data, such as surveying notes, aerial photography, satellite data or other maps to show topographical features, political boundaries and other features.

⁵⁷ bls.gov/soc

SOC Code	Occupation	Description
29-1071	Physician assistants	Provide health care services typically performed by a physician, under the supervision of a physician. Conduct complete physicals, provide treatment, and counsel patients. May, in some cases, prescribe medication. Must graduate from an accredited educational program for physician assistants.
29-1126	Respiratory therapists	Assess, treat, and care for patients with breathing disorders. Assume primary responsibility for all respiratory care modalities, including the supervision of respiratory therapy technicians. Initiate and conduct therapeutic procedures; maintain patient records; and select, assemble, check and operate equipment.
29-1141	Registered nurses	Assess patient health problems and needs, develop and implement nursing care plans, and maintain medical records. Administer nursing care to ill, injured, convalescent or disabled patients. May advise patients on health maintenance and disease prevention or provide case management. Licensing or registration required.
29-2011	Medical and clinical laboratory technologists	Perform complex medical laboratory tests for diagnosis, treatment and prevention of disease. May train or supervise staff.
29-2012	Medical and clinical laboratory technicians	Perform routine medical laboratory tests for the diagnosis, treatment and prevention of disease. May work under the supervision of a medical technologist.
29-2061	Licensed practical and licensed vocational nurses	Care for ill, injured, or convalescing patients or persons with disabilities in hospitals, nursing homes, clinics, private homes, group homes and similar institutions. May work under the supervision of a registered nurse. Licensing required.
29-2071	Medical records and health information technicians	Compile, process, and maintain medical records of hospital and clinic patients in a manner consistent with medical, administrative, ethical, legal and regulatory requirements of the health care system. Process, maintain, compile and report patient information for health requirements and standards in a manner consistent with the Health Care sector's numerical coding system.
31-1011	Home health aides	Provide routine individualized health care such as changing bandages and dressing wounds, and applying topical medications to the elderly, convalescents or persons with disabilities at the patient's home or in a care facility. Monitor or report changes in health status. May also provide personal care such as bathing, dressing and grooming of patient.
31-1014	Nursing assistants	Provide basic patient care under direction of nursing staff. Perform duties such as feed, bathe, dress, groom, or move patients or change linens. May transfer or transport patients. Includes nursing care attendants, nursing aides and nursing attendants.
31-9092	Medical assistants	Perform administrative and certain clinical duties under the direction of a physician. Administrative duties may include scheduling appointments, maintaining medical records, billing and coding information for insurance purposes. Clinical duties may include taking and recording vital signs and medical histories, preparing patients for examination, drawing blood and administering medications as directed by physician.
43-9061	Office clerks, general	Perform duties too varied and diverse to be classified in any specific office clerical occupation, requiring knowledge of office systems and procedures. Clerical duties may be assigned in accordance with the office procedures of individual establishments and may include a combination of answering telephones, bookkeeping, typing or word processing, stenography, office machine operation and filing.
49-9041	Industrial machinery mechanics	Repair, install, adjust or maintain industrial production and processing machinery or refinery and pipeline distribution systems.
51-2011	Aircraft structure, surfaces, rigging and systems assemblers	Assemble, fit, fasten and install parts of airplanes, space vehicles, or missiles, such as tails, wings, fuselage, bulkheads, stabilizers, landing gear, rigging and control equipment, or heating and ventilating systems.
51-2031	Engine and other machine assemblers	Construct, assemble, or rebuild machines, such as engines, turbines, and similar equipment used in such industries as construction, extraction, textiles and paper manufacturing.
51-4011	Computer-controlled machine tool operators, metal and plastic	Operate computer-controlled machines or robots to perform one or more machine functions on metal or plastic work pieces.

SOC Code	Occupation	Description
51-4012	Computer numerically controlled machine tool programmers, metal and plastic	Develop programs to control machining or processing of metal or plastic parts by automatic machine tools, equipment or systems.
51-4041	Machinists	Set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout and machining procedures.
51-4121	Welders, cutters, solderers and brazers	Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.
51-9198	Helpers – production workers	Help production workers by performing duties requiring less skill. Duties include supplying or holding materials or tools, and cleaning work area and equipment.

Appendix C – A Short History of the Skills Gap

The increasing “skills gap” faced by employers today resulted from restructuring and technological developments in the U.S. economy since the 1970s. Technology revolutionized labor and worker responsibilities. Manufacturing, in particular, once focused on standardization and mass production; however, due to technological advancements, much of this manual labor has become automated and tasked to machines. As a result, the U.S. shifted from goods production to a service-based economy.

The U.S. education system previously produced enough qualified workers to meet employer demand with the “responsibility of instilling the skills required for entry-level jobs.”⁵⁸ This eventually proved to be ineffective as employer demand increased, outpacing the education system’s ability to produce qualified workers. Consequently, many middle-skill jobs that previously required a high school diploma began requiring post-secondary education or training. The focus for secondary schools was no longer job-readiness or soft skills, yet employers were requiring more soft skills (i.e. critical thinking, collaboration and innovation) than ever before. This presents the problem of “soft skills” shortages that employers face today. Employers increasingly need workers at all career levels to think critically, work in teams and innovatively solve problems.⁵⁹

Much of the problem also stems from a misperception of degree requirements, as employers have increasing expectations for advanced degrees for positions that may not typically require them in other parts of the country. As jobs become more complex, completion of higher education signals to employers that the applicants have those desired soft skills, even if employers do not require higher educational attainment.⁶⁰

There is a deeply-ingrained notion that a four-year degree is the only career path to follow, with vocational trades left for those unable or unfit to attend college. This stigma exacerbates the skills shortage. The current workforce in vocational trades is retiring, adding pressure on employers to find replacements. Forty-four percent of workers in the overall labor force were at least 45 years old in 2012, with 55–64 year olds holding 15.5 percent of all jobs in the U.S.⁶¹ More than 60 percent of jobs are now posted with some kind of post-secondary education or training expectation by specialized schools, technical colleges or two-year community colleges. The education system must produce workers to meet these opportunities and close the growing skills gap.

⁵⁸ The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

⁵⁹ The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

⁶⁰ The Economist Intelligence Unit Limited. *Closing the skills gap: companies and colleges collaborating for change*. 2014.

⁶¹ Joshua Wright. “Rethinking Blue-Collar Jobs: USA TODAY Explores a ‘New Middle’ with EMSI Data,” EMSI. October 2014.

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