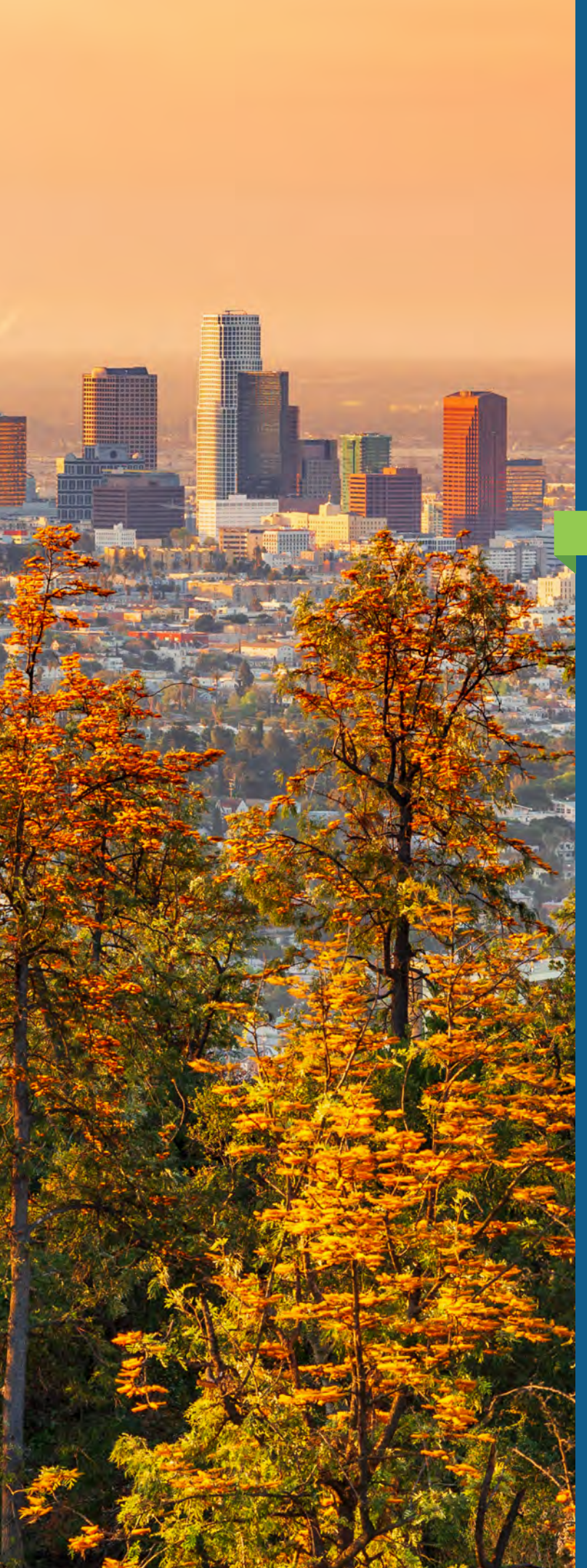

INDUSTRY DEEP DIVE

PROFESSIONAL SERVICES

IN THE LOS ANGELES BASIN

A KNOWLEDGE-BASED INDUSTRY

NOVEMBER 2018

Brought to you by:
CENTER FOR A COMPETITIVE WORKFORCE

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About CCW

Center for a Competitive Workforce

Center for a Competitive Workforce (CCW) links education and workforce partners to establish high-performing regional talent development systems in California for the rapidly changing industries that will dominate our economic future. The center's work addresses the talent gaps employers face and the supply of skilled graduates to meet projected workforce demand.

CCW was founded as a Strong Workforce Program within the 19 Los Angeles County community colleges in the L.A.|O.C. Regional Consortium.

Learn more: www.ccworkforce.org

FOUNDING PARTNERS

Centers of Excellence

As grant-funded technical assistance providers, the seven Centers of Excellence across the state, located strategically to study the regional economies of California, support the community colleges by providing customized data on high growth, emerging, and economically-critical industries and occupations and their related workforce needs.

LAOCRC

The Los Angeles and Orange County Regional Consortium (LAOCRC) provides local and regional decision makers with the increased capacity to measure regional progress toward goals of efficiency and effectiveness, while also improving their access to indicators that measure student/incumbent worker progress through the educational system.

LA Area Chamber of Commerce

The Los Angeles Area Chamber of Commerce champions economic prosperity and quality of life for the Los Angeles region by being the voice of business, promoting collaboration and helping members grow.

LAEDC

The Los Angeles County Economic Development Corporation is a 501c3 non-profit dedicated to advancing opportunity and prosperity for all via objective economic research and analysis, strategic assistance to government and business, and targeted public policy. These efforts are guided and supported by the expertise and counsel of the LAEDC's business, government and education members and partners.

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The Work Cycle Model

In 2016, California embarked on a path to train one million middle-skill workers and develop workforce opportunities to provide greater overall upward economic mobility and lift residents out of poverty.

To this end, the Strong Workforce Program was established to spur career education in the state's 114 community colleges. Seven areas have been targeted:

- Student success
- Career pathways
- Workforce data and outcomes
- Curriculum
- Faculty
- Regional coordination
- Funding

The purpose is to increase the number of students enrolled in career education programs that will lead to more certificates, degrees, transfers to four-year institutions and employment in high-demand, high-wage jobs.

To achieve the Strong Workforce Program's co-equal goals in the Los Angeles Basin, the Center for a Competitive Workforce (the Center) proposes to structure, deploy and structurally integrate the following five-part program model:

1. ACQUIRE PERTINENT DATA AND CONDUCT ANALYSIS

Conduct economic research and applied analysis to better understand the region's targeted industries, their associated labor markets, growth occupations and five-year forecasts.

2. ENGAGE INDUSTRY FOR REAL-TIME, ONGOING DATA COLLECTION AND VALIDATION

Validate and amplify the quantitative research and analysis with primary research, including survey instruments and firm-level intelligence gathered through the Los Angeles County Economic Development Corporation (LAEDC) and Los Angeles Area Chamber of Commerce industry cluster councils.

3. DISTILL DETAILED LABOR MARKET INTELLIGENCE

Distill and refine data elicited through the above processes into translatable, usable information for consumption by the community colleges.

4. TRANSLATE AND COMMUNICATE DATA INTELLIGENCE TO COLLEGE COMMUNITY

Connect quantitative research/analysis, primary research and firm-level intelligence to curriculum developers and other relevant decision-makers (e.g. deputy sector navigators, faculty and career education deans) at the community colleges.

5. NEW COURSES AND PROGRAMS DEVELOPED/UPDATED

Tailor new programs and courses through collaboration with industry professionals, that correct, modernize and/or enhance critical competencies and/or skills training gaps.

This report represents Phase 1 of the model. Phase 2 will begin almost simultaneously with this report's release.

Executive Summary

The Los Angeles Basin's competitive and rapidly changing economic landscape has given rise to a job market in which highly specialized knowledge and skills often mean the difference between success and failure. To help meet this challenge, the Center for a Competitive Workforce set out to study the major industries driving growth and pinpoint how education and industry stakeholders can calibrate the region's talent development system to fuel a vibrant economy.

This report is the latest in a series of reports by the Center and the Los Angeles Economic Development Corporation and focuses on the professional services industry in the Los Angeles Basin (Los Angeles and Orange counties).

Why Focus on Professional Services?

Professional services is a large industry that is particularly promising because it supports many occupations that pay well in component industries that are either largely insulated or stand to benefit from automation and technological advances.

Professional Services

SUPPLY VS. DEMAND

The Center also assesses whether community college supply is meeting workforce demand. Based on regional community college completions, a looming workforce shortage appears to exist, an undersupply of 2,000 workers each year to fill job openings in the region. More than 6,300 annual openings are projected for middle-skill occupations in the seven component industries studied for this report. But community college completions only totaled about 4,300 awards in the 2016-17 academic year.

The supply-and-demand comparison reveals that an oversupply may exist for paralegal programs, and architecture and engineering programs in the Los Angeles Basin. Meanwhile, there may be an undersupply of community college students to fill jobs in administration and support, veterinary medicine, environmental science, and computers and design.

IN THIS REPORT, THE CENTER:

- Analyzes the major shifts occurring in professional services
- Quantifies the industry's economic impact
- Identifies the jobs that have the brightest future for community college students in the region

WHERE WILL THE JOBS BE?

The highest number of openings will be in occupations related to management and technical consulting services. The greatest growth in employment is expected to occur in the computer systems design and related services industry (7,530 new jobs), followed by management, scientific and technical consulting services (4,860 new jobs).

Analysis of the skills classifications for total job openings over the next five years reveals that nearly half of projected openings will be for middle-skill occupations, which reinforces the selection of this industry as a valid target for community college programs.

OCCUPATION PROFILES

This study identifies 15 promising occupations for middle-skill workers, those who possess more educational attainment than a high school diploma but less than a bachelor's degree, in seven component industries that make up the professional services industry. Some in-demand middle-skill occupations to take note of include: network and computer systems administrators, secretaries and administrative assistants, veterinary technologists and technicians, and environmental science and protection technicians.

RISE OF AUTOMATION

The study also addresses which component industries (component industries) are likely to be affected by automation in coming years. Artificial intelligence is simplifying highly complex tasks while increasing productivity. The professional services industry is poised for further digital transformation, and some professional services jobs may decline or become obsolete as technology advances.

With the rise of automation and AI, employment in two component industries is predicted to contract: architectural and engineering services is projected to decline by 9.5 percent, representing a loss of 5,410 jobs; and advertising, public relations and related services will shrink by 2.4 percent, shedding 770 jobs in the region. Specialized design, computer systems design and various consulting services–which rely heavily on non-automatable knowledge-based skills, human creativity and problem solving–are expected to be shielded from disruption.

ADDITIONAL TRENDS

More trends to watch involve the increasing reliance on contingent workers, the creation of virtual web-based firms and capital-labor substituting technologies. Significant opportunities will exist for middle-skill jobs in science, math, technology and engineering (STEM) fields. At the same time, there is growing emphasis on soft skills, especially for professional services occupations which involve interaction with the public and working cooperatively with coworkers. Professional services employers highly value technical training involving work-based learning, such as internships and job readiness skills.

PROFESSIONAL SERVICES REPORT:
ADDITIONAL KEY FINDINGS

- **GOOD PAY**
  Professional services employees typically earn higher-than-average wages compared to the regional economy. Employees in professional services earn, on average, $65,030, which is more than the regional average across all industries, $59,890. The legal services industry pays on average $108,960 per year.

- **ECONOMIC IMPACT**
  The professional services industry generates $175.6 billion in economic output annually in the Los Angeles Basin, accounting for 12.4 percent of the gross regional product. In 2016 (the most recent data available), the professional services industry spent $59.3 billion on labor payments and distributed $12.4 billion in profits.

- **YOUNG WORKFORCE**
  A large share of the professional services workforce in the Los Angeles Basin skews younger; 53 percent of workers are between the ages of 25 and 44 years, and less than 20 percent are 55 years or older.

- **EMPLOYMENT CONCENTRATED**
  Professional services employment is two times greater in Los Angeles County than Orange County. There are 262,800 payroll employees in professional services in Los Angeles County, compared to 120,500 payroll employees in Orange County.

- **CONSULTING SERVICES DOMINATE**
  More than half of employment in professional services falls into three component industries: management and technical consulting services, legal services, and accounting and bookkeeping. These component industries combined employed more than 200,000 workers in the Los Angeles Basin in 2016. Management and technical consulting services accounts for 76,210 jobs alone.

- **GIG ECONOMY**
  The use of contingent workers is a growing trend in the industry with professional services currently employing a large number of consultants and independent contractors who work on a per-project basis. The number of contingent workers, more than 300,000, is almost equivalent to the number of payroll employees in the industry in the Los Angeles Basin.

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PROFESSIONAL SERVICES REPORT

Contents

Professional Services

A Knowledge-Based Industry

In the Center for a Competitive Workforce's baseline report "L.A. & Orange County Community Colleges: Powering Economic Opportunity" published in October 2017, the Los Angeles County Economic Development Corporation's (LAEDC's) Institute for Applied Economics identified six target industries in the Los Angeles Basin (Los Angeles and Orange counties) expected to undergo significant middle-skill job growth between 2016 and 2021. Professional Services was one of the six identified industries and the choice for the Center's third "deep-dive" industry report. This and other deep-dive industry reports are intended to establish a baseline from which the Center and the region's community colleges can further build their knowledge and, working in partnership with industry, amplify their understanding about the region's labor markets and the middle-skill workforce gaps, as gauged by the difference between industry needs and community college program completions.

In the professional services industry, human capital is of paramount importance compared to many other industries which tend to be more capital intensive. Knowledge-based services are provided to clients to fit their specific needs; these include legal services, accounting services, marketing services and custom computer design services, to name a few. The professional services industry has a very large presence in the region, with strong employment projections for occupations at almost all skill levels and all educational attainment levels over the next three to five years. For this reason, the industry offers significant opportunities for students attending community colleges in the region.

Professional Services Defined

Eight component industries make up the professional services industry: legal services; accounting, tax preparation, bookkeeping and payroll services; architectural, engineering and related services; specialized design services; computer systems design services; management, scientific and technical consulting services; advertising, public relations and related services; and other professional, scientific and technical services (Exhibit 1). The Los Angeles Basin's professional services businesses employ a wide range of workers by occupation, skill level, educational attainment and experience. There are distinct differences across the component industries that comprise professional services including the size of operations and staffing patterns. Labor shortages and skills gaps vary among these industries and across occupations.

The Professional Services Workforce

The Los Angeles Basin is experiencing a tight labor market, with its lowest annual unemployment rate (4.4 percent) since 2006 (Exhibit 2). However, many employers in professional services assert they are having difficulty finding qualified candidates with the right mix

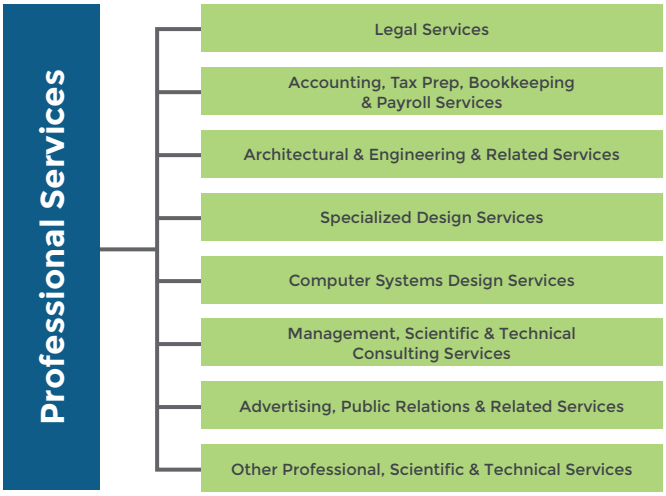


EXHIBIT 1:
Professional Services Industry Composition

The Los Angeles Basin is experiencing a tight labor market, with its lowest annual unemployment rate (4.4 percent) since 2006.

of skills to meet their diverse needs, meaning workers with the requisite skills are in high demand. There has been a move toward more knowledge-based occupations where a combination of soft skills and analytical skills are essential to a worker's professional advancement. Consequently, the proper education and training, or up-skilling, of the region's workforce is more important than ever.

The professional services industry generates $175.6 billion in economic output annually in the Los Angeles Basin, accounting for 12.4 percent of the gross regional product. (See the Economic Impact section of this report for a full analysis.) Approximately 85 percent of purchases made in the industry's supply chain are made using local vendors. Across all levels of educational attainment, average monthly earnings in professional services in the Los Angeles Basin are higher relative to the combined average of all industries. (Exhibit 3).

Significant opportunities exist within the professional services industry for middle-skill jobs, most especially science, technology, engineering and math (STEM) fields. New technology is driving demand for some middle-skill occupations and creating the need for new occupations as well. Information technology (IT) continues to provide ample entry-level opportunities for middle-skill workers, those with an associate degree, postsecondary nondegree award or certification. These jobs typically have pathways to more senior positions and higher wages with on-the-job training and experience, and additional technical training. When a higher level of education (namely a bachelor's degree) is preferred for hiring, a portfolio of work (e.g., work-based learning experiences such as an internship), in addition to certifications, may help demonstrate a candidate's qualifications and ability to perform the work required.

Significant opportunities exist within the professional services industry for middle-skill jobs, most especially STEM fields.

There are a number of trends in professional services impacting the industry's workforce including the use of contingent workers, automation, the creation of virtual web-based firms, and further advancements in digital technologies, along with other capital-labor substituting technologies.

Technology has increased digital connectivity, allowing workers to be mobile or work remotely. More employers are hiring workers on a contingent or per-job basis (short-term gigs). The so-called gig economy has predominantly affected technology-related occupations, but its influence has been increasingly felt, creeping into other occupations as employers across all industries look for ways to decrease their labor costs without compromising productivity. The number of contingent workers in the professional services industry in the Los Angeles Basin is almost equivalent to the number of payroll employees in professional services; as of 2016, the estimated number of contingent workers in the industry exceeded 300,000.

Across all skill levels, a number of professional services occupations are vulnerable to automation in the next decade. Artificial intelligence (AI) and algorithms, machine learning, big data, cloud computing and the internet of things allowing real-time connectivity are all impacting the industry. Indeed, many occupations in professional services already incorporate some form of automation into their job duties, such as payroll and timekeeping clerks, tax preparers and civil drafters (Exhibit 4). While increased automation and adoption of technological advancements do not necessarily translate into immediate job losses, these trends do indicate that the industry is poised for further digital transformation and may experience disemployment, resulting in the elimination of certain occupations or job duties, in the long run. In the near-term, jobs will simply be redefined as activities become more automated.

Advancements in information technology are facilitating more efficient ways of knowledge sharing. This is spurring changes in business models, brand development and marketing, and business development and client relations. There are a large number of

UNEMPLOYMENT IN THE LA BASIN, 1990–2017

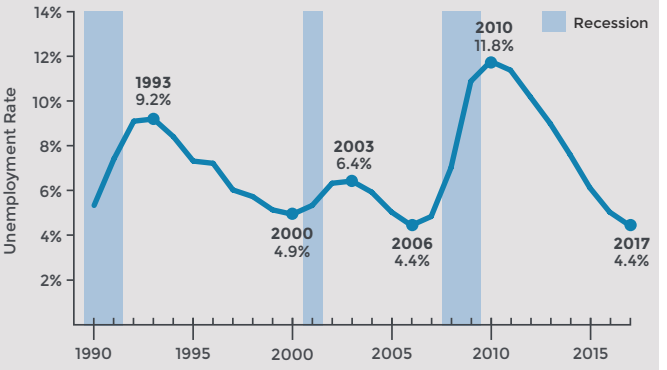


EXHIBIT 2:
Unemployment in the LA Basin 1990 to 2017

AVERAGE MONTHLY EARNINGS

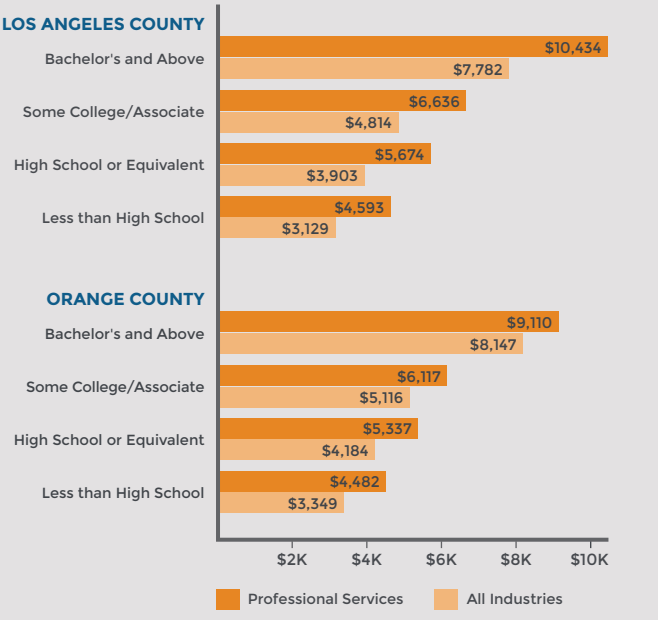


EXHIBIT 3:
Average Monthly Earnings, 2016, by Educational Attainment, ages 25+ years.

CURRENT DEGREE OF AUTOMATION

Highly Automated

- Data Entry Keyers

Moderately Automated

- Bill & Account Collectors
- Payroll & Timekeeping Clerks
- New Accounts Clerks
- Tax Preparers
- Civil Drafters
- GIS Technicians
- Civil Engineering Technicians

Slightly Automated

- Web Developer
- Environmental Engineering Technicians
- Environmental Science & Protection Technicians, incl. Health
- Veterinary Technologists/Technicians

Very Little Automated

- Graphic Designers
- Veterinary Assistants/Lab Animal Caretakers

EXHIBIT 4:
Current Degree of Automation

AGE DISTRIBUTION OF WORKFORCE

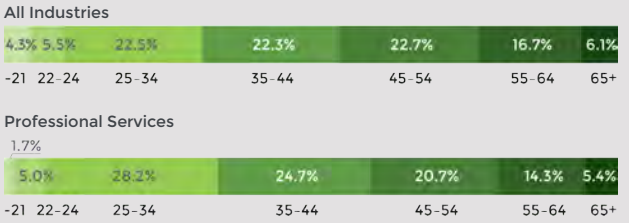


EXHIBIT 5:
Age Distribution of the Professional Services Industry Workforce

IN DEMAND SKILLS

- Interpersonal skills ("soft skills")
- Oral and written communication
- Job readiness
- Computer skills
- Problem solving/ decision making
- Team work/collaboration
- Organization and planning skills
- Attention to detail
- Research skills
- Relationship building
- Reading comprehension
- Information technology

EXHIBIT 6:
Skills in Demand in Professional Services

web-based, tech providers that offer automated back-office services across the various industries in professional services.

The continued deployment of AI brings with it the promise of simplifying highly complex tasks and increasing productivity. Currently, automation is augmenting labor in the industry, redefining and shuffling work activities within occupations rather than making entire occupations obsolete.

The aging of the workforce, and therefore issues related to attrition, does not appear to be as big of a concern in the professional services industry compared to other industries in the region, such as health care and manufacturing. A large share of the professional services workforce in the Los Angeles Basin skews younger; indeed, 53 percent of workers are between the ages of 25 and 44 years, and less than 20 percent are 55 years or older (Exhibit 5). However, several of the professional services component industries, particularly engineering, are facing the reality of an aging workforce.

> *Looking ahead, non-automatable knowledge-based skills will become the "bread and butter" of professional services.*

There has been a growing emphasis on softs skills for middle-skill jobs across all industries, but especially for those who interact with the public or who are required to work cooperatively with coworkers, as is commonly expected in professional services.

Professional services employers often cite technical training, previous intern experience and job readiness skills—including problem-solving skills and soft skills like effective communication—as some of the most desirable qualifications for workers in the industry (Exhibit 6).

Looking ahead, non-automatable knowledge-based skills will become the "bread and butter" of professional services; for example, analytical capabilities, relationship skills, data interpretation, strategic guidance, and predictive insights will be highly valued by employers.

In the near future, in order to be competitive, individuals who work in professional services will need to be adaptable, possess soft skills, acquire specialized skills specific to component industries (including related certifications and/or licenses), and have the ability to quickly adopt new technologies. In this way, workers in the professional services industry will have a better chance of remaining relevant and, most importantly, employed in an industry poised to undergo significant changes related to technological innovation in coming years.

Sizing Things Up

The Industry Defined

Analysis of professional services industry trends provides insights into the challenges and opportunities facing the industry's workers and employers. Understanding where the jobs are now, and in the future, is critical for tailoring training and career education programs, as well as regional policies to prepare for these changes and to cultivate a workforce that is competitive in a fast-changing global economy.

In this section, job counts, changes in payroll employment and wages are discussed for the Los Angeles Basin, a region encompassing Los Angeles and Orange counties.

As of 2016, the professional services industry employed 383,280 private payroll workers in the Los Angeles Basin, accounting for 6.5 percent of total regional employment.

Industry Employment

Professional services workers in the region comprise 36.1 percent of all professional services employment in California and nearly 4 percent of professional services employment nationwide. Management and technical consulting services accounts for 20 percent of total industry employment, the equivalent of 76,210 jobs. Legal services has the next largest share, with 18 percent of all industry employment (67,440 jobs), and accounting and bookkeeping services accounts for approximately 15 percent with 59,980 jobs, as does architectural and engineering services, with 57,040 jobs (Exhibit 7).

EXHIBIT 7:
Employment distribution across the professional services industry.

Across the two counties, the composition of employment in the professional services industry varies only slightly (Exhibit 8). However, industry size is significantly different between the two counties, with Los Angeles County dominating. There are 262,800 payroll employees in professional services in Los Angeles County, compared to 120,500 payroll employees in Orange County. Consequently, the number of middle-skill employment opportunities will be different for each county.

Much of the job growth in professional services has been fueled by an increase in technology-based industries.

Total employment in the industry has grown continuously over the last decade, with an average annual growth rate of 1.8 percent per year. From 2006 to 2016, employment in the professional services industry significantly outpaced total payroll employment growth (4.0 percent) across all industries in the region, adding over 31,000 jobs, an increase of nearly 9 percent (Exhibit 9).

Much of the job growth in this industry has been fueled by an increase in technology-based industries, including management and technical consulting, which added 13,000 jobs over the period, representing a growth rate of 27.5 percent. All, but two component industries displayed solid job growth over the period, specialized design services and architectural and engineering services.

Industry Wages

Professional services employees typically earn higher-than-average wages compared to the regional economy. Overall, employees in professional services earn, on average, $65,030, which is more than the regional average across all industries, $59,890.

Still, this is just an average across all professional services industries, so some component industries pay significantly higher wages while others pay significantly lower wages. For example, the legal services industry pays on average $108,960 per year while average annual wages in other professional and technical services is $56,200.

Professional services employment in the Los Angeles Basin accounted for close to 4 percent of all professional services employment nationwide.

Real wages in professional services grew by 10.8 percent overall, above the growth of all industries in the Los Angeles Basin, where inflation-adjusted (real) wages increased by less than 4 percent (Exhibit 10).

During the past five years, wage growth has been fastest in the accounting and bookkeeping industries, with 35 percent growth, followed by other professional and technical services with close to 27 percent; advertising, public relations and related services experienced 20 percent growth.

Competitiveness & Regional Advantage

A region's competitiveness in an industry is a function of many factors: the attractiveness and value of the product(s)/service(s) produced/delivered; the costs of inputs such as labor, land and energy; the productivity of individual firms; and the geographic concentration of the industry, where regionally-concentrated industries are likely to be more competitive than those same industries in other economic regions without high concentration.

Location quotients (LQ) are used to measure industry competitiveness. Based on analysis, the Los Angeles Basin's professional services industry is not highly concentrated compared to other regions, with the location quotients for most component industries about on par with the average concentration of the professional services industry nationwide (LQ of around 1.0). Only the specialized design services industry shows a slightly higher concentration with an LQ of 1.8.

Legend: Exhibits 8–10

- Legal Services
- Accounting & Bookkeeping
- Architectural & Engineering
- Specialized Design
- Computer Systems Design & Related
- Management & Technical Consulting
- Advertising, PR, & Related
- Other Professional & Technical
- Professional Services Average
- Total, Across All Industries

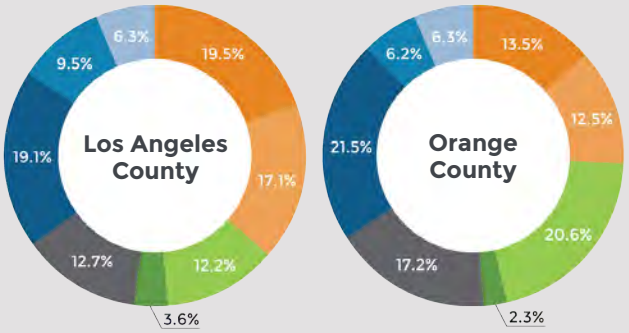


EXHIBIT 8:
Professional services employment distribution in LA & Orange counties in 2016.

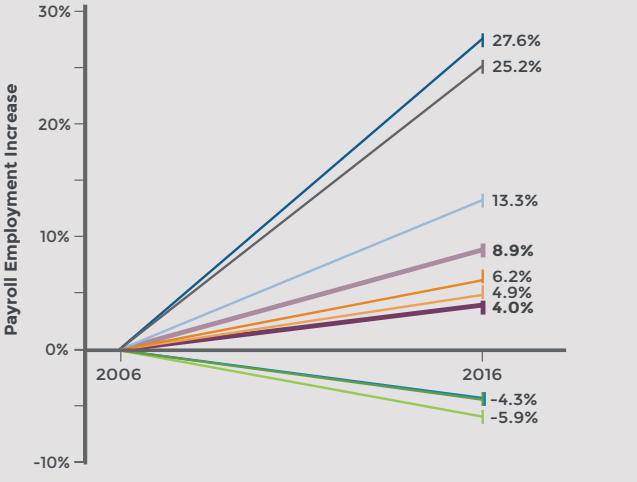


EXHIBIT 9:
Change in payroll employment from 2006 to 2016.

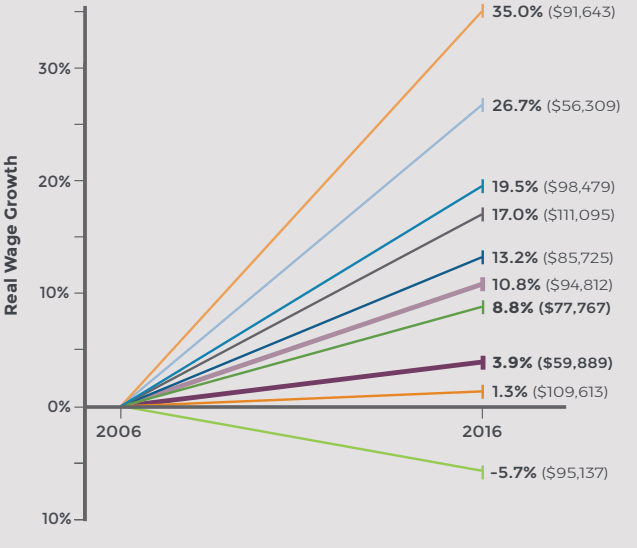


EXHIBIT 10:
Change in real wages from 2006 to 2016.

Demand-Side Analysis

Industry Outlook & Future Workforce Needs

To determine where the professional services industry is headed, a growth forecast of its component industries over the next five years is used to extrapolate future demand for workers.

5-YR PROJECTION

Between 2016 and 2021, the professional services industry is projected to grow in the Los Angeles Basin by almost 13,840 net new jobs.

The highest growth by number of jobs is expected to occur in the computer system design and related services industry (7,530 new jobs), followed by management, scientific and technical consulting services (4,860 new jobs). The highest number of jobs by proportion is forecasted to occur in the specialized design services industry (growth of 19.4 percent). Two component industries are predicted to experience a decline in payroll employment: architectural and engineering services, a decline of 9.5 percent, representing a loss of 5,410 jobs; and advertising, public relations and related services, a contraction of 2.4 percent, representing a loss of 770 jobs (Exhibit 11).

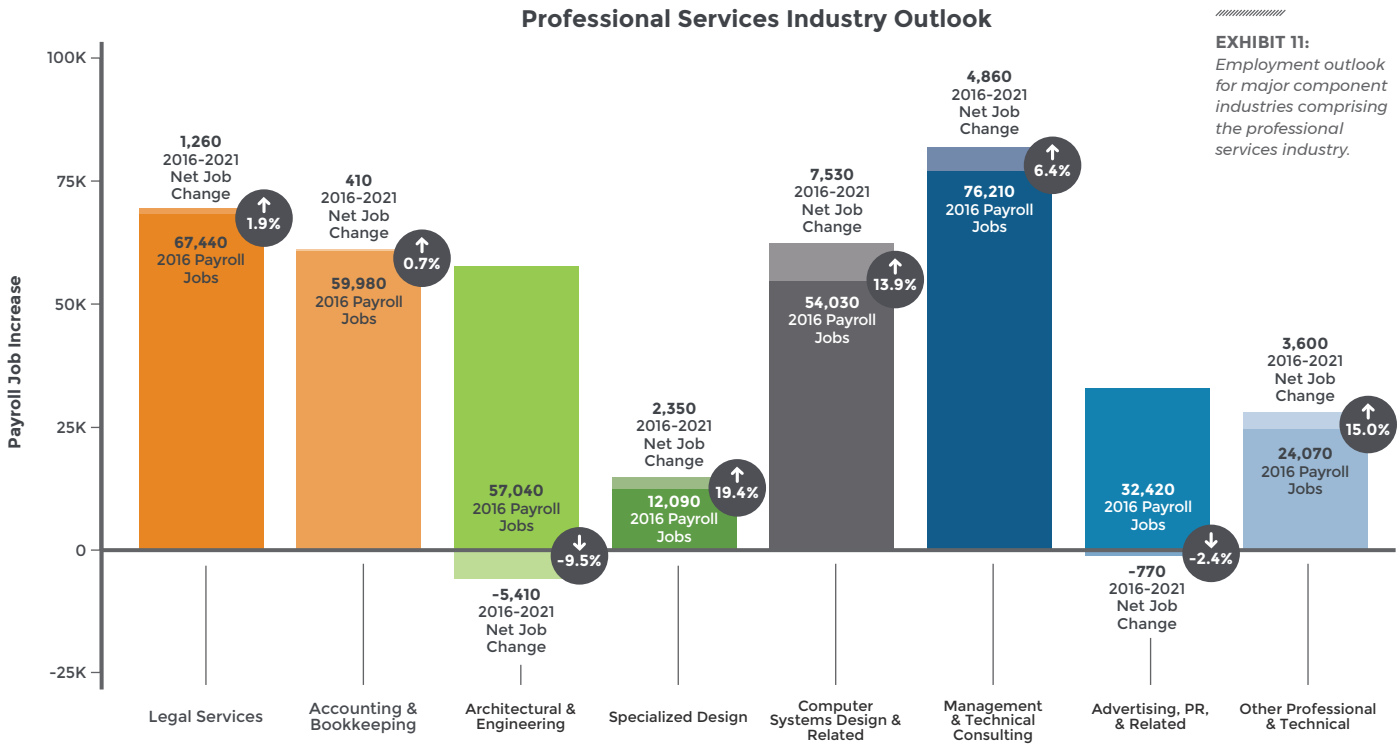


EXHIBIT 11:
Employment outlook for major component industries comprising the professional services industry.

The number of projected new jobs can be combined with job openings from replacements and retirements to provide an overall estimate of employer hiring needs. Most of the job openings expected over the next five years will be due to workers changing jobs or retiring, rather than the creation of new jobs in the professional services industry.

Overall, 50,680 total job openings will be created in the professional services industry in the Los Angeles Basin over the next five years, of which an estimated 36,840 will be replacement workers (Exhibit 12).

The professional services industry is projected to add nearly 14,000 net new jobs in the Los Angeles Basin by 2021.

The highest number of openings will be in occupations related to management and technical consulting services. These openings will be in occupations that include graphic designers, and environmental science and protection technicians.

Of all professional services industry openings over the five-year period, about 10 percent will be middle-skill jobs, those requiring some college education, a nondegree award or certificate, or an associate degree (Exhibit 13). More than half of the projected openings will be for workers with a bachelor's degree or higher, representing jobs that are above middle-skill. Just over 30 percent of total openings will require a high school diploma or less and are considered jobs that are below middle-skill.

Currently, middle-skill jobs comprise close to half of all jobs in the professional services industry (Exhibit 14). Similarly, analysis of the skills classifications for total job openings over the next five years reveals that nearly half of projected openings will be for middle-skill occupations, reinforcing the selection of this industry as a valid target for community college programs.

Middle-skill occupations in professional services are diverse, ranging from tax preparers and graphic designers to civil drafters and veterinary technicians. Job duties and core job competencies vary along with wages, as do employment status (full-time and part-time status) across industry occupations.

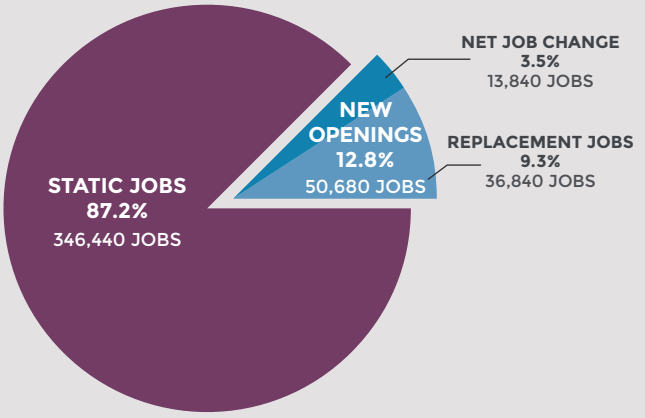
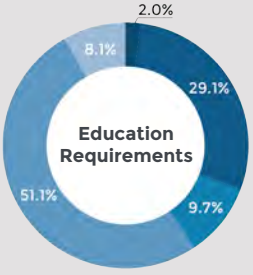


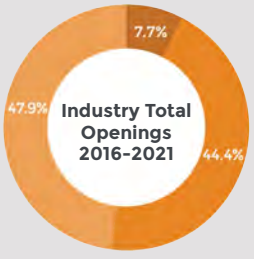
EXHIBIT 12:
Employment outlook for the professional services industry.



Less than HS
High School
Associate/Some College
Bachelor's
Master's+

Source: Estimates by LAEDC

EXHIBIT 13:
Minimum entry-level educational requirements for professional services industry job openings.



Below Middle-Skill
Middle-Skill
Above Middle-Skill

Source: Estimates & analysis by LAEDC

EXHIBIT 14:
Skills classifications for the region's professional services.

The professional services industry has a number of middle-skill occupations that have significant employment churn and relatively higher numbers of replacement jobs annually. This is important to note, as the net change in new jobs can be negative, but in occupations with a lot of movement, there can still be a high number of total openings in an occupation. For example, retirements represent additional job opportunities not related to growth. In the event that the predicted net change in jobs in a particular occupation slowed and dipped negative, the large number of openings from individuals changing jobs and retiring would still provide opportunities for job seekers.

Professional services is an industry with a large number of contingent workers, those who work in the gig economy on a per-project basis, such as consultants and independent contractors. This tends to lead to high replacement rates for these occupations. Examples of middle-skill occupations in the professional services industry with high replacement rates include environmental science and protection technicians (including health), forest and conservation technicians, and desktop publishers (Exhibit 15).

Professional Services

CHARACTERISTICS OF WORKERS HIRED IN 2016

Observing the characteristics of workers hired in the industry can reveal who is getting selected to fill vacant positions. The composition of all hires (the sum of new hires and recalls) in professional services in the Los Angeles Basin varies according to educational attainment, age, and race and ethnicity.

The professional services industry provides a wide range of jobs to individuals with different levels of education (Exhibit 16). Nearly a quarter of all hires, which include the estimated number of workers who started a new job in 2016 (new hires and recall employees), were middle-skill workers, those who have completed some college, a postsecondary nondegree award, or an associate degree. Above middle-skill workers, those with a bachelor's degree or higher, represent 30 percent of all hires, and those with a high school diploma or less (below middle-skill) account for an additional 30 percent.

MIDDLE-SKILL OCCUPATIONS

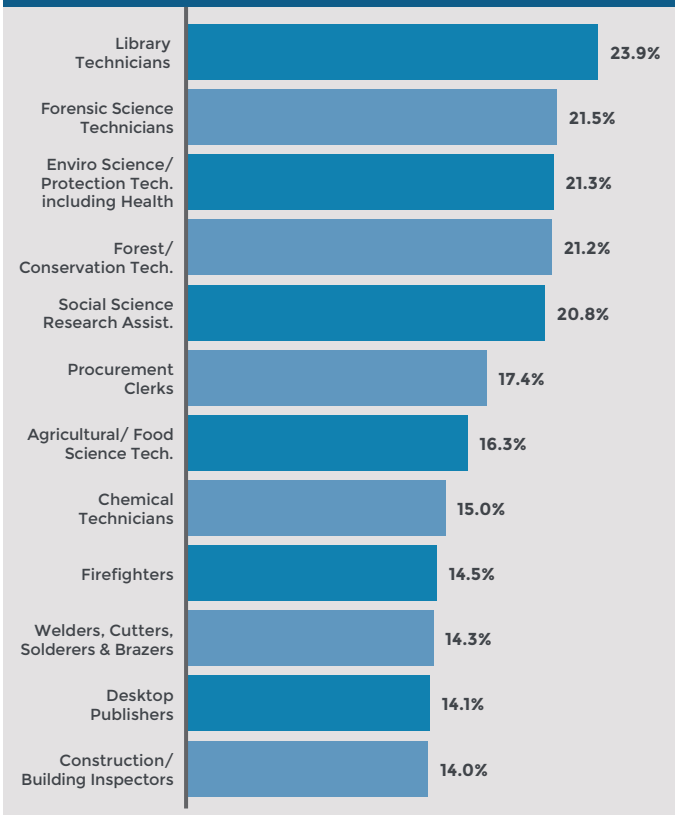


EXHIBIT 15:
Middle-skills occupations with high employment churn.

NEW HIRES IN 2016

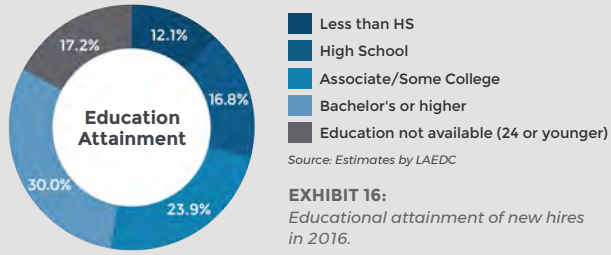


EXHIBIT 16:
Educational attainment of new hires in 2016.

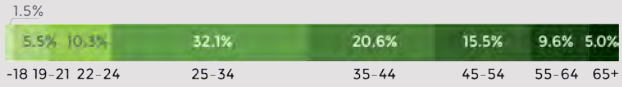


EXHIBIT 17:
Age distribution of new hires in 2016.

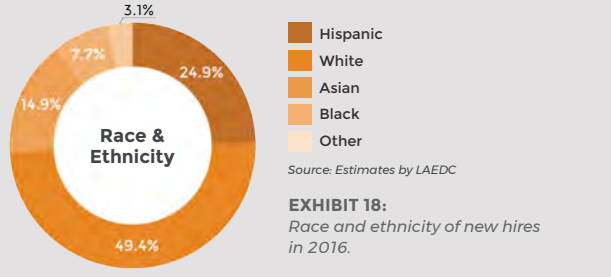


EXHIBIT 18:
Race and ethnicity of new hires in 2016.

Over two thirds of all hires in the industry in 2016 were in their prime working years, between the ages of 25 years and 54 years (Exhibit 17). The largest shares of new hires fall in the age groups of 25-34 years (32 percent) and 35-44 years (21 percent). Additionally, there are employment opportunities in the industry for older workers. Indeed, close to 15 percent of all professional services workers hired in the Los Angeles Basin were age 55 years and older. On the other end of the age spectrum, approximately 10 percent of all hires were 22-24 years of age.

Regionally, the professional services workforce is diverse in both race and ethnicity (Exhibit 18). A quarter of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races). Workers reporting their race as white account for just under half of all hires in the industry, and Asians and black/African American workers account for 15 percent and 8 percent of the hired workforce, respectively.

Occupational Movement in the Industry

The professional services industry has not been untouched by technology-driven change. Each component industry has been impacted differently.

Identifying professional services occupations that have experienced positive and negative changes in employment can help us understand the trends transforming the industry's workforce. For this reason, we look at the employment change in specific occupations from 2011 to 2016, along with their forecasted employment, to draw attention to those exhibiting robust growth and those that may be on the verge of becoming obsolete (Exhibit 19). Secondarily, based upon the occupations identified, we attempt to identify the underlying cause of these rates of change.

Professional services industry occupations exhibiting the most robust growth have the shared characteristic of being STEM-related. Growth in tax preparers reflects the preference of both individuals and businesses to hire professionals with expertise in preparing taxes, versus using available tax preparation software, to help them navigate current tax laws, maximize deductions, and avoid potentially costly penalties related to errors.

Occupations experiencing significant declines over the period include those that technology is pushing out. Prepress technicians and workers and photographic processing workers, and machine operators are examples of jobs that are becoming obsolete; printing presses and photo processing have become largely digital. Executive administrative assistants is another occupation that is losing relevance. It has become common for executive administrative assistants to provide services for more than one high-level staff member; additionally, software and apps allow executives to perform much of the work previously done by their assistants, such as calendar management and correspondence.

New middle-skill occupation designations, established between 2011 and 2016, in the professional services industry were mostly high-tech jobs, including computer user support specialists, web developers and computer network support specialists. Looking forward, this "STEMifcation" trend is expected to continue as the industries and the tools used in professional services become more technology-driven.

Workforce Trends

Many diverse industries make up professional services. Each has its own unique growth trajectory, occupational composition, technological innovations and disruptive forces. Examining what is taking place in each industry can help predict how these trends may impact the workforce. In the Industry Forecast section later in this report, additional quantification of the component industries comprising professional services, including industry size and the characteristics of hired workers, is provided.

Several trends are disrupting the legal services industry, one of the professional services component industries. Advances in computing technology and process solutions are reducing legal transaction costs and ushering in an era where new business models are being adopted, with firms like Elevate, Conduit Law and Lawyers on Demand scrapping the traditional billable-hours work model and instead charging a flat-rate fee for their services. Legal research is being automated thanks to machine learning. Software solutions, such as those created by ROSS Intelligence, are using AI to automate the highly labor-intensive and time-consuming process of researching legal cases. Finally, the industry is being affected by the rise of web-based tech providers that offer non-legal support: document review; cloud-based management platforms that simplify litigation management and the administration of multiple legal transactions such as automated timekeeping, virtual accounting services, presentation design and automated client intake forms.

Looking ahead, workers will require specialized skills to adapt to technology-driven changes occurring in the industry

Workers in the accounting, tax preparation, bookkeeping and payroll services industry are no strangers to the influence of technological innovation. Online tax tools, like TurboTax software for e-filing, have been impacting the industry for years. Automation and AI have the potential to be equally disruptive; however, they stand to increase efficiencies and thus productivity in the industry as well. Robotic process automation makes back-office functions routine by working with the existing IT structure of businesses, while AI is being used in auditing, predictive analytics and risk analysis. Additionally, workers in this industry have significant opportunities to become their own bosses, as part of the gig economy, working as free agents or consultants. Looking ahead, workers will require specialized skills to adapt to technology-driven changes occurring in the industry; these include data analytics, data visualization, data science (big data), statistics and IT experience.

The adoption of Building Information Modeling (BIM) technology in the architectural and engineering industries is creating opportunities for workers trained in this new technology. BIM models time and cost in addition to a three-dimensional representation of a structure and its equipment. As regulations for safety and environmental standards change, health, safety and environmental technicians and specialists are needed to ensure compliance; these are middle-skill fields. Competency in computer-aided engineering and computer-aided design (CAD) is highly valued and sought after, especially with the recent introduction of 3D CAD, allowing for the 3D modeling of designed products.

A number of smaller industries are encompassed by specialized design services, such as interior design, industrial design, graphic design and fashion-industry-related design (clothes, shoes, jewelry and textile design). 3D printing, augmented (AR) and virtual reality (VR), cloud rendering and software apps are technologies used across the specialized design services industry. Interior designers

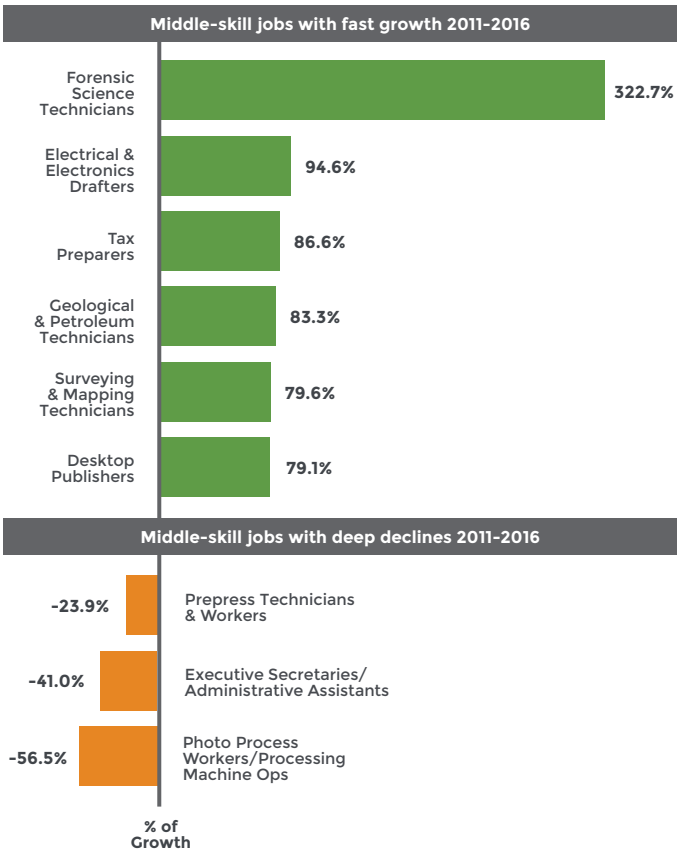


EXHIBIT 19:
Occupational Movement, Middle-skill job growth 2011 to 2016

are increasingly incorporating smart home technology, like motion and voice recognition software, into their designs, as well as sustainability and energy efficiency features for both commercial and residential projects. Robots perform cut-and-sew functions in factories for the fashion industry; AR and VR are being deployed in dressing rooms; and algorithms are being used to predict the latest trends and best pricing strategies within and between geographic locations. Graphic design uses a variety of highly sophisticated software and/or cloud-based tools for content creation, including Inkscape, HTML, CSS, and JavaScript, and a variety of Adobe creative software (InDesign, Photoshop, Illustrator and Dreamweaver).

Computer systems design and related services bring together hardware, software and communication technologies to develop, install and execute computer systems. Strong programming skills and IT knowledge are must-have skills for workers. Cybersecurity and cloud computing are examples of new middle-skill education programs being offered to help meet the changing IT needs of employers both in and outside the professional services industry (Exhibit 20).

Management, scientific and technical consulting services includes management consulting, environmental consulting, and other scientific and technical consulting. Big data, data mining, data analytics and visualization, machine learning, AI, cognitive computing, cloud computing and data science tools (SQL, Python and statistical software like R) are all heavily used across the various consulting industries. Changes in client expectations currently play a big role in this industry, with the push for services that are bigger, better and faster coinciding with increased publicly available data. Firms in this industry are experiencing pushback against once-standard billable hours, resulting in many firms moving toward a more commoditized, value-added model. And, as described above, many opportunities exist within this industry for workers to be contingent

EMERGING SKILLS & OCCUPATIONS

- Cybersecurity (user/network support techs)
- Cloud computing
- BIM technician
- Health/safety/environmental technicians and specialists
- Data skills used in e-discovery
- Veterinary technician specialization certifications

EXHIBIT 20

workers/free agents in the gig economy. With these democratizing changes reducing barriers to entry, many small, highly specialized consultancy firms are breaking into the market, bringing increased competition to the well-established, larger incumbent firms that previously dominated the industry.

Workers in the advertising, public relations and related services industry are charged with the difficult task of capturing the heavily distributed and divided attention of the public. Social media has been a game changer, used by businesses of all sizes and across all industries for business development, to improve brand awareness to increase client engagement and for marketing. Firms in the advertising, public relations and related services industry use social media as a core, essential tool, one that is no longer non-compulsory from a skills perspective, in addition to digital PR technology. Big data and AI are increasingly being used to gather information, provide industry insights, predict trends, monitor social media, and for digital storytelling. Along with the continued push toward PR measurement to determine return on investment (both qualitatively and quantitatively), this has resulted in the design and use of specialized software such as AirPR, TrendKite and Hootsuite, which are becoming part of the PR worker's core suite of competencies.

Other professional, scientific and technical services represents a diverse collection of industries, which includes photography, veterinary services, marketing research and public opinion polling, and translation and interpretation services. Although the list of industries in this classification is varied, the same disruptive technologies are still at play; big data, AI, machine learning, AR and VR, robotics, digitization, cloud computing are differentiators in the success of industries, firms and workers. In photography, image sensors that are capturing data and algorithms are used to produce augmented photos, a process called computational photography, a technology found on smartphones. Looking ahead, 3D capture, together with AR and VR, will embed itself in the industry, as will advancements in light and infrared sensors. Veterinary services are utilizing wearable technologies to gather data to monitor pet health and aid in diagnosis and treatment; 3D printing is being used to create prosthetics; in-home lab tests are becoming increasingly routine; and telemedicine is being deployed in rural areas (and under specific circumstances) as a way of overcoming the geographic isolation of remote clients. AI and big data will help to increase efficiencies in the market research and public opinion polling industries, and neural machine translation, used in software like Google Translate and Microsoft's Translator, stands to impact translation and interpretation services. Going forward, worker adeptness in all these technologies will be required to enter many of these industries.

Much of the same disruptive forces are at play across all professional services industries: advancements in technology; changing business models, such as scrapping billable hours for capped and/or success fees; and the move toward a gig economy, where many of the industry's workers are contingent or freelance workers.

Target Middle-Skill Occupations

Middle-skill occupations predicted to have significant job prospects over the next five years and that stand to benefit from investment into postsecondary non-degree and career education programs include graphic designers, tax preparers, and veterinary technologists and technicians.

The top 15 occupations by projected total openings in the Los Angeles Basin over the next five years are shown in Exhibit 21.

SOC	OCCUPATION	2016 EMPLOYMENT	2016–2021		
			NEW JOBS	REPLACEMENT JOBS	TOTAL JOB OPENINGS
27-1024	Graphic Designers	5,300	1,050	630	1,680
23-2011	Paralegals and Legal Assistants	10,540	270	1,160	1,430
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, & Executive	10,200	530	540	1,060
15-1134	Web Developers	2,950	670	190	860
15-1142	Network and Computer Systems Administrators	3,670	470	240	710
13-2082	Tax Preparers	4,710	70	590	660
43-3011	Bill and Account Collectors	1,870	370	230	600
29-2056	Veterinary Technologists and Technicians	2,550	460	130	590
15-1151	Computer User Support Specialists	5,180	140	330	480
17-3011	Architectural and Civil Drafters	4,690	190	280	470
27-3091	Interpreters and Translators	1,060	350	80	440
43-3051	Payroll and Timekeeping Clerks	1,150	210	150	360
47-4011	Construction and Building Inspectors	1,380	90	190	290
19-4091	Environmental Science and Protection Technicians, Including Health	670	120	140	260
17-3022	Civil Engineering Technicians	1,540	70	190	250

EXHIBIT 21:
Target middle-skill occupations by total openings, 2016-2021

Supply-Side Analysis

California's Community Colleges Talent Pool

From environmental science to accounting and finance, there are many different community college programs preparing students to access a diverse array of occupations in professional services. The wide scope of these community college programs provides a competitive talent pool for local employers in the Los Angeles Basin.

This section details community college program offerings and student completions related to middle-skill occupations in the region's professional services industry. For a complete list of colleges with related program offerings, see Appendix A.

Within each subcluster, one to four occupations that offer promising career prospects for community college students were selected for closer examination. These occupations have positive employment outlooks and pay above the living wage in the region.

WORKFORCE SHORTAGE

While student completions are very high in professional services compared to other academic disciplines, overall demand for graduates in this field appears to exceed supply.

OCCUPATION	AWARDS
• Accounting & Finance	1,168
• Computers & Design	1,286
• Architecture & Engineering	684
• Law	486
• Administration & Support	564
• Veterinary Medicine	72
• Environmental Science	23

Over the next five years, the Los Angeles Basin can expect approximately 6,340 total job openings annually for middle-skill occupations across all industries. In short, the region may be facing a significant workforce shortage in coming years, an undersupply of 2,000 workers to fill job openings in the professional services occupations examined in this report.

Supply Gaps Examined

The professional services industry is such a ubiquitous field that all 28 community colleges in the Los Angeles Basin offer programs that funnel students into related occupations. In total, there are 30 certificate and degree programs in the region that prepare students to enter occupations in professional services. Through these 30 programs, community colleges conferred nearly 4,300 awards in the 2016–17 academic year.

While student completions are very high in professional services compared to other academic disciplines, overall demand for graduates in this field appears to exceed supply. Over the next five years, the Los Angeles Basin can expect approximately 6,340 total job openings annually for middle-skill occupations across all industries. In short, the region may be facing a significant workforce shortage in coming years, an undersupply of 2,000 workers to fill job openings in the professional services occupations examined in this report.

However, when specific subgroups of professional services are examined, in some cases there is an oversupply of students. The following section will explore in depth which occupational clusters are meeting demand and which are falling short.

Because professional services occupations exist across many different industries, occupations were categorized into the following seven subclusters/concentrations:

OCCUPATION CONCENTRATIONS:

1. Accounting and finance
2. Computers and design
3. Architecture and engineering
4. Law
5. Administration and support
6. Veterinary medicine
7. Environmental science

ACCOUNTING AND FINANCE

Within the professional services industry, 320 annual openings are projected across three occupations related to accounting and finance (Exhibit 22). By comparison, across all industries, 880 annual openings are projected for the three identified accounting and finance occupations.

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
13-2082	Tax Preparers	4,710	130	4,710	130	$23.52
43-3011	Bill and Account Collectors	1,870	120	23,450	340	$19.54
43-3051	Payroll and Timekeeping Clerks	1,150	70	10,900	410	$21.71
TOTAL EMPLOYMENT		7,730	320	39,060	880	

EXHIBIT 22:
Employment outlook for occupations in accounting and finance.

The highest number of community college awards is in accounting, with 1,066 awards conferred in the 2016–17 academic year (Exhibit 23). Awards were substantially lower in tax studies, 53, and banking and finance, 49. In the case of accounting and finance, it appears the community colleges may be exceeding demand for these three occupations, not only within the professional services sector, but across all industries in the region, which have only 880 projected annual openings.

Only occupations that are middle-skill and that offer wages above the region's living wage were selected for this study. Within accounting and finance, the highest paid middle-skill job identified is tax preparers, with a median wage of $23.52 per hour, about $49,000 per year. Bill and account collectors earn a median wage of $19.54, slightly more than $40,000 per year.

PROGRAM	*2016–17 AWARDS*
• Accounting	1,066
• Tax Studies	53
• Banking & Finance	49
TOTAL	**1,168**

EXHIBIT 23:
Community college awards related to accounting and finance.

COMPUTERS AND DESIGN

For occupations related to computers and design, 750 annual openings are projected in the professional services industry (Exhibit 24).

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
27-1024	Graphic Designers	5,300	340	13,050	470	$25.59
15-1134	Web Developers	2,950	170	9,080	350	$32.41
15-1142	Network & Computer Systems Admin.	3,670	140	16,350	20	$42.01
15-1151	Computer User Support Specialists	5,180	100	27,720	730	$26.53
TOTAL EMPLOYMENT		17,100	750	66,200	1,570	

EXHIBIT 24:
Employment outlook for occupations in computers and design.

Graphic designers will have the most annual openings, 340, followed by web developers, 170.

Across all industries, 1,570 annual openings are projected across all four occupations related to computers and design. It should be noted that computer user support specialists have far more annual openings projected across all industries, 730, compared to the professional services industry, only 100.

Community college awards related to computers and design appear close to meeting workforce demand in the Los Angeles Basin, but a small undersupply seems to exist. Programs with the greatest number of awards include computer programming, computer networking, and graphic art and design (Exhibit 25). For all programs related to computers and design, there were 1,286 awards conferred in the 2016–17 academic year.

Occupations in computers and design all pay strong median wages, ranging from $25.59 per hour for graphic designers, approximately $53,000 per year, to $42 per hour for network and computer systems administrators, more than $87,000 per year. Web developers can expect to earn a median wage of $32.41, roughly $67,400 per year.

PROGRAM	*2016–17 AWARDS*
• Computer Programming	252
• Computer Networking	232
• Graphic Art and Design	181
• Computer Information Systems	123
• Information Technology, General	93
• Computer Infrastructure and Support	91
• Software Applications	78
• Computer Graphics and Digital Imagery	62
• Telecommunications Technology	49
• World Wide Web Administration	26
• Digital Media	22
• Multimedia	20
• Computer Software Development	20
• Computer Support	20
• Website Design and Development	17
TOTAL	**1,286**

EXHIBIT 25:
Community college awards related to computers and design.

ARCHITECTURE AND ENGINEERING

The occupation with the most annual openings, architectural and civil drafters, is projected to only offer 90 annual openings in the region in the professional services industry (Exhibit 26). This is followed by construction and building inspectors, with 60 annual openings. Overall, 200 total annual openings are projected for all architecture and engineering occupations in professional services. By comparison, 370 annual openings are projected across all industries.

As a result, it appears there may be an oversupply of students in architecture and engineering programs, not only within the professional services sector, but across all industries. Community college awards far outnumber these projected annual openings (Exhibit 27). For example, there were 243 awards conferred in architecture and architectural technology in the region during the most recent academic year with available data. There were another

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
17-3011	Architectural and Civil Drafters	4,690	90	5,670	130	$28.70
47-4011	Construction and Building Inspectors	1,380	60	3,740	130	$40.37
17-3022	Civil Engineering Technicians	1,540	50	3,100	110	$35.68
TOTAL EMPLOYMENT		7,610	200	12,510	370	

EXHIBIT 26:
Employment outlook for occupations in architecture and engineering.

203 completions in drafting technology, and 146 completions in engineering technology (general). In total, 684 awards were conferred in the 2016–17 academic year in programs related to architecture and engineering.

These occupations tend to be well paid. The highest paid workers, construction and building inspectors, earn more than $40 per hour, nearly $84,000 per year.

PROGRAM	2016–17 AWARDS
• Architecture and Architectural Technology	243
• Drafting Technology	203
• Engineering Technology, General	146
• Public Works	37
• Construction Inspection	31
• Architectural Drafting	16
• Civil Drafting	8
TOTAL	**684**

EXHIBIT 27:
Community college awards related to architecture and engineering.

LAW

As with architecture and engineering, there also seems to be an oversupply of students for law-related occupations, not only within the professional services industry, but across all industries. Nearly 300 annual openings are projected for paralegals and legal assistants within professional services, while 280 annual openings are projected across all industries (Exhibit 28). By comparison, community colleges in the region conferred 486 paralegal awards in the 2016–17 academic year (Exhibit 29).

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
23-2011	Paralegals and Legal Assistants	10,540	290	12,770	280	$24.76
TOTAL EMPLOYMENT		10,540	290	12,770	280	

EXHIBIT 28:
Employment outlook for occupations in law.

PROGRAM	2016–17 AWARDS
• Paralegal	486

EXHIBIT 29:
Community college awards related to law.

ADMINISTRATION AND SUPPORT

Within the area of administration and support, 300 annual openings are projected for secretaries and administrative assistants (except legal, medical, and executive), and interpreters and translators, in the professional services industry (Exhibit 30). Across all industries, annual openings are much higher for secretaries and administrative assistants, which total 2,900. By comparison, annual openings for interpreters and translators remain nearly the same between professional services and all industries. The total number of projected annual openings across all industries for all administration and support occupations is 3,030.

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	10,200	210	105,760	2,900	$18.83
27-3091	Interpreters and Translators	1,060	90	2,760	130	$25.59
TOTAL EMPLOYMENT		11,260	300	108,520	3,030	

EXHIBIT 30:
Employment outlook for occupations in administration and support.

Workforce demand for secretaries and administrative assistants across all industries appears to far exceed supply. In the 2016–17 academic year, community colleges reported conferring 475 awards in office technology/office computer applications (Exhibit 31). This number is far below the 2,900 annual openings projected for secretaries and administrative assistants.

In the case of interpreters and translators, supply appears to be nearly meeting demand. Nearly 90 awards were conferred in sign language interpreting in the 2016–17 academic year. Within professional services, 90 annual openings are projected, and across all industries, 130 annual openings are projected for this occupation.

Wages are substantially higher for interpreters and translators, than secretaries and administrative assistants. The median wage for interpreters is $25.59 per hour, compared to $18.83 per hour for secretaries and administrative assistants.

PROGRAM	2016–17 AWARDS
• Office Technology/Office Computer Applications	475
• Sign Language Interpreting	89
TOTAL	**564**

EXHIBIT 31:
Community college awards related to administration and support.

VETERINARY MEDICINE

In the region, there is an apparent undersupply of workers to fill positions for veterinary technologists and technicians. Within professional services, 120 annual openings are projected for veterinary technologists and technicians, and the same number of openings is projected across all industries (Exhibit 32).

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
29-2056	Veterinary Technologists and Technicians	2,550	120	2,710	120	$18.62
TOTAL EMPLOYMENT		2,550	120	2,710	120	

EXHIBIT 32:
Employment outlook for occupations in veterinary medicine.

By comparison, veterinary technician programs offered by community colleges conferred 72 awards in the 2016–17 academic year in the Los Angeles Basin (Exhibit 33). The median wage for veterinary technologists and technicians is $18.62 per hour, which translates to around $38,700 per year.

PROGRAM	*2016–17 AWARDS*
• Veterinary Technician (Licensed)	72

EXHIBIT 33:
Community college awards related to veterinary medicine.

ENVIRONMENTAL SCIENCE

An undersupply of workers also appears to exist in environmental science. Within professional services, 50 annual openings are projected for environmental science and protection technicians (including health) (Exhibit 34). That number climbs to 90 projected annual openings across all industries.

SOC	OCCUPATIONAL GROUP	PROFESSIONAL SERVICES		ACROSS ALL INDUSTRIES		MEDIAN HOURLY WAGE
		2016 EMPLOY.	ANNUAL OPENINGS	2016 EMPLOY.	ANNUAL OPENINGS	
19-4091	Environmental Science and Protection Technicians, Including Health	670	50	1,230	90	$24.64
TOTAL EMPLOYMENT		670	50	1,230	90	

EXHIBIT 34:
Employment outlook for occupations in environmental science.

In the 2016–17 academic year, only 23 awards were conferred in environmental technology by community colleges in the region (Exhibit 35). Those who work as environmental science and protection technicians can expect to earn a solid median wage, nearly $25 per hour, more than $51,000 per year.

PROGRAM	*2016–17 AWARDS*
• Environmental Technology	23

EXHIBIT 35:
Community college awards related to environmental science.

OVERSUPPLY:

- Accounting and Finance
- Architecture and Engineering
- Law

UNDERSUPPLY:

- Administration and Support
- Computers and Design
- Environmental Science
- Veterinary Medicine

Top Programs by Number of Awards

Since community colleges play a vital and critical role in preparing students to enter middle-skill occupations in professional services, this study identified the top five programs in the Los Angeles Basin that conferred the greatest number of awards in the 2016–17 academic year (Exhibit 36).

Community colleges in the Los Angeles Basin are producing more accounting certificates and degrees than any other program related to professional services, double the number of awards conferred by the next largest program, paralegal. There were 1,066 awards conferred in accounting in the 2016–17 academic years. As discussed earlier, it appears the community colleges may be exceeding demand for occupations in accounting and finance, not only within professional services, but across all other industries.

Although the third largest program by number of awards in the region is office technology/office computer applications, 475 total awards in 2016–17, workforce demand is not being met. Across all industries, 2,900 annual openings are projected for secretaries and administrative assistants, meaning that demand is roughly six times greater than the community college supply in the Los Angeles Basin.

Paralegal programs, and architecture and architectural technology programs rank second and fifth as programs conferring the most awards in the Los Angeles Basin. However, an oversupply appears to exist within both the law subcluster and the architecture and engineering subcluster.

PROGRAM	*2016–17 AWARDS*
• Accounting	1,066
• Paralegal	486
• Office Technology/Office Computer Applications	475
• Computer Programming	252
• Architecture and Architectural Technology	243

EXHIBIT 36:
Community college programs with the most completions in the Los Angeles Basin, 2016–17 academic year.

Computer programming is the fourth largest program by number of awards in the region. It is just one of many programs in the region training students to enter occupations in the computers and design subcluster. Since computer programming can prepare students to enter many different occupations, it is difficult to determine precisely whether demand is being met. Collectively, it appears that the community college programs with a focus on computer science and graphic design are nearly meeting demand in the region. Overall, 1,570 annual openings are projected across all four occupations related to computers and design, a number which does not greatly exceed the 1,286 awards conferred in related community college programs in the 2016–17 academic year.

Additional information about regional career education programs that have demonstrated successful employment and student completion outcomes can be found on the California Community Colleges Chancellor's Office (CCCCO) Doing What Matters (DWM) website: https://dwmshowcase.com/showcase_workforce_stars.asp

Workforce Development Boards Talent Pool

Los Angeles County America's Job Centers, previously known as WorkSource Centers, serve over 250,000 individuals each year. These one-stop centers are operated by seven Workforce Development Boards (WDBs) responsible for providing workforce development services and programs to job seekers and employers.

Two of the seven WDBs in Los Angeles County shared data on their training programs and participant numbers for this study: Los Angeles City WDB and Los Angeles County WDB. The America's Job Centers (WorkSource Centers) assist clients with accessing training providers in the community. The information below does not overlap with the previously discussed data. The data included in this section should be considered a snapshot of the services provided that are related to training additional workers for occupations in professional services, and not a complete picture.

By including this information, this study seeks to bring attention to the WDBs as facilitators for training in the region. WDBs primarily send participants to trainings offered by ROPs, adult education providers and for-profit technical schools. Usually, this training does not result in a degree or certificate, but in the completion of a number of hours of training for an occupation that typically does not require postsecondary education. The two WDBs providing data trained 815 participants through 20 programs related to professional services. WDB programs with the most participants include computer skills/use, IT-related, and accounting and bookkeeping (Exhibit 37).

PROGRAM/COURSE	NUMBER OF PARTICIPANTS
Computer Skills/User	350
IT-related	101
Accounting and Bookkeeping	79
Construction	57
General Office/Administrative Assistant	49
Business Management	40
Microsoft Office	33
Project Management	30
Graphic Design and Web Design	22
Social Media and SEO	10
Paralegal	10
Recycling and Sustainability	7
Veterinary	5
Animation	5
Communication	4
Computer Aided Drafting	4
Entrepreneurial Training	3
Technical Writing	2
Interpretation and Translation	2
Contract Management/General Contractor	2
TOTAL	815

EXHIBIT 37:
Programs related to professional services and participant numbers for two WDBs in the region.

Industry Forecast

Where the jobs will be

To better understand where the professional services industry is headed, its component industries are quantified and their growth is forecasted over the next five years. These projections are used to extrapolate future workforce needs, i.e., the demand for workers.

Legal Services

Sizing Things Up

In 2016, legal services employed 67,440 payroll workers in the Los Angeles Basin. This accounts for 17.6 percent of business, scientific and technical services (professional services) industry employment, excluding here and in the remainder of this report scientific research and development services (NAICS 5417).

> *About half of the legal services jobs in the Los Angeles Basin are in occupations considered middle-skill.*

Projections indicate that middle-skill jobs will comprise 50.1 percent of all jobs in the legal services industry by 2021 (Exhibit 38). With a regional location quotient of 1.3, the industry is competitive compared to the rest of the nation. Since 2006, the component industry has added almost 4,000 jobs, exceeding the pre-recession employment level by 6.2 percent.

Industry Outlook

Between 2016 and 2021, the legal services industry is projected to grow by 1.9 percent across all skill levels to 68,700 jobs (Exhibit 39). However, the middle-skill portion of this component industry is projected to diminish slightly by 0.3 percent to 33,330 jobs. The increase of 1,260 jobs is in net new jobs irrespective of employment churn (replacement jobs) in the industry.

Source: Estimates & analysis by LAEDC

EXHIBIT 38:
Skills classifications for the region's legal services industry.

Characteristics of Workers Hired

The composition of all hires (the sum of new hires and recalls) in legal services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 24 percent of all hires were middle-skill workers, those having completed some college, a postsecondary nondegree award or an associate degree. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, comprising 34 percent and 19 percent respectively. Approximately 10 percent of all hires were 22-24 years of age. Nearly 30 percent of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 42). Workers reporting their race as white accounted for half of all hires in the industry. Asian workers accounted for 12 percent, and black/African-American workers accounted for 6 percent of all hires in the industry.

Future Workforce Needs

The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the legal services industry is projected to add 6,690 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 1,260 jobs will be net new jobs and 5,430 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 3,240 projected openings will be for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this industry, especially paralegal assistant, secretarial and collection-related occupations. Additional broad categories include customer service workers, title examiners and data entry workers. However, given advances in data-capture technology and other forms of automation, these roles might be most subject to long-term diminution as a proportion of the legal services sector.

MIDDLE-SKILL OCCUPATIONS: SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Paralegals	1,420
• Legal Secretaries	770
• Administrative Assistants (except legal, medical and executive)	290
• Bill an Account Collectors	120
• Title Examiners, Abstractors and Searchers	110
• Customer Service Representatives	100

Age Distribution of Workforce

EXHIBIT 41:
Age distribution of the legal services industry.

Average Monthly Earnings by Education

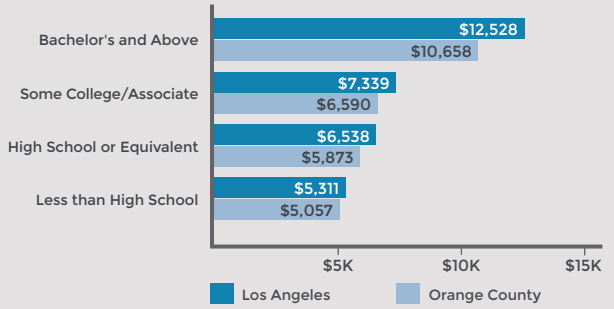
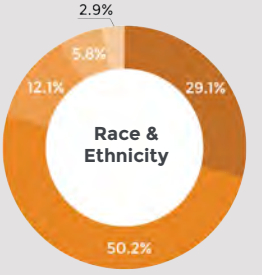


EXHIBIT 40:
Average monthly earnings by educational attainment 2016.



Source: Estimates by LAEDC

EXHIBIT 42:
Race and ethnicity of workers hired in the legal services industry in 2016.

Professional Services Industry Outlook

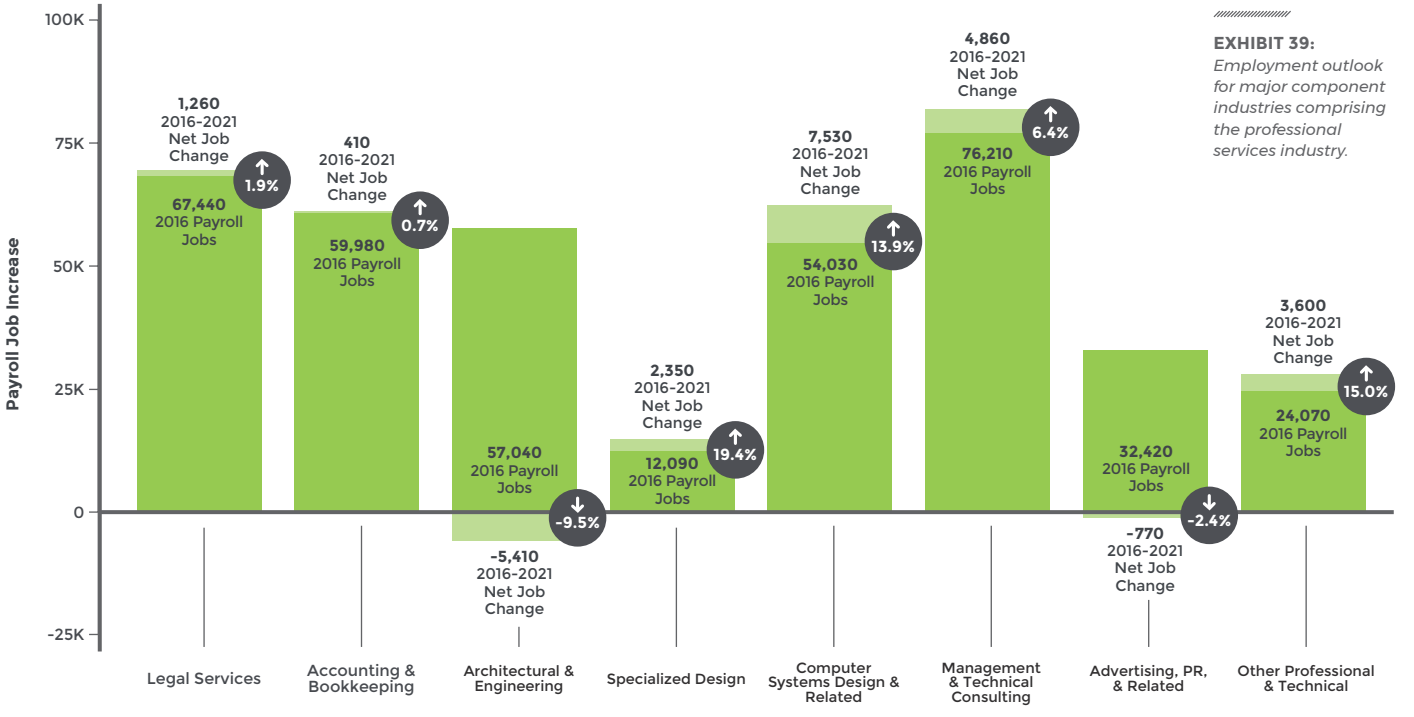


EXHIBIT 39:
Employment outlook for major component industries comprising the professional services industry.

Accounting & Bookkeeping Services

Sizing Things Up

In 2016, accounting and bookkeeping services employed 59,980 payroll workers in the Los Angeles Basin, or 15.6 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 35.8 percent of all jobs in the accounting and bookkeeping services industry by 2021 (Exhibit 43).

With a regional location quotient of 1.2, the industry is competitive compared to the rest of the nation. This should not be surprising given the concentrated presence of large regional finance, health care and entertainment businesses in the region, many of which contract with firms for these services. Since 2006, the industry has added over 2,820 jobs, exceeding the pre-recession employment level by 4.9 percent.

Industry Outlook

Between 2016 and 2021, accounting and bookkeeping jobs in the Los Angeles Basin are projected to grow by 1.2 percent across all skill levels, to 60,390 jobs (Exhibit 39). The middle-skill portion of this industry is projected to grow at a slightly faster rate of 1.3 percent, to 23,620 jobs. This indicates a slight increase in middle-skill employment as a proportion of the industry's employment.

Characteristics of Workers Hired

The composition of all hires in accounting and bookkeeping services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 26 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), were middle-skill workers. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 31 percent and 22 percent respectively. Approximately 8 percent of all hires were 22-24 years of age. Just over 21 percent of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 46). Workers reporting their race as white accounted for over half (56 percent) of all hires in the industry. Workers identifying as Asian accounted for 11 percent and black/African-American workers accounted for 9 percent.

Future Workforce Needs

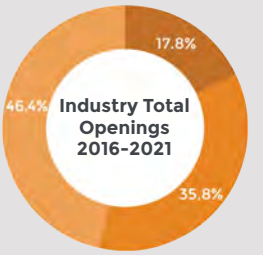
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the accounting and book keeping services industry is projected to add 6,810 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 410 jobs will be net new jobs and 6,400 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 2,670 projected openings will be for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this industry, especially tax preparation, payroll and collection-related occupations. Additional broad categories include secretaries, sales workers, and production and expediting clerks. Despite advances in automation, many jobs in this sector may be shielded from becoming outmoded since they require critical thinking and contextual awareness hitherto uncompensated by computers and machines.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Secretaries (except legal, medical and executive)	430
• Tax Preparers	390
• Bill and Account Collectors	230
• Payroll and Timekeeping Clerks	170
• Sales Representatives	110
• Production, Planning and Expediting Clerks	100



Source: Estimates & analysis by LAEDC

EXHIBIT 43:
Skills classifications for the region's accounting and bookkeeping services industry.

Average Monthly Earnings by Education

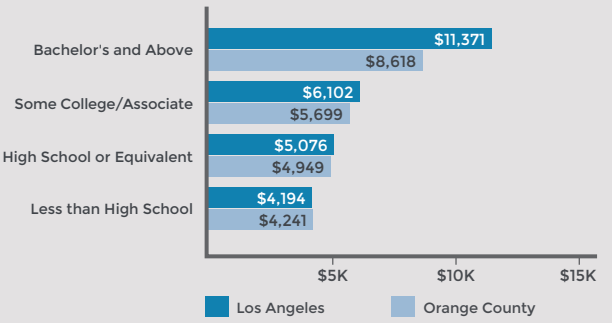


EXHIBIT 44:
Average monthly earnings by educational attainment 2016.

Age Distribution of Workforce

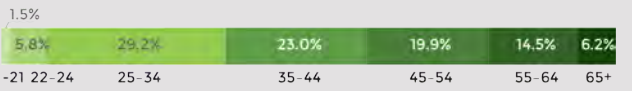
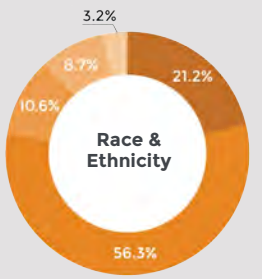


EXHIBIT 45:
Age distribution of the accounting and bookkeeping services industry.



Source: Estimates by LAEDC

EXHIBIT 46:
Race and ethnicity of workers hired in the accounting and bookkeeping services industry in 2016.

Architectural & Engineering Services

Sizing Things Up

In 2016, architectural and engineering services employed 57,040 payroll workers in the Los Angeles Basin, or 14.9 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 39.4 percent of all jobs in the architectural and engineering services industry by 2021 (Exhibit 47).

With a regional location quotient of 0.8, the industry is somewhat less competitive compared to the rest of the nation. Since 2006, the component industry has lost almost 4,160 jobs, remaining 6.8 percent below the 2006 level of employment and only 1.1 percent above the 2011 employment level.

Industry Outlook

Between 2016 and 2021, the architecture and engineering services industry is projected to decline by 9.5 percent across all skill levels to 51,640 jobs (Exhibit 39). The middle-skill portion of this component industry is projected to shrink as well by 7.8 percent to 20,910 jobs. However, this indicates a slight increase in middle-skill employment as a proportion of the industry's employment by 0.8 percent.

Characteristics of Workers Hired

The composition of all hires in architectural and engineering services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 24 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), were middle-skill workers, having completed some college, a postsecondary nondegree award or an associate degree. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 29 percent and 19 percent respectively. Approximately 10 percent of all hires were 22-24 years of age. Just over a quarter (26 percent) of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 50). Workers reporting their race as white accounted for just under half of all hires in the industry, and Asians and black/African-American workers accounted for 19 percent and 5 percent respectively.

Future Workforce Needs

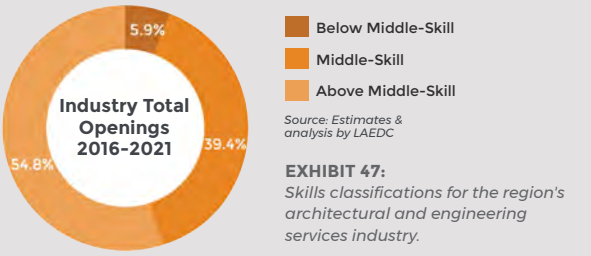
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the architectural and engineering services industry is projected to have 730 openings, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 5,410 jobs will be net jobs lost and 6,140 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 300 projected openings are for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this industry, especially drafters, engineering technicians and a variety of inspection and testing roles. Additional broad categories include surveyors and scientific technicians. Given extensive computer use in drafting, surveying, geophysical and building inspection and testing, the industry at large, and middle-skill jobs in particular, are somewhat susceptible to usurpation by automation in the future.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Architectural and Civil Drafters	540
• Civil Engineering Technicians	220
• Construction and Building Inspectors	200
• Inspectors, Testers, Sorters, Samplers & Weighers	190
• Chemical Technicians	90
• Surveying and Mapping Technicians	60



Source: Estimates & analysis by LAEDC

EXHIBIT 47:
Skills classifications for the region's architectural and engineering services industry.

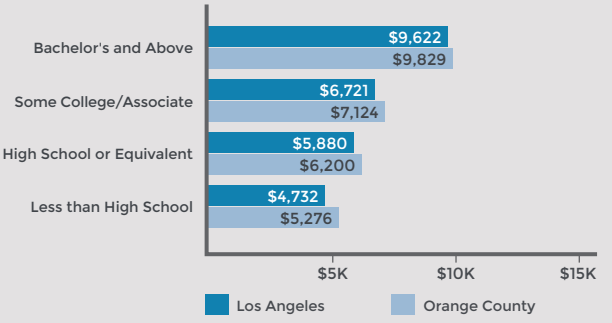


EXHIBIT 48:
Average monthly earnings by educational attainment 2016.

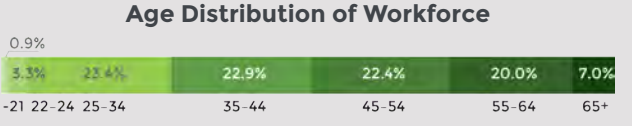
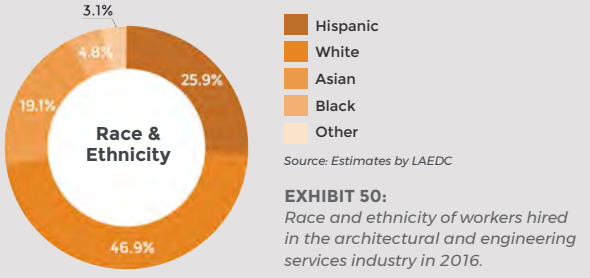


EXHIBIT 49:
Age distribution of the architectural and engineering services industry.



Source: Estimates by LAEDC

EXHIBIT 50:
Race and ethnicity of workers hired in the architectural and engineering services industry in 2016.

Specialized Design Services

Sizing Things Up

In 2016, specialized design services employed 12,090 payroll workers in the Los Angeles Basin, or 3.2 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 54.1 percent of all jobs in the specialized design services industry by 2021 (Exhibit 51).

With a regional location quotient of 1.8, the specialized design services industry is almost twice as competitive compared to the rest of the nation. Given the concentration of the creative and marketing industries in the Los Angeles Basin, this regional comparative advantage might be expected. Since 2006, the component industry has lost 540 jobs, remaining 4.3 percent below the 2006 level of employment, but 16.0 percent above the 2011 employment level.

Industry Outlook

Between 2016 and 2021, 19.4 percent growth is projected across all skill levels in specialized design services in the Los Angeles Basin, an increase of 14,440 jobs (Exhibit 39). The middle-skill portion of this industry is projected to grow commensurately by 19.0 percent to 7,840 jobs. However, this indicates a slight decrease in middle-skill employment as a proportion of the industry's employment by 0.2 percent.

Characteristics of Workers Hired

The composition of all hires in specialized design services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 24 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), were middle-skill workers. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 33 percent and 21 percent respectively. Approximately 10 percent of all hires were 22-24 years of age. A quarter of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 54). Workers reporting their race as white accounted for just over half (52 percent) of all hires in the industry. Workers identifying as Asian accounted for 16 percent and black/African-American workers accounted 4 percent.

Future Workforce Needs

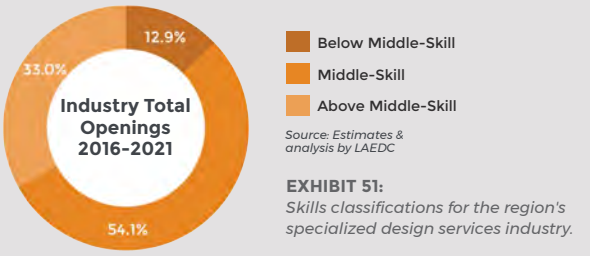
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the specialized design services industry is projected to add 3,630 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 2,350 jobs will be net new jobs and 1,280 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 1,970 projected openings are for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in the specialized design services industry, especially graphic designers, customer service representatives and fashion designers. Additional broad categories include secretarial, clerical and printing operations roles. Since many of these roles require human creativity beyond the current capacity of computers, this sector will likely be exempt from widespread job displacement related to automation for the foreseeable future.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Graphic Designers	800
• Administrative Assistants (except legal, medical and executive)	180
• Customer Service Representatives	120
• Production, Planning and Expediting Clerks	80
• Fashion Designers	70
• Printing Press Operators	70



Source: Estimates & analysis by LAEDC

EXHIBIT 51:
Skills classifications for the region's specialized design services industry.

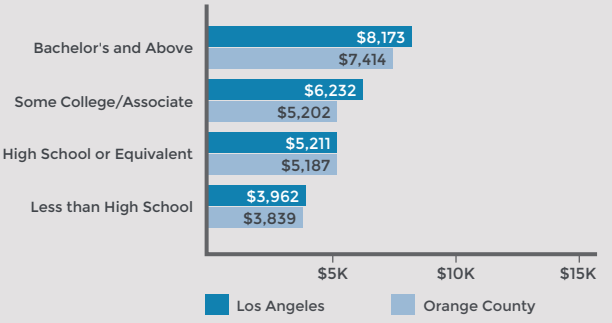


EXHIBIT 52:
Average monthly earnings by educational attainment 2016.

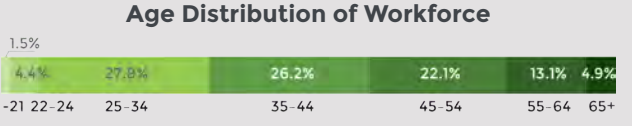
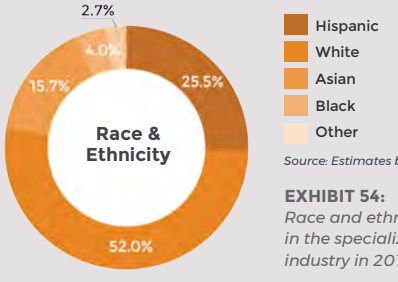


EXHIBIT 53:
Age distribution of the specialized design services industry.



Source: Estimates by LAEDC

EXHIBIT 54:
Race and ethnicity of workers hired in the specialized design services industry in 2016.

Computer Systems Design & Related Services

Sizing Things Up

In 2016, computer systems design services employed 54,030 payroll workers in the Los Angeles Basin, or 14.1 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 32.8 percent of all jobs in the accounting and bookkeeping services industry by 2021 (Exhibit 55).

With a regional location quotient of 0.6, the industry is half as competitive compared to the rest of the nation. When compared to Silicon Valley and the departure or establishment of computer and information technology in other localities, this metric is concerning, though expected. Since 2006, however, the component industry has added 10,880 jobs in the region, exceeding the 2006 level of employment by over 25 percent and the 2011 employment level by 18.8 percent.

Industry Outlook

Between 2016 and 2021, computer systems design services is projected to grow by 13.9 percent across all skill levels to 61,560 jobs (Exhibit 39). The middle-skill portion of this industry is projected to grow commensurately by 21.3 percent to 21,990 jobs, representing a 2.2 percent increase in middle-skill employment as a proportion of the industry's overall employment.

Characteristics of Workers Hired

The composition of all hires in computer systems design and related services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 23 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), had completed some college, a postsecondary nondegree award or an associate degree. These hires are filling middle-skill positions in the industry. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 35 percent and 24 percent respectively. Approximately 10 percent of all hires were 22-24 years of age. Just under 17 percent of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 58). Workers reporting their race as white accounted for just under half (46 percent) of all hires in the industry, and Asians and black/African-American workers accounted for 28 percent and 6 percent respectively.

Future Workforce Needs

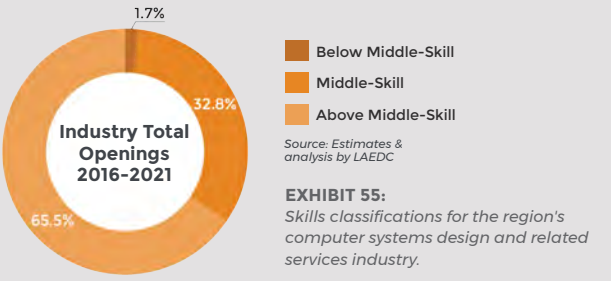
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the computer systems design and related services industry is projected to add 12,160 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 7,530 jobs will be net new jobs and 4,630 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 4,340 projected openings are for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this sector, especially systems administrators, customer service representatives and user support specialists. Additional broad categories include web developers and sales representatives. Since these roles are directly tied to the rise of automation as a job creator and displacer, this sector and those employed by it will continue to benefit from the advances of computing technology and its use in the workplace.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Network and Computer Systems Administrators	640
• Computer User Support Specialists	590
• Sales Representatives	530
• Web Developers	420
• Customer Service Representatives	260



Source: Estimates & analysis by LAEDC

EXHIBIT 55:
Skills classifications for the region's computer systems design and related services industry.

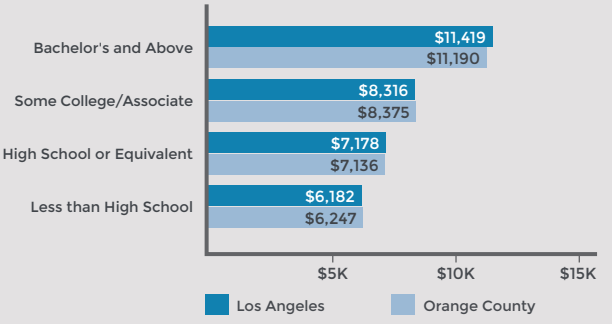


EXHIBIT 56:
Average monthly earnings by educational attainment 2016.

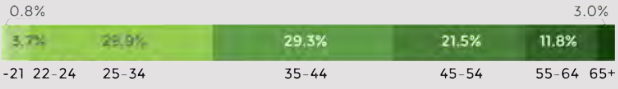
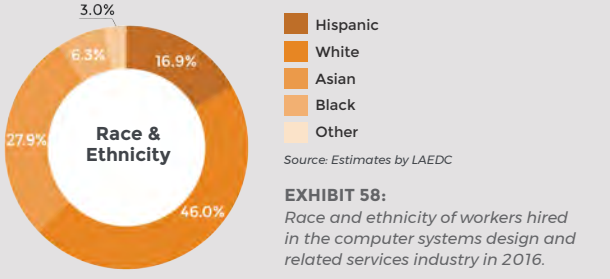


EXHIBIT 57:
Age distribution of the computer systems design and related services industry.



Source: Estimates by LAEDC

EXHIBIT 58:
Race and ethnicity of workers hired in the computer systems design and related services industry in 2016.

Management, Scientific & Technical Consulting Services

Sizing Things Up

In 2016, management, scientific and technical consulting services employed 76,210 payroll workers in the Los Angeles Basin, or almost 20 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 36.0 percent of all jobs in the accounting and bookkeeping services industry by 2021 (Exhibit 59).

With a regional location quotient of 1.2., the industry is somewhat more competitive regionally compared to the rest of the nation. The presence of a proportionately large number of higher education institutions in the region likely contributes to this advantage given the specialization required for work in this space. Since 2006, the component industry has added 16,390 jobs, exceeding the 2006 level of employment by over 27 percent and the 2011 employment level by over 20 percent. This might be partially due to the extraordinary growth of specialized consulting as an overall field in the past several decades.

Industry Outlook

Between 2016 and 2021, the management, scientific and technical consulting services industry is projected to grow by 6.4 percent across all skill levels to 81,070 jobs (Exhibit 39). The middle-skill portion of this industry is projected to grow commensurately by 5.1 percent to 29,090 jobs. However, this indicates a slight decrease in middle-skill employment as a proportion of the industry's employment by 0.4 percent.

Characteristics of Workers Hired

The composition of all hires in management, scientific and technical consulting services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 23 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), were middle-skill workers. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 31 percent and 19 percent respectively. Approximately 12 percent of all hires were 22-24 years of age. Just over 30 percent of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 62). Workers reporting their race as white accounted for 42 percent of all hires in the industry, and Asians and black/African-American workers accounted for 17 percent and 8 percent respectively.

Future Workforce Needs

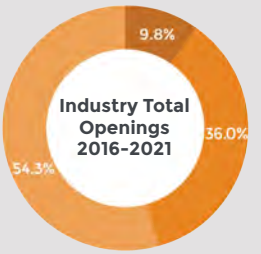
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the management, scientific and technical consulting services industry is estimated to add 12,260 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 4,860 jobs will be net new jobs and 7,400 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 4,400 projected openings are for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this sector, especially customer service representatives, graphic designers, web developers and clerical roles. Additional broad categories include purchasing agents as part of the logistics aspect of this industry and environmental science technicians. The specialization, critical thinking skills and creativity required by this consultancy-heavy industry suggests relative safety for workers from displacement due to automation.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Production, Planning and Expediting Clerks	130
• Customer Service Representatives	110
• Graphic Designers	70
• Purchasing Agents (except wholesale, retail and farm products)	60
• Web Developers	50
• Environmental Science and Protection Technicians (including health)	50



Source: Estimates & analysis by LAEDC

EXHIBIT 59:
Skills classifications for the region's management, scientific and technical consulting services industry.

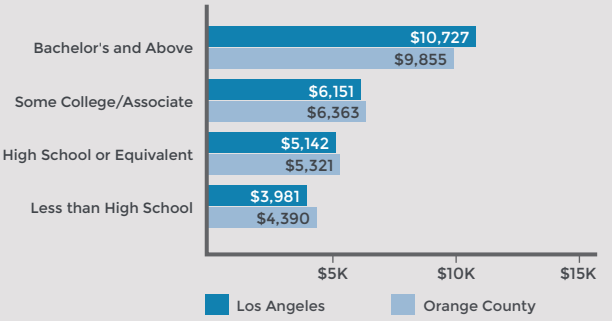


EXHIBIT 60:
Average monthly earnings by educational attainment 2016.

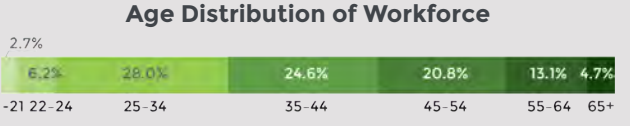
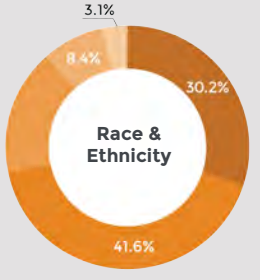


EXHIBIT 61:
Age distribution of the management, scientific and technical consulting services industry.



Source: Estimates by LAEDC

EXHIBIT 62:
Race and ethnicity of workers hired in the management, scientific and technical consulting services industry in 2016.

Advertising, PR & Related Services

Sizing Things Up

In 2016, advertising, public relations and related services employed 32,420 payroll workers in the Los Angeles Basin, or 8.5 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 46.3 percent of all jobs in the advertising, public relations and related services industry by 2021 (Exhibit 63).

With a regional location quotient of 1.4, the industry is somewhat more competitive regionally compared to the rest of the nation. As the media and entertainment capital of the United States, the Los Angeles Basin would presumably maintain a comparative advantage in this sector compared to the rest of the county. However, since 2006, the component industry has lost 1,470 jobs, remaining below the 2006 level of employment by over 4 percent, but exceeding the 2011 employment level by 8.6 percent. Part of this anemic recovery might be due to the changing nature of advertising as a space disrupted by digital and social media.

Industry Outlook

Between 2016 and 2021, advertising and public relations services is projected to shrink by 2.4 percent across all skill levels to 31,650 jobs (Exhibit 39). However, the middle-skill portion of this component industry is projected to grow slightly by almost 1 percent to 15,140 jobs. This indicates a slight increase in middle-skill employment as a proportion of the industry's employment by 1.6 percent.

Characteristics of Workers Hired

The composition of all hires in advertising, public relations and related services in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Nearly 23 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), were filling middle-skill positions in the industry. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 36 percent and 20 percent respectively. Approximately 14 percent of all hires were 22-24 years of age. Just under a quarter (23 percent) of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 66). Workers reporting their race as white accounted for just over half (51 percent) of all hires in the industry, and Asians and black/African-American workers accounted for 13 percent and 10 percent respectively.

Future Workforce Needs

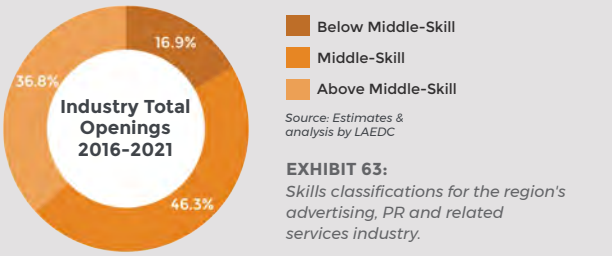
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the advertising, PR and related services industry is projected to add 2,730 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 770 jobs will be net jobs lost and 3,490 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 1,300 projected openings are for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this sector, especially advertising sales agents, graphic designers, web developers and other sales representatives. Additional broad categories include customer services representatives, content producers and content directors. This sector presents a mixed bag for employment opportunities as overall industry employment diminishes marginally while middle-skill employment grows marginally. Indeed, some elements of advertising and public relations are being rendered obsolete by digital media while others are enhanced by it.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Advertising Sales Agents	830
• Graphic Designers	370
• Customer Service Representatives	150
• Producers and Directors	130
• Web Developers	110



Source: Estimates & analysis by LAEDC

EXHIBIT 63:
Skills classifications for the region's advertising, PR and related services industry.

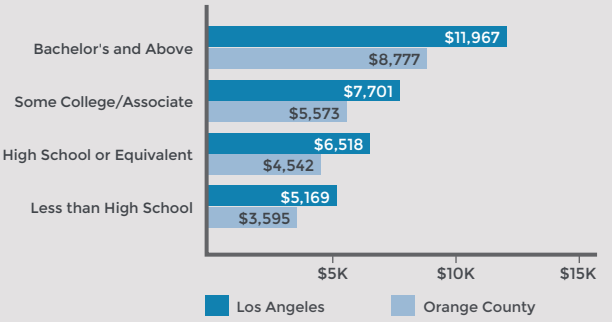


EXHIBIT 64:
Average monthly earnings by educational attainment 2016.

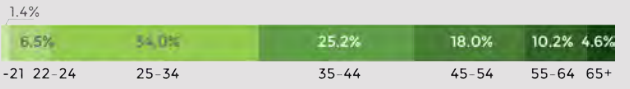
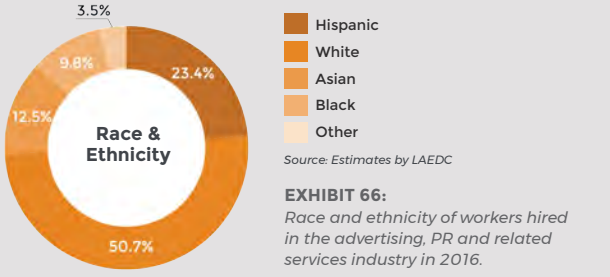


EXHIBIT 65:
Age distribution of the advertising, PR and related services industry.



Source: Estimates by LAEDC

EXHIBIT 66:
Race and ethnicity of workers hired in the advertising, PR and related services industry in 2016.

Other Professional & Technical Services

Sizing Things Up

In 2016, other professional and technical services employed 24,070 payroll workers in the Los Angeles Basin, or 6.3 percent of the overall professional services industry. Projections indicate that middle-skill jobs will comprise 55.9 percent of all jobs in the other professional and technical services industry by 2021 (Exhibit 67).

With a regional location quotient of 0.7, the industry is somewhat less competitive regionally compared to the rest of the nation. Since this sector contains a panoply of roles, this competitiveness metric is somewhat hard to expound upon. Since 2006, the component industry has lost 2,830 jobs, exceeding the 2006 level of employment by over 13 percent and further exceeding the 2011 employment level by 8.5 percent.

Industry Outlook

Between 2016 and 2021, the other professional services industry is projected to expand by 15 percent across all skill levels to 27,670 jobs (Exhibit 39). The middle-skill portion of this industry is projected to grow commensurately by almost 13.7 percent to 12,010 jobs. However, this indicates a slight decrease, 0.5 percent, in middle-skill employment as a proportion of the industry's employment.

Characteristics of Workers Hired

The composition of all hires in this industry in the Los Angeles Basin in 2016 varies according to educational attainment, age, and race and ethnicity.

The industry provides a wide range of jobs to individuals with different levels of education. Just over 22 percent of all hires, the estimated number of workers who started a new job in 2016 (new hires and recall employees), were middle-skill workers, possessing some college, a postsecondary nondegree award or an associate degree. The largest shares of new hires fall in the age groups of 25-34 years and 35-44 years, 34 percent and 17 percent respectively. Approximately 14 percent of all hires were 22-24 years of age. Over a third (34 percent) of all hires in 2016 reported their ethnicity as Hispanic or Latino (all races) (Exhibit 70). Workers reporting their race as white accounted for 44 percent of all hires in the industry, and Asians and black/African-American workers accounted for 12 percent and 7 percent respectively.

Future Workforce Needs

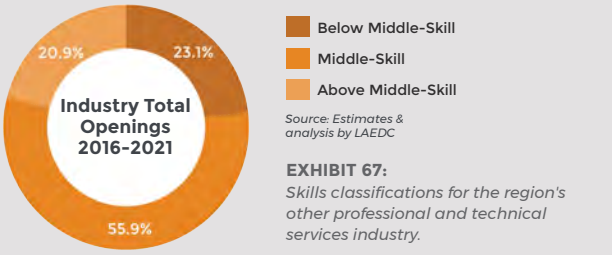
The number of projected new jobs, combined with job openings from replacements and retirements, provide an overall estimate of employer hiring needs. Overall, the other professional and technical services industry is projected to add 5,850 jobs, new and replacement, in the Los Angeles Basin by 2021, of which an estimated 3,600 jobs will be net new jobs and 2,250 jobs will be replacement workers. Analysis of the skills classifications for total job openings by 2021 reveals that 2,540 projected openings are for middle-skill occupations.

Top Middle-Skill Occupations

Middle-skill occupations will continue to drive labor demand in this industry, especially receptionists, marketing analysts and specialists, photographers and customers service representatives. Additional broad categories include veterinary assistants, laboratory technicians and interpreters. The paramount necessity of the human element in many of the roles involved in this sector, especially the creative and analytical roles, means this industry should be a relative haven from the adverse labor impacts of automation.

MIDDLE-SKILL OCCUPATIONS:
SIGNIFICANT JOB PROSPECTS (2021)

OCCUPATIONAL GROUP	*OPENINGS*
• Receptionists and Information Clerks	310
• Market Research Analysts & Marketing Specialists	300
• Photographers	270
• Interpreters and Translators	220
• Veterinary Assistants & Laboratory Animal Caretakers	220
• Customer Service Representatives	200



Source: Estimates & analysis by LAEDC

EXHIBIT 67:
Skills classifications for the region's other professional and technical services industry.

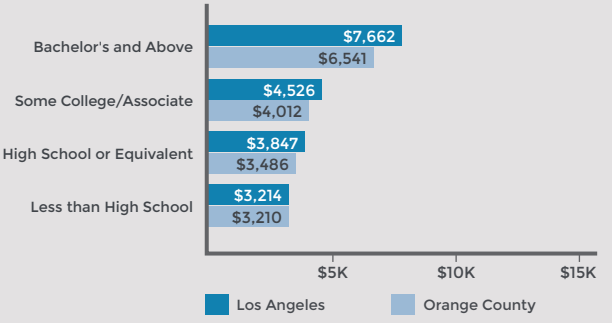
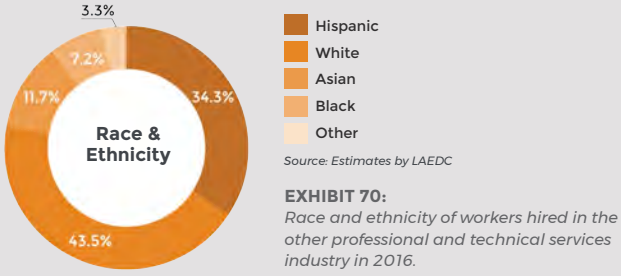


EXHIBIT 68:
Average monthly earnings by educational attainment 2016.

EXHIBIT 69:
Age distribution of the other professional and technical services industry.



Source: Estimates by LAEDC

EXHIBIT 70:
Race and ethnicity of workers hired in the other professional and technical services industry in 2016.

Conclusions & Recommendations

The professional services industry is a major economic driver in the regional economy. Overall, 50,680 total job openings will be created in the industry in the Los Angeles Basin over the next five years, with employers seeking to fill many of those openings with middle-skill workers.

Overall, 50,680 total job openings will be created in the industry in the Los Angeles Basin over the next five years.

A comparison of the two counties comprising the Los Angele Basin shows that professional services employment is two times greater in Los Angeles County than Orange County. There are 262,800 payroll employees in Los Angeles County, compared to 120,500 payroll employees in Orange County. More than half of employment in professional services falls into three component industries: management and technical consulting services, legal services, and accounting and bookkeeping. These component industries combined employed more than 200,000 workers in the Los Angeles Basin in 2016. Management and technical consulting services accounts for 76,210 jobs alone.

The high percentage of middle-skill jobs that comprise the professional services industry makes prioritizing this industry for the development of training and educational programs particularly compelling. One of this report's key findings is that nearly half of projected openings in this industry will be for middle-skill occupations over the next five years in the region. Moreover, the professional services industry is largely composed of a young workforce, with 53 percent of workers between the ages of 25 and 44 years; less than 20 percent are 55 years or older. And professional services employees typically earn higher-than-average wages compared to the regional economy. Workers in professional services earn $65,030, on average, more than the regional average across all industries, $59,890. The legal services industry pays particularly well, $108,960 on average.

TOP COMPONENT INDUSTRIES

- Management & Technical Consulting Services
- Legal Services
- Accounting & Bookkeeping

Impending worker shortage

When workforce demand is considered, there is some urgency for the creation and expansion of programs targeting the professional services industry. When considering only community college program completions, a looming workforce shortage appears to be on the horizon. Based on regional community college completions, there could be an undersupply of 2,000 workers each year to fill job openings in the region. More than 6,300 annual openings are projected for middle-skill occupations in the industry. Yet, community college completions only totaled about 4,300 awards in the 2016-17 academic year.

A closer analysis of community college supply reveals programs may need to be calibrated to meet forecasted demand. In some cases—such as accounting and finance, and architecture and engineering—regional programs appear to be graduating more students than there are job openings across all industries. In other cases—such as administration and support, and computers and design—there are not enough students to fill projected job openings. The Center recommends the community colleges take a closer look at these programs to determine whether program capacity is sufficient to meet demand. Areas of concern, where there may be an undersupply of students, include veterinary medicine and environmental science. In the case of secretaries and administrative assistants, demand is roughly six times greater than supply in the region.

The Future Workforce

Attention also should be directed toward component industries in the professional services industry where the greatest amount of growth is expected to occur. Projections show the computer systems design and related services industry will have 7,530 new jobs. Another high-growth component industry is management, scientific and technical consulting services, in which 4,860 new jobs are anticipated. Community colleges may want to closely partner with industry stakeholders in these areas to update and/or expand programs preparing students to enter related occupations.

Specifically, occupations in management and technical consulting represent an area that community colleges should keep an eye on. Not only is employment expected to grow, but this field is fairly insulated from automation. Examples include graphic designers, and environmental science and protection technicians, occupations that rely on human creativity, problem solving and critical thinking. Community colleges may want to consider developing programs with specializations focused specifically on skills involved in management and technical consulting to meet future workforce demand.

An important finding with implications for community colleges has to do with the gig economy. The number of contingent workers, more than 300,000, in the professional services industry is almost equivalent to the number of payroll employees in the industry. In preparing students to enter the professional services industry, the community colleges may want to direct attention toward developing programs that prepare students to navigate and operate successfully in the gig economy. Certain skill sets are required for independent contractors and consultants, particularly in the areas of small business, finance and accounting, that are not typically required for payroll employees. These skills can mean the difference in an independent contractor's ability to succeed in an economy in which self-employment and project-based work is becoming more the norm.

As programs are developed and modernized, technical training should be a top consideration. Professional services employers are citing technical training, including internships and job readiness skills, among the most desirable qualifications for new hires.

Opportunities and challenges

This study looked not only at where the greatest job growth will be, but also asked the question: Where won't the jobs be? Two component industries in professional services are predicted to experience a decline in payroll employment. Architectural and engineering services is expected to decline by 9.5 percent over the next five years, shedding 5,410 jobs in the region. Meanwhile, advertising, public relations and related services is projected to contract by 2.4 percent, eliminating 770 jobs. An analysis of community college supply indicates the community colleges in the region may already be oversupplying the architectural and engineering services industry. It is imperative to take stock of current community college program enrollments to ensure students will be able to obtain employment upon graduation.

As in many other industries, rapid technological change is transforming professional services. Digitization, artificial intelligence and other forms of automation are disruptive forces, causing some occupations to become obsolete. The professional services industry is being revolutionized by new forms of knowledge sharing, new business models and new methods of brand development and marketing. As community colleges in the region look toward developing new programs and updating or revising existing programs related to professional services, they should take into consideration whether the occupations they are training for are housed within component industries vulnerable to automation. This report highlights three component industries that may experience disruption in coming years from automation: legal services, architectural and engineering services, and advertising, PR and related services.

However, five component industries appear to be shielded from automation due to the creative and analytical skill sets required for their activities, and these industries offer promising opportunities for community college students. Component industries that require a human element that extends beyond the capacity of computers are: accounting and bookkeeping; specialized design; computer systems design and related; management, scientific and technical consulting; and other professional and technical services. Opportunities are expected to flourish in the technology-based component industries that make up professional services, i.e., STEM-related component industries. As the professional services industry undergoes further technological transformation, occupations based on non-automatable, knowledge-heavy competencies are primed to take off.

KEY FINDINGS

- Nearly half of projected openings will be for middle-skill occupations over the next five years.
- The professional services industry is largely composed of a young workforce, with 53 percent of workers between the ages of 25 and 44 years.
- Professional services employees typically earn higher-than-average wages compared to the regional economy.
- Professional services employers are citing technical training, including internships and job readiness skills, among the most desirable qualifications for new hires.

AT RISK FOR DISRUPTION
DUE TO AUTOMATION

- Architecture and Engineering
- Advertising, PR and related services
- Legal services

SHIELDED FROM DISRUPTION
DUE TO AUTOMATION

- Accounting and Bookkeeping
- Computer Systems Design and related
- Management, Scientific and Technical Consulting
- Other Professional and Technical services
- Specialized Design

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Occupation Profiles

Employment Numbers & Worker Characteristics

Detailed information has been compiled for the top 15 middle-skill occupations in the professional business services industries. Data from 2016, the most recent available, was used to determine wages and worker characteristics for the charts included with the profiles.

The information on top industries employing these occupations, current and projected employment, wages and demographics can be used by community colleges to tailor existing programs and guide outreach to potential students. The occupational analyses that follow may even inspire new program development or new approaches in attracting students to promising career paths.

EACH OCCUPATIONAL PROFILE CONTAINS:

- Hourly wages paid in 2016 for workers in Los Angeles and Orange counties compared to the living wage
- The distribution of workers across industry sectors in the Los Angeles Basin
- Metrics for the occupation including the number of current jobs and projected openings
- Worker characteristics, such as educational attainment, age distribution, race and ethnicity, and gender

PROFESSIONAL SERVICES

TOP 15 OCCUPATIONS

- **Graphic Designers** (SOC 27-1024)
- **Paralegals & Legal Assistants** (SOC 23-2011)
- **Secretaries & Administrative Assistants** *except Legal, Medical and Executive* (SOC 43-6014)
- **Web Developers** (SOC 15-1134)
- **Network & Computer Systems Administrators** (SOC 15-1142)
- **Tax Preparers** (SOC 13-2082)
- **Bill & Account Collectors** (SOC 43-3011)
- **Veterinary Technologists & Technicians** (SOC 29-2056)
- **Computer User Support Specialists** (SOC 15-1151)
- **Architectural & Civil Drafters** (SOC 17-3011)
- **Interpreters & Translators** (SOC 27-3091)
- **Payroll & Timekeeping Clerks** (SOC 43-3051)
- **Construction & Building Inspectors** (SOC 47-4011)
- **Environmental Science & Protection Technicians,** *including Health* (SOC 19-4091)
- **Civil Engineering Technicians** (SOC 17-3022)

Graphic Designers

(SOC 27-1024)

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

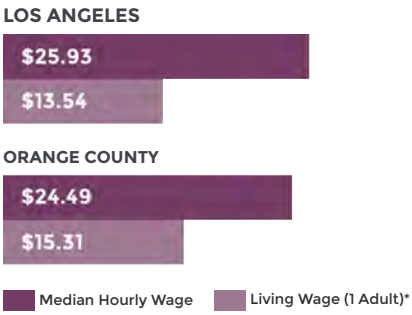
5-YR PROJECTION

2,350
Total projected openings 2021 (5-Yr)
790 Net Job Change
1,550 5-Yr Replacements

1,680
PBS-related projected openings 2021
1,050 Net Job Change
630 5-Yr Replacements

13,050
Industry jobs in LA/OC 2016

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

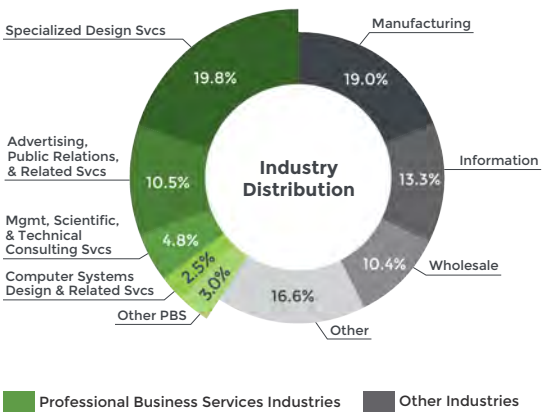
5,300 → **41.0%**

Graphic Designers employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Graphic Designers are primarily employed in the professional and business services industry. The top three component industries employing this occupation in the LA Basin are:

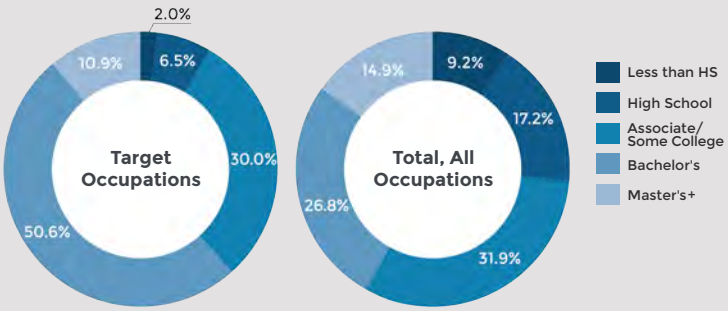
- Professional, Scientific & Technical Services (NAICS 541)
- Printing & Related Support Activities (NAICS 323)
- Motion Picture & Sound Recording Industries (NAICS 623)



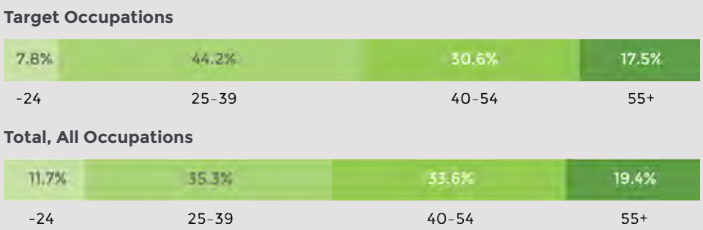
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

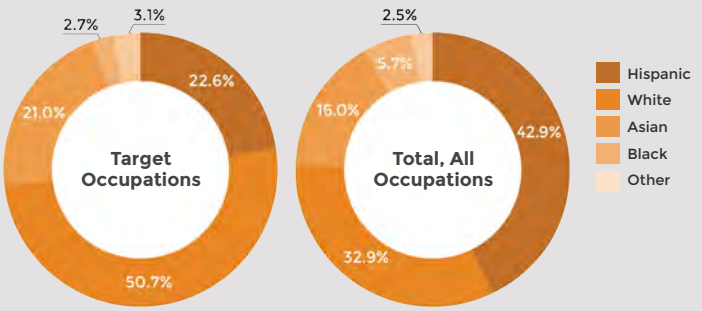
EDUCATIONAL ATTAINMENT 2016



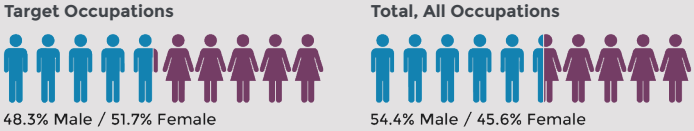
AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

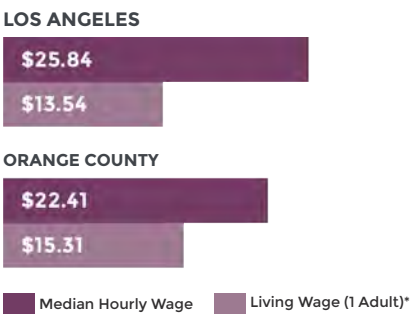


Paralegals & Legal Assistants

(SOC 23-2011)

Assist lawyers by investigating facts, preparing legal documents, or researching legal precedent. Conduct research to support a legal proceeding, to formulate a defense, or to initiate legal action.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

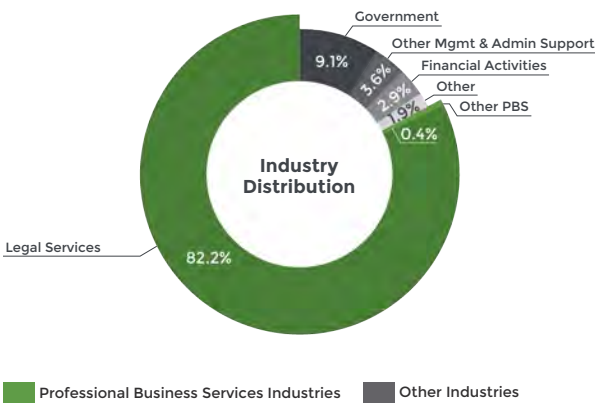
10,540 → **83.0%**

Paralegals & Legal Assistants employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

The vast majority of **Paralegals & Legal Assistants** are employed in professional and business services; however, some are employed in government. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Local Government (NAICS 93)
- Management of Companies & Enterprises (NAICS 551)



5-YR PROJECTION

1,410

Total projected openings 2021 (5-Yr)

10 Net Job Change
1,550 5-Yr Replacements

1,430

PBS-related projected openings 2021

270 Net Job Change
1,160 5-Yr Replacements

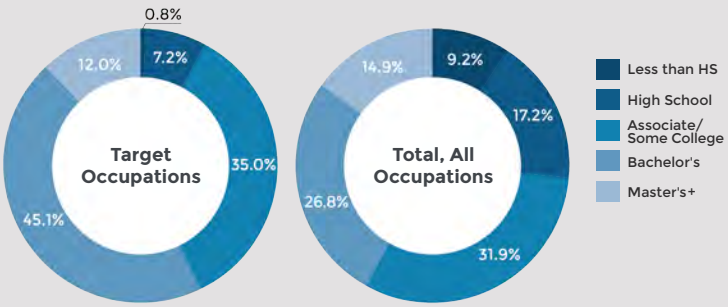
12,770

Industry jobs in LA/OC 2016

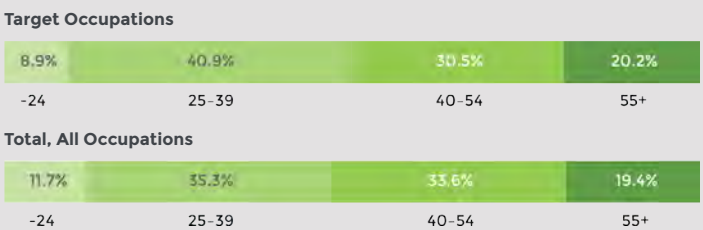
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

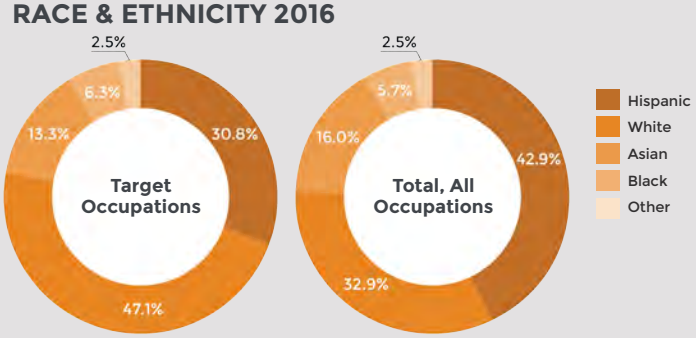
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

28.6% Male / 71.4% Female

Total, All Occupations

54.4% Male / 45.6% Female

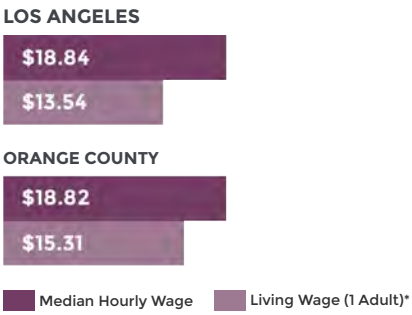
Secretaries & Administrative Assistants

except Legal, Medical, & Executive

(SOC 43-6014)

Perform routine administrative functions such as drafting correspondence, scheduling appointments, organizing and maintaining paper and electronic files, or providing information to callers.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

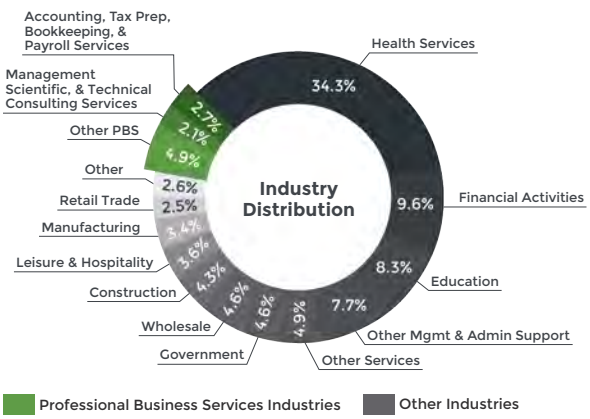
10,200 ⟶ **10.0%**

Secretaries & Administrative Assistants employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Secretaries & Administrative Assistants are hired across a number of different industries. The top three component industries employing this occupation in the LA Basin are:

- Social Assistance (NAICS 624)
- Professional, Scientific & Technical Services (NAICS 541)
- Educational Services (NAICS 611)



5-YR PROJECTION

14,480

Total projected openings 2021 (5-Yr)

8,910 Net Job Change
5,580 5-Yr Replacements

1,060

PBS-related projected openings 2021

530 Net Job Change
540 5-Yr Replacements

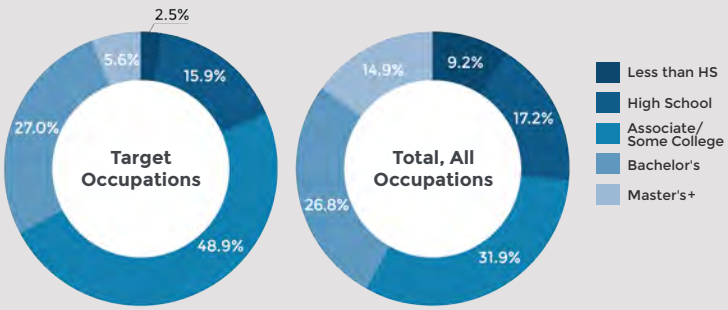
105,760

Industry jobs in LA/OC 2016

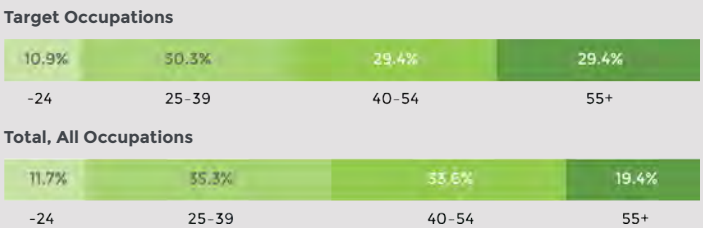
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

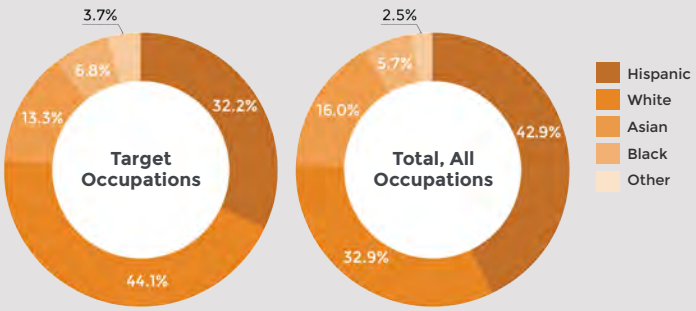
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

9.3% Male / 90.7% Female

Total, All Occupations

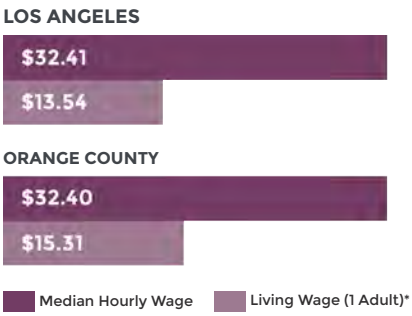
54.4% Male / 45.6% Female

Web Developers

(SOC 15-1134)

Design, create, and modify Web sites. Analyze user needs to implement Web site content, graphics, performance, and capacity. May integrate Web sites 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.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

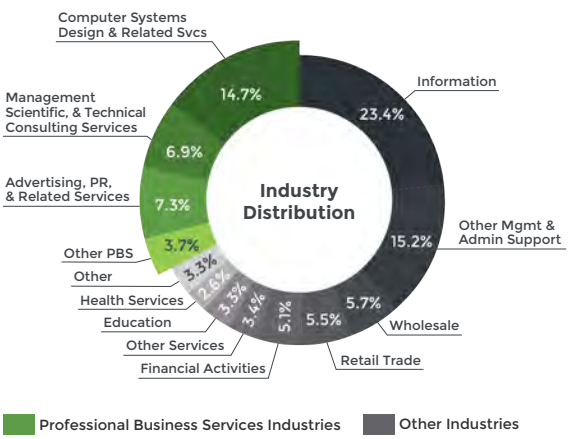
2,950 → **32.0%**

Web Developers employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Web Developers are hired across a number of different industries; however, a significant number are employed in professional and business services. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Management of Companies & Enterprises (NAICS 551)
- Data Processing, Hosting & Related Services (NAICS 518)



5-YR PROJECTION

1,770

Total projected openings 2021 (5-Yr)

1,190 Net Job Change
580 5-Yr Replacements

860

PBS-related projected openings 2021

670 Net Job Change
190 5-Yr Replacements

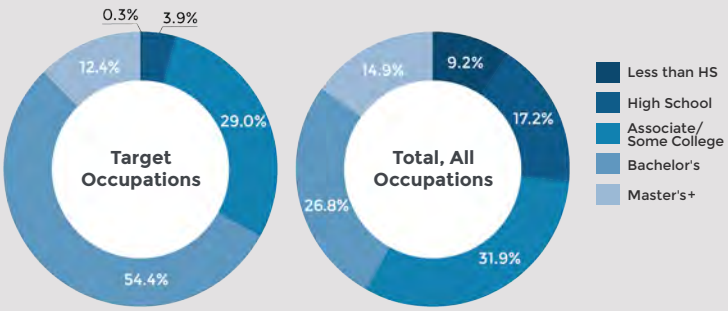
9,080

Industry jobs in LA/OC 2016

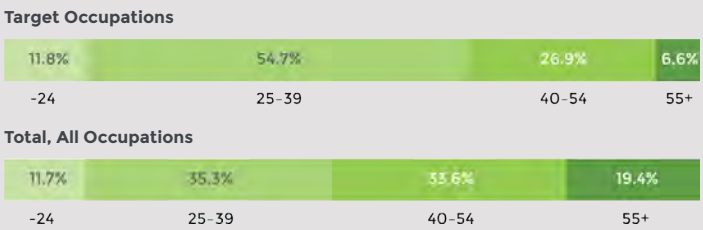
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

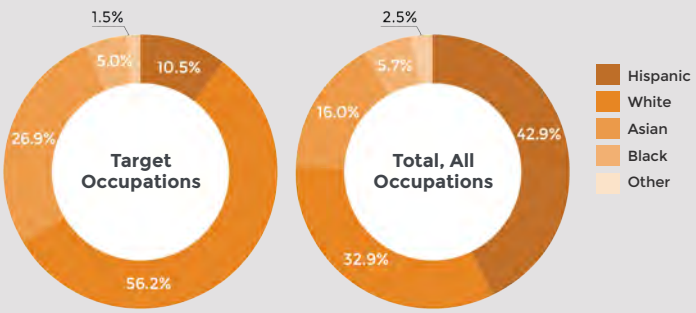
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

65.3% Male / 34.7% Female

Total, All Occupations

54.4% Male / 45.6% Female

Network & Computer Systems Admin.

(SOC 15-1142)

Install, configure, and support an organization's local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Monitor network to ensure network availability to all system users and may perform necessary maintenance to support network availability.

2016 HOURLY WAGES IN LA BASIN

** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

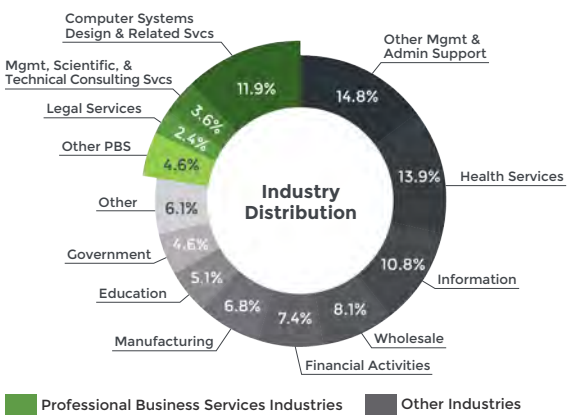
3,670 → **22.0%**

Network & Computer Systems Administrators employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Network & Computer Systems Administrators are hired across a number of different industries; however, a large number are hired in professional and business services. The top three industry subsectors employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Administrative & Support Services (NAICS 561)
- Management of Companies & Enterprises (NAICS 551)



5-YR PROJECTION

110

Total projected openings 2021 (5-Yr)

-940 Net Job Change
1,060 5-Yr Replacements

710

PBS-related projected openings 2021

470 Net Job Change
240 5-Yr Replacements

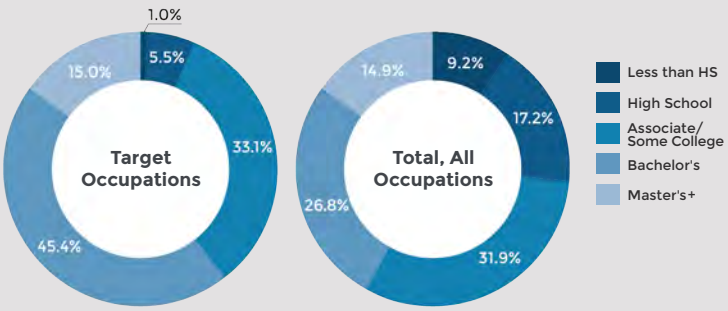
16,350

Industry jobs in LA/OC 2016

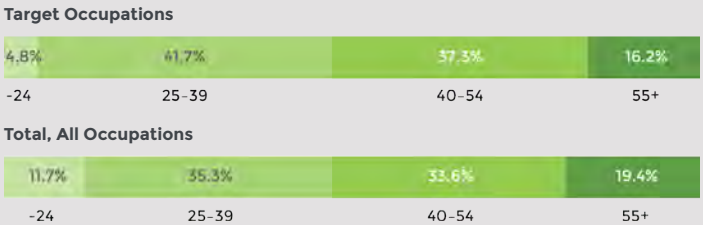
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

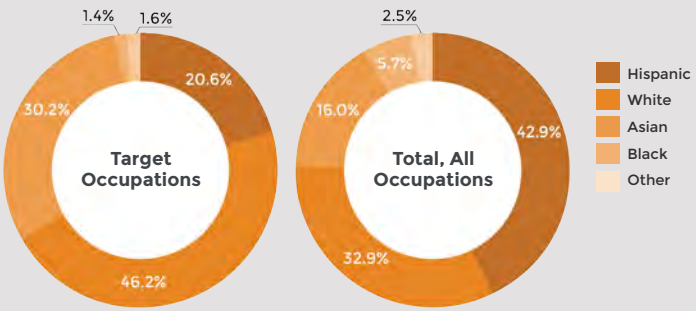
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

78.2% Male / 21.8% Female

Total, All Occupations

54.4% Male / 45.6% Female

Tax Preparers

(SOC 13-2082)

Prepare tax returns for individuals or small businesses.

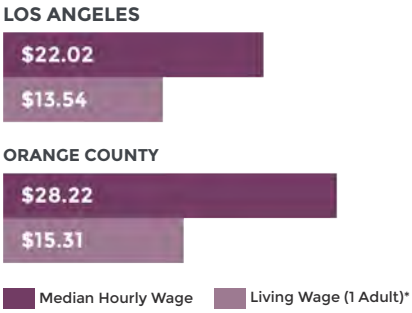
5-YR PROJECTION

660
Total projected openings 2021 (5-Yr)
70 Net Job Change
590 5-Yr Replacements

660
PBS-related projected openings 2021
70 Net Job Change
590 5-Yr Replacements

4,710
Industry jobs in LA/OC 2016

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

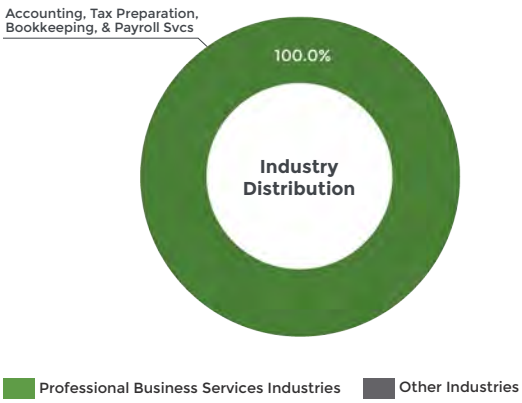
4,710 → **100.0%**

Tax Preparers employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Tax Preparers are only hired by the professional and business services industry. The top component industry employing this occupation in the LA Basin:

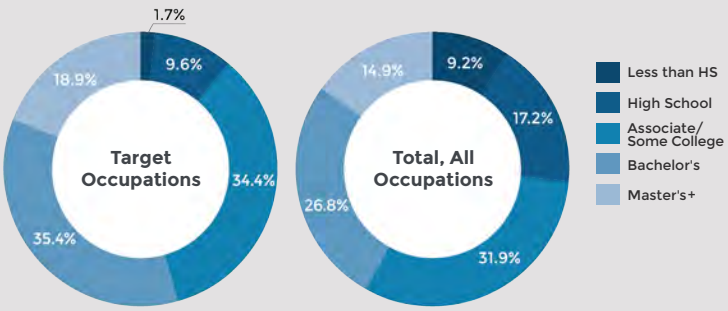
- Professional, Scientific & Technical Services (NAICS 541)



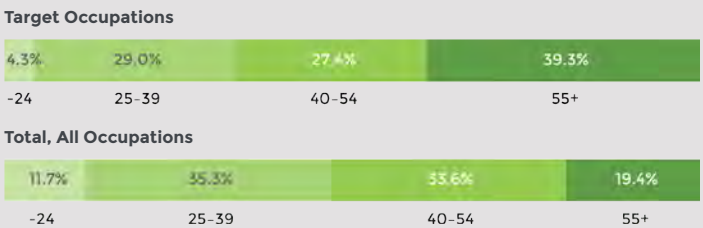
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

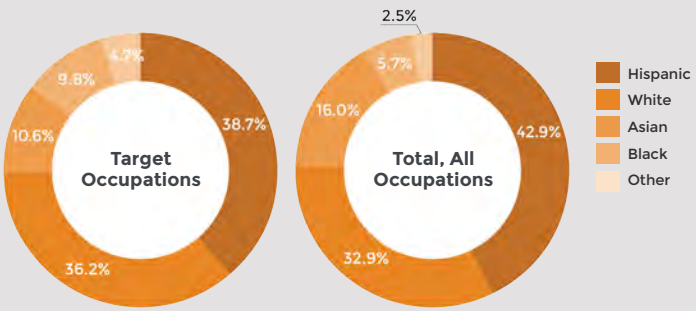
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

46.8% Male / 53.2% Female

Total, All Occupations

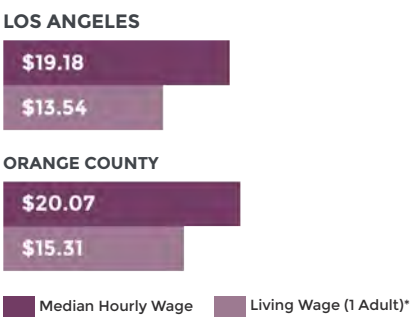
54.4% Male / 45.6% Female

Bill & Account Collectors

(SOC 43-3011)

Locate and notify customers of delinquent accounts by mail, telephone, or personal visit to solicit payment. Duties include receiving payment and posting amount to customer's account, preparing statements to credit department if customer fails to respond, initiating repossession proceedings or service disconnection, and keeping records of collection and status of accounts.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

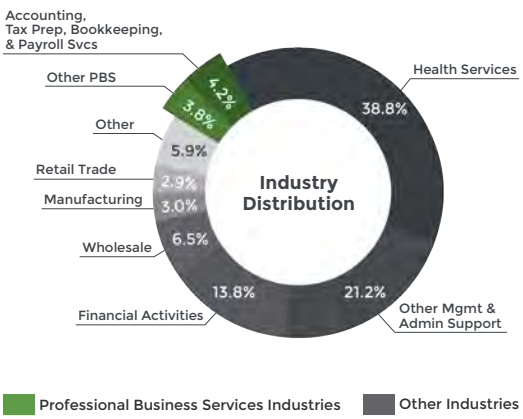
1,870 → **8.0%**

Bill & Account Collectors employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Bill & Account Collectors are employed in a wide variety of industries. The top three component industries employing this occupation in the LA Basin are:

- Ambulatory Health Care Services (NAICS 621)
- Administrative & Support Services (NAICS 561)
- Credit Intermediation & Related Activities (NAICS 522)



5-YR PROJECTION

1,690

Total projected openings 2021 (5-Yr)

-1,180 Net Job Change
2,870 5-Yr Replacements

600

PBS-related projected openings 2021

370 Net Job Change
230 5-Yr Replacements

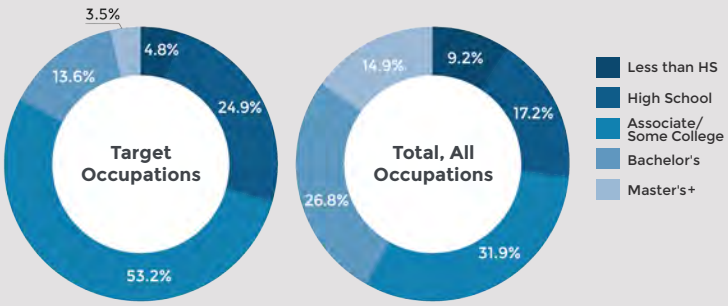
23,450

Industry jobs in LA/OC 2016

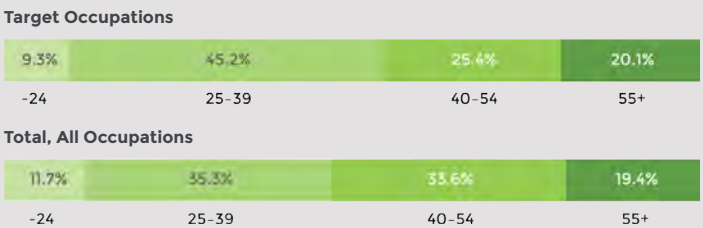
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

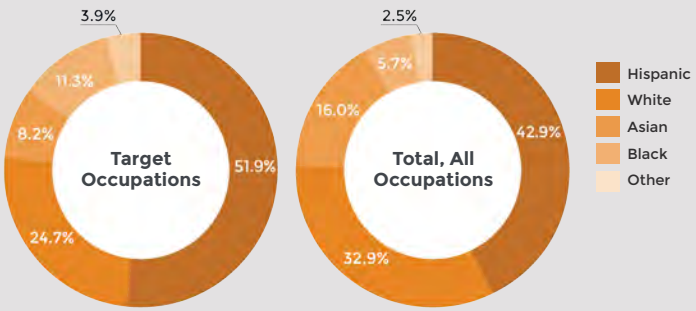
EDUCATIONAL ATTAINMENT 2016



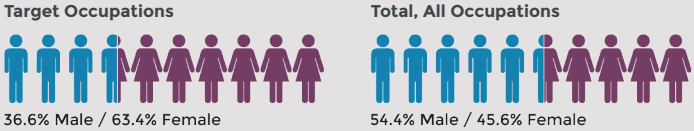
AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

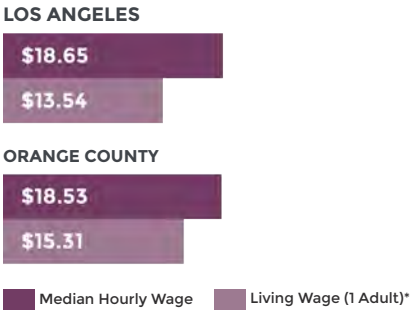


Veterinary Technologists & Technicians

(SOC 29-2056)

Perform medical tests in a laboratory environment for use in the treatment and diagnosis of diseases in animals. Prepare vaccines and serums for prevention of diseases. Prepare tissue samples, take blood samples, and execute laboratory tests, such as urinalysis and blood counts. Clean and sterilize instruments and materials and maintain equipment and machines. May assist a veterinarian during surgery.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

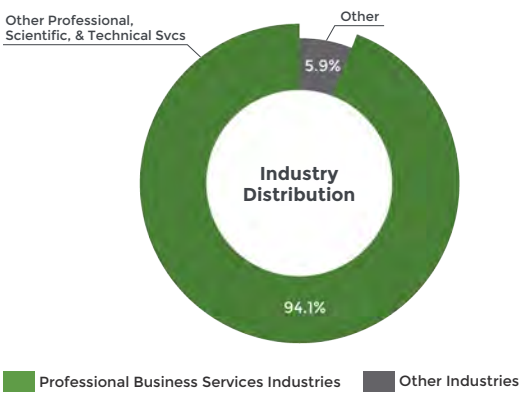
2,550 → **94.0%**

Veterinary Technologists & Technicians employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Veterinary Technologists & Technicians are virtually only hired by the PBS industry. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Educational Services (NAICS 611)
- Personal & Laundry Services (NAICS 812)



5-YR PROJECTION

590

Total projected openings 2021 (5-Yr)

450 Net Job Change
140 5-Yr Replacements

590

PBS-related projected openings 2021

460 Net Job Change
130 5-Yr Replacements

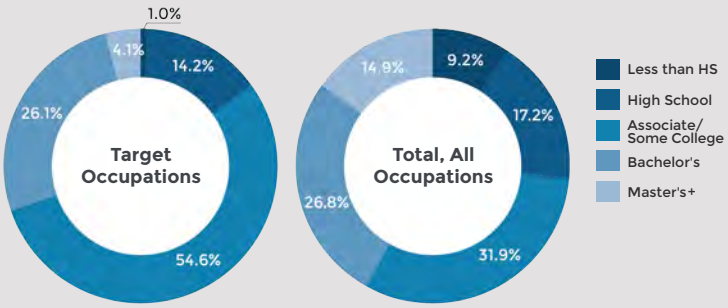
2,710

Industry jobs in LA/OC 2016

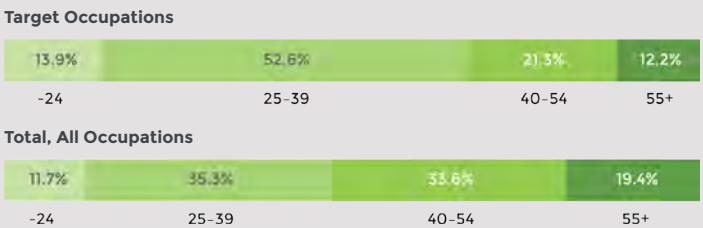
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

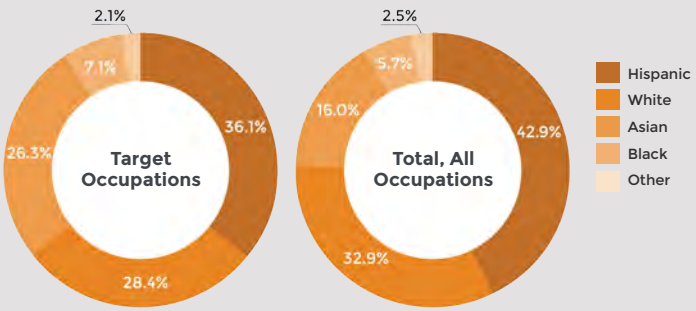
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

33.9% Male / 66.1% Female

Total, All Occupations

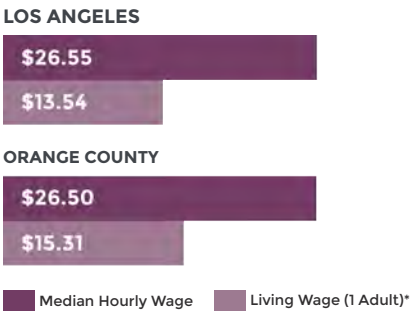
54.4% Male / 45.6% Female

Computer User Support Specialists

(SOC 15-1151)

Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, 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.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

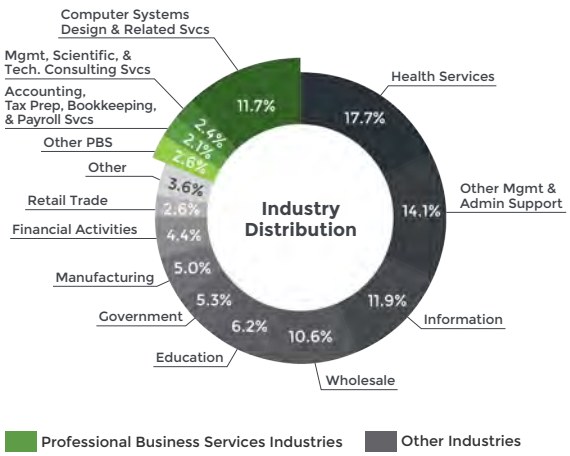
5,180 → **19.0%**

Computer User Support Specialists employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Computer User Support Specialists are employed by a variety of different industries. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Administrative & Support Services (NAICS 561)
- Merchant Wholesalers, Durable Goods (NAICS 423)



5-YR PROJECTION

3,650

Total projected openings 2021 (5-Yr)

1,870 Net Job Change
1,780 5-Yr Replacements

480

PBS-related projected openings 2021

140 Net Job Change
330 5-Yr Replacements

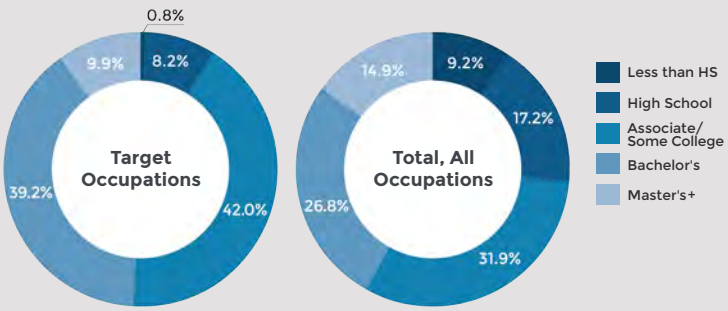
27,720

Industry jobs in LA/OC 2016

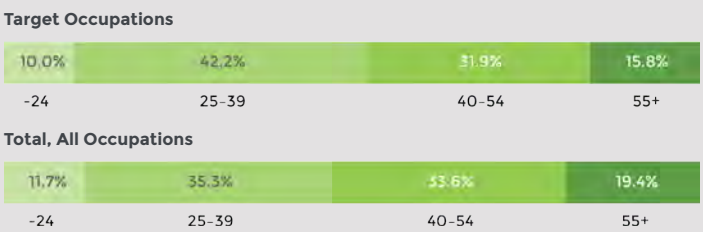
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

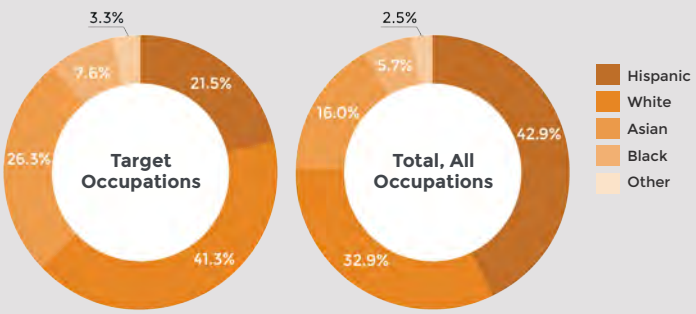
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

78.0% Male / 22.0% Female

Total, All Occupations

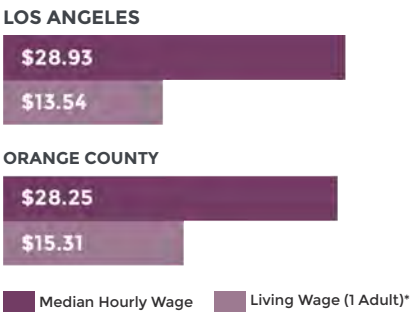
54.4% Male / 45.6% Female

Architectural & Civil Drafters

(SOC 17-3011)

Prepare detailed drawings of architectural and structural features of buildings or drawings and topographical relief maps used in civil engineering projects, such as highways, bridges, and public works. Use knowledge of building materials, engineering practices, and mathematics to complete drawings.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

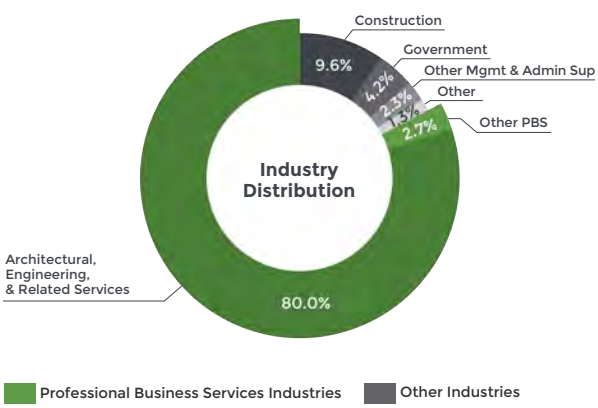
4,690 → **83.0%**

Architectural & Civil Drafters employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Architectural & Civil Drafters are broadly employed in the professional business services industry. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Construction of Buildings (NAICS 236)
- Specialty Trade Contractors (NAICS 238)



5-YR PROJECTION

650

Total projected openings 2021 (5-Yr)

320 Net Job Change
330 5-Yr Replacements

470

PBS-related projected openings 2021

190 Net Job Change
280 5-Yr Replacements

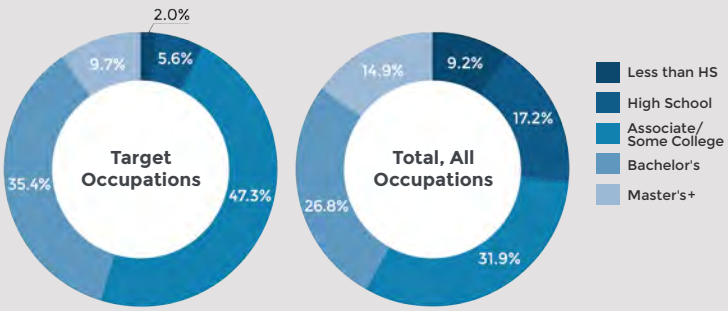
5,670

Industry jobs in LA/OC 2016

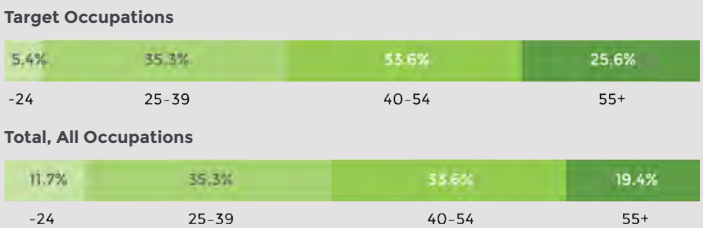
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

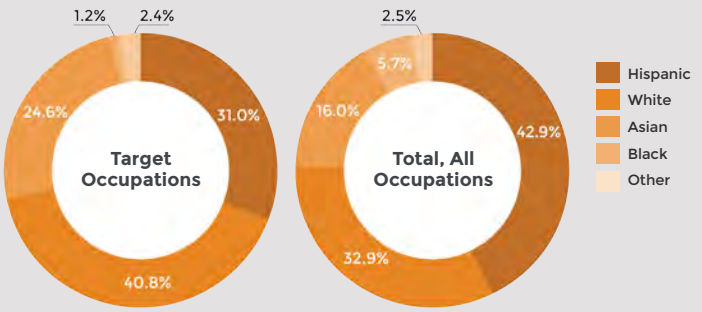
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

76.0% Male / 24.0% Female

Total, All Occupations

54.4% Male / 45.6% Female

Interpreters & Translators

(SOC 27-3091)

Interpret oral or sign language, or translate written text from one language into another.

5-YR PROJECTION

660

Total projected openings 2021 (5-Yr)

440 Net Job Change
220 5-Yr Replacements

440

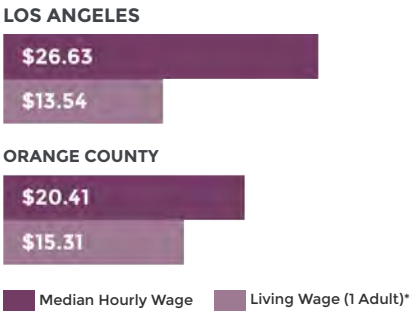
PBS-related projected openings 2021

350 Net Job Change
80 5-Yr Replacements

2,760

Industry jobs in LA/OC 2016

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

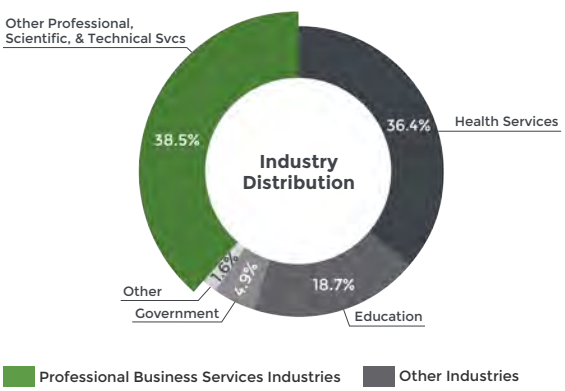
1,060 → **38.0%**

Interpreters & Translators employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Interpreters & Translators are employed primarily in professional business services, health services and education. The top three component industries employing this occupation in the LA Basin are:

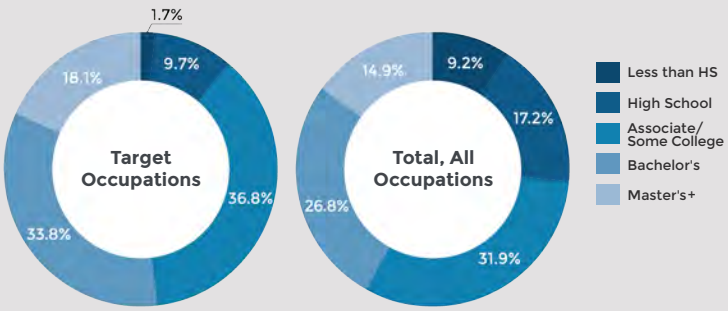
- Professional, Scientific & Technical Services (NAICS 541)
- Educational Services (NAICS 611)
- Social Assistance (NAICS 624)



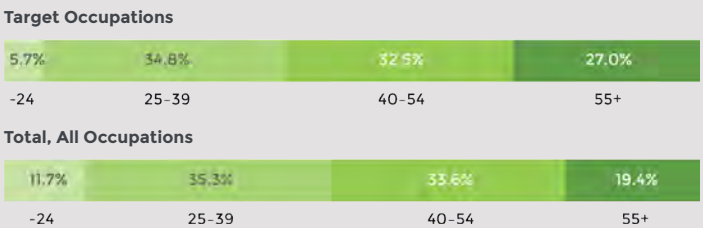
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

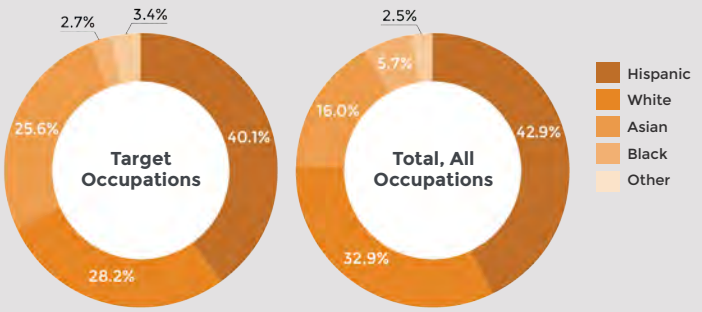
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

43.3% Male / 56.7% Female

Total, All Occupations

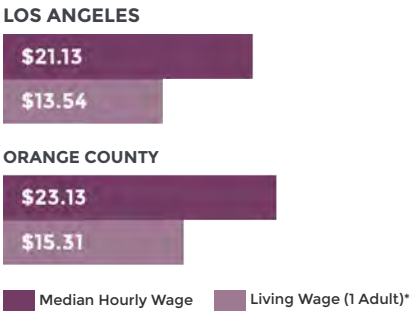
54.4% Male / 45.6% Female

Payroll & Timekeeping Clerks

(SOC 43-3051)

Compile and record employee time and payroll data. May compute employees' time worked, production, and commission. May compute and post wages and deductions, or prepare paychecks.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

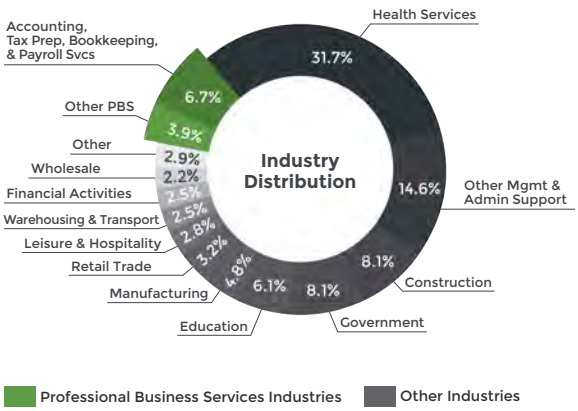
1,150 → **11.0%**

Payroll & Timekeeping Clerks employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Payroll & Timekeeping Clerks are employed in virtually all industries. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Administrative & Support Services (NAICS 561)
- Social Assistance (NAICS 624)



5-YR PROJECTION

2,040

Total projected openings 2021 (5-Yr)

580 Net Job Change
1,460 5-Yr Replacements

360

PBS-related projected openings 2021

210 Net Job Change
150 5-Yr Replacements

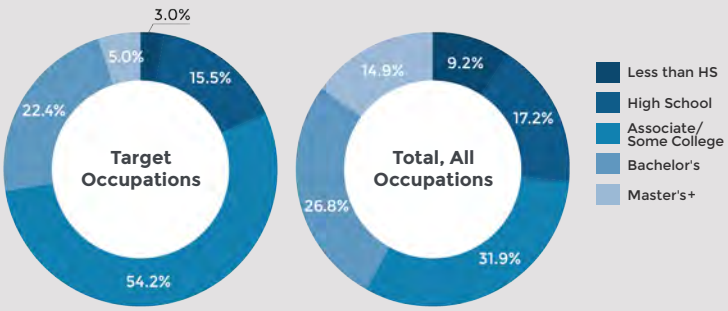
10,900

Industry jobs in LA/OC 2016

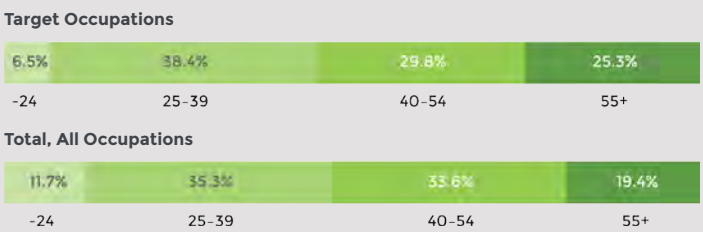
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

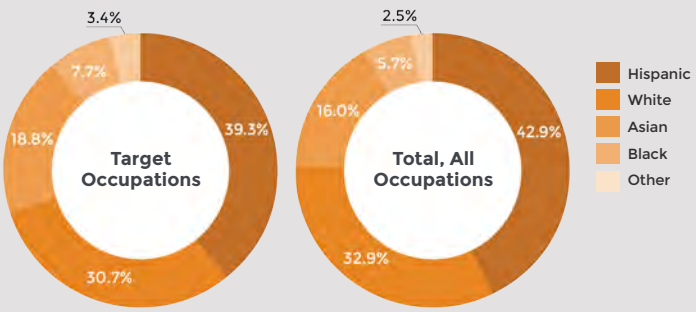
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

17.6% Male / 82.4% Female

Total, All Occupations

54.4% Male / 45.6% Female

Construction & Building Inspectors

(SOC 47-4011)

Inspect structures using engineering skills to determine structural soundness and compliance with specifications, building codes, and other regulations. Inspections may be general in nature or may be limited to a specific area, such as electrical systems or plumbing.

2016 HOURLY WAGES IN LA BASIN

** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

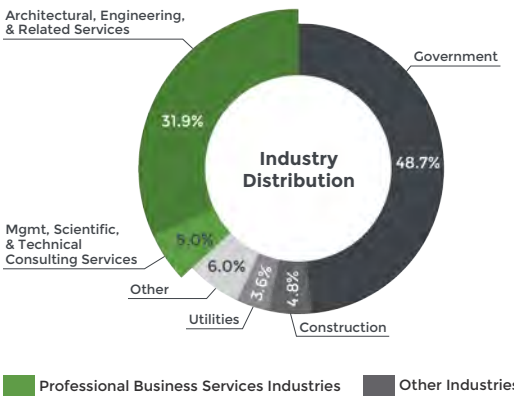
1,380 → **37.0%**

Construction & Building Inspectors employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Construction & Building Inspectors are mostly employed by government and in the professional and business services industry. The top three component industries employing this occupation in the LA Basin are:

- Local Government (NAICS 93)
- Professional, Scientific & Technical Services (NAICS 541)
- Administrative & Support Services (NAICS 561)



5-YR PROJECTION

640

Total projected openings 2021 (5-Yr)

120 Net Job Change
520 5-Yr Replacements

290

PBS-related projected openings 2021

90 Net Job Change
190 5-Yr Replacements

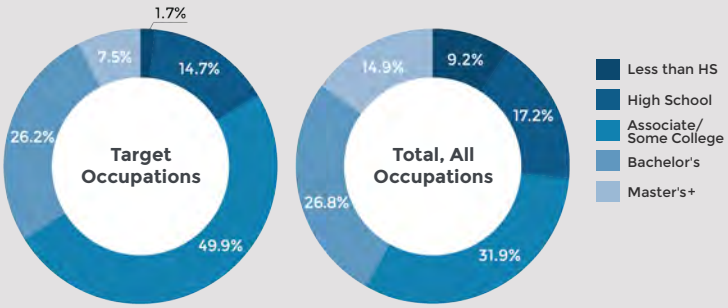
3,740

Industry jobs in LA/OC 2016

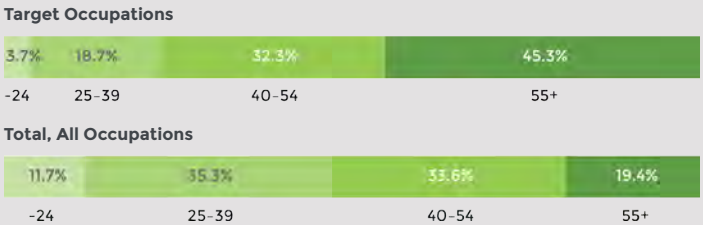
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

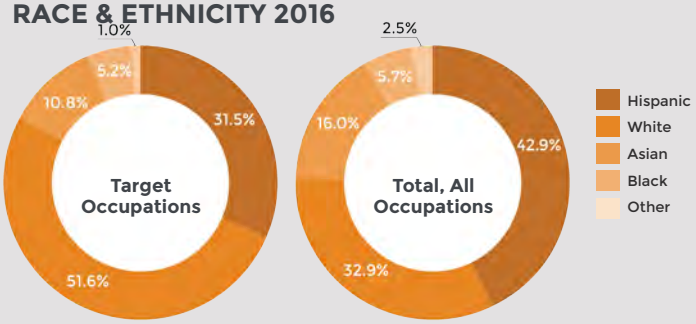
EDUCATIONAL ATTAINMENT 2016



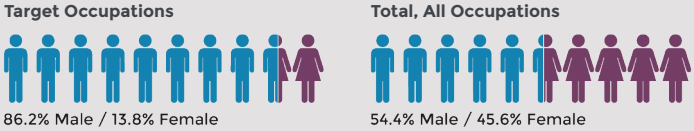
AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016



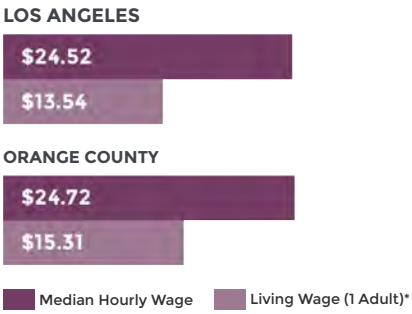
Environmental Science & Protection Technicians

including Health

(SOC 19-4091)

Perform laboratory and field tests to monitor the environment and investigate sources of pollution, including those that affect health, under the direction of an environmental scientist, engineer, or other specialist. May collect samples of gases, soil, water, and other materials for testing.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

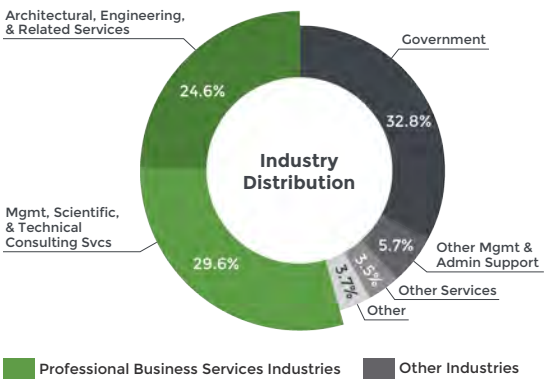
670 → **54.0%**

Environmental Science & Protection Tech. employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Environmental Science & Protection Tech. are primarily employed in either PBS or government. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Local Government (NAICS 93)
- Religious, Grantmaking, Civic, Professional & Similar Organizations (NAICS 813)



5-YR PROJECTION

440

Total projected openings 2021 (5-Yr)

180 Net Job Change
260 5-Yr Replacements

260

PBS-related projected openings 2021

120 Net Job Change
140 5-Yr Replacements

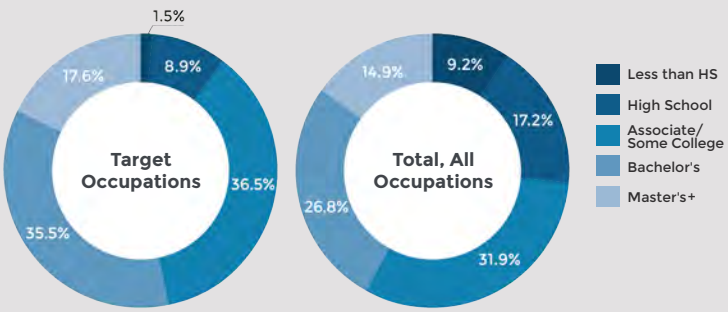
1,230

Industry jobs in LA/OC 2016

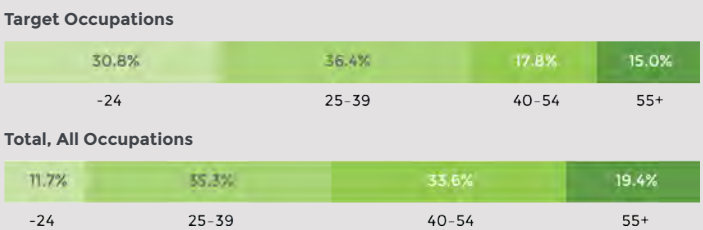
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

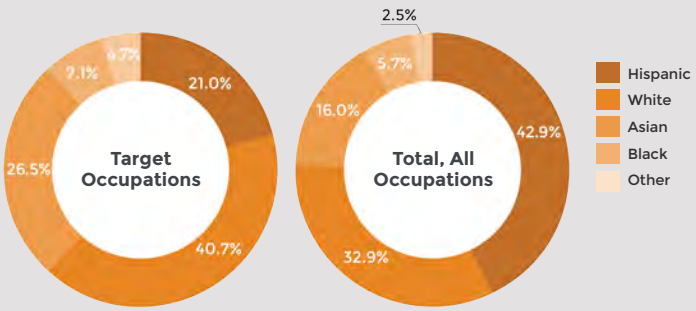
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

53.5% Male / 46.5% Female

Total, All Occupations

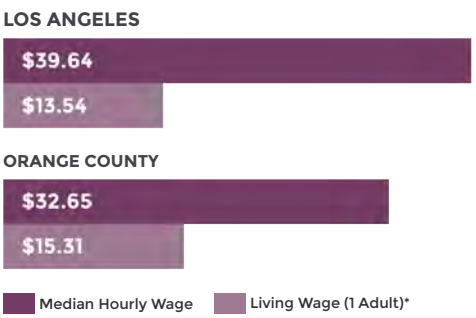
54.4% Male / 45.6% Female

Civil Engineering Technicians

(SOC 17-3022)

Apply theory and principles of civil engineering in planning, designing, and overseeing construction and maintenance of structures and facilities under the direction of engineering staff or physical scientists.

2016 HOURLY WAGES IN LA BASIN



** MIT Living Wage Calculator*

2016 INDUSTRY DISTRIBUTION

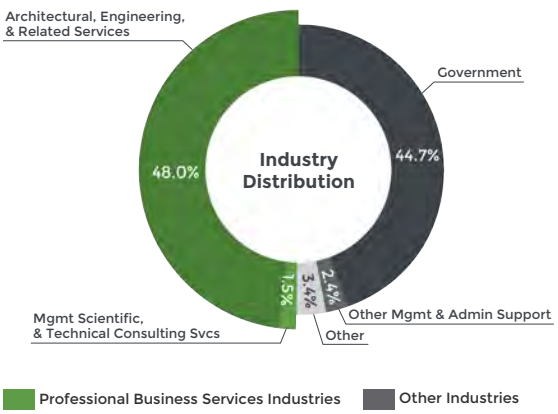
1,540 → **50.0%**

Civil Engineering Technicians employed in the PBS industry in the LA Basin

Percentage of employment in this occupation across all industries

Civil Engineering Technicians are mostly employed in either professional and business services or government. The top three component industries employing this occupation in the LA Basin are:

- Professional, Scientific & Technical Services (NAICS 541)
- Local Government (NAICS 93)
- State Government (NAICS 92)



5-YR PROJECTION

560

Total projected openings 2021 (5-Yr)

190 Net Job Change
370 5-Yr Replacements

250

PBS-related projected openings 2021

70 Net Job Change
190 5-Yr Replacements

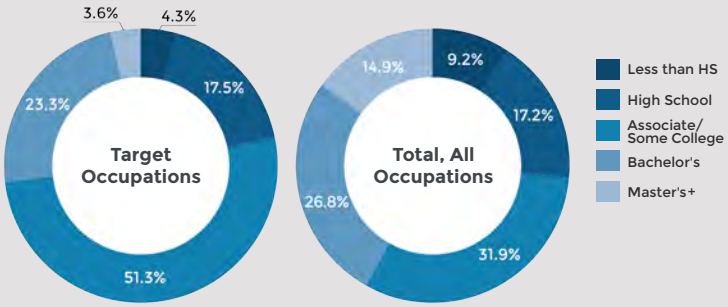
3,100

Industry jobs in LA/OC 2016

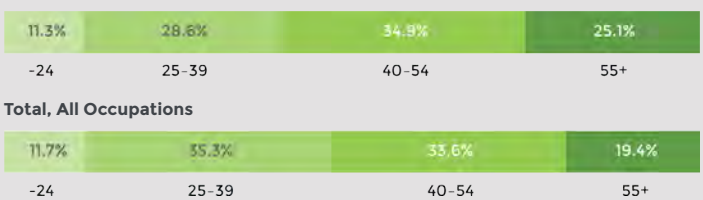
Worker Characteristics

The demographics of the workforce provide an additional layer of information to further highlight who is employed in this occupation in the LA Basin:

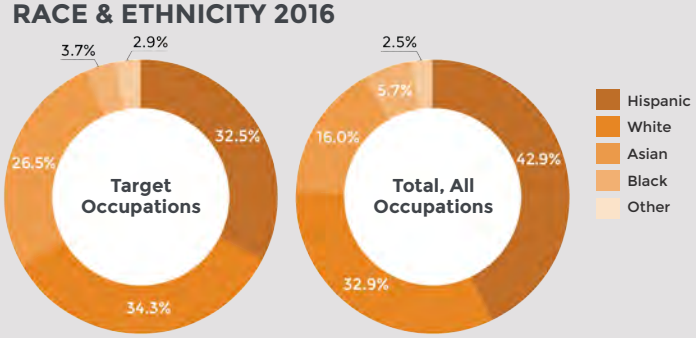
EDUCATIONAL ATTAINMENT 2016



AGE DISTRIBUTION 2016



RACE & ETHNICITY 2016



GENDER 2016

Target Occupations

80.3% Male / 19.7% Female

Total, All Occupations

54.4% Male / 45.6% Female

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Economic Impact

What the Professional Services Industry Contributes to the Regional Economy

The extent to which an industry's impact extends to other sectors of the economy and into local households depends on the share of industry revenue recirculated within the region. The total economic contribution of the professional services industry to the economy of the Los Angeles Basin is magnified through its supply chain and payroll spending.

Where the Professional Services Industry Spends Its Revenues

Firms generate revenues through sales of their products and services, using those funds to purchase the inputs needed to produce their products and services, pay workers and taxes, and generate a return on capital in the form of profits.

The professional services industry impacts a broad spectrum of industries through its supply chain.

In 2016 (the most recent data available), the professional services industry spent $59.3 billion on labor payments and distributed $12.4 billion in profits (Exhibit 71). Purchases of intermediate inputs into production reached $31.1 billion, accounting for 29.9 percent of all outlays. Tax payments represent a very small percentage of all outlays.

The overall impact that an industry has on the broader regional economy depends upon the expenditures made within the region. In general, outlays for labor costs occur locally, and households are supported by these earnings.

If most of the inputs used in production are purchased from local suppliers, those firms experience increased demand for their products and can ramp up hiring, thereby supporting additional households in the region. If, on the other hand, most of the inputs are purchased elsewhere in the nation, then these purchases have no impact locally (other than perhaps in their transportation and storage) and the industry itself generates fewer indirect effects.

Together, labor costs and regional purchases of intermediate inputs determine the spillover, or multiplier, impacts of the industry.

$104.2 BILLION TOTAL OUTLAYS IN 2016

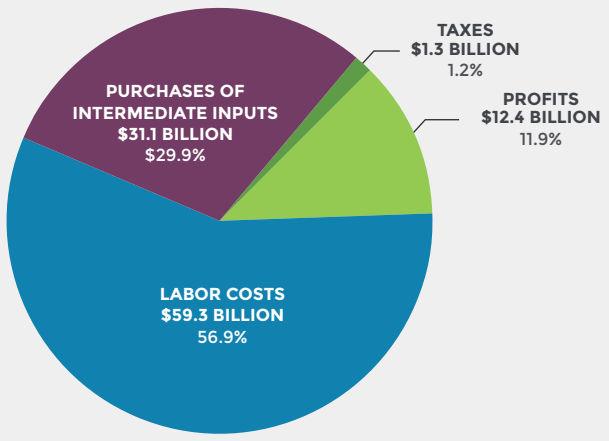

EXHIBIT 71:
How professional business services allocates revenues.

Sources: BEA; Analysis by LAEDC

The Professional Services Industry's Regional Economic Contribution

The contribution of the professional services industry to the regional economy is measured by analyzing its direct activity, as well as indirect and induced activity. This contribution is dependent on the payments made to suppliers of intermediate goods and services in the region and payments made to workers, who usually live locally and spend most of their incomes on household purchases from local suppliers.

In addition to the 383,280 direct payroll jobs in the professional services industry, there were more than 303,600 contingent workers in the industry. An additional 160,640 jobs were supported in 2016 through indirect effects of supply chain purchases (those made outside the industry) (Exhibit 72). About 310,880 jobs were supported through the household spending of employees in the industry and its supply chain.

Only 15 percent of all intermediate goods and services are purchased from vendors outside the Los Angeles Basin.

Labor income (which includes wages and benefits) earned by all professional-services supported employment in the Los Angeles Basin reached $83.5 billion in 2016. This accounts for just over 15 percent of all labor income paid in the region.

The industry produced $117.2 billion in value-added, which accounted for 12.4 percent of the Los Angeles Basin's gross regional product (Exhibit 73).

The overall impacts of the professional services industry are widely distributed across many sectors of the economy through indirect and induced effects, including construction, food services, manufacturing industries, real estate, rental, leasing, wholesale trade, and administrative support and waste services.

The professional services industry's total fiscal impact in 2016–including direct, indirect and induced activity–exceeded $26.7 billion (Exhibit 74). This includes, for example, property taxes paid by firms and households, sales taxes on consumption purchases, personal and corporate income, and payroll taxes paid for and by employees.

Industry Supply Chain Analysis

The intermediate purchases of the professional services industry comprise an important part of the industry's overall economic contribution. As mentioned earlier, intermediate purchases accounted for 29.9 percent of the industry outlays, or $31.1 billion, in 2016.

Gross inputs are a combination of goods and services. In this industry, approximately 45 percent of intermediate goods are firms purchasing services from other firms in the same industry, for example, an architectural firm hiring an accounting firm to keep their books. (See panel in exhibit below.) Financial activities-related services, such as insurance and credit intermediation, accounted for just over 20 percent of purchases. Manufactured goods accounted for just under 10 percent of intermediate inputs. Trade, transportation and utilities, information services, and leisure and hospitality, respectively, accounted for 7 percent, 7 percent and 6 percent of intermediate inputs, including such services as courier services, power and electric, wholesale purchases and data processing, hosting, and related services. The remaining 3 percent of inputs were provided by other industries.

Regional Purchase Gap

The ability of a region to fill the demands of its industries speaks to the richness and diversity of the regional economy. Not all regions can effectively compete, or wish to compete, with suppliers of specific goods and services based elsewhere. Industries making purchases of goods elsewhere are clearly benefiting from lower costs, better quality or other advantages to importing intermediate goods rather than purchasing from local firms.

The percent of all inputs purchased regionally are shown in the right.

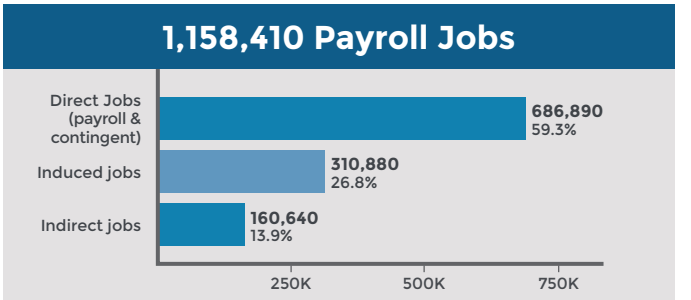

EXHIBIT 72:
Direct, indirect and induced jobs resulting from professional business services.

	DIRECT	TOTAL	% OF LA BASIN
Output ($ billions)	$104.2	$175.6	11.5%
Employment (jobs)*	686,890	1,158,410	13.7%
Labor Income ($ billions)	$59.3	$83.5	15.2%
Value-Added ($ billions)	$73.0	$946.0	12.4%

*Includes contingent workers

Sources: Estimates by LAEDC

EXHIBIT 73:
Professional business services industry's total economic contribution, 2016

TYPE OF TAX	$ BILLIONS
Personal income taxes	$10.2
Social insurance	$8.8
Sales and excise taxes	$2.6
Property taxes	$1.7
Corporate profits taxes	$2.3
Other taxes	$1.2
TOTAL	$26.7

TYPE OF GOVERNMENT	$ BILLIONS
Federal	$18.5
State	$5.7
Counties	$1.8
Cities	$0.8
TOTAL	$26.7

Sources: Estimates by LAEDC

EXHIBIT 74:
Professional business services industry's fiscal impacts by type.

panel of Exhibit 75. In general, financial services—which includes banking and insurance, and professional and business services—are purchased from regional suppliers. Firms in the professional services industry purchase about 92.4 percent of these services from regional suppliers. Similarly, the region is able to supply the industry with most of its needs locally, with regional purchases accounting for more than 80 percent of the industry's purchases of trade, transportation and utilities, information, leisure and hospitality, other services, construction, and education and health services.

In contrast, just 25 percent of the industry's purchases of manufacturing-related goods and services occur in the Los Angeles Basin. Because this represents a small share of the industry's intermediate inputs, the impact on the overall regional supply pipeline is very small in magnitude related to this lost opportunity. In terms of value, the industry spends about $2.2 billion with firms outside the region.

The percentage of intermediate goods and services that an industry is able to purchase from local suppliers has a direct impact on its contribution to the region's economic activity. The higher that percentage, the larger the multiplying effects that its revenues will have, which translates to increased wealth generation for the region.

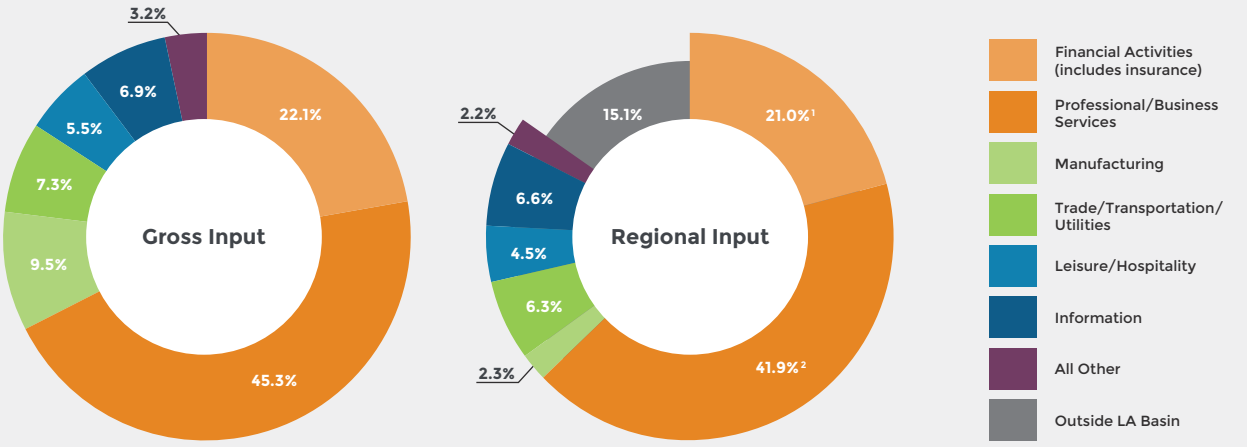

EXHIBIT 75:
Health care services, regional provision of inputs.

[1] 95 percent of industry purchases are financial activities/services in the LA Basin
[2] 92 percent of industry purchases are professional/business services in the LA Basin

Appendix A:

Regional Community College Programs, Certificates, Degrees

2016-2017

Accounting & Finance Programs

ACCOUNTING (TOP 050200)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	11	14
Citrus	16	-
Coastline	36	27
Compton	2	2
Cypress	-	4
East Los Angeles	137	12
El Camino	4	11
Fullerton	3	11
Glendale	28	27
Golden West	7	10
Irvine Valley	141	28
Los Angeles City	5	12
Los Angeles Harbor	5	3
Los Angeles Mission	-	10
Los Angeles Pierce	-	12
Los Angeles Southwest	2	-
Los Angeles Trade	13	12
Los Angeles Valley	44	36
Long Beach	16	11
Mt San Antonio	58	31
Orange Coast	11	11
Pasadena	12	8
Rio Hondo	2	9
Saddleback	29	13
Santa Ana	71	24
Santa Monica	25	27
Santiago Canyon	3	3
West Los Angeles	11	6
TOTAL	692	374

BANKING & FINANCE (TOP 050400)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Citrus	1	-
Glendale	3	1
Los Angeles City	2	1
Los Angeles Mission	-	1
Los Angeles Southwest	1	1
Los Angeles Valley	22	13
Pasadena	2	1
TOTAL	31	18

TAX STUDIES (TOP 050210)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Irvine Valley	16	-
Los Angeles Pierce	32	-
Saddleback	5	-
TOTAL	53	-

Architecture & Engineering Programs

ARCHITECTURE & ARCHITECTURAL TECHNOLOGY (TOP 020100)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	6	14
East Los Angeles	11	2
El Camino	6	13
Fullerton	2	7
Glendale	3	-
Los Angeles Harbor	3	7
Los Angeles Pierce	2	2
Los Angeles Trade	8	1
Los Angeles Valley	2	-
Long Beach	1	11
Mt San Antonio	63	4
Orange Coast	23	20
Pasadena	-	5
Rio Hondo	3	10
Saddleback	8	6
TOTAL	141	102

ARCHITECTURAL DRAFTING (TOP 095310)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Citrus	1	-
Long Beach	4	8
Santa Ana	2	1
TOTAL	7	9

CIVIL DRAFTING (TOP 095320)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Irvine Valley	1	-
Rio Hondo	4	3
TOTAL	5	3

CONSTRUCTION INSPECTION (TOP 095720)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Coastline	-	5
Fullerton	4	3
Pasadena	10	3
Saddleback	6	-
TOTAL	20	11

DRAFTING TECHNOLOGY (TOP 095300)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	24	17
Citrus	1	1
East Los Angeles	26	7
El Camino	5	6
Fullerton	-	8
Golden West	15	2
Irvine Valley	3	2
Los Angeles Harbor	-	2
Los Angeles Pierce	4	4
Los Angeles Valley	2	-
Mt San Antonio	41	4
Rio Hondo	4	5
Santa Ana	15	5
TOTAL	140	63

ENGINEERING TECHNOLOGY, GENERAL (REQUIRES TRIGONOMETRY) (TOP 092400)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	3	3
East Los Angeles	1	-
Glendale	12	-
Pasadena	-	122
Santa Ana	3	2
TOTAL	19	127

PUBLIC WORKS (TOP 210210)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Citrus	20	6
Santiago Canyon	5	6
TOTAL	25	12

Computers & Design Programs

COMPUTER GRAPHICS & DIGITAL IMAGERY (TOP 061460)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Citrus	1	6
Coastline	1	-
Cypress	11	-
Orange Coast	20	8
Saddleback	6	2
Santa Ana	3	4
TOTAL	42	20

COMPUTER INFORMATION SYSTEMS (TOP 070200)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Citrus	5	-
Compton	-	1
Cypress	-	5
East Los Angeles	5	9
El Camino	1	14
Fullerton	1	6
Glendale	2	-
Los Angeles City	-	3
Los Angeles Mission	-	3
Los Angeles Trade	13	10
Pasadena	1	1
Rio Hondo	2	8
Santa Ana	15	3
Santiago Canyon	-	2
West Los Angeles	4	9
TOTAL	49	74

COMPUTER INFRASTRUCTURE & SUPPORT (TOP 070800)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Coastline	20	47
Cypress	1	-
Los Angeles Valley	6	-
Long Beach	1	-
Mt San Antonio	-	16
TOTAL	28	63

COMPUTER SUPPORT (TOP 070820)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cypress	3	-
Glendale	-	2
Los Angeles Pierce	14	-
Pasadena	1	-
TOTAL	28	63

COMPUTER NETWORKING (TOP 070810)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	3	7
Coastline	19	1
Cypress	28	-
Irvine Valley	14	5
Los Angeles City	11	-
Los Angeles Pierce	24	13
Long Beach	6	19
Mt San Antonio	9	-
Saddleback	13	8
West Los Angeles	38	14
TOTAL	165	67

COMPUTER PROGRAMMING (TOP 070710)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	-	1
Cypress	22	5
East Los Angeles	5	-
Glendale	1	-
Irvine Valley	-	16
Los Angeles City	43	-
Los Angeles Mission	2	-
Los Angeles Pierce	1	5
Los Angeles Southwest	-	2
Los Angeles Valley	16	10
Mt San Antonio	56	12
Orange Coast	15	14
Pasadena	-	1
Santa Monica	9	16
TOTAL	170	82

COMPUTER SOFTWARE DEVELOPMENT (TOP 070700)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cypress	1	-
Golden West	1	6
Orange Coast	3	2
Pasadena	4	-
Saddleback	3	-
TOTAL	12	8

Computers & Design Programs (continued)

DIGITAL MEDIA (TOP 061400)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
East Los Angeles	1	-
Golden West	8	5
Irvine Valley	3	5
TOTAL	12	10

GRAPHIC ART & DESIGN (TOP 103000)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	-	6
East Los Angeles	6	6
Fullerton	-	16
Glendale	14	-
Golden West	26	6
Irvine Valley	2	-
Los Angeles City	-	5
Los Angeles Pierce	6	4
Los Angeles Valley	3	-
Mt San Antonio	7	14
Pasadena	8	2
Saddleback	11	6
Santa Monica	18	12
Santiago Canyon	-	3
TOTAL	101	80

INFORMATION TECHNOLOGY, GENERAL (TOP 070100)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cypress	1	-
East Los Angeles	8	-
Los Angeles Harbor	1	-
Los Angeles Mission	4	-
Long Beach	11	16
Mt San Antonio	45	4
West Los Angeles	3	-
TOTAL	73	20

MULTIMEDIA (TOP 061410)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cypress	1	-
Los Angeles Mission	6	2
Long Beach	1	-
Orange Coast	2	1
Pasadena	1	-
Santa Monica	3	3
TOTAL	14	6

SOFTWARE APPLICATIONS (TOP 070210)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	1	3
Coastline	9	-
Fullerton	1	-
Irvine Valley	27	1
Los Angeles City	2	-
Los Angeles Mission	2	-
Los Angeles Southwest	-	2
Mt San Antonio	2	-
Pasadena	1	1
Saddleback	6	3
Santa Monica	6	11
TOTAL	57	21

TELECOMMUNICATIONS TECHNOLOGY (TOP 093430)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Los Angeles Pierce	12	-
Los Angeles Trade	17	18
Mt San Antonio	2	-
TOTAL	31	18

WEBSITE DESIGN & DEVELOPMENT (TOP 061430)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Coastline	1	-
Irvine Valley	7	1
Los Angeles Pierce	2	-
Saddleback	4	1
Santa Ana	1	-
TOTAL	15	2

WORLD WIDE WEB ADMINISTRATION (TOP 070900)

COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Glendale	2	1
Los Angeles Pierce	5	-
Long Beach	3	2
Saddleback	4	1
West Los Angeles	6	2
TOTAL	20	6

Administration & Support Programs

OFFICE TECHNOLOGY/OFFICE COMPUTER APPLICATIONS (TOP 051400)		
COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	12	4
Citrus	19	-
Coastline	10	30
Compton	1	3
Cypress	6	3
East Los Angeles	42	1
Glendale	14	18
Golden West	3	1
Irvine Valley	4	-
Los Angeles City	22	4
Los Angeles Harbor	16	8
Los Angeles Mission	26	6
Los Angeles Pierce	39	1
Los Angeles Southwest	1	-
Los Angeles Trade	26	11
Los Angeles Valley	73	11
Long Beach	13	5
Mt San Antonio	12	4
Pasadena	12	1
Saddleback	6	3
Santa Ana	1	2
West Los Angeles	-	1
TOTAL	358	117

SIGN LANGUAGE INTERPRETING (TOP 085010)		
COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Compton	1	2
El Camino	17	13
Golden West	14	11
Los Angeles Pierce	-	4
Mt San Antonio	5	7
Saddleback	7	6
Santiago Canyon	2	-
TOTAL	46	43

Veterinary Medicine Programs

VETERINARY TECHNICIAN (LICENSED) (TOP 010210)		
COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Los Angeles Pierce	-	33
Mt San Antonio	-	39
TOTAL	-	72

Law Programs

PARALEGAL (TOP 140200)		
COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Cerritos	48	-
Coastline	43	32
Compton	2	2
El Camino	7	8
Fullerton	30	26
Irvine Valley	23	8
Los Angeles City	-	27
Los Angeles Mission	20	8
Los Angeles Southwest	-	2
Los Angeles Trade	11	5
Mt San Antonio	-	35
Pasadena	53	19
Santa Ana	26	22
West Los Angeles	18	11
TOTAL	281	205

Environmental Science Programs

ENVIRONMENTAL TECHNOLOGY (TOP 030300)		
COLLEGE	# OF CERTIFICATES	# OF ASSOCIATE DEGREES
Irvine Valley	4	-
Rio Hondo	-	7
Santa Monica	6	5
Santiago Canyon	-	1
TOTAL	10	13

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Appendix B: Methodology

How (and Why) We Did What We Did

Numerous data sources and methodologies were used to measure the target industry for this deep dive.

Industry Forecast

An economic forecast is created to project employment by industry over the next five years using statistical analysis of historical data paired with the most recent qualitative information impacting a set of 151 industries in the Los Angeles Basin. The industries configured for this forecast are defined through the North American Industry Classification System (NAICS) and comprise industries denoted with 2-digit, 3-digit and 4-digit codes through the NAICS hierarchical classification system. A key input for the regional forecast is projected population growth in Los Angeles and Orange counties, provided by the California Department of Finance. State and national trends concerning production methods, consumer behavior, construction and property values that correspond to each industry are a few of the inputs used for the economic forecast model.

Occupations and Projections

Occupations are commonly classified using the Standard Occupational Classification (SOC) System, developed by the Bureau of Labor Statistics. This system classifies workers into 840 detailed occupations that share similar job duties, skills, education and training. These occupations are not industry-specific, but are common to many industries. For example, retail salespersons are employed in a full spectrum of industries, from department and discount stores to computer systems design.

The economic forecast for employment by industry is used to guide a projection of net new jobs for each occupation, calculated by applying the industry occupational composition to the detailed industry employment forecast; occupational forecasts are aggregated across industries.

The United States Census Bureau estimates replacement needs by industry and occupation through detailed surveys of employers and households. These take into account industry changes, the age of the current workforce within each industry and occupation, and the nature of the career path. These estimates are an important component of occupational job openings and workforce development needs, since the retirement and promotion of individuals leave openings for new entrants and those moving up the career ladder.

Total openings are the sum of projected five-year replacement needs and positive net new jobs forecast over the period.

Target Industries and Occupations

Target industries are selected using a variety of metrics: middle-skill job share; the projected change in middle-skill jobs from 2016 to 2021 (number and rate); the five-year job replacement rate; the 2016 location quotient; the change in location quotient from 2006 to 2016; the 2016 annual average wage relative to all industries; and value added per worker. (Middle-skill jobs require education and training beyond a high school diploma but less than a bachelor's degree.)

Target occupations are selected in a two-step process. First, all occupations identified as middle-skill are isolated from each target industry. Then, a variety of metrics are used to select target occupations: 2016 employment; projected net job change; replacement rate; number of projected replacement jobs from 2016 to 2021; number of projected total job openings from 2016 to 2021; and annual median wages.

Location Quotient

A common metric to assess a region's competitiveness is employment concentration or location quotients. A location quotient for an industry in a specific region compares the percent of total employment in the industry to the average percent nationwide. For example, if 4 percent of employment in a region is in the aerospace industry compared to 2 percent across the nation, the location quotient for the region's aerospace industry is 2, indicating the region is more specialized in aerospace than the nation.

A location quotient equal to 1.0 indicates the employment concentration in the region is equal to the nation, meaning the region is not highly-specialized in that industry. Higher location quotients imply a competitive advantage. While there can be some variation in this metric, the location quotient threshold of 1.2 usually demonstrates regional specialization and competitiveness.

Supply

Community colleges and other two-year educational institutions provide education and training relevant to middle-skill occupations. Com-paring occupations with related training programs provides information for supply-and-demand analysis. The number of awards conferred by community colleges reflects the most recent data available from the 2015-16 academic year. Award data for other two-year education institutions is from the 2014-15 academic year. Due to data and timing limitations, training gap forecasts approximate unmet labor demand and do not represent an absolute oversupply or undersupply of available talent. In addition, a one-to-one relationship between program completions and occupational demand does not exist because some programs train for multiple occupations. Consequently, awards for some education and training programs overlap with multiple occupations.

Economic Impact & Contribution Analysis

Economic contribution analysis is used to estimate the portion of a region's economic activity that can be attributed to an existing industry sector, including the expenditure of money for goods and services from regional vendors. These purchases circulate throughout the regional economy.

The professional services industry spends billions of dollars every year on wages and benefits for employees and contingent workers. These workers, as well as the employees of all suppliers, spend a portion of their incomes on groceries, rent, vehicle expenses, health care, entertainment, and so on. This recirculation of household earnings multiplies the initial industry spending through indirect and induced effects.

The extent to which the initial expenditures multiply is estimated using economic models that depict the relationships between industries (such as businesses and their suppliers) and among different economic agents (such as industries and their employees). These models are built upon data of expenditure patterns reported to the Bureau of Labor Statistics, U.S. Census Bureau and Bureau of Economic Analysis of the U.S. Department of Commerce. Data is regionalized to reflect local conditions such as wage rates, commuting patterns, and resource availability and costs.

The magnitude of the multiplying effect differs from one region to another depending on the extent to which the local region can fill the demand for all rounds of supplying needs. For example, the automobile manufacturing industry has high multipliers in Detroit and Indiana since these regions have deep supplier networks, while the same industry multiplier in Phoenix is quite small. In another example, the jobs multiplier for the construction industry is higher in, say, Arkansas, than in California because a given amount of spending will purchase fewer workers in Los Angeles than in Little Rock.

Multipliers also differ from year to year as relative material and labor costs change and as the production "recipe" of industries change. For example, the IT revolution significantly reduced the job multiplier of many industries (such as manufacturing, accounting and publishing) as computers replaced administrative and production workers.

The metrics used to determine the value of the economic contribution are employment, labor income, value-added and the value of output. Employment includes full-time, part-time, permanent and seasonal employees and the self-employed, and is measured on a job-count basis regardless of the number of hours worked. Labor income includes all income received by both payroll employees and the self-employed, including wages and benefits such as health insurance and pension plan contributions. Value-added is the measure of the contribution to GDP made by the industry, and consists of compensation of employees, taxes on production and gross operating surplus (otherwise known as profit). Output is the value of the goods and services produced. For most industries, this is simply the revenues generated through sales; for others, such as retail, output is the value of the services supplied.

Estimates are developed using software and data from IMPLAN Group, LLC which traces inter-industry transactions resulting from an increase in demand in a given region. The economic region of interest in this document is the Los Angeles Basin. The activity is reported for 2016, the most recent year for which a complete set of data is available. Estimates for labor income and output are expressed in 2016 dollars to maintain consistency with the reported industry activity.

The total estimated economic contribution includes direct, indirect and induced effects. Direct activity includes materials purchased and employees hired by the industry itself. Indirect effects are those which stem from employment and business revenues resulting from purchases made by the industry and any of its suppliers. Induced effects are those generated by household spending of employees whose wages are sustained by both direct and indirect spending.

Contribution analysis differs from economic impact analysis in that linkages between the individual component industries are removed, so that indirect activity is not double-counted as part of direct activity. For example, firms in the aerospace industry purchase supplies from smaller manufacturers of aerospace parts, which would then be included as both direct revenue of the parts supplier and as an expense of the aerospace industry, resulting in a double-counting of overall revenue. Breaking these inter-industry linkages eliminates this double-counting and is a more accurate method of estimating the economic contribution of the industry cluster.

Data Sources

All data was obtained from the Bureau of Labor Statistics and the Census Bureau. Annual employment and payroll data are from the Quarterly Census of Employment and Wages series. Estimates for non-disclosed employment and payroll data were produced using proportional shares of the prior year's data or using midpoint estimates from the Census Bureau's County Business Patterns dataset. Occupational data are from the Occupational Employment Statistics program. Unless noted otherwise, all data is for the 2016 calendar year.

Supply Chain & Output Analysis

Composition of gross output is a metric tracked by the BEA at the state level. It is assumed that the proportion attributable to each component of this metric at the county level is comparable to that at the state level. This seems reasonable given the size of the Los Angeles Basin and its economic activity in the state. Estimates of regional purchases of intermediate goods and services are produced using econometric models by the IMPLAN Group, LLC.

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