Oregon Talent Assessment

Prepared by ECONorthwest and Program and Policy Insight for
the Oregon Workforce and Talent Development Board

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Executive Summary

U.S. business leaders have identified access to skilled labor as a competitive strength in the United States, but a deteriorating one. They and civic leaders point to an anomaly: persistent underemployment while employers struggle to match the right talent to open positions. Concerns have ranged from widespread skill gaps (e.g., too few workers with STEM or technical skills) to skill shortages in specific, in-demand occupations (e.g., welders) to too few applicants with requisite soft skills: work ethic, motivation, the ability to work in teams.

Some economists challenge the notion of gaps and shortages. They counter that if they existed, wages would have risen faster than they have in recent years. Absent strong wage growth, some economists contend the skills problem has more to do with a timing mismatch than chronic gaps or shortages. In short, employers, civic leaders, and economists acknowledge a U.S. skills problem, but frequently disagree on its nature.

The Oregon Higher Education Coordinating Commission (HECC) hired ECONorthwest and Program and Policy Insight to assess the market for skills from business and industry's perspective. Specifically, the *Oregon Talent Assessment* serves as business and industry's determination of in-demand occupations, skills, talent, gaps, and trends. Its goal is to elevate the understanding of Oregon's skills problem by creating common data and language that can be shared across employers, educators, and workforce intermediaries. The *Assessment* is one part of a fully integrated series of strategic plans aimed at strengthening workforce planning and execution. HECC's intention is to update the *Assessment* every two years.

The *Talent Assessment* draws on quantitative and qualitative research. It summarizes key occupational and wage trends found in a variety of federal and state data sources and reviews projections. The perspectives of employers are collected through surveys and focus group interviews. Employers' perspectives generally align with market data, and the report highlights the instances where they do not.

The timing of the *Talent Assessment* is notable in two regards. First, it comes in the latter stages of a long U.S. economic expansion. Oregon's job growth has outpaced the nation's, incomes are up, and employers are operating in an increasingly tight labor market. Second, technological progress, which is always evolving, appears to be accelerating. Advances in machine learning and artificial intelligence are disrupting work and putting a higher premium on skills that are uniquely human. An assessment performed two years from now, in a different economic and technological context, could yield significantly different findings.

The 2018 *Assessment's* key findings:

1. **Most employers do not report, and data do not suggest, widespread gaps in basic skills.** This report defines a skills gap as a widespread shortfall of basic skills that would be consistent with a broad failure of the education system. A majority (77 percent) of employers agreed that their applicants possessed the basic skills required for their vacant positions: the abilities to read for and locate information, to write for communication, and to apply mathematics. Those who identified deficiencies specified inadequate writing skills.

The employers' responses are supported by a flattening of the college wage premium since 2000. An emerging theory is that automation is disrupting previously high-wage jobs and forcing some well-trained graduates into lower paid occupations. Others argue that slow-growing business investment is limiting innovation and opportunity for high-end work. Whatever the cause, policymakers should keep close track of the college wage premium—especially in light of the increasing cost of attending college.

2. **About half of employers report a shortage of occupational skills required for specific occupations—with problem solving and critical thinking at the top of the list.** Our report characterizes a shortfall of hard skills—project management, problem solving, machine operation, software competencies, and the like—as a notable challenge in particular occupations. The skills could be learned through on-the-job training, internships, apprenticeships, or well-designed project-based activities in traditional education settings. While interviewees acknowledge the need to train individuals for tasks specific to the job, there was broad agreement that for nearly all levels of occupations, the labor pool was generally not equipped with baseline occupational skills, such as the ability to work with tools and machines, or knowledge of relevant computer software. Respondents in the outdoor gear/apparel, construction, bioscience, food and beverage, and wood products sectors reported the biggest challenges, with the absence of critical thinking and problem solving as the lead deficiencies.

3. **Employers signal a high demand for engineers, skilled tradespeople, and project managers.** While industries have specific employment needs, there are occupational needs that exist across sectors. The most frequently cited occupations across industries include engineers, skilled trades, and project managers. Nearly all sectors are in need of engineers, with the type of engineer dependent on the sector, such as marine engineer in the maritime sector, biomedical engineer in the biomedical sector, or software engineer in the technology sector. Electrical and mechanical engineers are in demand across sectors.

   Several interviewees across multiple sectors cited the need for managers to oversee complex business and technical operations or products. Applicants need a broad range of skills, including data analysis, critical thinking, interpersonal and leadership skills, and knowledge of business operations.

4. **Employers recruit out-of-state to meet talent needs.** Several key stakeholders indicated that they needed to recruit and hire out-of-state to meet their employment needs for specific occupations: utility line workers, electricians, millwrights, engineers (particularly bachelor's or master's level mechanical, industrial, electrical, computer, and chemical engineers), UX/UI (user experience/user interface) managers, and middle-level project managers. With respect to recruiting electricians and millwrights, employers cited barriers to hiring out-of-state due to Oregon's strict licensing standards.

5. **Interpersonal skills are lacking while also growing in importance**. The skills are called by many different names: interpersonal, soft, essential, social. They are the skills associated with an individual's habits, personality, and character, including dependability, leadership, honesty, and the ability to work in teams.

Only a narrow majority of employers (55 percent) agreed that applicants possessed the interpersonal skills required for their vacant positions. When employers were asked what skills applicants lacked, communication skills, motivation, dependability, and time management all elicited high responses.

The employers' responses are echoed in recent research that tracked skills associated with growing and shrinking occupations over the past three decades. Occupations that required a mix of high social and high math skills grew at the fastest rate followed by occupations that required high social skills. Occupations that required high math skills and low social skills shrank as a size of the labor market, while occupations that required low social and low math skills fared the worst of all. The conclusion: the labor market has been rewarding humans for performing tasks that computers cannot do.

6. **Modest wage growth tempers declarations of widespread skill shortfalls**. The traditional relationship between unemployment rates and wage inflation is broken in this economic expansion. Nationally, low unemployment rates would suggest an economy near full employment, which typically triggers higher wages and inflation concerns. In this business cycle, wages have yet to accelerate. The relatively modest wage growth makes economists question employers' calls of skill gaps and shortages.

   Oregon's experience is somewhat different than the nation's. Recovery and wage growth at the state level has outpaced the U.S. average. However, Oregon's average wages are still below national levels. Pay in Oregon's rapidly expanding professional and business services sector, which increased at an annual rate of 4.2 percent between 2007 and 2017, could support a story of shortages. It's hard to find similar evidence in other sectors. Even in construction, where anecdotes of cost overruns are common, wage growth corresponds to broad economy averages. Employer survey responses align with this wage story. When asked how they overcome hiring difficulties, only 35 percent identified wage increases as a remedy.

7. **Populations that remain outside the labor force, late in this economic expansion, warrant priority consideration under the forthcoming adult workforce goal**. This economic expansion, at the time of publication, is the second longest in the post-World War II era. Yet labor force participation rates (i.e., the share of the population working or seeking work) are still below those recorded in the early 2000s and 1990s. For the expansion to continue, more people will have to be pulled off the sidelines. Sizable, traditional working age populations are still without work. Almost half have a high school degree or less. And among that population, half receive federal food assistance and 40 percent have children. These late-expansion, non-workers—especially those with limited education—are obvious candidates for a full suite of basic skills training, supportive work environments, and job search assistance programs.

8. **Demography and automation play the leading roles in job projections**. The Oregon Employment Department's recently released 10-year projections boil down to several broad themes: an aging population will demand more healthcare and caregiving; automation will continue to erode employment in all sectors related to paper, from papermaking to publishing; today's low residential

and commercial vacancy rates (and high prices) suggest strong growth in the construction sector; and the government—at all levels—is positioned for slow growth. Five of the top ten fastest growing occupations are health-related: physician assistants, home health aides, nurse practitioners, health specialties teachers, and health diagnosing practitioners. With the leading edge of the Baby-boom generation entering their mid-70s, these projections seem like a reasonable scenario.

The scope and pace of technological progress is the big question mark. In the near term, most observers anticipate continued destruction of routine work tasks, with disproportionate impacts in food service, office and administrative, sales, and production occupations. Most affected occupations won't disappear entirely, but the nature of the job will change, and workers will have to adapt accordingly. Artificial intelligence experts anticipate even more disruption and see technology outperforming human labor at higher points on the skill ladder (e.g., disease diagnosis, creative writing, clothing design). The trends warrant close monitoring.

9. **Employer forecasts of talent needs are common, short-term, and largely unshared.** Almost all (97 percent) survey respondents and the majority of interviewed stakeholders note that they primarily use internal company data and analysis to guide forecasting and planning. Most industry stakeholders suggest forecasting timeframes ranging between 3 and 12 months, with ongoing weekly discussions. Respondents described rapidly changing information and the need to be responsive and nimble to changing conditions.

   The majority of stakeholders indicate that they limit their forecasting analysis to internal use only and do not share with other firms, training providers, or educational or workforce institutions.

10. **Employers report progress on strengthening the talent supply chain through externships, internships, apprenticeships, and reinvigorated career technical education programs**. Respondents described a number of recruiting mechanisms designed to attract prospective employees at a younger age. Educator externships expose K-12 teachers, administrators, and counselors to the work they do, and the skillsets required to be successful in these careers. This in turn influences how young people learn about workplace skills and engage with career path options. CTE programs are expanding in high schools, allowing students to get hands-on experience in a wider variety of career options and skill areas. Industries are working closely with postsecondary institutions to develop and support curricular options to train their future workforce. Businesses and education institutions are supporting work-based learning opportunities for future potential employees, such as apprenticeships and internships. Industries are collaborating with associations and workforce development to invest in augmenting displaced workers' skillsets to support them in transitioning to careers in new sectors. Some industries are working to diversify their workforce by targeting women, minorities, and veterans in their training and recruitment efforts.

Chapter 1: Introduction

U.S. business leaders have identified access to skilled labor as a competitive strength in the United States, but a deteriorating one. They and civic leaders point to an anomaly: persistent underemployment while employers struggle to match the right talent to open positions. Concerns have ranged from widespread skill gaps (e.g., too few workers with STEM or technical skills) to skill shortages in specific, in-demand occupations (e.g., engineers, welders). Employer surveys also routinely report too few applicants with requisite soft skills: work ethic, motivation, the ability to work in teams.

Some economists challenge the notion of gaps and shortages. They counter that if they existed, wages would have risen faster than they have in recent years. Absent strong wage growth, some economists contend the skills problem has more to do with a mismatch than gaps or shortages. Workers are acquiring skills, but the timing is off and the skills don't match today's market demand. Consequently, for too many workers, skill investments aren't translating into higher wages.

In short, employers, civic leaders, and economists acknowledge a U.S. skills problem, but frequently disagree on its nature.

Stepping into the middle of the debate, workforce strategists—led by Harvard University's Joseph Fuller—contend the problem is created by a broken supply chain for labor. Employers do a poor job of communicating skill needs to educators, and educators fail to communicate opportunities to students. The dysfunctional supply chain overproduces some skills and under-produces others. Their proposed remedies fall into four broad categories: 1) improved coordination and communication between employers and workforce educators; 2) better data and consistent language about the nature of the skills problem; 3) clearer, structured career paths for aspiring workers; and 4) aligned monetary incentives to improve system performance.

Oregon workforce agencies, colleges, and businesses are working along all these fronts. This report focuses primarily on the second of the four remedies: better data about the nature of the skills problem. The *Oregon Talent Assessment* serves as business and industry's determination of in-demand occupations, in-demand skills, talent gaps, and trends. Its goal is to elevate the understanding of Oregon's skills problem by creating common data and language that can be shared across employers, educators, and workforce intermediaries. The *Assessment* is one part of a fully integrated series of strategic plans aimed at strengthening workforce planning and execution.

The *Assessment* is organized as follows:

- **Chapter Two: The Condition of Oregon's Market for Skills** begins to frame the skills problem in Oregon. It introduces the concepts of skill gaps, shortages, and mismatches and uses market data to determine whether any or all of the conditions exist. Analyses also investigate labor underutilization and populations that remain outside the workforce late in this economic expansion.
- **Chapter Three: The Future of Work** discusses how automation has and will continue to disrupt work, alter tasks within occupations, and put a higher premium on interpersonal skills. The chapter then takes a new look at the Oregon

Employment Department's projections for in-demand occupations and skills. A related analysis organizes in-demand jobs by their associated skills (e.g., communication/critical thinking, physical work, clerical/service, machine operation/processes) to highlight clusters of related occupations, which could point to skill profiles that foster flexible job transitions.

- **Chapter Four: Employers' Perspectives on In-Demand Skills and Occupations** draws on surveys, interviews, and focus groups to summarize recent hiring experiences. Employers from ten key industrial sectors reflect on their success in finding basic, occupational, and interpersonal skills in their applicant pools. They also discuss the occupations required for business success.
- **Chapter Five: Employers' Responses to Skill and Occupational Needs** characterizes how businesses—in collaboration with educators and workforce developers—identify and strengthen the skills and talent in Oregon's labor force. It discusses the condition of supply chain relationships in which employers share information on their needs, educators and workforce intermediaries adjust outreach and programming, and trainees prepare to enter the workforce.
- **Chapter Six: Conclusions** reflects on the *Assessment's* quantitative and qualitative findings and highlights implications for public policy. Findings from the *Assessment* should inform strategies across the education continuum from early childhood education and Measure 98's high school focus to the 40/40/20 and new adult workforce goals.

Chapter 2: The Condition of Oregon's Market for Skills

Introduction

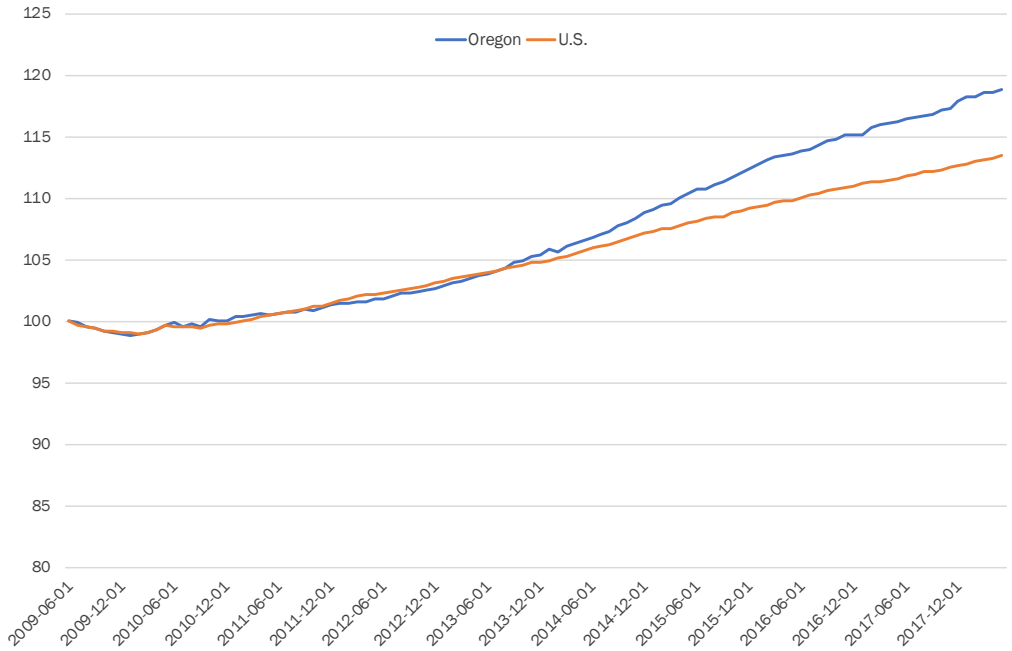
This study assesses Oregon's talent in a variety of ways, with this chapter relying on data routinely collected by federal and state agencies. It defines and reviews potential skill problems and then provides an in-depth review of populations that remain jobless late in this economic expansion.

The assessment of skill problems and joblessness should be considered in the broader context of Oregon's economic performance. Human capital—the stock of knowledge and skills of a working population—sits at the foundation of regional and state economies. So a state's economic performance is, in no small part, a reflection of its workforce's talent.

Oregon's performance during this economic expansion suggests a capable talent pool. Job growth has largely outpaced the nation's since 2009 (see Figure 2.1). Per capita income, while still below the U.S. average, is growing faster than in most states. Median household incomes are up (adjusted for inflation), and the share of Oregonians living in poverty is down. In short, Oregon has enjoyed one of the stronger economic recoveries in the country, and it has its talent to thank for that.

That said, the recovery hasn't reached all households or geographies and considerable distance still exists between Oregon and the nation's top economic performers. Uncovering and addressing the remaining workforce challenges is a key step to a more prosperous and inclusive economic future.

Figure 2.1. Total nonfarm employment, indexed (June 2009 = 100), Oregon and U.S.



Data source: U.S Bureau of Labor Statistics

Skill gaps, shortages, and mismatches

Labor policy discussions often conflate different kinds of problems that relate to worker skills. With a goal of clarity, this report will discuss skill problems in three categories[1]:

- **Skill gaps:** Widespread shortfalls in basic skills, usually associated with a failure of the education system. Oregon's adoption of the 40/40/20 postsecondary attainment goal is predicated in large part on an assumption that Oregon has—or will have—a skills gap.
- **Skill shortages:** Shortfalls of skills required by specific occupations. For example, it's possible that the education system has succeeded in delivering basic skills but has fallen short on producing a number of specialized skills required at a particular point in time (e.g., engineers or welders).
- **Skill mismatches:** The supply and demand for skills is out of sync in either direction—oversupply or undersupply. For example, potential workers are entering a labor market with good hard and soft skills that do not match the needs of a local economy.

The balance of the section investigates possible gaps, shortages, and mismatches in Oregon.

Skill gaps

Harvard University economists Claudia Golden and Lawrence Katz made a compelling case of widespread U.S. skill gaps in their seminal book *The Race Between Education and Technology.* Their research charted the college wage premium throughout the 20th Century and asserted that when the skills of the labor force didn't keep pace with technological improvements, the college wage premium tended to rise. That's because wages would be bid up for the relatively scarce skills of those who could develop and interact with increasingly sophisticated technology on the job.

They found that labor skills—thanks to post World War II investments in education—kept pace with technological change between 1940 and 1980. But, beginning in the 1980s, graduation rates for U.S. high schools plateaued, and the rate of growth in postsecondary attendance and graduation slowed. Meanwhile, technological progresses continued, and wages accelerated for college degree holders, especially those who designed new technologies or leveraged them in their work. By 2005, the U.S. college wage premium was as large as it has been in the early 21st Century.

Golden and Katz's early 2000s findings were consistent with a skill gap: a broad underproduction of the cognitive and soft skills that are generally associated with college graduates. Based on their findings and those of others, 42 states, including Oregon, have set goals to improve rates of postsecondary attainment.

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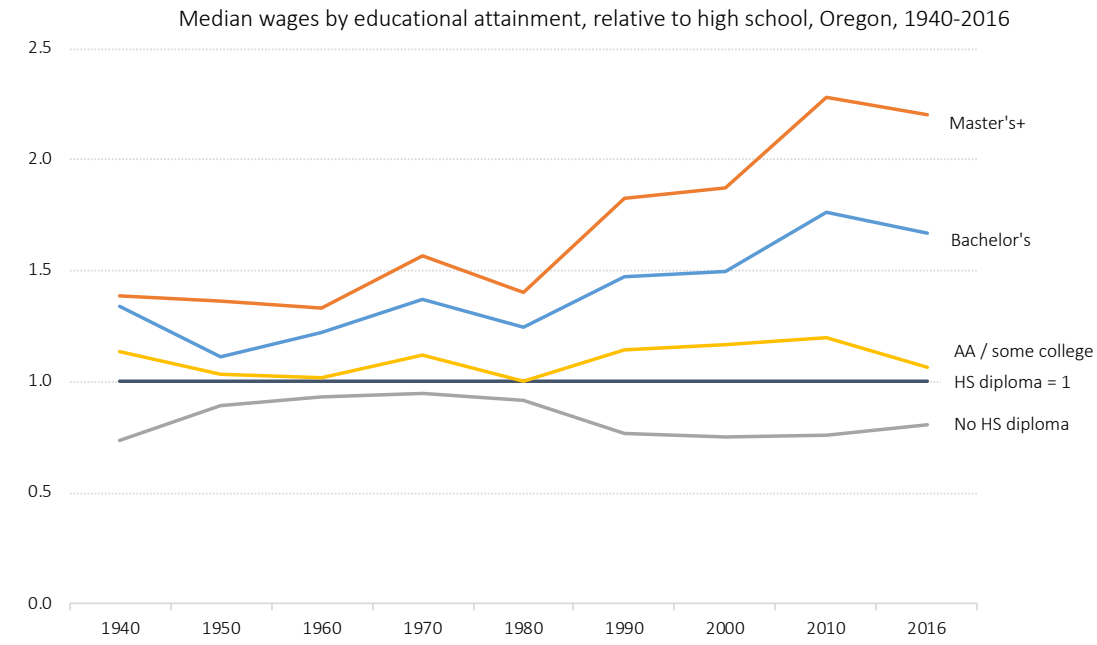
[1] The categories are drawn from Cappelli, Peter. (August 2014). *Skill Gaps, Skill Shortages, and Skill Mismatches: Evidence for the US.* National Bureau of Economic Research. Cambridge, MA.

Nationally, evidence suggests the college wage premium has flattened since 2000. Potential causes include the slow growth of middle-skill jobs once performed by college graduates or a decline in the demand for cognitive skills because of a slowdown in technology investment.[2]

College wage premiums in Oregon are broadly consistent with the larger U.S. story (see Figure 2.2). Bachelor's and graduate degree holders saw large wage gains relative to high school diploma holders between 1980 and 2005. Somewhat contrary to the national narrative, Oregon's premiums for bachelor's and graduate degrees show continued growth after 2005, with flattening in later years.

Both the Oregon and U.S. trends suggest that a skill gap persists but isn't growing at the rates measured in the 1980s and 1990s. Postsecondary education remains a sound financial investment but, with the wage premiums flattening, students—and the institutions that serve them—will need to be more conscious about the cost of education.

Figure 2.2. Oregon's college wage premium



Data source: US Census; American Community Survey PUMS data

[2] See Valletta, Robert. (October 17, 2017). *Recent Flattening in the Higher Education Wage Premium: Polarization, Skill Downgrading, or Both?* Federal Reserve Bank of San Francisco. San Francisco, CA.

Skill shortages

Reports of skill shortages were common early in this economic expansion when unemployment rates were high and have increased as the labor market has tightened. When economists hear reports of skill shortages, a first instinct is to investigate wages. Basic economic theory concludes that if a shortfall of a good or service exists, its price should rise. If the price isn't rising (in this case, employers aren't offering higher wages), then it suggests that the advertised positions may not be critical to the employers' business strategies.

Up to this point in the economic recovery, wage trends do not signal widespread skill shortages in U.S. labor markets. Typically, low unemployment is coupled with wage inflation, but that hasn't been the case in this expansion. Economists have advanced a variety of theories for the break in the historic low unemployment-inflation relationship. One leading theory involves a larger-than-usual population of traditional-working-age residents (ages 25-54) who, until recently, remained outside the labor force and were not counted as unemployed. As the economy has continued to expand, they have been gradually assimilated into the labor market, providing additional supply of new hires for employers and helping keep wages down.

Oregon's wage growth has outperformed the nation's during this recovery. Nonetheless, average wages remained below the U.S. levels in all but two private industries: manufacturing and education/health services. Relative to Oregon wage growth overall, the Oregon industry with the most growth between 2007 and 2017 was the professional and business services sector (see Figure 2.3). With average pay increasing at a 4.2 percent annual rate during the period (and 5.5 percent annually in the last five years), the sector could make a persuasive case for shortages. Other sectors with above-average growth in recent years include natural resources, financial activities, and information. Concerns about rising construction budgets triggered a review of construction-related occupations by Oregon's Office of Economic Analysis (OEA), which found that wages for those occupations were growing no faster than wages in other industries.[3]

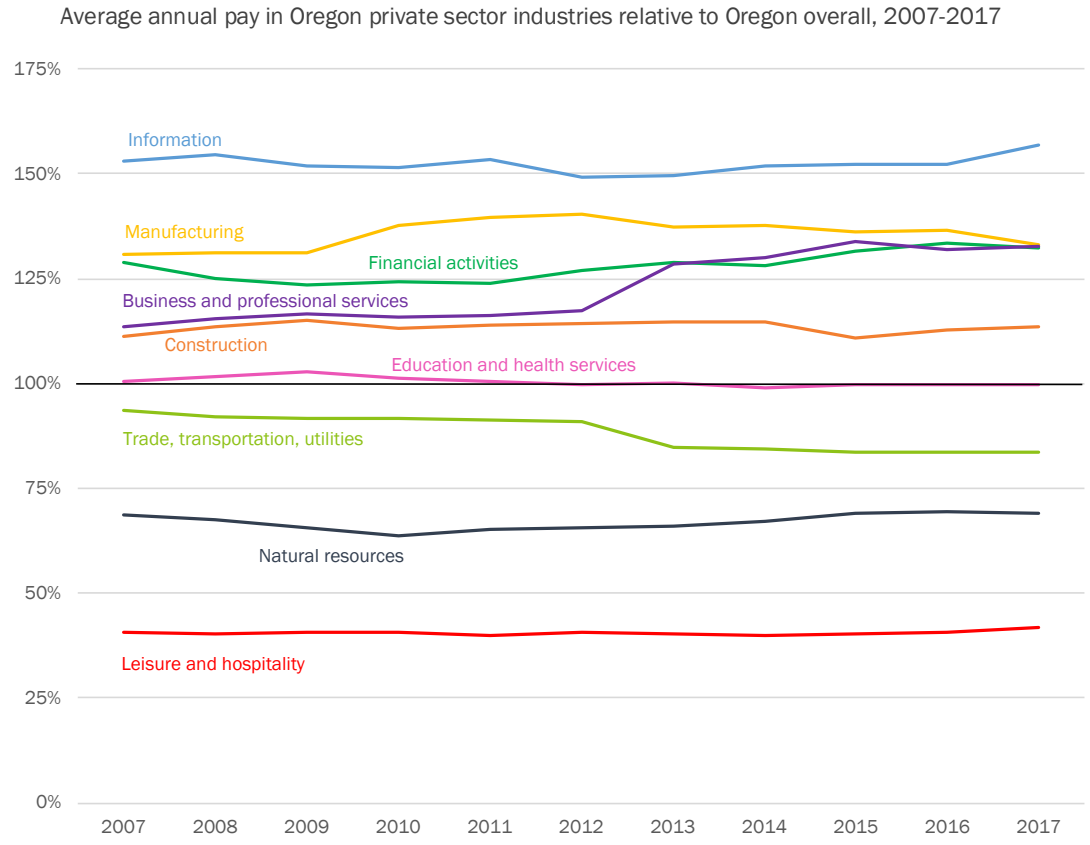
Wage trends overall do not point to widespread shortages: Oregon's growth in real median hourly wage from 2016 to 2017 was just 0.1 percent. However, some occupations do exhibit the defining characteristic of a current shortage, with year-over-year wage growth far exceeding the statewide average. In Figure 2.4, these jobs lie in the right tail of the distribution and include occupations such as metal and plastic workers; extruding, forming, pressing, and compacting operators; paper goods machine setters, operators, and tenders; and drywall and ceiling tile installers. The observed outliers in wage growth can be short-lived, due in part to small sample sizes, but also due to rapidly changing market conditions, as supply and demand reach more stable equilibria.

The Oregon Employment Department's (OED) difficult-to-fill jobs report also presents evidence of potential shortages. The report highlights a number of occupations to watch: truck drivers, carpenters, personal care aides, construction laborers, farm workers and

[3] See https://oregoneconomicanalysis.com/2018/06/20/construction-wages-graph-of-the-week/

laborers, and restaurant cooks. Notably, the majority of difficult-to-fill jobs (71 percent) required no more than high school diploma.[4] Considering wages and vacancies in combination can provide useful evidence about occupations in short supply, at least in the short-term.

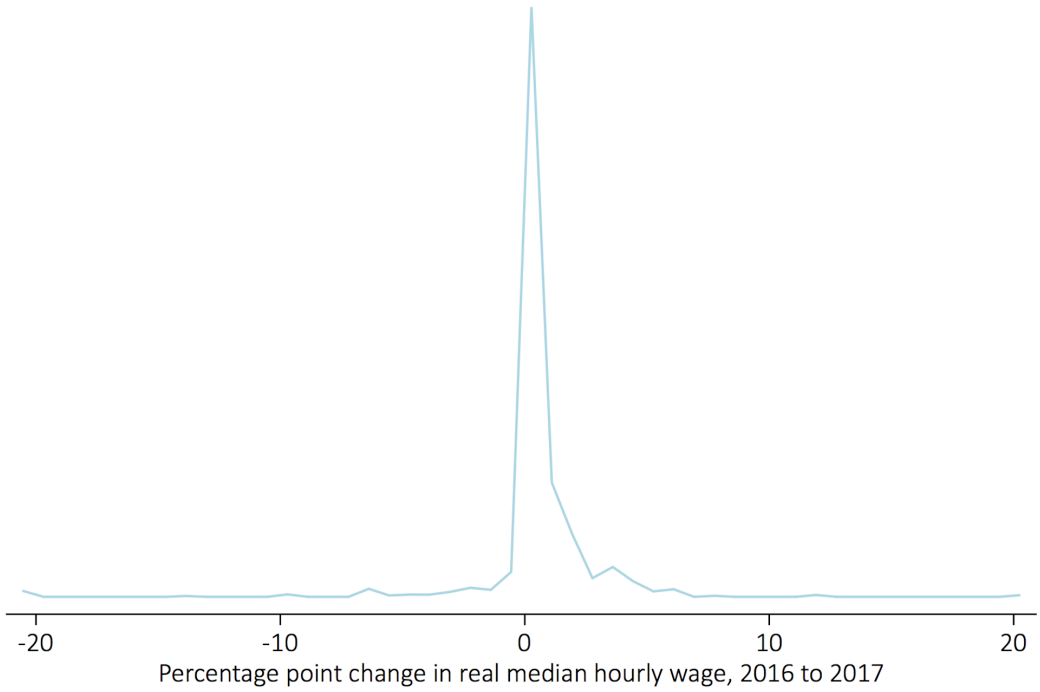
Figure 2.3. Wage growth in most Oregon industries is in line with overall Oregon wage growth (Oregon overall = 100%)



Data source: Quarterly Census of Employment and Wages

[4] Oregon Employment Department. (June 2018). *Oregon's Current Workforce Gaps*: *Difficult to fill job openings*. Based on the Oregon Job Vacancy Survey.

Figure 2.4. Distribution of Oregon occupations by percentage point change in real median hourly wage, 2016 to 2017



Data source: U.S. Bureau of Labor Statistics. Includes occupations with total employment of 1,000 or more.

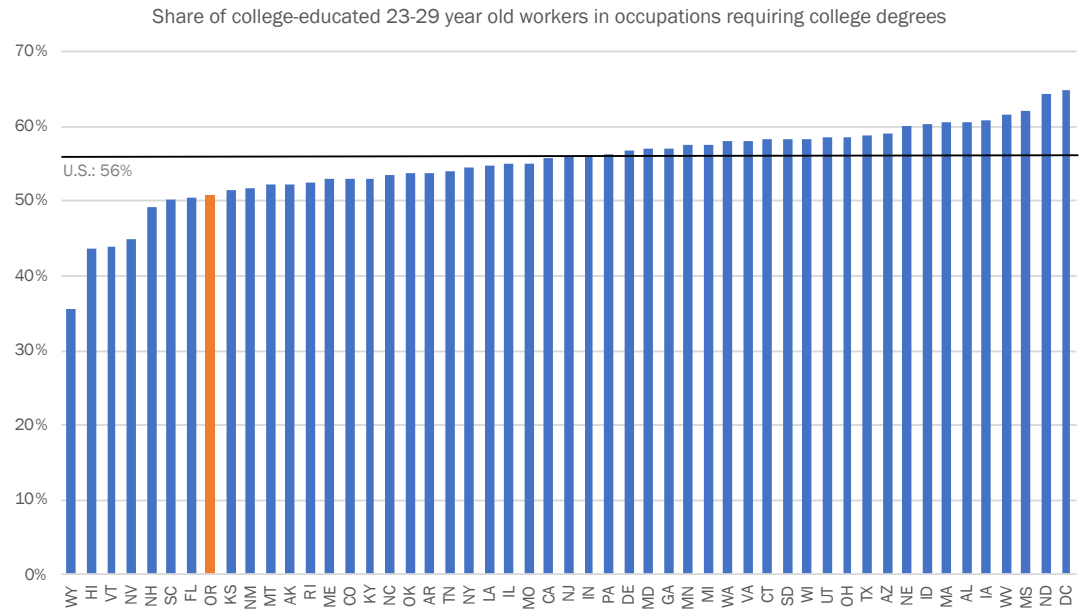
Skill mismatches

The recent flattening of the college wage premium has triggered concerns about skill mismatches. In this case, the concern relates to college-educated workers who occupy jobs that do not require a college degree (see Figure 2.5). As a result, the college degree holder will see lower returns on her educational investment to the extent that her earnings would have been higher in a job that required more advanced training. This suggests the possible need for (1) better education of students and prospective students about potential labor market outcomes for their chosen field of study and/or (2) credential pathways that are better aligned with labor market needs.

For some occupations these apparent mismatches might be the result of official job categorizations that have not kept pace with actual occupational and employer needs. An emerging body of research, however, suggests that these mismatches increasingly result from employers unnecessarily "up-skilling" job requirements (e.g., requiring a bachelor's degree of administrative secretaries, an occupation in which only one in four incumbents holds a bachelor's degree[5]).

[5] Fuller, Joseph B., Jennifer Burrowes, Manjari Raman, Dan Restuccia, and Alexis Young. (November 2014). "Bridge the Gap: Rebuilding America's Middle Skills." Report, U.S. Competitiveness Project, Harvard Business School. Report authored jointly by Accenture, Burning Glass Technologies, and Harvard Business School.

Figure 2.5. About half of Oregonians with a bachelor's degree are in a job requiring one



Data source: American Community Survey PUMS data and Oregon Employment Department

Oregonians who are still out of work

The timing of this talent assessment provides a unique opportunity to investigate the characteristics of individuals who have not experienced the effects of the economic recovery. This economic expansion is a long one by historic standards, but labor force participation rates (i.e., the share of the population working or seeking work) have still not returned to levels of the early 2000s or 1990s. An aging population plays a role, but participation rates are subpar for the so-called prime-age population (25-54) as well. For the expansion to continue into 2019 and beyond, employers and workforce developers would have to engage this remaining out-of-work population.

In 2016, 27 percent of Oregon's 25-64 population did not work, compared with a U.S. rate of about 26 percent. Following the methodology of a recent Brookings Institution report, we excluded students, pensioners, the disabled, and stay-at-home parents from the out-of-work population and segmented the remaining population into seven clusters[6]:

1. **Less-educated young**. People in their late 20s or early 30s with no postsecondary credential; about one-third are married and a slight majority have children; about one-in-five are foreign born.

[6] Ross, Martha and Natalie Holmes. (June 2017). *Meet the out-of-work. Local profiles of jobless adults and strategies to connect them to employment.* The Brookings Metropolitan Policy Program. Washington, DC

2. **Less-educated prime age**. People in their 40s with no postsecondary credential; about half are married and half have children in the household; about one-in-five are foreign born.

3. **Less-educated, eyeing retirement**. People in their late 50s with no postsecondary credential; two-thirds are married and relatively few have children in the household.

4. **Moderately educated younger people**. People in their late 20s or early 30s with some experience in two-year colleges; roughly half are married and half have children in the household.

5. **Moderately educated older people**. People in their late 50s with some experience in two-year colleges; two-thirds are married and relatively few have children in the household.

6. **Highly educated younger people**. People in their 30s with a bachelor's degree or higher; about half are married and half have children in the household; about one-in-five are foreign born.

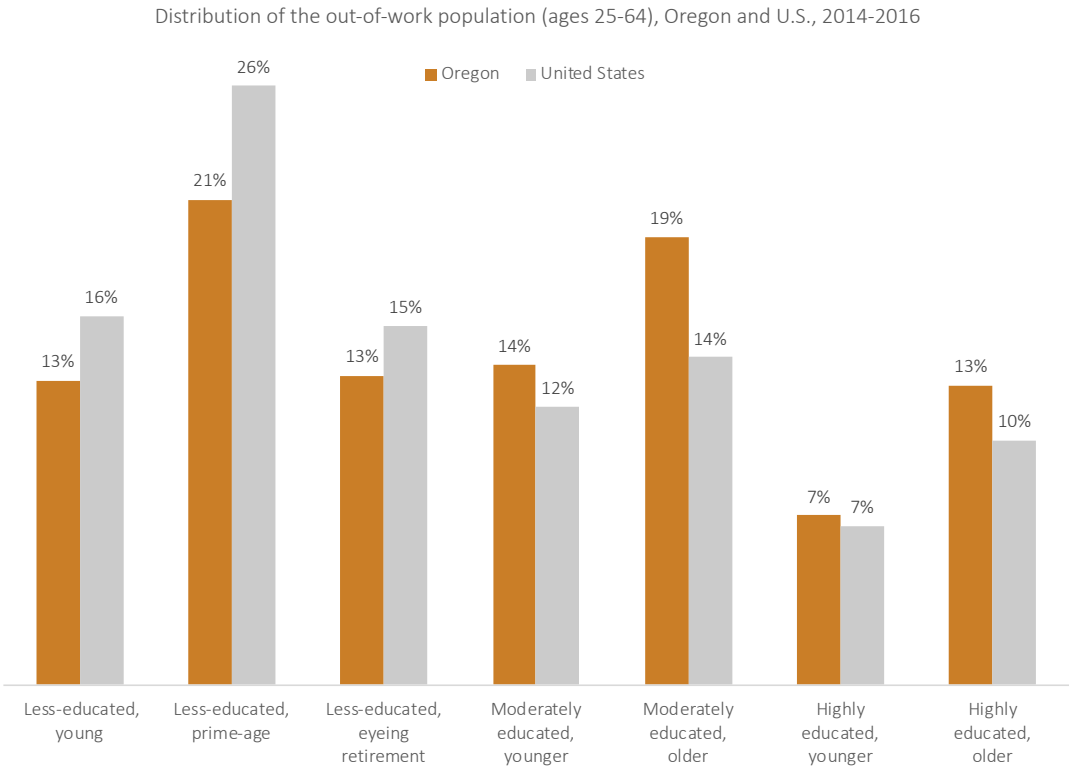
7. **Highly educated older people**. People in their late 50s; more than two-thirds are married; few have children in the household; almost 90 percent are non-Hispanic White.

Overall, Oregon's out-of-work population is better educated than the nation's (see Figure 2.6). That finding is consistent with Oregon's lower exposure to China's emergence in world trade, which disrupted labor markets in Midwest and Southeastern states.[7]

The seven out-of-work clusters are especially relevant as the state implements a new adult attainment goal. The majority of these non-workers are beyond traditional school enrollment ages. If labor force engagement is the goal, each cluster requires a unique strategy and policy response. The less educated populations may benefit from a full suite of basic skills training, supportive work environments, and job search assistance programs. For those with children, programming may extend into parental coaching, prekindergarten, and childcare. People with some college experience are more likely to benefit from industry sector strategies, on-the-job training, and apprenticeships that accelerate transitions to occupations that roughly align with their past work experience.

[7] Autor, David et al. (January 2016). *The China Shock.* National Bureau of Economic Research. Cambridge, MA.

Figure 2.6. Oregon's out-of-work population is better educated than the nation's



Data source: American Community Survey PUMS data; Ross & Holmes (2017), The Brookings Institution. Includes individuals aged 25-64 who were not in the labor force or who were unemployed, excluding students, pensioners, the disabled, and stay-at-home parents.

Chapter 3: The Future of Work

Introduction

A talent assessment necessarily looks beyond the next 6 to 24 months. Employers and educators have longer horizons and must prepare their businesses, workers, and students for a rapidly evolving labor market. Producing a reliable job outlook, which is always a challenge, is getting harder. Computers will continue to eliminate routine work and require humans to focus on uniquely human tasks.

This chapter opens with a discussion of the central workforce topic of the day: the anticipated acceleration of technological progress. If technologists' most aggressive predictions come true, computerization will unfold so abruptly that governments will either have to invent new jobs or pay some people not to work. But even under more modest predictions, the future will require workers with durable basic skills and an ethic of lifelong learning to adapt to new occupations altered by technology.

The chapter then looks to the past to predict the future. Technology's disruption of work is not a new phenomenon and, over the past several decades, the labor market has rewarded workers with strong social skills. That trend is almost certainly going to continue. The chapter concludes by reviewing the Oregon Employment Department's recently released 2017-2027 employment projections and what they imply for in-demand skills.

The age of accelerating automation[8]

Technology and automation have been with us for centuries and yet, as economies transformed from agrarian to industrial and industrial to digital, humans always managed to find work to do. But, technologists believe this time will be different. They see an unprecedented wave of automation that will disrupt our physical and digital worlds.

In the physical domain, autonomous vehicles, drones, robots, 3D printers, sensors, and wearables will affect how we move around, how we manufacture goods, how we get goods to market, and more. The startup Otto delivered 50,000 beers with an autonomous truck in 2016.[9] Meanwhile, carmakers, ride-sharing services, and technology firms are locked in a race to bring autonomous passenger vehicles to complex urban settings.

On the digital side, recent advances in artificial intelligence (AI) have been impressive. To get a better handle on possible impacts of AI on modern life, a team of researchers at

[8] The discussions on automation draw on research commissioned by the Portland Business Alliance and funded by the Bank of America. The full report is found at: https://portlandalliance.com/automation/

[9] https://www.wired.com/2016/10/ubers-self-driving-truck-makes-first-delivery-50000-beers/

Oxford and Yale universities surveyed 352 AI experts from across the world and asked them to predict when AI would outperform humans on a range of tasks. Their findings: AI could outperform humans in language translation by 2024, high-school essay writing by 2026, truck driving by 2027, retail activities by 2031, writing a best-selling book by 2049, and surgery by 2053. The respondents saw a 50 percent chance that AI could outperform humans on all tasks within 45 years and could automate all jobs in 120 years.[10]

Along a similar line of inquiry, two Oxford University engineers assessed a risk of computerization for 702 detailed U.S. occupations.[11] They looked within occupations for tasks that were "computerization bottlenecks," those that required social intelligence (e.g., social perception, negotiation, persuasion, caregiving), creative intelligence (e.g., originality, fine arts), or perception and manipulation (e.g., finger dexterity, manual dexterity, working in cramped/awkward positions). Occupations with none of these so-called bottlenecks had a higher risk of computerization.

The distribution of risk predictions—shown for Oregon occupations circa 2016—makes some intuitive sense (see Figure 3.1). Most transportation occupations fall in the high-risk category—unsurprising given the recent attention and investment paid to autonomous vehicles. Sales work, also on the high end, has seen recent losses as brick-and-mortar retailers give way to online shopping. Low-risk occupations consist of tasks that humans are uniquely able to do: persuasion and negotiation in legal matters; compassion and caring in healthcare; creativity and originality in engineering and design. Automation is a bigger threat to occupations that pay low- and middle-wages with a few exceptions: health care support, building and ground maintenance, and installation and repair work are at the lower ends of both the wage and risk scales.

Automation will be limited by Polanyi's paradox, named after the economist/philosopher Michael Polanyi, which asserts that many tasks draw on tacit, intuitive knowledge that is difficult to write down or codify.[12] Human drivers use judgment and common sense when they encounter surprises on a roadway—for example, different reactions for a downed power line than for a tree branch. The qualities of leadership are hard to teach or fully explain, but we know it when we see it. We can identify great teachers but would have a hard time documenting all the specific qualities and actions it takes to create one. Architects, designers, and artists rely on an aesthetic sense to build and create work that is appealing to others. Body language can be as important as the spoken word in communication but is hard to train. Emotional intelligence is critical in all work settings but is difficult to document. Computerization and robotics have begun to infiltrate tasks previously believed to be off-limits, and technologists believe that machines will

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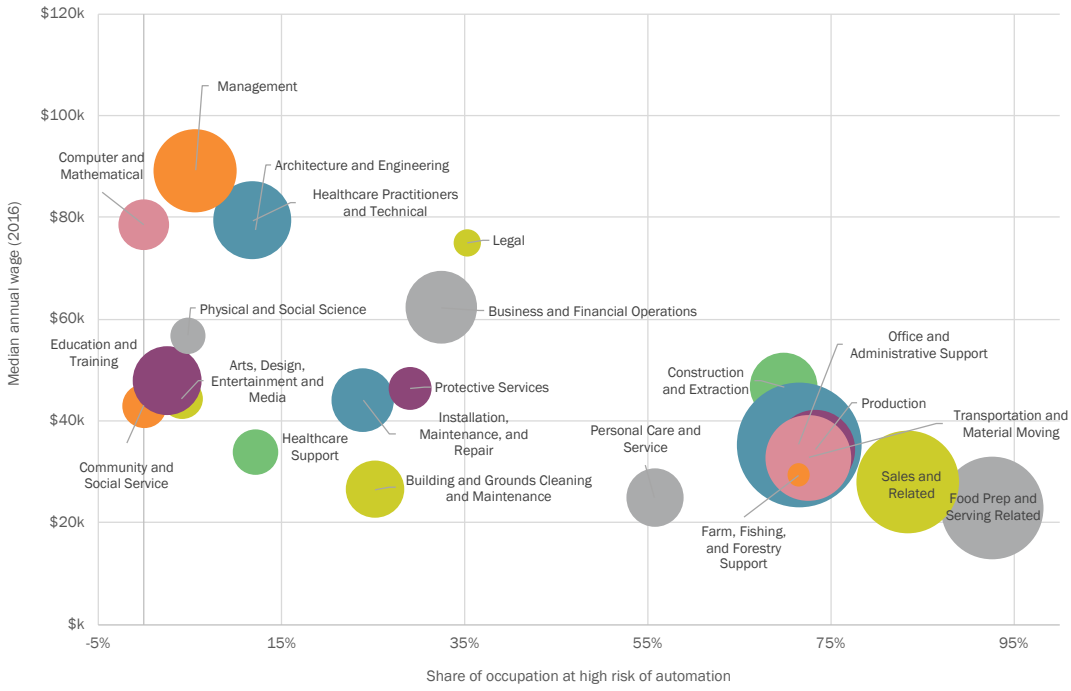
[10] Grace, Katja et al. (May 2018). *When Will AI Exceed Human Performance?* Future of Humanity Institute. University of Oxford. Oxford, UK.

[11] Frey, Carl and Michael Osborne. (September 17, 2013). *The Future of Employment: How Susceptible are Jobs to Computerisation?* University of Oxford. Oxford, UK.

[12] Autor, David. (2014). *Polanyi's Paradox and the Shape of Employment Growth.* Massachusetts Institute of Technology. Cambridge, MA.

eventually develop tacit knowledge through massive amounts of testing, trial, and error. How far they get will determine the degree of labor market disruption.

Figure 3.1. Occupational group size by median annual wage and share at high risk of automation, Oregon, 2016



Data source: Frey et al. and Bureau of Labor Statistics data

The growing importance of social skills

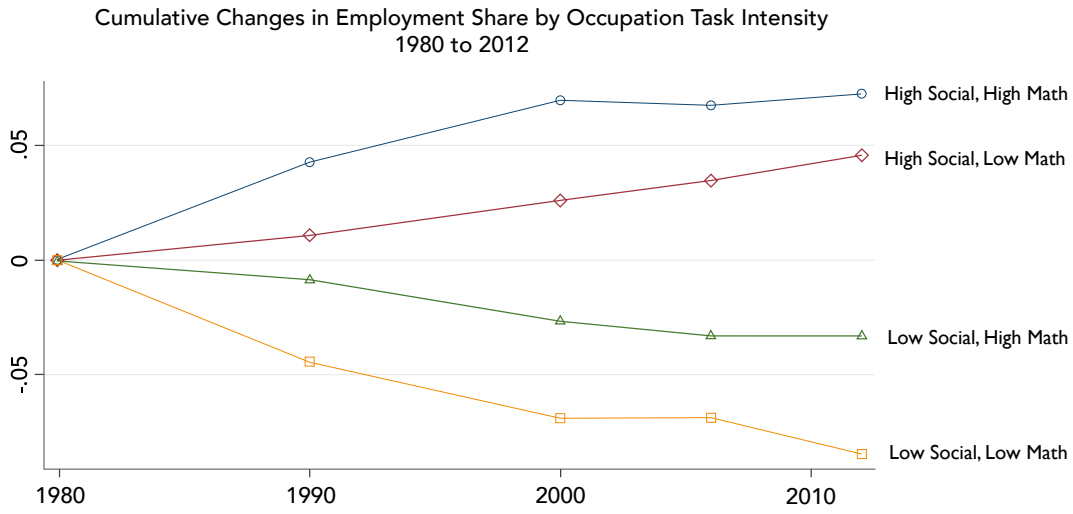
Automation's impact on the labor market is not a new phenomenon. Technological progress has changed the nature of work for centuries, and new research has shed light on the impacts of the past few decades.

Since 1980, economists have measured a decline in routine work and associated job polarization. Job polarization refers to the relatively strong growth of low- and high-skilled occupations combined with slower growth in the middle. Economist David Autor and others have found that disproportionate shares of middle-skill occupations consisted of easily documented, rule-based tasks that lent themselves to automation.[13] Production work on factory floors (e.g., automobile assembly) were early examples. But, gradually, automation entered offices and overtook tasks previously performed by bank tellers, architectural drafters, paralegals, and medical technicians.

[13] Autor, David H. et al. (2006). The Polarization of the US Labor Market. *The American Economic Review*, 189-194.

New findings deepen our understanding of technology's impact on the workplace and underscore the increasing importance of social skills. Harvard University's David Deming tracked the skills used in growing and shrinking occupations since 1980.[14] He found that occupations requiring both social and math skills grew as a share of all jobs, as did occupations that require social skills alone (see Figure 3.2). Occupations requiring math skills but no social skills declined as a share of all jobs. Occupations requiring neither social nor math skills fared the worst of all.

Figure 3.2. Humans are being awarded for being human



Source: Deming, D.J. (2017). *The Growing Importance of Social Skills in the Labor Market*.

Deming also uncovered some possible explanations for the post-2000 flattening of the college wage premium. Jobs in science, technology, engineering, and mathematics (STEM) declined as a share of the labor force between 2000 and 2012. Computers are moving up the skill ladder and competing for tax preparation, wealth management, cancer diagnosis, and other previously well-compensated tasks. Meanwhile, the cognitive occupations that require significant interpersonal interaction continue to grow: managers, teachers, nurses, physicians, lawyers, and economists.

Part of the economic value of social skills may come from the facilitation of team-based "task trading." Successful work products demand a complex mix of tasks from a team. Teammates with strong social skills are more likely to figure out their comparative advantage, organize tasks accordingly, and maximize the team's—and company's—productivity.

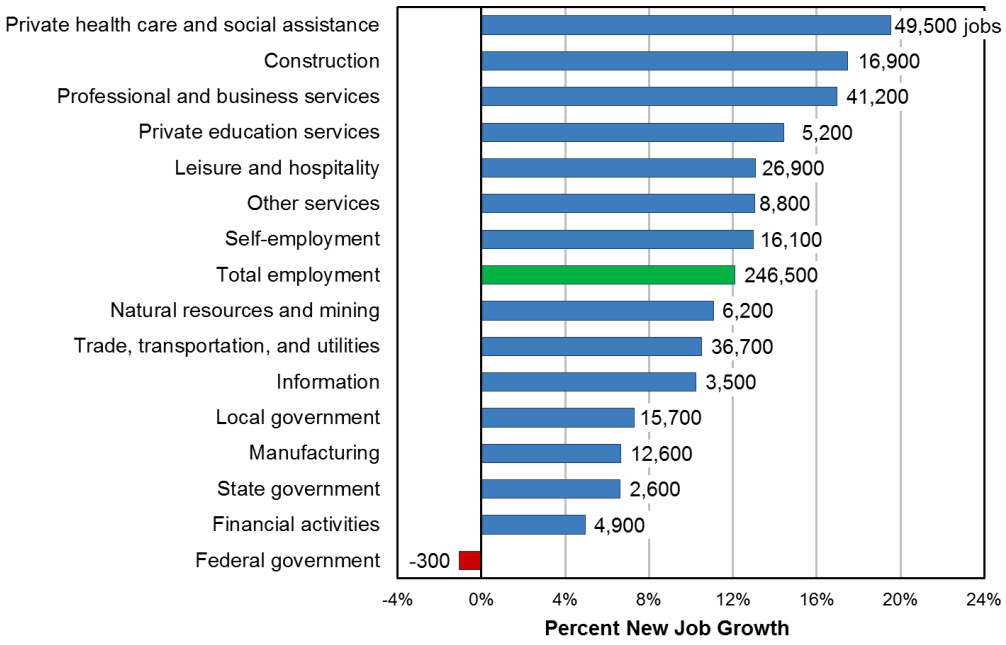
[14] Deming, David. (May 2017). *The Growing Importance of Social Skills in the Labor Market*. Harvard University. Cambridge, MA.

The ten-year employment projections

The Oregon Employment Department (OED) publishes ten-year employment projections every two years. The projections tie back to long-term economic forecasts and assume that a number of key demographic trends continue, and that the public policy environment is stable (e.g., no abrupt expansion or contraction of government activity). Economists combine econometric and qualitative methods and, for the latter, attempt to anticipate how technological innovation, changes in production methods, product substitutability, and offshoring could affect the demand for specific occupations.[15] The projections provide a plausible scenario of employment outcomes given underlying assumptions about the economy.

OED's 2017-2027 projections, released in June 2018, show a 12 percent employment increase over the decade—or 245,800 jobs[16] (see Figure 3.3). OED shows one-in-five of those new jobs (49,500) will be in the healthcare and social assistance sector, given the aging of the population. Professional and business services has the next largest number of new jobs (41,200), driven by computer system design and company management activities, followed by trade, transportation, and utilities (36,700 new jobs). The economists also anticipate strong growth in residential and commercial construction (16,900 new jobs), given today's low vacancy rates and elevated prices.

Figure 3.3. Health care leads long-term employment growth, Oregon industry projections, 2017-2027



Source: Oregon Employment Department

[15] United States Bureau of Labor Statistics. Employment Projections. *Handbook of Methods.* U.S. Department of Labor. Washington, DC.

[16] https://www.qualityinfo.org/projections#1

The data in OED ten-year projections can be reorganized to illustrate combinations of four broad skill competencies that will underlie new jobs:

1. Clerical and service work
2. Physical work
3. Operating machines and processes
4. Communication and critical thinking

For example, financial activities combine critical thinking with service work while computer programming sits at the intersection of critical thinking and operating processes (see Figure 3.4). The data visualization co-locates occupations that draw from similar skill sets (e.g., bookkeepers with insurance claim agents, computer operators with sound engineer technicians, architectural drafters with interior designers). Seemingly dissimilar occupations can have a lot of skill overlap, which provides opportunities to transfer skills between occupations if needed.

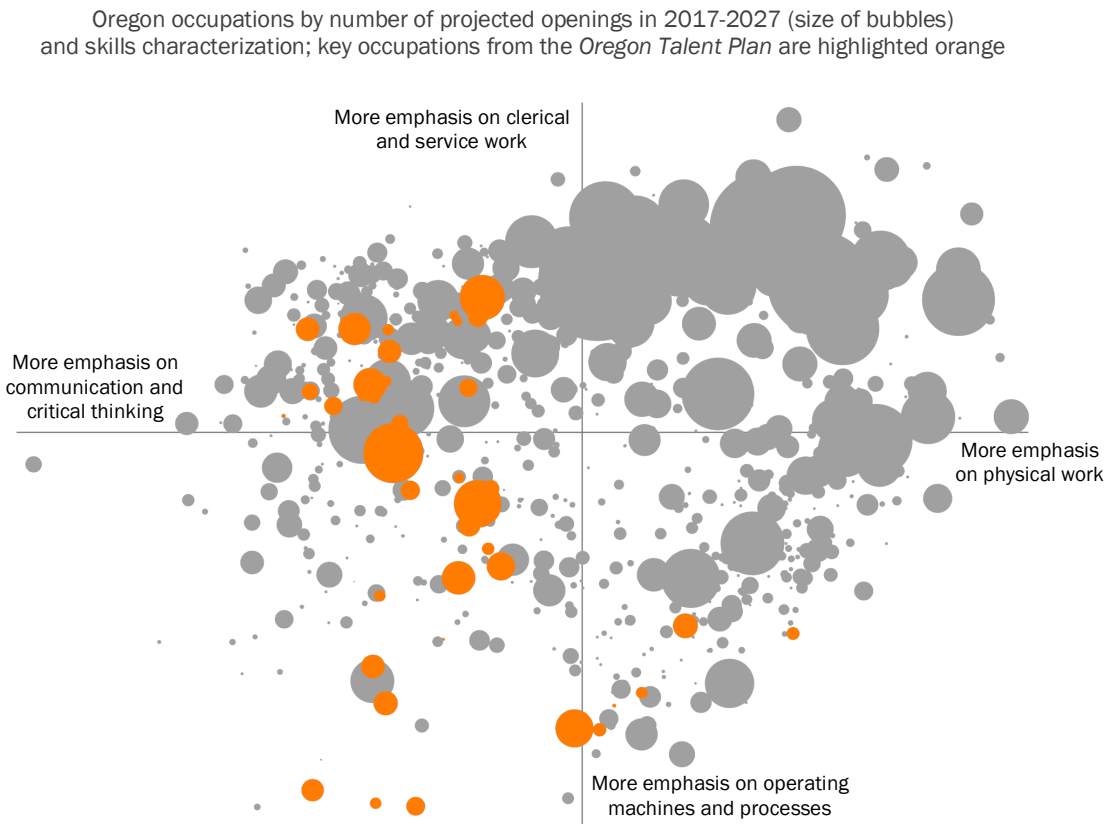
The size of the bubbles represents the number of job openings from 2017-2027 based on OED's ten-year projections. Many openings sit in the upper right quadrant, at the intersection of clerical, service, and physical work. Occupations combining clerical/service and communications / critical thinking (upper left quadrant) are also projected to have a large number of openings.

The occupations highlighted orange are those deemed critical to the growth of Oregon's key industries by the 2017 *Oregon Talent Plan*. These include accountants and financial analysts in the upper left quadrant; registered nurses, therapists, and pharmacists in the middle left; programmers and engineers in the lower left; and machinists, millwrights, electricians, and maintenance technicians in the lower right. The *Talent Plan* identified occupations that drive the growth of other jobs, taking into account demand factors such as job concentrations in Oregon compared to the U.S., projected new and replacement openings, growth rates, retirement exposure, wage premiums, and industry competitiveness.[17]

Occupations with the largest number of projected openings differ somewhat from the key occupations that drive growth in Oregon's traded sector. The *Talent Plan*'s critical occupations sit mostly at the intersection of clerical/service skills, communication / critical thinking skills, and operating machines and processes, with relatively less emphasis on physical work. While these high-multiplier occupations deserve special attention and focus, the majority of Oregon's projected job openings are likely to be in a somewhat different set of occupations, with relatively more emphasis on physical and clerical/service work.

[17] *The Oregon Talent Plan: A Needs Assessment and Investment Strategy*. (June 2017).

Figure 3.4. Oregon jobs on a skills spectrum[18]



Data sources: O*NET, Bureau of Labor Statistics, Oregon Employment Department, the *Oregon Talent Plan*

[18] O*Net scores hundreds of jobs on dozens of characteristics. Using a technique known as principal components analysis, these characteristics are distilled into four general categories: clerical and service work; physical work; operating machines and processes; and communication and critical thinking.

Chapter 4: Employer Perspectives

Introduction

The 2018 *Talent Assessment* included diverse data collection and analysis tasks, with a focus on ten key industries identified by HECC prior to the study:

- Advanced manufacturing
- Bioscience
- Construction
- Energy
- Food and beverage manufacturing
- Healthcare
- Maritime
- Outdoor gear and apparel
- Technology and software development
- Wood products

In addition to a review of statewide administrative and economic indicators, we collected descriptive data through individual stakeholder interviews, focus groups, and an online stakeholder survey. In this section, we summarize stakeholder input across all qualitative and descriptive data sources. In total, 37 interviews, five focus groups, and 363 survey responses were incorporated into this summary.

Methodology

We used diverse outreach methods to solicit industry participation in engagement opportunities. Stakeholder engagement methods, including the online survey, were not intended to collect a representative or generalizable sample of industry contacts, but instead to provide broader descriptive stakeholder feedback on key research questions. We consulted with several statewide business and industry associations for initial key contacts in each of the focus industries. These contacts provided additional references to individuals or associations with relevant industry workforce knowledge. In total, 58 stakeholders participated in interviews or focus groups:

- Bioscience: 4
- Construction: 7
- Energy: 4
- Food and Beverage: 8
- Healthcare: 5
- Manufacturing: 3
- Maritime: 3
- Outdoor Gear and Apparel: 14
- Technology: 6
- Forest and Wood Products: 4
- **Total: 58**

In addition to interviews and focus groups, we engaged stakeholders through an online survey collecting information on hiring, training and productivity, and workforce planning and forecasting. Stakeholders that participated in interviews and focus groups were asked to complete the survey and share the link broadly with their industry networks for greater stakeholder engagement. Where possible, we directly distributed the survey link to industry associations. The survey was also publicized at the 2018 Talent Summit to facilitate participation.

In total, 363 individuals completed the stakeholder survey. Among those, 134 survey respondents identified his or her sector as "Other." During data analysis, "Other" responses were post-coded to identify additional key respondent categories by sector. The table below illustrates survey participation among the 10 industries of focus in the *Assessment* (identified with an asterisk), as well as the additional sectors identified during analysis.

	Number of survey respondents	Percent of survey respondents
Accounting/finance and professional services	23	6.3
Advanced manufacturing*	25	6.9
Bioscience*	7	1.9
Construction*	21	5.8
Education	24	6.6
Energy*	6	1.7
Food and beverage manufacturing*	24	6.6
Government	17	4.7
Healthcare*	31	8.5
Hospitality	7	1.9
Human Resources	13	3.6
Maritime*	3	0.8
Nonprofit	21	5.8
Outdoor gear and apparel*	6	1.7
Technology and software development*	89	24.5
Wood products*	13	3.6
Other, please specify	29	8
Sector missing	4	1.1
Total	**363**	**100**

It is important to note that the survey methodology was not developed to collect a representative sample of industry in general or by sector, thus findings may not be generalizable to the larger population. Instead, the descriptive data and associated analysis provide targeted, explanatory input to supplement broader talent development trends and support development of workforce system response. The appendices provide industry-specific profiles with additional detail about survey results and interview / focus group findings.

Hiring and in-demand occupations and skills

Industry stakeholders provided extensive input on general hiring conditions, in-demand occupations, and in-demand skills.[19] In this section, we discuss employers' difficulty in finding qualified applicants and how this experience varies from previous years; how employers have responded to difficulty in hiring; occupations that are in demand across and within key Oregon industries; and in-demand skills, including education level, basic skills, hard or occupational skills, and soft or interpersonal skills.[20]

Industry experience with hiring

In today's job market, employer survey results indicate that hiring difficulties are widespread and as bad as or worse than the previous year. In response, most employers are increasing their recruiting efforts, and some are increasing wages, but over a third report they are hiring a less qualified applicant or leaving the position open.

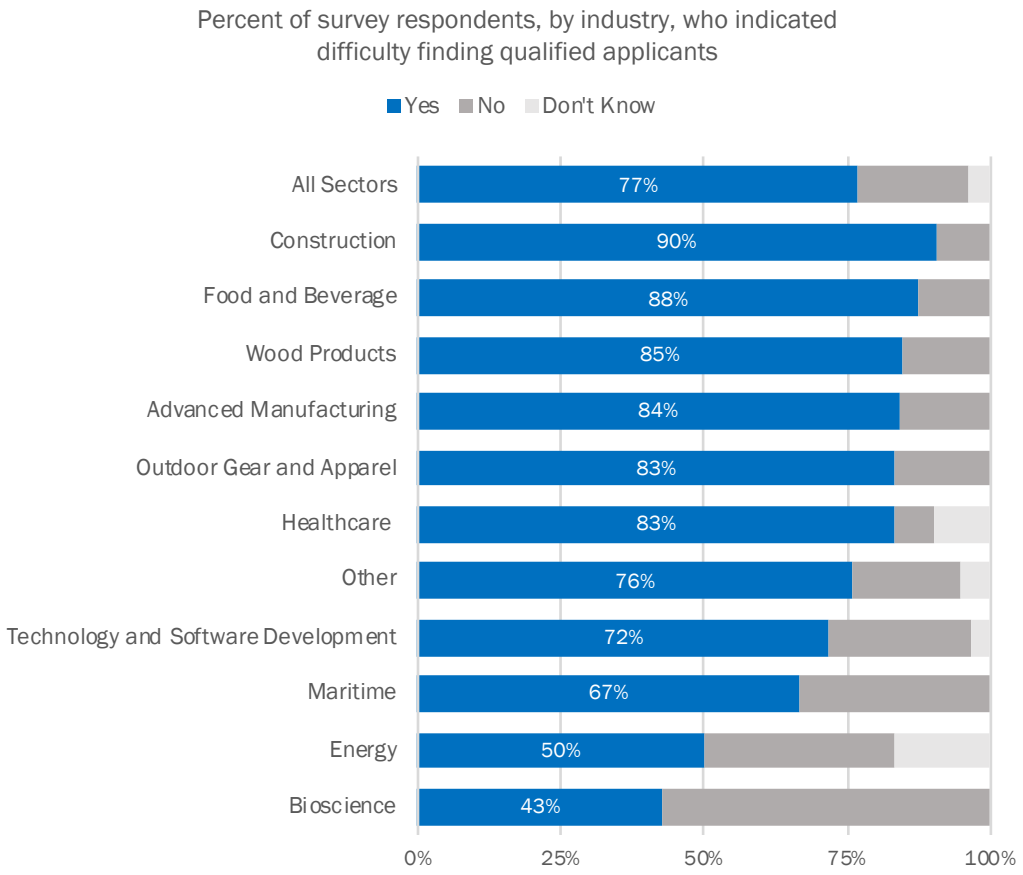
- **Pace of hiring is strong, and difficulty in hiring spans across industries.** Almost all survey respondents (92 percent across all sectors) indicated that they had hired new employees over the preceding 12 months. Seventy-seven percent of respondents across all sectors noted difficulty in finding qualified applicants for the jobs they were trying to fill (see Figure 4.1). Reports of hiring difficulties were highest within food and beverage, wood products, and advanced manufacturing.

  Most respondents indicated that their experience filling positions over the last 12 months was harder than or comparable to the previous year. The industries most likely to report increased difficulty hiring were food and beverage (63 percent), outdoor gear and apparel (67 percent) and construction (48 percent).

[19] In-demand occupations include jobs with a high number of jobs and job openings, and low unemployment or excess supply. Similarly, in-demand skills are those in greater demand among employers, with low availability or excess supply of skilled workers.

[20] Definitions of basic, occupational, and soft or interpersonal skills vary in the field. For the purposes of the *Oregon Talent Assessment* we drew on existing definitions used in similar assessments (e.g., the Iowa Workforce Development's 2014 Workforce Needs Assessment Survey). For greater definition on each skill category, please see the text box on page 28.

Figure 4.1. Stakeholders across industries note difficulty in finding qualified applicants

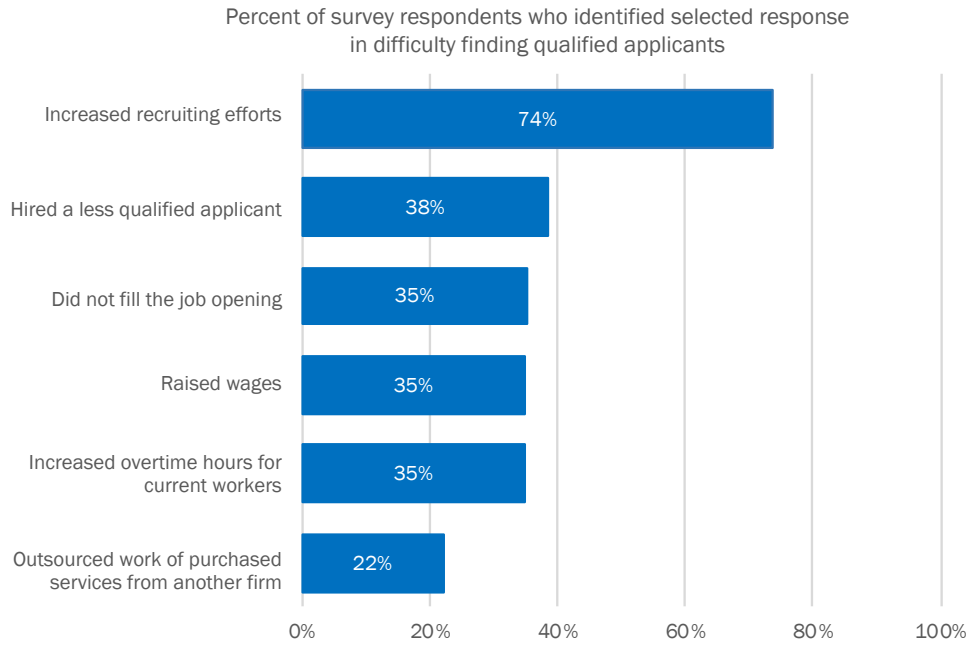


*Percent reporting hiring is **more difficult** than in the last 12 months:*
38%

*Percent reporting that hiring is **about the same** as the last 12 months:*
44%

- **Employers increased recruitment efforts in the face of hiring difficulties.** In response to difficulty in finding qualified applicants, most employers (74 percent) increased their recruiting efforts (see Figure 4.2). Overall, employers also frequently cited hiring a less qualified applicant (38 percent), not filling the position (35 percent), raising wages (35 percent), and increasing overtime for current workers (35 percent). Adoption of these strategies varied across industries. For example, raising wages was most frequently cited by respondents within the outdoor gear and apparel (100 percent), wood products (64 percent), advanced manufacturing (62 percent), and food and beverage (57 percent) industries. Similarly, relatively more food and beverage respondents indicated that they increased overtime for current workers (67 percent) and hired a less qualified applicant (62 percent) as a result of difficulty in finding workers.

Figure 4.2. Employers increased recruitment efforts in response to difficulty in hiring



In-demand occupations

While industries have specific employment demands, certain occupational needs exist across sectors. Interview and focus groups participants across industries frequently cited the need for engineers, skilled tradespeople, and project managers.[21]

- **Engineers and skilled trades are in broad demand**. Nearly all sectors are in need of engineers, with the type of engineer dependent on the sector, such as marine engineers in the maritime sector, biomedical engineers in the biosciences sector, and software engineers in the technology sector. Multiple industries identified the following engineering specialties as in-demand: electrical engineers (energy and technology sectors) and mechanical engineers (wood products, outdoor gear and apparel, and technology sectors). Additionally, the growing use of automation and mechanization is driving the need for electricians and mechanics in several industries.
- **Managers are needed to keep projects and operations on track**. Several interviewees across sectors cited the need for managers to oversee complex business and technical operations or products. Applicants need a broad range of skills, including data analysis, critical thinking, interpersonal and leadership skills, knowledge of business operations and, ideally, a technical understanding of the

[21] See Appendix A (industry profiles) for lists of in-demand occupations identified by key stakeholders from individual industries.

product or type of operation (e.g., a manager with a software engineering background, or a production line manager with mechanical skills).

- **Employers pursue out-of-state recruitment to meet talent needs.** Several key stakeholders indicated that they needed to recruit and hire out-of-state to meet their employment needs for specific occupations. For example, stakeholders reported shortages of utility line workers, electricians, engineers (particularly bachelor's or master's level mechanical, industrial, electrical, computer and chemical engineers), UX/UI (user experience/user interface) managers, and middle-level project managers. With respect to recruiting electricians, employers cited barriers to hiring out-of-state due to Oregon's strict licensing standards.

In-demand skills

Across industries, most survey respondents agreed that applicants had the education level and basic skills required for the job, but they were less positive about soft skills and hard or occupational skills. Largely similar themes were expressed in interviews and focus groups with employers across industries.

- **Most applicants had the education needed.** The vast majority of survey respondents thought that applicants had the appropriate education levels to fill their vacant positions (81 percent overall; see Figure 4.3). Interviews and focus groups revealed that employers seek out targeted training or a bachelor's degree or higher within industries requiring highly skilled labor, including the healthcare industry and higher-level positions in technology and software development, energy, bioscience and other industries in need of engineers. Associate degrees or certificates and on-the-job apprenticeships in skilled trades, in particular, are preferred within construction, advanced manufacturing, energy, and wood products.

Skill definitions

The following skill categories and examples were used in the survey, interviews, and focus groups during the employer engagement process.

Education level, including high school diploma or GED, some college coursework, CTE diploma or certificate, CTE associate degree, academic associate degree, bachelor's degree, master's degree, and doctorate.

Basic skills, including locating information, reading for information, applied mathematics, and written communication.

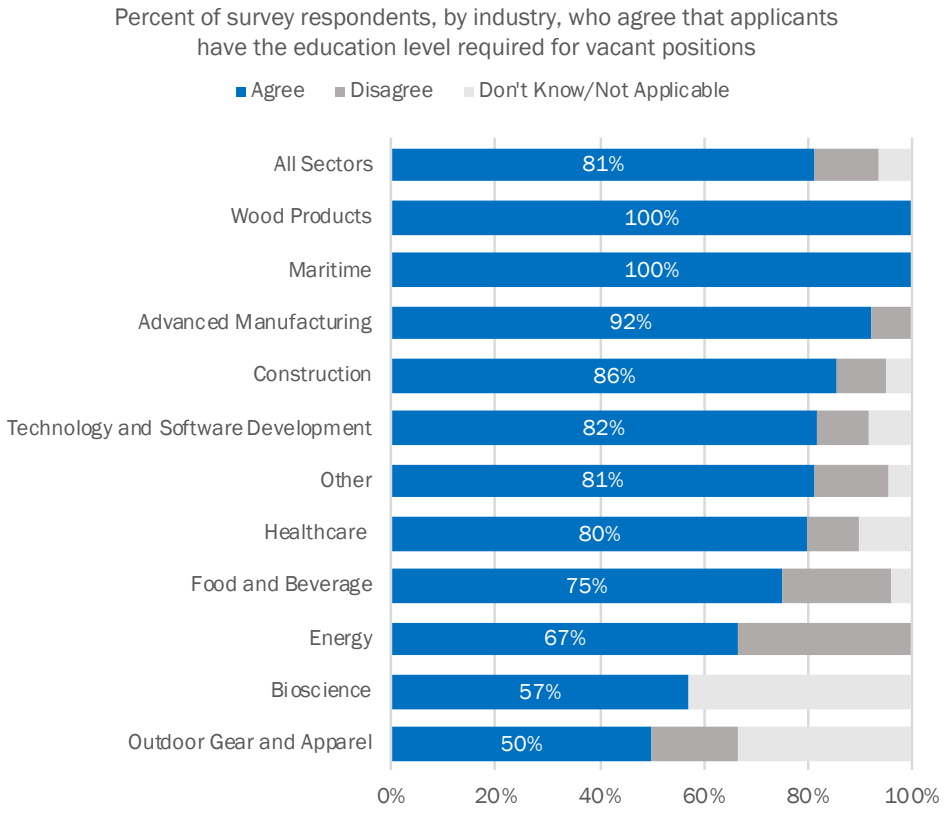
Hard or occupational skills, technical and know-how skills that apply directly to the job, including basic computer literacy, basic communication/writing, computer software, critical/analytical thinking, machine operation, and project management.

Soft or interpersonal skills, skills associated with an individual's habits, personality, and character, including communication skills, dependability, honesty, leadership, motivation, teamwork, and time management.

Just 12 percent of survey respondents disagreed that applicants have the needed education levels. All 13 survey respondents from the forest and wood products

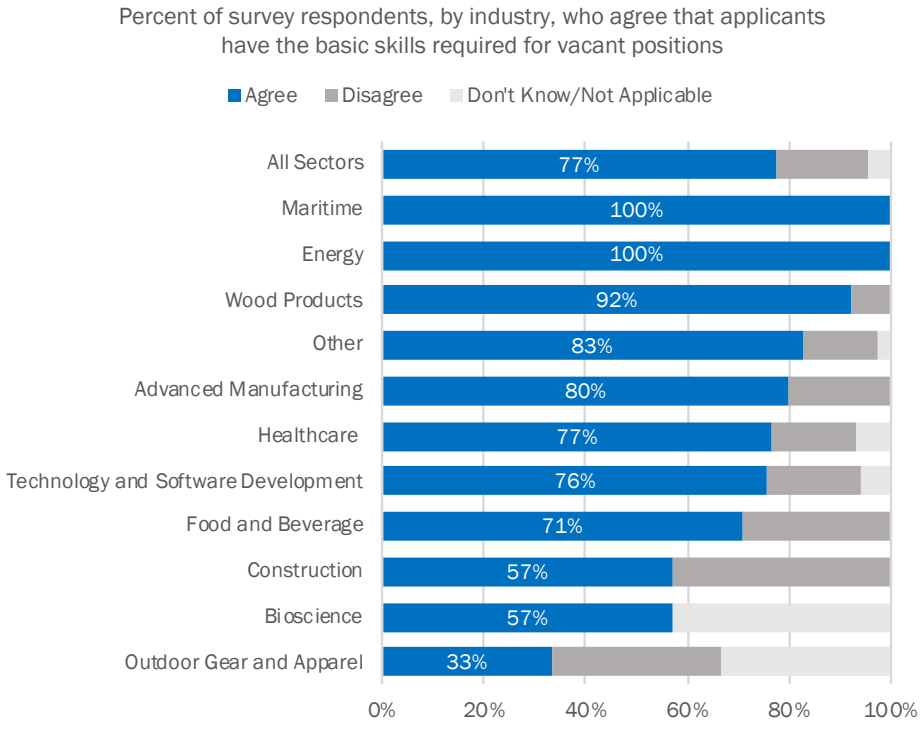
and the three maritime industry survey respondents agreed that applicants have the needed education levels. For these industries, as well as advanced manufacturing and construction, most interviewees felt that education level was subordinate to hard and soft skills and work experience. In the healthcare sector, the consensus among interviewees was that level of education drives hiring more than hard skills, suggesting that education levels may serve as a better proxy for skills in the healthcare industry than in other industries. In advanced manufacturing and construction, on the other hand, hard skills may be prioritized over education level.

Figure 4.3. Most thought applicants have the appropriate education level



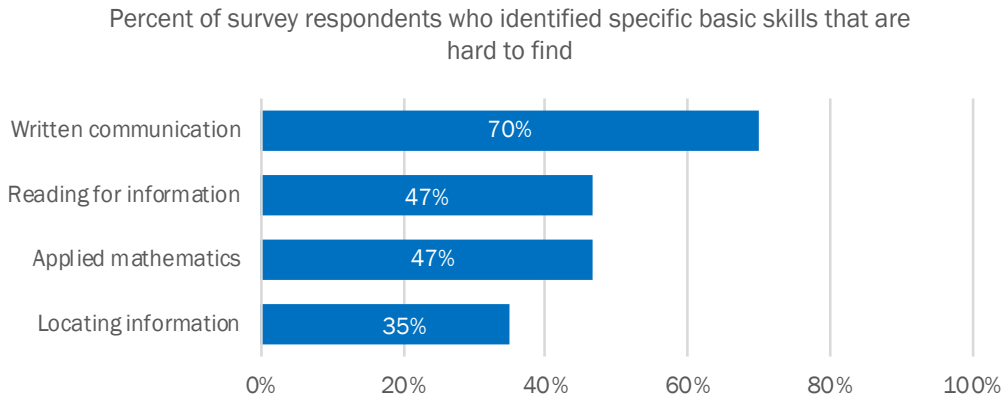
- **Most applicants have the basic skills required, with some variation across sectors.** Across industries, most respondents (77 percent) agreed that applicants have the basic skills required for vacant positions, while 18 percent disagreed with this statement (see Figure 4.4). The industries that were more likely to disagree that applicants had the needed basic skills were construction (43 percent of 21 survey respondents), outdoor gear and apparel (33 percent of six survey respondents), and food and beverage (29 percent of 24 survey respondents). Interview participants provided input on shortages in specific basic skills. Construction and advanced manufacturing respondents, for example, seek kinesthetic learners who have shown they can work with their hands and are competent in reading tape measures and other essential construction and manufacturing skills.

Figure 4.4. Most believe applicants have the basic skills required for vacant positions



Among respondents who disagreed that applicants had the required basic skills, 70 percent identified written communication as a hard-to-find skill among applicants (see Figure 4.5). This was the basic skill selected by the largest proportion of respondents to this question, followed by applied mathematics and reading for information (both 47 percent). Among interview and focus group respondents, mathematics and basic data analysis (e.g., reading a chart or spreadsheet) were cited most frequently as in-demand across nearly all 10 focus industries.

Figure 4.5. Written communication is the basic skill most in-demand



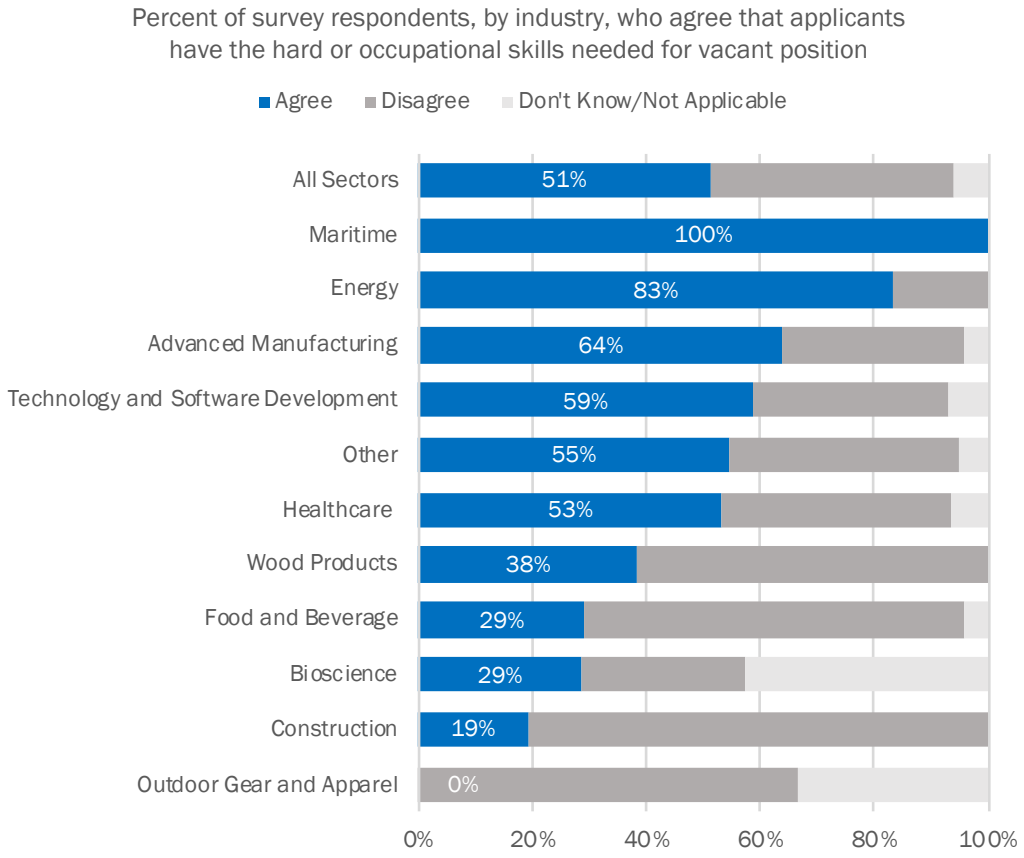
Note: Results reflect survey respondents who disagreed with the statement that job applicants have the basic skills required for vacant positions.

"Skilled labor is really crazy – people are retiring and we're all fighting for the people to replace them."

—Forest-wood products stakeholder

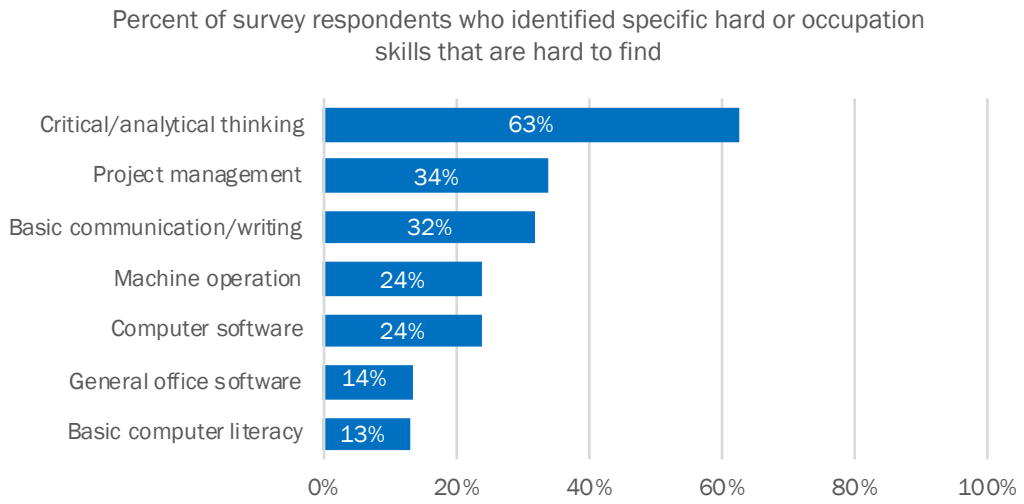
- **Hard skills are in-demand, particularly critical thinking.** Compared to education level and basic skills, fewer survey respondents across all sectors (51 percent) agreed that applicants have the hard or occupational skills needed for vacant positions, suggesting that although applicants may have appropriate education levels, their education may not have equipped them with the needed skills (see Figure 4.6). Only one in five construction respondents (19 percent of 21 survey respondents) agreed that participants have the occupational or hard skills required for vacant positions. This was followed by food and beverage (29 percent of 24 survey respondents) and wood products (39 percent of 13 survey respondents). The construction industry, as well as the manufacturing and processing side of the food and beverage and wood products industries, depend in large part on the skilled trades and people who are able to work with automation and machines. Interviewees indicated they sought applicants with these skills, but that they were willing to train a motivated and promising applicant, if needed.

Figure 4.6. Hard skills are lacking, according to many industry employers



Among respondents who did not feel applicants had the required hard or occupational skills, nearly two-thirds (63 percent) identified critical/analytical thinking as a difficult skill to find among applicants (see Figure 4.7). The need for critical thinking and problem-solving was also a common theme among interview and focus group participants in nearly all industries. For example, stakeholders in industries as diverse as healthcare and wood products cited critical thinking as necessary for all jobs, from medical assistants to specialized physicians, or hourly mill workers to administrators with bachelor's degrees.

Figure 4.7. Critical thinking is the hard skill most in-demand



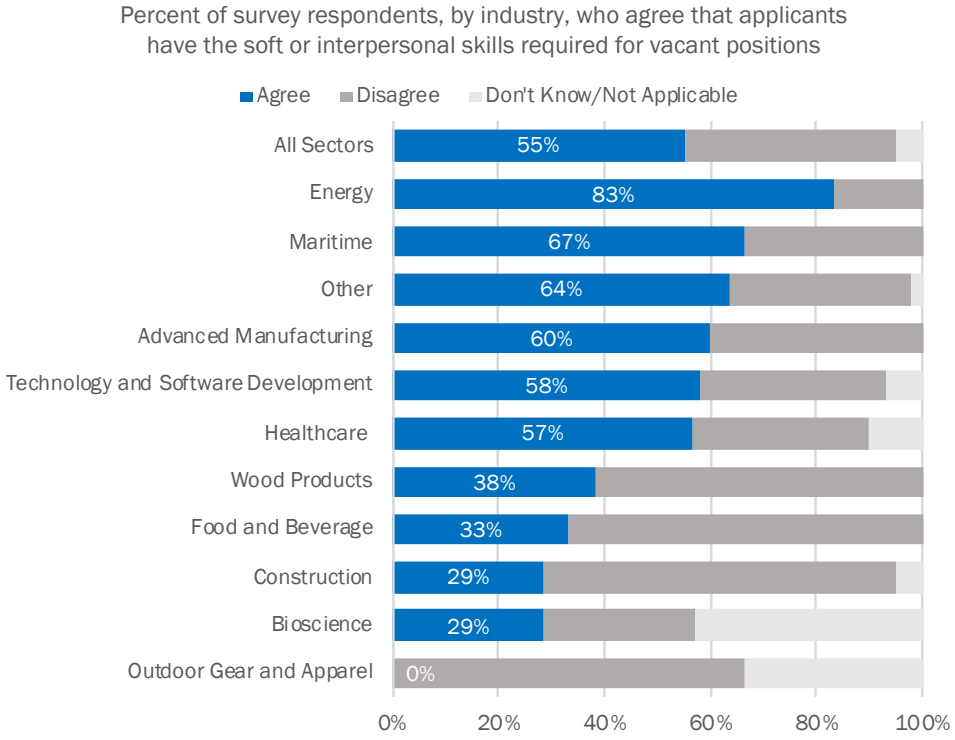
Note: Results reflect survey respondents who disagreed with the statement that job applicants have the hard or occupational skills required for vacant positions.

"If I have a person capable of showing up for work, with a pleasant attitude and ability to be on a team – I am going to grab them and try to find a place for them in my organization."

—Food and beverage stakeholder

- **Soft skills are broadly in-demand, and hard to find.** Compared to education level or basic skills, fewer survey respondents across all sectors agreed that applicants had the soft skills (55 percent) needed for the job (see Figure 4.8). Like hard or occupational skills, this suggests that education level may not be a suitable proxy for skills in certain industries, and that certain essential skills may not be universally taught in K-16 education.

Figure 4.8. Respondents were split on whether applicants have the needed soft skills

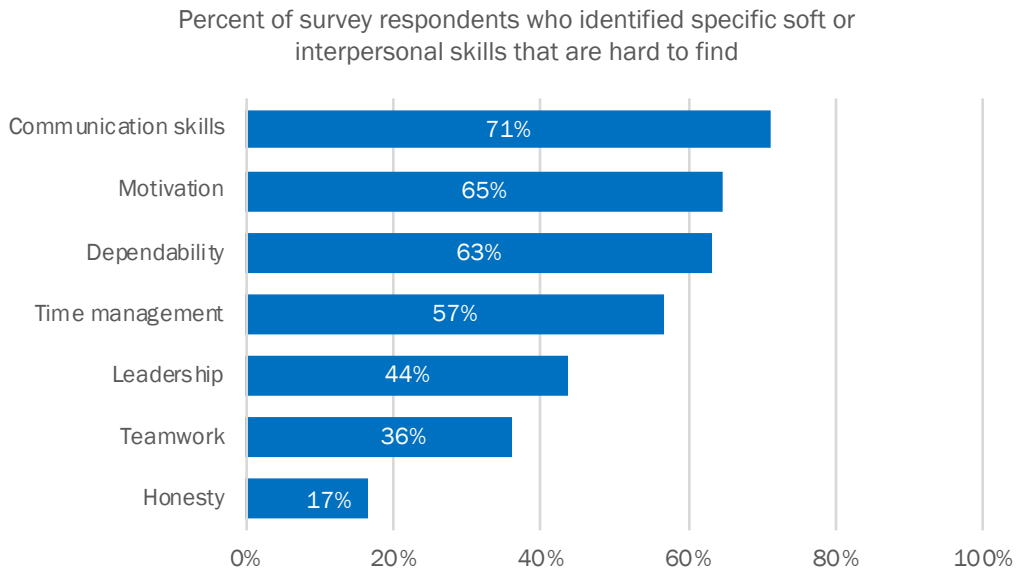


"We've adjusted toward hiring for fit first because it can be harder to find leadership skills, written and oral communication. We assess for strengths and needs, and train on an employee's needs."

—Forest-wood products stakeholder

Among the 40 percent of respondents who disagreed that applicants had the needed soft or interpersonal skills, the specific soft skills most often identified as hard to find were communication skills, motivation, dependability, and time management (see Figure 4.9). The demand for the same soft skills were identified across most industries in the interviews and focus groups. In many industries and for many types of jobs, interviewed employers indicated they prioritize soft and basic skills over hard skills and work experience. Interviewees and focus group participants in food and beverage, advanced manufacturing, wood products, and outdoor gear and apparel indicated that hiring for fit can often trump, or at least be on par with, hard skills. However, not all soft skills are essential in lower-skilled, entry-level positions. While dependability and motivation are key on the manufacturing floor, advanced manufacturing employers reported they can be somewhat lenient on requirements for strong communication skills, which are viewed as less critical in those positions. Wood products stakeholders, on the other hand, indicated that while it can be hard to find people with the necessary hard or occupational skills to operate a mill, it is harder to find entry-level laborers with the motivation to work.

Figure 4.9. Communication skills, motivation, and dependability are in-demand soft skills



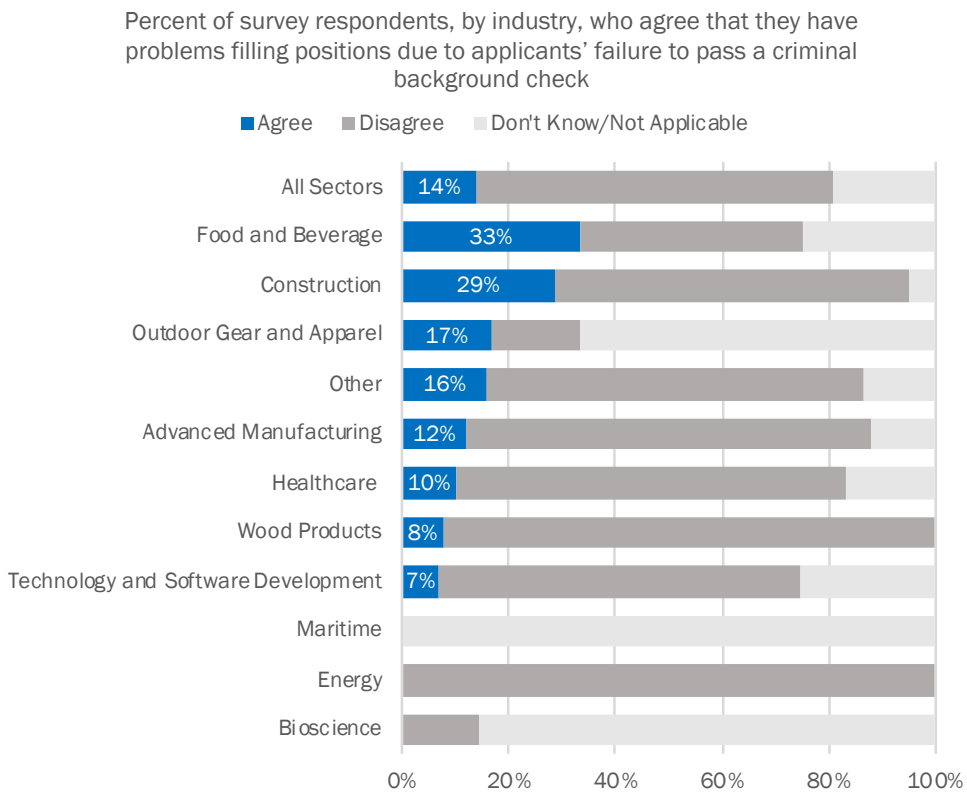
Note: Results reflect survey respondents who disagreed with the statement that job applicants have the soft or occupational skills required for vacant positions.

"Education and schooling is great, but what employers really want to see is apprenticeships and certificates."

—Advanced manufacturing stakeholder

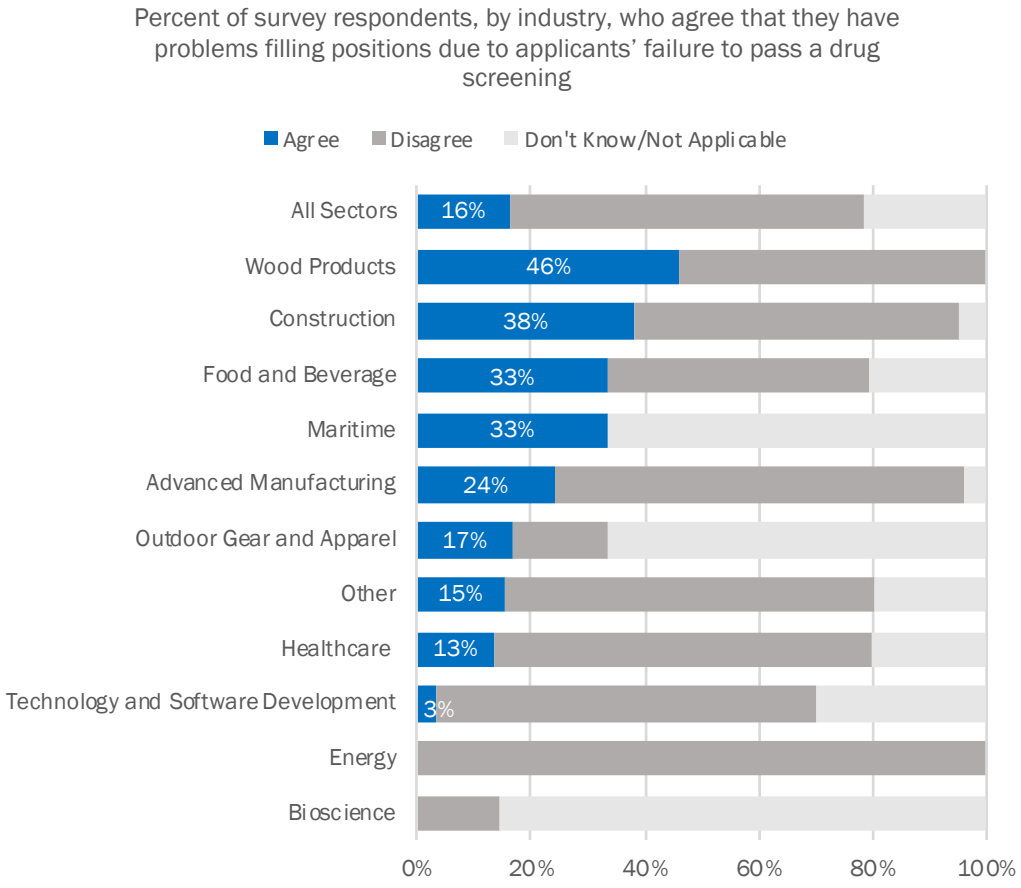
- **Work experience is essential for developing the talent pool.** Work experience, either through previous relevant employment or through internships or apprenticeships, was universally valued by employers interviewed. Smaller employers, in particular, cited challenges hiring recent graduates without work experience because they could not afford the investment of time to bring the candidate to a productive level. Within advanced manufacturing, technology, and construction, apprenticeships and internships were considered highly beneficial to the industry. For example, graduates of MECOP (Multiple Engineering Cooperative Program) – a partnership of OSU, Oregon TECH, PSU and University of Portland – were cited as in high demand.
- **Criminal background doesn't pose widespread difficulty in hiring.** Most respondents across sectors did not cite problems in filling positions due to an applicant's difficulty in passing a background check. Two-thirds (67 percent) of respondents across all sectors disagree that they have problems filling positions because of applicant difficulty in passing a background check (see Figure 4.10). Many more participants responded Don't Know or Not Applicable to this question compared to the other skills. The high number of Don't Know or Not Applicable responses is likely indicative of the type of jobs for which respondents are hiring. According to interview results, criminal background checks were primarily conducted by employers seeking laborers, and for most of these employers, it was not a substantial issue. For example, some stakeholders within advanced manufacturing or energy reported they only do felony background checks or that they are "second-chance" or "felony-friendly" employers – policies that are largely adopted in order to fill positions.

Figure 4.10. Most do not cite problems in filling positions due to criminal background



- **Failure to pass a drug screen is not a substantial issue.** Most respondents (62 percent) across all sectors did not have problems filling positions due to applicant failure to pass a drug screening (see Figure 4.11). Similar to the question regarding criminal background, many more participants responded Don't Know or Not Applicable to this question compared to the other skills, suggesting they do not require drug tests for their positions. According to interview and focus group participants, a clear drug screen was not a significant issue for most industries, but within advanced manufacturing, participants indicated a clear drug screen was a substantial issue. For example, a central Oregon company recently omitted marijuana from its drug screen in order to fill positions. They report the challenge is explaining to applicants that despite Oregon law, marijuana is still illegal at the federal level, which is relevant for national companies with facilities in Oregon. A clean drug screen was also cited by interviewees as an issue in the construction and wood products industries.

Figure 4.11. Failure to pass a drug screening not an issue for most industries



Contextual considerations

Throughout the process of engaging industry and business leaders for the talent assessment, stakeholders discussed a number of contextual factors influencing talent development. Although these factors are not in the direct purview of the workforce development system or associated partners, they affect talent development in the state. Collective focus or advocacy may improve conditions and facilitate greater talent development.

- **High cost of living (housing and transportation).** Business owners throughout the state commonly discussed the high cost of living as a root cause of skill gaps and shortages. Salaries are not able to keep pace with the rising cost of housing. A business owner discussed how the high cost of housing is pricing out the young, creative class in Portland, which is their workforce. Expensive rents often mean employees have to live further from where they work and commute by car rather than walk, bike, or take mass transit. The costs associated with commuting by car are high for individual workers in terms of health, quality of life, and cost, as well as for the community at large in terms of road usage and congestion. One employer noted that they recently paid $14,000 in parking fees for their employees. Likewise, healthcare and maritime representatives noted that the high cost of living along the Oregon coast limits the number of skilled applicants for in-demand positions throughout the region. Stakeholders discussed the broad recognition of these problems, but felt viable solutions were elusive.

- **High cost of Public Employees Retirement System (PERS).** Many stakeholders reflected that the high cost of PERS was a primary driver of the state's budget. Stakeholders reported feeling that the public education system is insufficiently funded as a direct result of the cost of funding PERS. One stakeholder said, "PERS is killing the education system; we don't have money to pay for teachers. That is a big issue. Until that is solved, we have a big problem." Another observed that PERS is "an existential crisis for the state."

- **Underperforming public education system.** Business/industry stakeholders discussed several related issues with the state's public K-12 education system. Individuals were concerned that the education system's poor reputation makes it hard to attract talent to the state. Families generally do not want to relocate to a region with poor schools. The current education system is perceived as underfunded, which makes investment in talent development initiatives like increased work-experience opportunities challenging. Underfunding also affects diversity. Exclusion from opportunity early in a student's educational career has a negative effect on talent development. Talent needs the opportunity to grow and thrive.[1]

  > *"To get people to come to Oregon, having a great school system and a better university system can do more to attract talent than anything else we can do."*
  >
  > *—Outdoor gear and apparel focus group stakeholder*

- **Changing social norms.** People reflected on the reasons for the perceived growing gaps in essential skills like communication, conflict resolution, accountability, and collaboration, particularly in younger workers. Many believed issues related to shifts in technology use, the emergence of social media as a dominant communication mechanism, changing family structures, and broader cultural changes have collectively influenced expectations and norms.

- **Immigration system.** Businesses commented on the impact of federal immigration policies on their ability to hire and retain foreign students who are educated in the U.S., which, in some cases, resulted in their sending jobs overseas.

[1]Merisotis, Jamie. (2015). *America Needs Talent: Attracting and Deploying the 21st Century Workforce*. RosettaBooks.

Chapter 5: Employer Responses

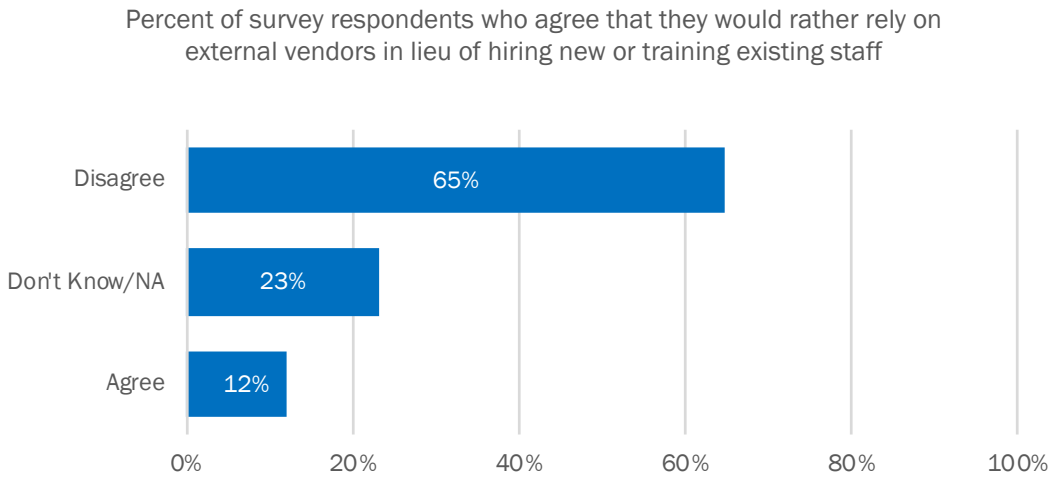
Industry response to occupation and skill needs

Industry stakeholders—in collaboration with educational institutions, governmental workforce development programs, and others—are endeavoring to develop skills and talent in Oregon's workforce. This chapter focuses on what is presently being done to recruit and train talent in current and future workers according to industry stakeholders who participated in the survey, focus groups, or interviews.

Approaches to hiring decisions

More than two-thirds of survey respondents noted a preference for hiring and training workers rather than relying on external vendors or contractors (see Figure 5.1). Interviewees generally concurred, reporting feeling that using external contractors costs more and produces lower quality outputs.[22]

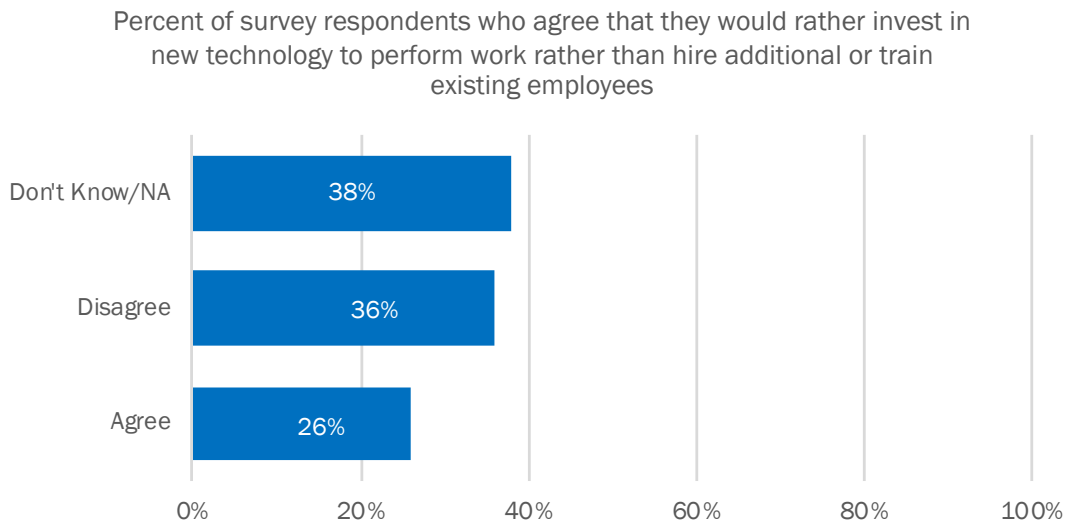
Figure 5.1. Businesses prefer to hire or train workers, versus use external vendors



[22] This question was drawn from the Harvard Business School's Survey on U.S. Competitiveness. To avoid influencing responses based on the phrasing of the survey question, the Harvard Business School randomly split survey respondents into two groups. Similarly, in the Oregon Talent Assessment Survey, half of survey respondents were presented the statement, "My firm prefers to hire additional employees or train existing employees rather than rely on external vendors." and the other half read, "My firm prefers to rely on external vendors rather than hire additional employees or train existing employees." In the narrative of the survey responses, The Harvard Business School averaged those who agreed with the former statement and those who disagreed with the latter. We have adapted the survey question for the Oregon context, and adopted the same survey, analysis, and reporting methodology in this report. Compared to respondents to the Harvard survey, of which 49 percent preferred relying on external vendors that can be outsourced rather than hire additional employees, Oregon respondents are more favorable toward hiring additional or training existing employees (see *Bridge the Gap: Rebuilding America's Middle Skills*).

When posed a similar question to compare hiring new or training existing employees to investing in new technology, the response was less clear (see Figure 5.2).[23] This may be because the question is less dichotomous in nature; evolving technology requires having a workforce skilled enough to use the technology well. Technology is often a complement to worker skillsets and is not simply a replacement of unskilled workers.[24] Interviewees spoke to this issue in terms of the need for continued skill augmentation over an individual's working lifetime.

Figure 5.2. Businesses do not have clear preference for new technology in lieu of new or more-trained staff



Recruitment practices

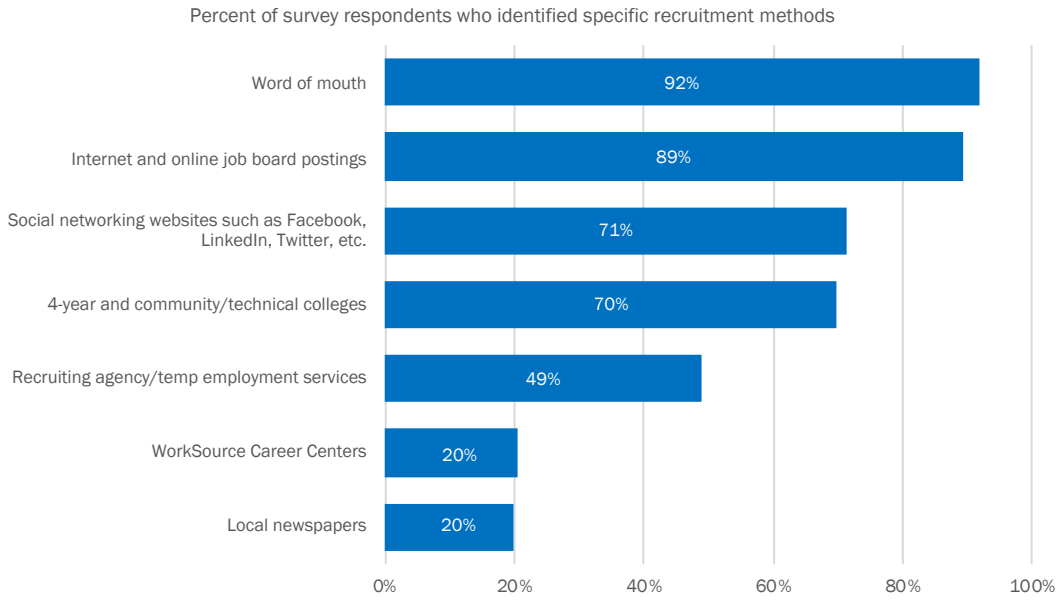
Stakeholders across industries uniformly reflected on the increasing difficulty of hiring and retaining skilled workers. In response to this challenge, most survey respondents (74 percent) reported increasing their recruiting efforts. To recruit workers, the most frequently cited strategy was word of mouth (92 percent; see Figure 5.3). According to interviewees and focus group attendees, word of mouth may include relationship-

[23] This question was drawn from the Harvard Business School's Survey on U.S. Competitiveness. To avoid influencing responses based on the phrasing of the survey question, the Harvard Business School randomly split survey respondents into two groups. In the Oregon Talent Assessment Survey, half of survey respondents were presented the statement, "My firm prefers to invest in new technology to perform work rather than hire additional or train existing employees," and the other half read, "My firm prefers to hire additional employees or train existing employees rather than invest in new technology to perform work." In the narrative of the survey responses, The Harvard Business School averaged those who agreed with the former statement and those who disagreed with the latter. We have adapted the survey question for the Oregon context, and adopted the same survey, analysis, and reporting methodology in this report. Compared to respondents to the Harvard survey, of which 46 percent preferred investing in new technology to perform work rather than hire or retain employees, Oregon respondents are more favorable toward hiring additional or training existing employees (see *Bridge the Gap: Rebuilding America's Middle Skills*).

[24] Merisotis, Jamie. (2015). *America Needs Talent: Attracting and Deploying the 21st Century Workforce*. RosettaBooks.

building through work-based training experiences like internships, apprenticeships, onsite dislocated worker training, or through the social, professional, and educational connections of current employees. Businesses also posted openings in various online resources and recruited through postsecondary education and training institutions. Twenty percent of survey respondents said they used WorkSource career centers as a recruitment resource, with energy (50 percent), advanced manufacturing (40 percent), and construction (38 percent) respondents more likely to use WorkSource for recruitment.

Figure 5.3. Recruiting mostly occurs through relationships (personal, educational, and training) and online



Interviewees shared additional outreach mechanisms, including the example of Lane County's Technology Association of Oregon's (TAO's) Elevate programming, which helps students get exposure to local career options in technology, advanced manufacturing, and healthcare through organized bus tours of local businesses. Stakeholders also discussed rebranding efforts to decrease the stigma of certain industries, such as wood products and construction, as well as career and job fairs.

Additional themes include the following:

- **Businesses vary in their ability and willingness to pay high salaries and provide benefits.** Interviewees reflected that good wages and benefits are an important component of recruiting and retaining talent. One third (35 percent) of survey respondents said they had raised wages to find qualified workers. Some business stakeholders bemoaned their inability to raise wages or provide benefits for a variety of reasons, including the demand for cheap products by consumers (e.g. food and beverage, forest and wood) and competition within their industry, whether from international companies with lower labor costs (e.g. advanced manufacturing) or from domestic companies. Others felt it was their duty as business owners to pay employee salaries commensurate with the cost of living and let the price of their product reflect this value.

"I believe everyone should be able to put their kids in school and drive a decent car. If we're going to make a commitment to someone, we want to make sure we're doing it right."

—Outdoor industry stakeholder

- **Stakeholders in the healthcare industry discussed the use of loan repayment as an approach to recruiting workers in rural areas.** Interviewees remarked that although successful, loan reimbursement is also very costly to employers, and were interested in greater federal or state support to continue this practice. Interviewees also noted interest in exploring additional, less expensive recruitment approaches to supporting rural healthcare access.
- **Some industries are targeting diverse prospective employees in their recruiting efforts.** The technology and outdoor industry associations shared explicit goals and strategies to increase diversity in their workforces. TAO in Portland, in collaboration with local businesses and partners, developed an in-depth plan to focus on diversity throughout the talent recruitment pipeline, including working on internal culture, increasing outreach and education about tech-related careers, reducing education costs, influencing curricular choices, increasing work experience opportunities, and coaching, mentoring, and upskilling under-represented employees.[25]

Training practices

Across industries, businesses are investing in training their current workforce. Ninety percent of survey respondents indicated their business had paid for classroom training, workshops, or seminars lasting at least four hours for any employee over the last 12 months. Across all sectors, almost half of survey respondents (49 percent) reported that the number of employees who received training provided by the firm had increased over the last three years. Nearly 40 percent indicated that the number of employees receiving training had stayed about the same over that time period. A substantial proportion of respondents across sectors identified the development of a more skilled, flexible, versatile, or productive workforce as a training motivation (89 percent; see Figure 5.4).

Industry and business leaders provided insight into the types of training used to strengthen the skills of their workforce. To build their current workforce, survey respondents and interviewees were most likely to turn to on-the-job training (OJT), use of in-house staff or expertise, and industry, business, or professional associations (see Figure 5.5). Interviewees in all sectors reflected on the importance of OJT, particularly in occupations requiring the use of safety protocols, heavy machinery, complex equipment and technology, or other specialized skillsets. Respondents from energy, healthcare, food and beverage, construction, and manufacturing sectors all cited above-average use of OJT compared to all sectors. Survey respondents were overwhelmingly satisfied with all modes of training provided, which suggests that once a good training fit is established, employers are satisfied with the product.

Survey respondents also noted broad use of tuition reimbursement programs (45 percent) to support current workforce training. Most tuition reimbursement programs (67 percent) are limited to job-related training.

[25] 2017-2019 Talent Strategy Plan, Techtown PDX Partnership.

Figure 5.4. Businesses are investing in enhancing skills of the existing workforce

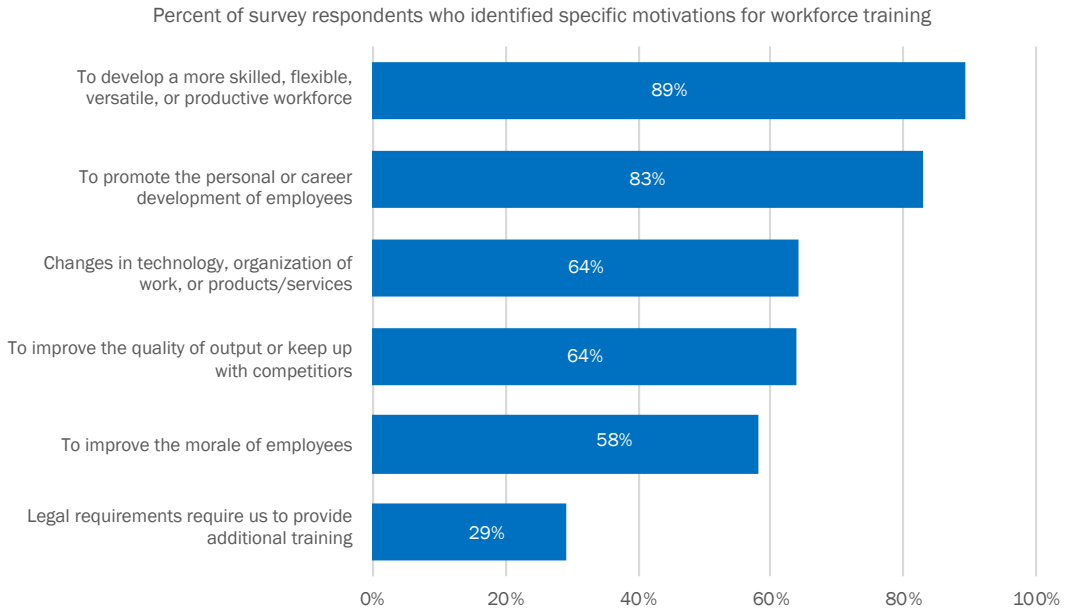
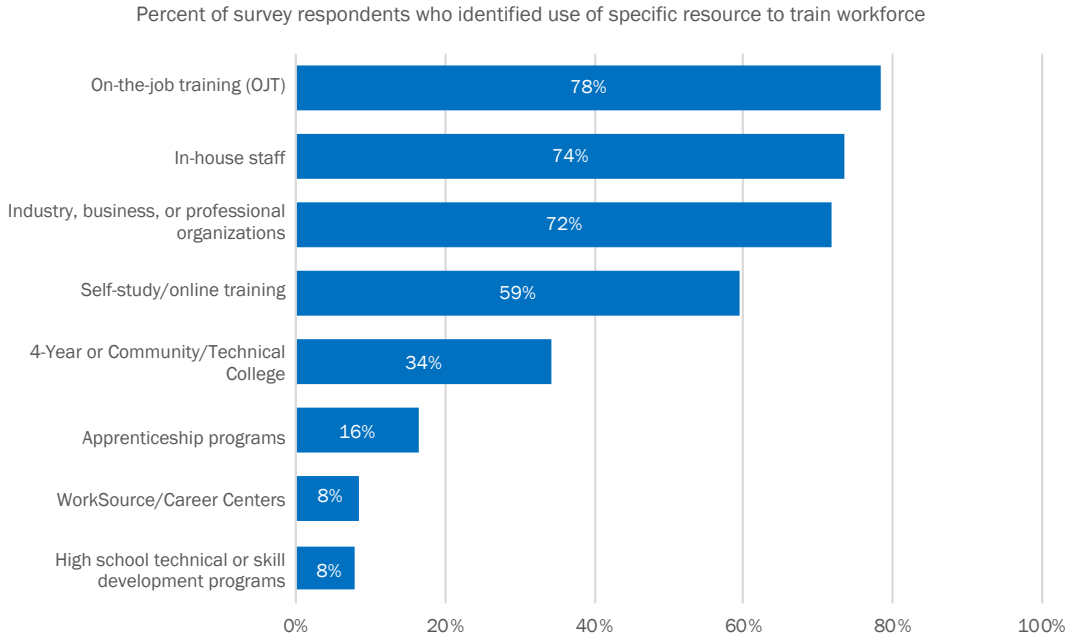


Figure 5.5. Businesses primarily use on-the-job and internal training to strengthen the skills of their workforce



Stakeholders stressed the importance of skill building throughout individuals' working careers, augmenting skillsets to enable growth and shifts in career paths. Stakeholders also expressed a desire to see work experience opportunities universally provided at younger ages to support students in connecting to meaningful career paths and associated skill development early in their lives.

Additional points about training practices included the following:

- **Educator externships and business tours expose students to more career paths.** Increasing awareness of career paths and their associated skills (essential and occupational) allows educators to develop curricula to support industry needs and expose students to more diverse career options. Stakeholders in many industries discussed the success of the high school educator externship programs.
    - TAO in Lane County piloted an externship with 10 teachers and one counselor from 10 communities last summer. The educators and counselors brought their knowledge of technology industry roles and skills to high school students. Teachers are paid as part of this externship program.
    - Associated General Contractors has extensive educator externship programs in Portland, Salem, Medford, and Pendleton, which include exposure to safety, job sites, project management, estimating, and other career skills. Teachers then connect these topics to lesson plans. The program has grown from 10 educators in the first year to almost 100 in the third year (summer 2018). Teachers are paid as part of this externship program.
    - Oregon Freeze Dried Foods invited high school principals in the region to tour their plant, and discussed skills needed by their workforce. Worker absenteeism was one topic discussed; as a result, one principal revised student attendance expectations to respond to this skill development need.

  Stakeholders suggested that increased communication between industry and educators can also address ongoing stigma prevalent in the manual trades. Businesses employing tradespeople commonly associated such stigma with the demise of career and technical education (CTE) programs. The stigma may also contribute to the tendency of educators, counselors, family members, and even people currently employed in the trades to provide little support for young people to pursue these careers. In response, stakeholders discussed rebranding efforts to decrease the stigma of certain industries, such as wood products and construction, and encourage greater participation in externships and career and job fairs.

- **CTE programs are expanding in high schools.** Eight percent of survey respondents overall used CTE programs to strengthen the skills of their workforce, with variation in use by sector, including greater use among advanced

Business associations were generally viewed as effective collaborators and connectors for industry because they are able to support employers' quickly evolving training needs at the speed of business.

The Oregon Bioscience Association was commended by interviewees for the work they do with businesses to train the existing workforce through their BioPro programming. Classes are business-defined and delivered on site.

Also discussed were the Oregon Forest Resources Institute, the Technology Association of Oregon, Associated General Contractors, the Oregon Outdoor Association, Food Northwest, OHSU continuing education, and others.

"The path to success is a great education, but we have to redefine what an education means; there's not just one road to Rome."

—Construction industry stakeholder speaking to need for CTE

manufacturing (32 percent), wood products (23 percent), and outdoor products (20 percent). CTE examples held up by interviewees as successful models include:

  - ***Career and Technical Education Center (CTEC) in Salem*** is a partnership between the Mountain West Career Technical Institute, the Salem-Keizer School District, and local industries and offers a wide array of career and technical learning opportunities for high school juniors and seniors.
  - ***Regional STEM Hubs***, including Elevate Lane County, are partnerships between school districts and workforce teams. Elevate Lane County runs Experience Oregon Tech, Experience Oregon Manufacturing, Experience Oregon Health, and Experience Oregon Food and Beverage programs for high schoolers.
  - ***Benson High School*** polytechnic school in Portland, with its focus on technology, engineering, and bioscience, is reported to do a good job of providing students with hands-on experience with equipment.

- **Industries are defining postsecondary degree and certificate programs**. At the postsecondary level, many Oregon industries work closely with community colleges and universities to make curricula responsive to workforce skill needs. Survey respondents across industries use both four- and two-year colleges as training resources: one in five survey respondents said they rely on four-year colleges to strengthen workforce skills, and 24 percent use community or technical colleges. Promising practices described by stakeholders include the following:
  - The outdoor gear and apparel industry has recently worked collaboratively with a number of education institutions to establish several workforce development programs: Portland State University's Athletic and Outdoor Industry Certificate; University of Oregon's Sports Product Management programs; the Pensole Footwear Design Academy; Oregon State University (OSU) Cascades Tourism, Recreation, and Adventure Leadership program; and OSU Cascades Outdoor Products degree.
  - Wood products stakeholders discussed skills-based training provided at North Idaho College, based on an industry-education partnership. The program has been successful at increasing the wood products workforce in the region; industry leadership expressed a desire to see similar programs in place in Oregon to expand the effect of college education on industry-specific skills.
- **Apprenticeships are key for skilled trades, and increasingly more popular broadly.** Among survey respondents, apprenticeships were most used in energy (67 percent among 6 survey respondents), construction (57 percent among 51 survey respondents), and wood products (46 percent among 13 survey respondents). Interviewees and focus group participants discussed the crucial importance of apprenticeships for people training to work in the trades, such as electricians, millwrights, and carpenters. Because of the longstanding nature of trade apprenticeships, stakeholders observed that apprenticeships generally work well, with a few caveats related to capacity limitations and the transition of high school CTE and pre-apprenticeship credits to postsecondary education and training institutions. Other stakeholders expressed how the current system does

not support ongoing skill augmentation over a working lifetime. Credits do not consistently transfer between institutions, making it hard for individuals to pursue skill development courses in multiple organizations, without having to repeat classes. A related issue was discussed in terms of differing state requirements for licensure. Oregon generally has higher requirements than other states, making it unattractive for licensed skilled trades people to relocate to Oregon from other states because they have to take a pay cut while they work towards Oregon licensure.

Interviewees noted efforts to use apprenticeships in other, non-trade industry sectors. One example was the Apprenti program, which is focused on training displaced workers for technology occupations across multiple industries in Lane and Deschutes counties. The effort to expand the use of apprenticeships beyond the trades has uncovered constraints in Department of Labor supervisory requirements, which mandate one-on-one supervision that interviewees feel makes less sense for other, non-trade occupations.

- **Internships are seen as valuable work-based learning opportunities.** In addition to work-based learning through apprenticeships, interviewees and focus group participants across industry sectors remarked on the value of internships for aspiring workers and for businesses. Respondents reported that internships enhance essential and technical/occupational skills in students, clarify education, training, and career tracks for students and businesses, and allow students and businesses to assess mutual fit for future employment. Companies discussed the benefits of hiring previous interns, and some also remarked on their civic duty to invest in the workforce through investing in training interns. Specific examples of internship programs include the following:

  - ***Better Together***, a nonprofit that works with area school districts and industry/business partners to enhance the K-16 experience, with every high school junior or senior having a paid internship or work experience.
  - ***MECOP*** (formerly known as Multiple Engineering Cooperative Program), which coordinates engineering internships from Oregon's four large universities.
  - ***Emerging Leaders Internship Program***, which supports internship programs focused on underserved communities.
  - ***Saturday Academy***, which runs 10-week summer apprenticeships embedding high school and college students in science and engineering companies.
  - ***Community College Cooperative Education Agreements***, in which community colleges send students out into the field as part of their studies.
  - ***Kaiser Permanente-Portland Leadership Foundation***, in which scholarship recipients are supported to be more interview-ready so they can get an internship with Kaiser.

  Some industry stakeholders, including some bioscience and outdoor industries representatives, discussed the need for more organization in internship pathways to better support students and businesses. Success stories were referred to as

"labors of love" on the part of the student and the business to make internships happen, rather than a systemic process. Others talked about the rigidity and cost of organized internship programs, making it a poor fit for certain companies.

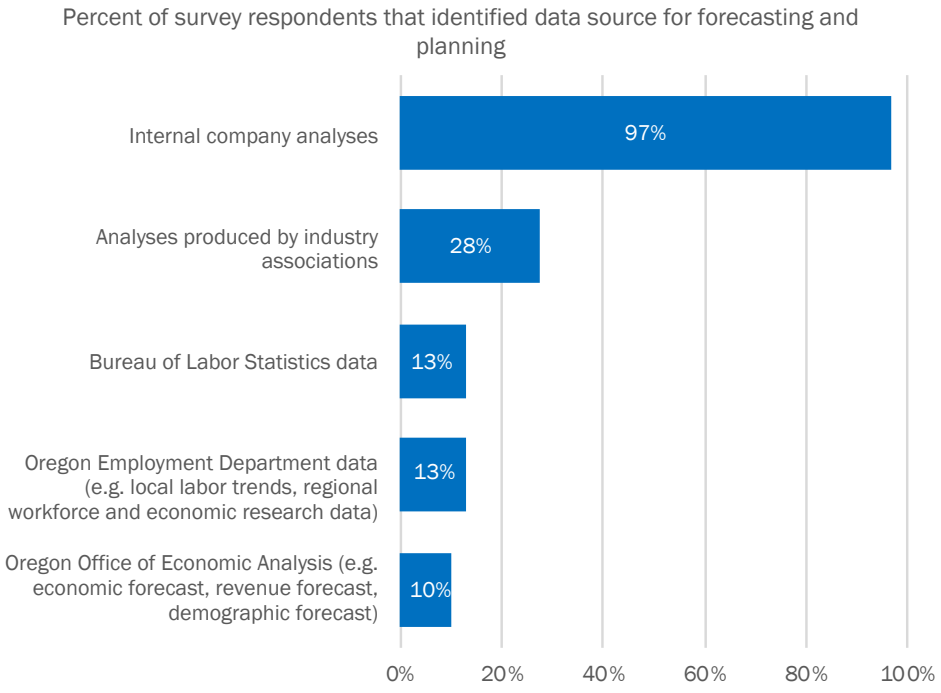
- **Use of WorkSource training was limited.** Business stakeholders reflected on the complexity of the workforce development system, describing it as hard to navigate and engage. Many remarked on its slowness, inefficiencies, and lack of clarity regarding funding opportunities. However, several stakeholders discussed targeted success in partnering with WorkSource for training. Although nine percent of survey respondents overall said they used WorkSource or Career Centers to provide training for their employees, a larger share of respondents from construction (24 percent of 21 survey respondents), and advanced manufacturing (20 percent of 25 survey respondents) identified using WorkSource in this capacity. Interview participants provided examples of WorkSource training support, including incumbent worker grants to uptrain workers in specialized skills, and grant funding to support an instructor and certification opportunities for existing staff.
- **Industries, associations, and workforce development are investing in upskilling for displaced workers.** Stakeholders shared collaborative approaches to augmenting workers' skill sets to help them transition between industry sectors. Interviewees indicated that this was most successful when similar skills and aptitudes are required in the two industries.
    - The Oregon Bioscience Association established BioCatalyst training, with a focus on re-employing workers laid off from the technology sector into bioscience and life science companies. This training program was started with a grant from the Oregon Talent Council to establish a certificate program for dislocated workers. Participants attended classes onsite with businesses statewide, allowing workers and businesses to assess mutual fit and create relationships throughout the training process. The training resulted in a placement rate of more than 70 percent.
    - TAO is doing similar work in collaboration with industry, workforce investment boards, and other local stakeholders through the Apprenti program. Apprenti is focused on quickly upskilling women, minorities, and veterans and then connecting them to apprenticeships with technology companies, which ideally translate into ongoing employment.
    - The Military to Manufacturing (M2M) program is focused on augmenting the skills of veterans for private sector, manufacturing work.

Forecasting

Survey respondents and interview participants were asked about their forecasting and planning practices, including data used, frequency of planning, and collaboration with other business or organizations. Respondents overwhelmingly use internal data for internal analysis and planning, without considerable collaboration across employers or associations.

- **Employers primarily use internal data for business forecasting and planning.** Ninety-seven percent of survey respondents identified internal company analysis for business planning and forecasting, followed by 28 percent that use analysis produced by industry associations (see Figure 5.6). Fewer than 13 percent of survey respondents overall indicated using other data, such as Oregon Employment Department or Bureau of Labor Statistics data, for business planning. However, more survey respondents from the healthcare, construction, and energy industries reported using these data for forecasting and planning, relative to overall respondents.

Figure 5.6. Employers rely on internal company data and analyses for business forecasting



Stakeholder interview respondents provided greater detail on key internal company metrics used in analysis:

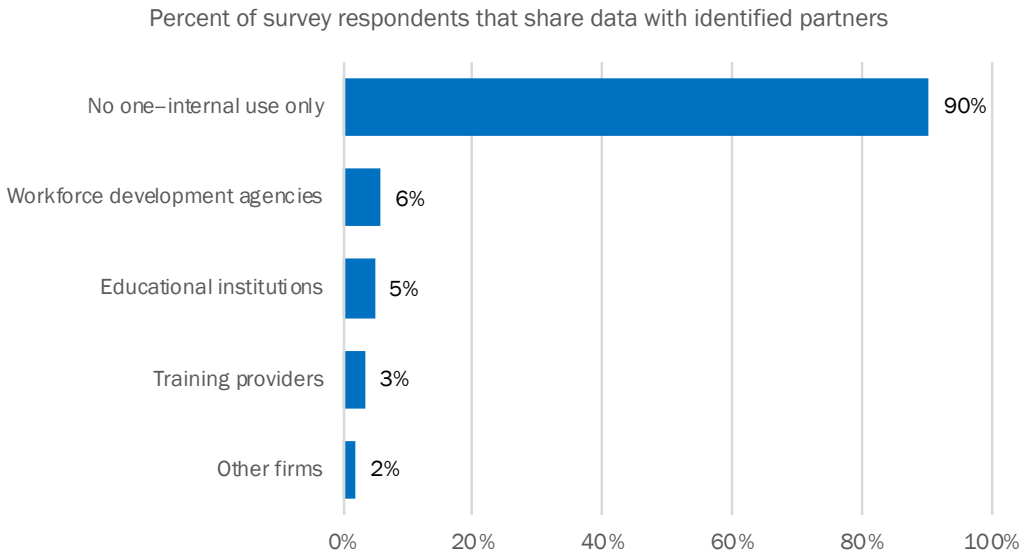
- ***Projected retirements.*** Many interview respondents described retirement analysis as a critical component to their staffing forecast. Several industry respondents, including those in construction, manufacturing, and healthcare, noted demographic shifts as an important factor. These industries reported that as their workforce ages, jobs open up and targeted training needs to replace experienced workers are identified.
- ***Historical staff turnover.*** Some companies use historical analysis on staff turnovers to predict typical hiring needs separate from larger demographic, industry, or economic changes.
- ***Historical product or production demand.*** Similarly, industry representatives use historical product or production demand to predict ongoing personnel needs and hiring response.

- ***Awareness of client needs.*** Stakeholder representatives noted the importance of communicating with clients to anticipate changes in product demand. Several manufacturing representatives, for example, discussed requesting six-month projections from clients to inform contracting or expansion decisions.
- ***Increased product or production demand.*** New clients, increased orders, and other demand factors influence hiring decisions. Companies use their historical production and personnel data to determine expanded staffing needs for increased products or production.
- ***Impact of automation.*** Some industry stakeholders include the impact of automation or capital improvements in their internal staffing and planning analysis. Automated capital improvements, such as a robotic packer, could decrease staffing needs. However, employees who can manage a robotic packer will need a different skill set than those who were doing manual packing, which requires either a skills upgrade for existing employees or new hires proficient in the required automation.
- ***New economic indicators.*** Industry stakeholders include broader economic trends and indicators in their internal analysis, including new forecasting metrics responding to emerging economic trends. Retail products such as some food and beverage, technology, and outdoor gear and apparel products, for example, may track engagement (increased traffic to online sites or brick-and-mortar shops), retainment (holding engagement in the site or store with sustained interested), and conversion to sales (how to convert the engaged, retained consumer into a customer) as key indicators of product growth. Similarly, technology companies are often forecasting in uncertain and new markets, where estimating total and serviceable available market metrics are not supported by existing external data, but instead by informed guesses based on the size of the market and likely rate of market capture.
- ***Change in bellwether allied industries.*** Several companies rely on market forecasts from allied industries to predict business demand within their own sector. For example, both construction and wood product representatives look to architecture forecasting to predict growth in their respective industries. Construction stakeholders indicated that they regularly call their colleagues in architecture for forecasting information or reference the Federal Reserve's Beige Book to glean current and predictive industry trends. For commercial construction, they rely on the state Department of Transportation budget and plan for indication of public works and large-scale construction projects, including roads and infrastructure.

- **Business forecasting tends to be short-term and ongoing.** Most industry stakeholders report forecasting timeframes ranging between three and 12 months. Respondents described rapidly changing information, particularly in technology and other burgeoning sectors, and the need to be responsive and nimble to changing conditions. Even respondents who indicated forecasting at the six-month interval noted that they discuss related planning implications on an ongoing weekly basis. The timeframe of forecasting is determined by the availability of evolving internal business data rather than intermittent data releases from external sources.

- **Forecasting data are primarily for internal use only.** Ninety-percent of survey respondents across sectors indicate that they limit their forecasting analysis to internal use only and do not share with other firms, training providers, or educational or workforce institutions (see Figure 5.7). However, construction and advanced manufacturing respondents were more likely than the average of all industries to indicate that they shared forecasting data with training providers, educational institutions, and workforce development agencies. More food and beverage respondents said they shared data with educational institutions compared to all sectors, and more healthcare respondents said they shared data with workforce development agencies compared to all industries, suggesting stronger data sharing networks among certain industries.

Figure 5.7. Employers overwhelmingly retain forecasting data for internal use only



Broadly, interview respondents noted that the competitive nature of most industries severely limits data sharing and transparency; employers may be more likely to share forecasting data with allied industries than with direct peer competitors. However, some stakeholders did describe their current data sharing practices. For example, industry representatives that serve on workforce boards indicated that they share data with peers and training centers. One outdoor gear and apparel company described coordination with area high schools and OSU Cascades for talent development efforts based on forecasting data. Companies may also be more willing to share data or forecasting status when looking to hire. For example, one manufacturing stakeholder described outreach to other area manufacturers focusing on different products to see if they had any excess staff capacity that would be a good fit for their needs. Although they were not producing the same product, the employees had transferable skills and the company was able to recruit roughly 20 workers to their facility.

- **Rural regions noted more collaboration around forecasting and recruitment.** The cost of recruitment visits, overlapping needs for skilled labor across employers, and limited supply of local talent with targeted skills has encouraged cross-competitor collaboration in rural regions. One stakeholder from the food and

beverage industry noted, for example, that these factors facilitate greater collaboration among food processors—even if they are competing for labor—to jointly address the skill needs in their community. Healthcare providers in rural areas also described collaborative efforts to share data on staffing needs and recruitment plans. For example, one healthcare stakeholder described joint efforts by a local hospital, coordinated care organization (CCO), and providers who were collectively seeking medical staff that could increase access to Medicaid patients. They strategized on how to share recruitment costs, who could provide funds for a signing bonus, who could contribute towards the state loan repayment program, and other opportunities to delegate resources for the hire. In another rural community, a healthcare stakeholder described sharing recruitment visit costs, arranging visits with multiple providers during the visit, and hosting joint dinners across interested providers. Because one hire, regardless of the home organization, affects call capacity for the whole community, there is greater willingness to share forecasting and recruitment information and resources.

Talent development opportunities

Stakeholders generally agreed that it is the collective responsibility of all talent development partners—industry, education, and government—to invest in and develop talent in Oregon's workforce. To this end, stakeholders expressed a desire to define outcomes and performance measures collaboratively among partners to provide a structure for ongoing engagement and continuous improvement. Many noted a need to incorporate equity and diversity measures to work actively toward reducing inequality in Oregon.

Oregon has many examples of innovative talent development initiatives, and stakeholders encourage broader systems change to develop consistent, systematic opportunities and outcomes for Oregon workers. The following sections articulate stakeholder feedback on talent development activities and opportunities to build a more cohesive workforce system.

System-building opportunities

- **Identify talent development partner roles and responsibilities.** Stakeholders provided input on the role that industry, education, and government can play in developing workforce talent.
    - ***Industry.*** Beyond creating the opportunities for individuals to work, most stakeholders feel that private businesses should actively collaborate with educators and workforce development agencies to develop talent. This collaboration includes defining skillsets and career paths, communicating talent needs, providing material support to educators and trainers, offering work experience opportunities, and facilitating ongoing learning opportunities for employees.
    - ***Education.*** Stakeholders broadly viewed education as the foundation for developing a wide range of essential skills in young people, including soft skills like communication, teamwork, and reliability, as well as basic skills such as reading, math, data analysis, problem solving, and computer skills.

Participants were interested in seeing education's role in the cradle-to-career progression be more deliberately coordinated with the broader talent development ecosystem.

  - ***Government.*** The government has an important role in the talent development system. The public workforce system operates as an educator and skill developer, a convener, a funder, and a policymaker.

- **Prioritize ongoing learning and skill augmentation.** Stakeholders are interested in seeing people's skills and learning outcomes recognized, not just traditional degrees. A shift toward a system that supports learning along a career pathway would allow a person-based approach, where individuals could be recognized for learning different skills in different programs at different points in their lives. The resulting versatile workforce would continue to learn new skillsets over a working lifetime. Changes could include systemic transference of high school CTE skills to apprenticeship programs, recognition of skills learned through work experience opportunities, and stackable credits in broad postsecondary learning environments.

- **Identify strategic opportunities for collaboration across businesses.** Associations and organizations do provide opportunities for effective cross-industry collaboration. However, stakeholders also acknowledged that competition for employees and customers can limit information and resource sharing between businesses. Survey respondents reflected this mixed assessment of cross-industry collaboration, with roughly equal proportions (34 percent each) of respondents across industries disagreeing or agreeing that employers and workforce intermediaries in Oregon communicate and collaborate in ways that benefit employers and employees. Interviewees cited examples of when they felt comfortable collaborating, and times when they felt their approach (e.g., rebranding of an older industry to show the high level of technology and sophistication in the company) was a strategic advantage over their competition.

- **Increase postsecondary education and training access and affordability.** Many business leaders discussed the incredible burden of large college debts that their employees shoulder. Some shared how the emotional toll of this debt affects worker productivity and creativity. Stakeholders expressed concerns about equity of opportunity, and how the high cost of postsecondary training and education exacerbates inequality.

- **Improve talent development infrastructure and system building.** Stakeholders repeatedly discussed the important role their local workforce investment boards played in getting industry and education stakeholders to the table to analyze and respond to talent development needs. Businesses felt that the public workforce system has a role in sharing information about available workforce development resources, including tax subsidies, transportation infrastructure, and training options.

  In addition, stakeholders discussed the role government can play in helping to fund updated technical equipment needed in high school and postsecondary CTE programs. Government statutes, regulations, policies, and processes can also be reviewed and refined to ensure they support talent development across industry

sectors. Stakeholders suggested using key performance indicators in this process of analyzing government infrastructure's impact on talent development outcomes. Business leaders specifically discussed the need for the following: reduced supervisory requirements for non-trade apprenticeships; labor laws that support work experience opportunities for young students; alignment of licensure requirements for trades with more states; and certification or recognition of safety-related skill building in work experiences. On a broader level, interviewees discussed the government's role in shaping market decisions such as the location of manufacturing.

Training development opportunities

- **Increase communication regarding talent needs.** Businesses know the occupations and associated skillsets they need to be successful. Many stakeholders felt that businesses need to speak up more and relay to K-12 and postsecondary educators, as well as policymakers, the skillsets needed and the skill gaps, shortages, and mismatches they experience in their workforce. Businesses also need to articulate and share career paths for prospective employees in their industry, including requisite skills necessary for success and any associated pathways.

- **Increase collaboration between industry, education, and training providers to develop responsive curricula.** Stakeholders observed how current approaches to teaching in K-16 education focus primarily on academics, and how social competencies and career skills are less coherently provided. Industry and business leaders consistently shared how important essential skills are to the success of workers, and how younger applicants and employees are more likely to lack them. Stakeholders discussed how they wanted to see young people learning how to communicate clearly, think critically, work in teams, solve problems creatively, analyze data, and use software both individually and collaboratively. Respondents encouraged industry input in curriculum development to ensure skill gaps are systemically addressed. A more responsive education sector and deeper industry collaboration would allow students to be trained for the jobs of the future, not just the jobs of today.

- **Adjust curriculum development timeframes to meet real-time industry demand.** While there are many examples of businesses successfully shaping postsecondary education and training programs to support talent development needs, there is a general consensus that accredited postsecondary curriculum development and approval takes too long to meet industry demand. Some stakeholders described even more fundamental divides between businesses and education institutions, such as unresponsiveness of postsecondary educators and trainers to business needs (e.g., "They wanted to give me welders, but I don't need welders."). In light of these limitations, some industries have worked directly with community colleges to adjust curriculum development schedules or have found other organizations more able to provide responsive, on-demand training. For example, when bioscience businesses had to implement new International Organization for Standardization (ISO) standards within months of release, the Oregon Bioscience Association was able to work with businesses to deliver this curriculum in real-time.

- **Increase collaboration with CTE programs.** Industry leaders were enthusiastic about the expansion of high school CTE programs; many said this is precisely what industries and students need. Stakeholders felt that having more CTE programs statewide increases student exposure to a broader array of career paths, which is a first step in growing talent pipelines. Stakeholders encourage ongoing business support of burgeoning CTE programs, including financial support to purchase needed equipment and technology.
- **Actively support work-based learning opportunities.** There is near-universal agreement among stakeholders that work-based learning opportunities are vital to an effective talent development system. They provide valuable insight for prospective employees and businesses and help engage students in learning. Interviewees discussed a variety of successful work experience approaches they thought should be continued and expanded, including internships, apprenticeships, innovation programs, maker centers, and CTE programs. Work-based learning opportunities allow businesses to actively shape the talent development of the workforce rather than rely solely on the education system. In addition, industry stakeholders commented on the importance of a variety of work experience methods in recruiting. Internships, apprenticeships, and work experience opportunities associated with incumbent/displaced worker training were all cited as effective recruitment mechanisms.

Chapter 6: Conclusions

This report represents business and industry's determination of in-demand occupations and skills and future trends that will shape Oregon's labor market. Its findings must be considered in the context of current economic conditions. The U.S. economy is in the latter stages of a prolonged economic expansion. Unemployment is low, labor force participation is on the rise, and federal policies have recently added stimulus.

Oregon has outperformed the nation in this cycle, with above-average rates of job and income growth. The economic performance was built on a foundation of a solid labor pool. However, Oregon average incomes and wages are still below U.S. levels. So, if broad economic performance were the measure of talent, one could conclude Oregon's workforce is a competitive strength that has improved during this recovery but has plenty of additional room for growth. If employers had their way, that growth would come in the forms of stronger interpersonal skills, more sophisticated writing ability, and an array of job-specific technical and management skills.

This *Talent Assessment* is diagnostic rather than prescriptive. With this assessment in hand, employers, educators, and workforce developers can better understand Oregon's talent and then design and fund strategies that propel that talent to top-tier status. The report concludes with a number of observations to guide strategy development.

First, the pace of technological progress is likely to accelerate. Technologists describe an inflection point where progress transitions from a linear to an exponential path. The labor market already rewards workers with strong social and interpersonal skills, and those skills will become increasingly valuable as automation evolves. Improving social and interpersonal skills is an only partially known territory and will require initiatives along the education and workforce continuum. Prekindergarten programs, which show long-term impacts on graduation, employment, and earnings (often without test score improvement), appear to be an important start. Beyond that, the K-16 education system will need to offer more experiences that mimic work: project-based assignments that require students to work in teams, solve problems, persuade, negotiate, trade tasks, and lead.

Second, stakeholders should pay close attention to the college wage premium. The trends measured and reported in the early 2000s justified calls for big increases in postsecondary attainment. Since then, the premium appears to have flattened. Automation may be finding its way into higher-paying work or a lack of business investment could be limiting opportunities for college graduates. That said, the premium remains sizable, and postsecondary attainment is still a good investment for most students. But the cost of postsecondary attendance is rising. The flat premium / rising cost scenario requires a much deeper understanding of productivity in higher education. Guided pathways, intrusive advising, stackable credentials, and STEM initiatives are designed to improve returns on an increasingly expensive investment. Those are good starts, but the research on higher education productivity is still in its early stages. There's much to be learned.

Third, Oregon appears to have answered the call for a stronger investment in career technical education (CTE). Here, employers' perspectives and general public support, as demonstrated in the passage of Measure 98, are in unusually strong alignment. The challenge going forward is implementation: ensuring that lawmakers appropriate funds

consistent with Measure 98's intent and that educators invest in productive programs. Measure 98 gives employers a platform to scale their recruitment efforts—internships and externships—and expose more students to lower-cost paths to the middle class.

Fourth, delivering on the adult workforce goal is a joint education-business responsibility. The education system has a lead role to play with an increasingly important population: people who are prime working age and unemployed or out of the labor force entirely. Automation could put additional pressure on this population and, in many cases, reconnection to work will require more than business-provided internships and on-the-job training.

But a lot of lifelong learning is going to take place inside companies themselves. Employer needs are urgent and idiosyncratic and will always be hard to convey to educational partners. When new demand hits or processes change, the best source for talent is typically existing employees who are already familiar with the company's mission, culture, and products. While existing employees might be missing specific technical skills, employers already have valuable insight into their motivation, dependability, and willingness to learn new skills.

Oregon is well-positioned to continue to grow its talent base and develop innovative solutions for potentially weak points in the supply chain for labor. This report contributes to those efforts by presenting business and industry's assessment of in-demand occupations and skills as well as data and consistent language about the nature of the skills problem.

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Appendix A: Industry profiles

Industry: Advanced manufacturing

Key findings

While most survey and interview respondents from advanced manufacturing felt that candidates had the education level needed to fill vacant positions, many cited deficiencies in hard skills that increased education and training could provide, such as the skilled trades and general engineering and technical training. Many expressed that they felt the loss of career and technical education (CTE) in high school was negatively affecting the availability of skilled labor. Work experience, particularly experience working with hands, machines, and tools, was viewed as an essential quality that job candidates lacked, particularly early-career candidates. Employers rely heavily on internal training resources to train their workers. They would like to see CTE become a mandatory graduation requirement in high schools to increase work-based learning opportunities. Industry employers see the development of soft skills as the highest priority for the public workforce system, followed by hard or occupational skills.

The survey respondent sample of 25 may not represent broader industry trends. An additional three individuals were interviewed, and other industry leaders were engaged at the talent summit.

ADVANCED MANUFACTURING

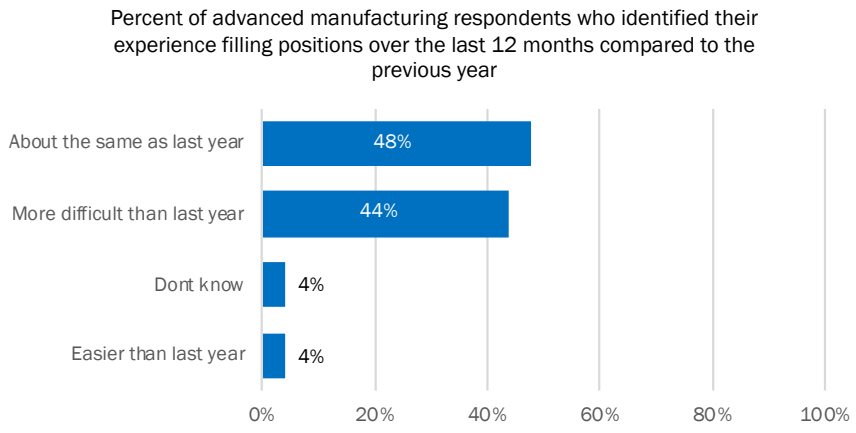
Percent reporting they had **hired new employees** in last 12 months:

88%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

72%

Figure 1. Compared to last year, most advanced manufacturing survey respondents cite the same level of or more difficulty in finding qualified applicants



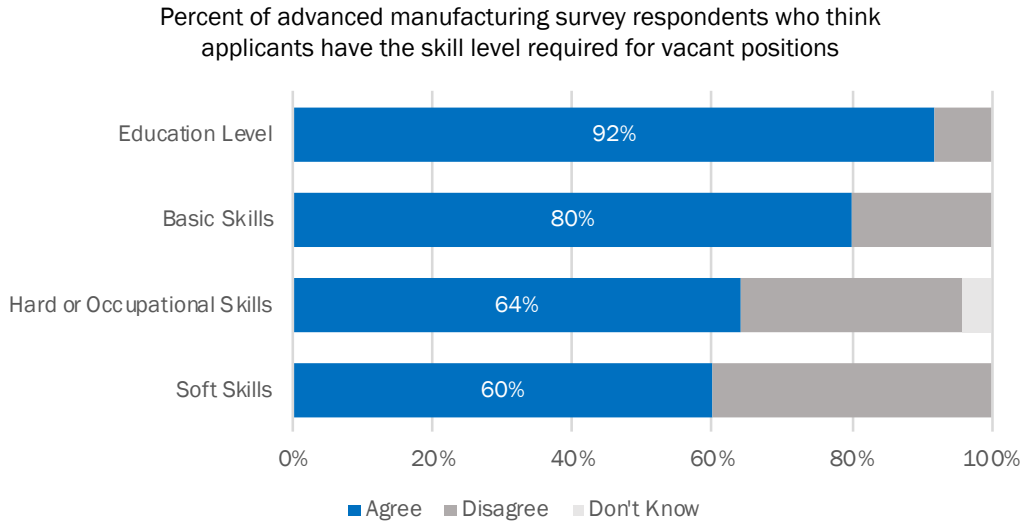
Key occupations in demand

Business leaders interviewed in the advanced manufacturing industry cited the following occupations as in-demand:

- Sanitation/maintenance workers
- Production line laborers
- Skilled trades/maintenance:
  - Machinists
  - Welders
- Drafters
- Warehouse operators
- Heavy machinery operators (e.g., fork lift)

Key skills in demand

Figure 2. Most advanced manufacturing survey respondents think applicants have the required skills, especially education level and basic skills



Employer interviews and the key stakeholder survey revealed the following in-demand skills and/or shortage of skills in the advanced manufacturing industry:

- **Education level.** Nearly all advanced manufacturing survey respondents (92 percent) felt that applicants had the education level needed for vacant positions. As one interviewee expressed, education level is less important in hiring, although an AA or AS degree is desirable when all else is equal. This stakeholder perceived a moderate shortage of applicants with one to two years of community college coursework. Other stakeholders indicated that the technical skills needed within their facility were so specific (e.g., gel coating or laminating) that they did not expect candidates to come equipped with a degree in that skill; there is not enough demand for those specific skills in the job market to absorb a classroom of graduates. Stakeholders look for basic vocational skills and provide the training themselves. Interviewees consistently expressed that the labor pool did not have sufficient, if any, CTE courses in high school.
- **Basic skills.** While 80 percent of survey respondents thought their applicants had the basic skills needed, basic math and reading skills were cited as in-demand by several interviewees.
- **Hard skills.** Approximately two thirds of survey respondents felt candidates had the appropriate hard skills to fill vacant positions. There was broad agreement among advanced manufacturing interviewees that general vocational skills—such as operating power tools or working with hands—were in high demand, but hard to find. Students may graduate from high school with a high GPA but lack practical skills. For companies producing limited-run, high-end products, craftmanship and attention to quality were desired hard skills.
- **Soft skills.** Survey respondents were least likely to agree that candidates had the soft skills necessary for vacant positions. Interviewees elaborated that certain soft skills are prioritized over others. Several stakeholders indicated that they are willing to overlook deficits in communication skills, particularly for early-career applicants, and will train motivated and dependable employees on the manufacturing floor. Later-career applicants may have some experience working with their hands but are more likely to have a spotty work history or fail to pass a drug screen.

- **Work experience.** Work experience in the form of apprenticeships or internships, like MECOP (Multiple Engineering Cooperative Program), was cited as in high demand within the advanced manufacturing sector. Interview stakeholders indicated that MECOP graduates are immediately placed and often have several offers.
- **Clear criminal background.** Most advanced manufacturing survey respondents (76 percent) do not identify difficulty filling positions due to an applicant's criminal background. Interviewees indicated this was only a moderate issue. Some companies do felony-only background checks and many are "second chance" or "felony-friendly" employers.
- **Clean drug screen.** Most advanced manufacturing survey respondents (72 percent) do not identify difficulty filling positions due to drug screening issues. However, interview results suggest this finding may depend on the region and type of job. For low-skilled, entry-level jobs, a Bend-area employer cited marijuana as a substantial challenge. This stakeholder reported that a Central Oregon company recently removed marijuana from their drug panel in order to fill positions. Companies that must comply with federal law face difficulties educating employees about the difference between Oregon and federal law.
- **Other.** Advanced manufacturing employers in rural areas have some difficulty finding applicants with adequate transportation to and from remote manufacturing plants.

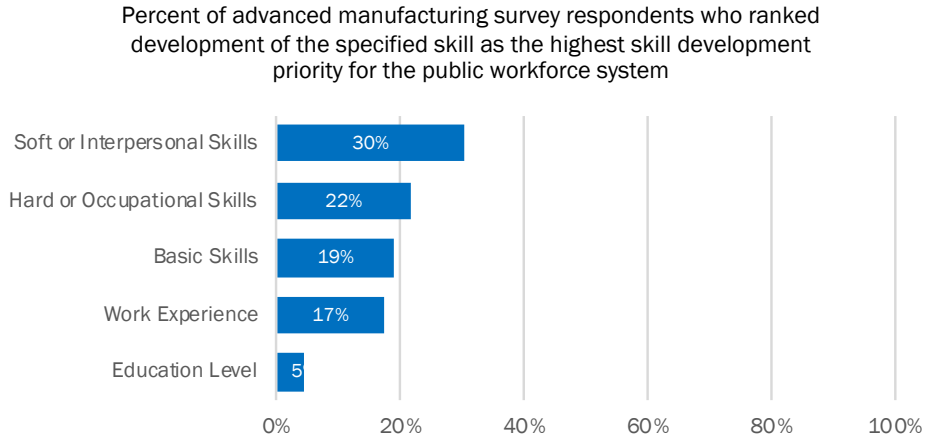
Responses to skill development needs

The advanced manufacturing industry relies heavily on internal training to develop the specialized skillsets needed in their workforce. Almost all survey respondents use on-the-job training (96 percent), in-house staff (88 percent), and industry, business, or professional organizations (84 percent).

Industry stakeholders want to see educators and businesses collaborate to support more work-based learning opportunities for students at younger ages. Interviewees emphasized the importance of CTE programs, as well as internships and apprenticeships, and indicated a desire for such programs to be incorporated into every child's education. Business leaders discussed a need to reduce the negative stigma associated with manufacturing and hoped that increased exposure to the industry would reduce the stigma.

Advanced manufacturing survey respondents identified soft or interpersonal skills and hard or occupational skills as development priorities in the public workforce system. Interviewees mentioned that the quickly evolving manufacturing industry requires an evolving skillset. Thus, training incumbent workers is important. Interviewees cited incumbent worker grants from WorkSource as valuable in training efforts.

Figure 3. Advanced manufacturing respondents identify development of soft and occupational skills as public workforce priorities



Industry: Bioscience

Key findings

Bioscience stakeholders generally perceived skill issues related to both hard/occupational and soft skills. Their trade organization plays a leading role in responding to the skill needs in the incumbent workforce by providing training options that are responsive to industry demand. The assessment of the bioscience industry comprises seven survey respondents and four interviewees. We also engaged with bioscience stakeholders at the talent summit breakout sessions. Because of the small sample size, our findings are not necessarily representative of or generalizable to the broader bioscience industry in Oregon.

BIOSCIENCE

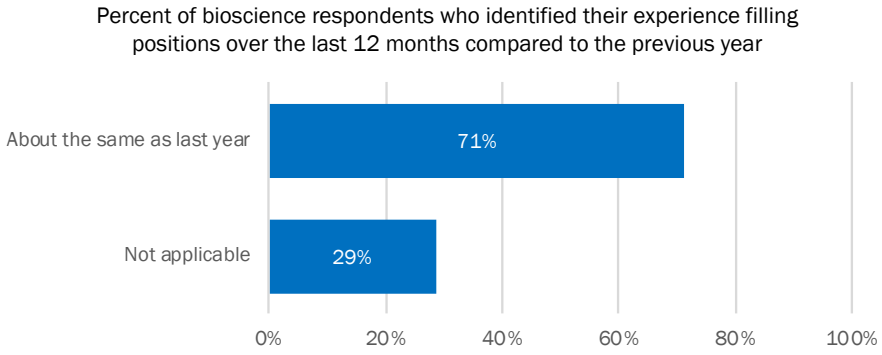
Percent reporting they had **hired new employees** in last 12 months:

43%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

43%

Figure 1. Compared to last year, most bioscience survey stakeholders cite the same level of difficulty in finding qualified applicants



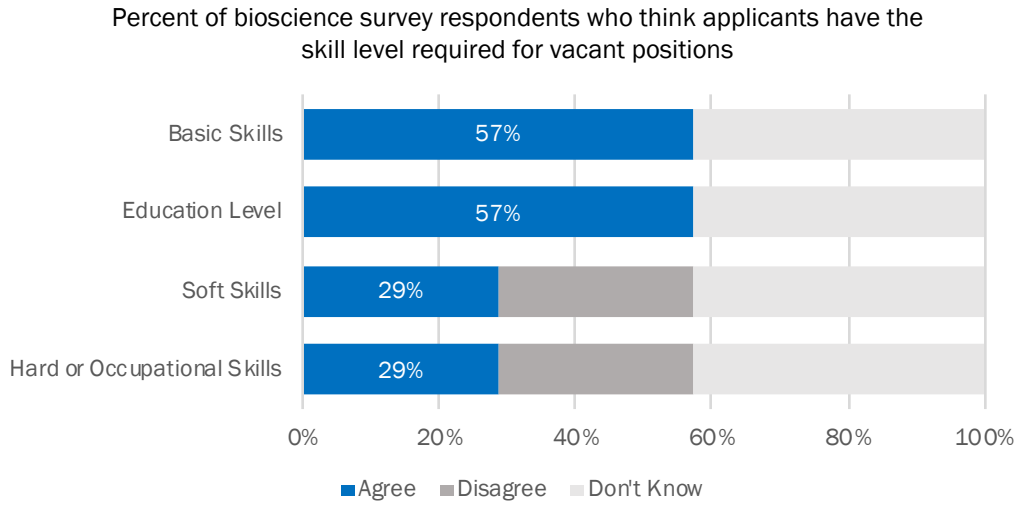
Key occupations in demand

In interviews, business leaders in the bioscience industry cited the following occupations as in-demand:

- Research assistants
- Quality assurance and compliance (e.g. FDA regulatory knowledge)
- Lab technicians
- Project managers
- Biomedical engineers
- Advanced manufacturing

Key skills in demand

Figure 2. Bioscience respondents think applicants have the required education levels and basic skills, but lack soft and occupational skills



Employer interviews and the key stakeholder surveys revealed the following in-demand skills and/or shortage of skills in the bioscience industry:

- **Education level.** Most survey respondents felt that applicants had the education needed to fill vacant positions.
- **Basic skills.** Interviewees cited demand for basic math, data analysis, and written communication skills but did not indicate a shortage of these skills among their applicants. Survey responses align with these impressions, with most respondents agreeing that applicants have the basic skills required for the job.
- **Hard skills.** In light of growth in digital health products, bioinformatics, and interfacing with medical devices, the industry is in need of people with skills in computer science, cybersecurity, IT, and data analytics. FDA regulatory knowledge and experience is also highly valued. Interviewees cited the need for, and lack of, critical thinking and office software knowledge (e.g., Excel, Word), particularly among early-career applicants. Survey respondents were split on whether applicants had the necessary hard skills to fill vacant positions, with half agreeing and half disagreeing (a substantial proportion of respondents indicated they didn't know or the question was not applicable).
- **Soft skills.** Bioscience employers value soft skills, including communication and leadership skills. However, survey and interview results were mixed as to whether prospective and current employees lacked these skills. Survey respondents were split on whether applicants had the needed soft skills, with half agreeing and half disagreeing (a substantial proportion of respondents indicated they didn't know or the question was not applicable). In interviews, the lack of soft skills was seen as more of an issue with early- and mid-career employees than with more experienced applicants or employees.
- **Work experience.** Stakeholders within bioscience emphasized the value of practical skills, including lab experience and gowning practices, and indicated that it is not enough to understand the science taught in 4-year colleges. The challenge is learning the real-world application of science.
- **Clear criminal background**. Most bioscience respondents (86 percent) did not know of the impact or found the impact of criminal background results not applicable to their situation.

- **Clean drug screen.** Interviewees and survey respondents did not view this as a concern with their workforce.
- **Other.** Stakeholders did not discuss other skillsets perceived as missing in the bioscience workforce.

> "For our industry specifically, we are really leaning toward personalized medicine and a lot of data analysis. I'm concerned we are not going to fill that skill set. Our ability to keep up and fill pipelines of talent is a concern. I'm worried we aren't being proactive enough and working with industry enough to fill the need in a timely manner."

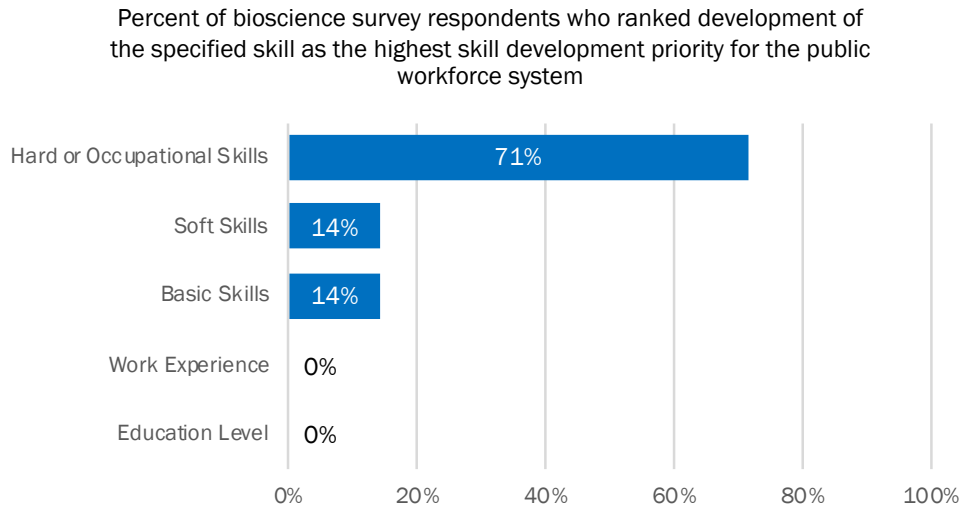
Responses to skill development needs

Industry stakeholders recognized the good work being done to develop skills in the bioscience workforce at the community college and university level and the need for additional training to help students translate what they learn in school to the workplace. Additionally, stakeholders reported that the bioscience workforce needs skill augmentation throughout a career: "An initial education at a university won't take you through a lifetime. We need to invest in incumbent work training."

Training efforts in the bioscience industry are led by the Oregon Bioscience Association and focus on incumbent and displaced worker training through the BioPro and BioCatalyst training programs. Training is industry-led and industry-vetted, with the industry association facilitating the process, including finding trainers (industry-level consultants), convening training on-site at businesses, and evaluating training outcomes with businesses. Training topics are generally focused on enhancing soft/essential and hard/occupational skillsets.

Oregon's workforce system collaborated in the development and implementation of the BioCatalyst program for displaced workers, with some WorkSource clients finding employment through program participation. Seventy-one percent of bioscience survey respondents identified development of hard or occupational skills as the development priority for the workforce system, and 14 percent identified soft skills and basic skills each as the priority.

Figure 3. Hard or occupational skills identified as public workforce priority



Industry: Construction

Key findings

According to construction industry stakeholders, hard skills are highly valued and in short supply, particularly among recent high school graduates. Stakeholders discussed recruitment limitations associated with a broader culture of under-valuing work in the trades and capacity constraints in apprenticeship programs. Construction industry representatives hope the growing focus on career and technical education (CTE) programs will help address persistent skill issues in the industry.

The construction survey respondent sample size of 21 may not represent broader industry trends. An additional seven individuals were engaged through a focus group and interviews. We also engaged with construction stakeholders at the talent summit breakout sessions.

CONSTRUCTION

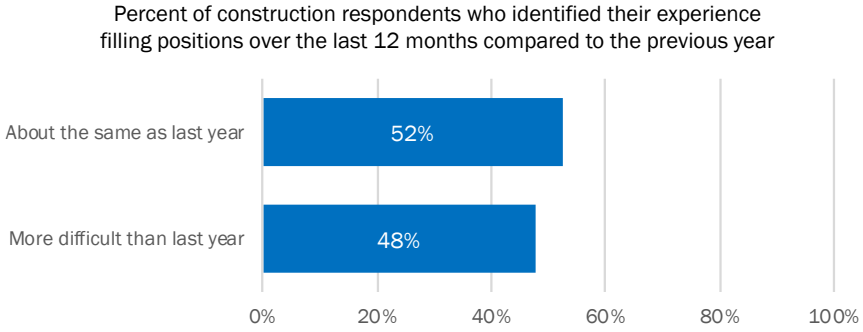
Percent reporting they had **hired new employees** in last 12 months:

100%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

91%

Figure 1. Compared to last year, most construction survey stakeholders cite the same level of or more difficulty in finding qualified applicants



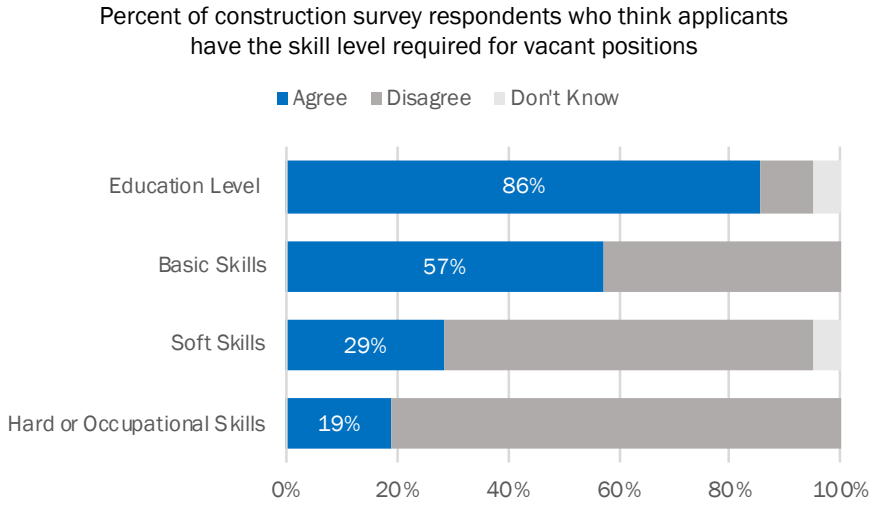
Key occupations in demand

In interviews, employers in the construction industry cited the following occupations as in-demand:

- Construction project managers
- Engineers
- Skilled trades:
  - Sheet metal workers
  - Plumbers
  - Drywallers
  - Glaziers
  - Cement workers
  - Electricians
  - Mechanics
  - Carpenters

Key skills in demand

Figure 2. Most construction respondents think applicants have the required education levels, but lack hard or occupational skills



Interview participants and the key stakeholder surveys revealed the following in-demand skills and/or shortage of skills in the construction industry:

- **Education level.** Most construction industry survey respondents felt that applicants had the required education level for vacant positions. Construction industry interviewees report that there is no shortage of college degree holders on the job site. Some college degree holders find their way into construction after reportedly struggling to find the right fit in the workforce. Employers indicate that most apprentices or new hires in the industry are in their mid-to-late twenties, and attribute this to a failure to expose students to construction trades and the merits of the industry in high school. Construction employers cite a need for more construction management degree holders.
- **Basic skills.** Over half of survey respondents (57 percent) thought that applicants had the necessary basic skills for the job. Interviewees did not cite basic skills as a key in-demand skill set.
- **Hard skills.** Construction industry employers were most likely to cite hard skills as lacking among applicants; only 19 percent of respondents thought applicants had these skills. According to construction industry interviewees, over the last 15 years fewer applicants are able to work with their hands. Interviewees also cite shortages in the skilled trades and a need for safety protocol training and awareness.
- **Soft skills.** Similar to hard skills, only 29 percent of survey respondents felt that applicants had the necessary soft skills. Interviewees report that soft skills, like leadership and management, are hard to find in the market.
- **Work experience.** Several interviewees cited the value of work experience, including both practical experience doing a specific skill and general knowledge of the construction industry.
- **Clear criminal background.** Most survey respondents (67 percent) did not think that applicants' failure to pass a background check made it harder for them to fill positions, while 29 percent of construction respondents did. The issue of criminal background checks did not come up as an issue in the interviews with construction industry stakeholders.

> "Most people can learn their craft after four years in an apprenticeship or on the job, but soft skills take a while. We need a balance between soft skills and skilled trades."

- **Clean drug screen.** As with criminal background checks, many respondents did not know about the impact of drug screens or did not find the question applicable, but of those who did, just over half (57 percent) did not think that applicants' failure to pass a drug screening made it harder for them to fill positions. More than one third of respondents (38 percent) did identify problems in hiring related to drug screening. Interviewee input indicates that construction jobs require a clean drug screen. Marijuana legalization was discussed as a complicating issue.
- **Other.** Construction employers cite a need for job seekers who are willing to temporarily relocate to be near a construction site, or who have transportation to get to remote jobsites. Some also discussed desire for a more diverse workforce, including increased representation of women and minorities.

Responses to skill development needs

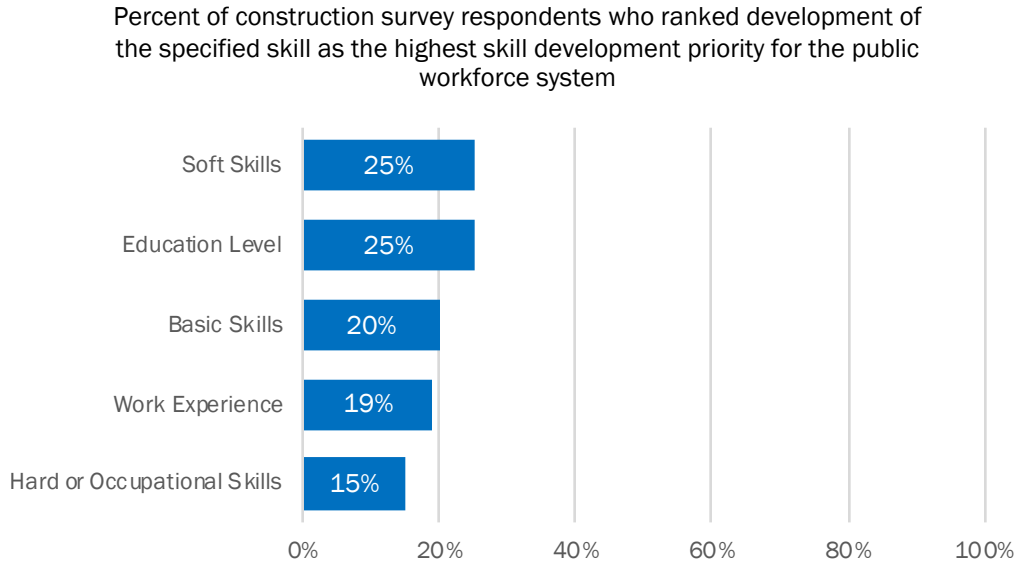
Construction companies rely heavily on on-the-job training, with 95 percent of survey respondents citing this as a training resource. The second most used resources were apprenticeships and in-house staff (57 percent each). Interviewees agreed, discussing how they are internally building their own leaders from skills to management.

Construction stakeholders viewed the need for a collaborative approach to building social capital in the state's workforce. Businesses felt that education should focus on developing soft skills and informing students of career opportunities outside of college. Interviewees and focus group attendees wanted to see a reduction in the negative stigma associated with construction and working in the trades by broadening educators' and students' understandings of career path options. Associated General Contractors-Oregon has implemented extensive educator externship programs to support increased awareness of construction career opportunities and associated skill needs.

Interviewees cited the importance of growing career and technical education (CTE) programs in high schools. Stakeholders were glad to see the recent transition back toward CTE programs. Stakeholders noted the greater success the construction industry has had working with postsecondary schools. Stakeholders reported that OSU has a good construction management program. Many reflected on the need for continuity of skill development recognition between high school and postsecondary programs, with possible solutions including dual credits or other approaches to recognizing pre-apprenticeship credits when applying for apprenticeships. Interviewees discussed promising work in developing career pathways for trades occurring in the Mid-Willamette Education Consortium.

Stakeholders generally did not see a lot of value in working with the public workforce system to develop talent for the construction industry. They cited the complexity and slowness of the system as barriers to collaboration. Stakeholders reported that government responses were uncoordinated, with every county's workforce system trying to recreate the wheel. One-quarter of construction survey respondents identified development of soft skills or education level as the first skill development priority for the workforce system. These responses were followed closely by basic skills, work experience, and hard or occupational skills.

Figure 3. Construction respondents were fairly evenly split in identifying the number one skill development priority for the public workforce system.



Industry: Energy

Key findings

Energy sector representatives generally indicate that candidates have the skills they seek, but representatives also report a severe shortage of utility line workers. They also cite a need for experienced engineers, particularly electrical and chemical. To fill both line worker and engineer positions, employers are recruiting and hiring out-of-state. A small number of energy stakeholders participated in the assessment, with six survey respondents and three interviewees. We also engaged with energy stakeholders at the talent summit breakout sessions. Because of the smaller sample size, our findings may not represent broader energy industry trends.

ENERGY

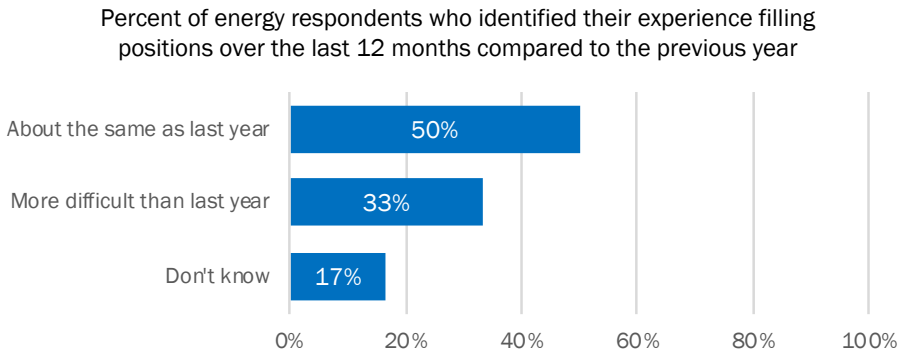
Percent reporting they had **hired new employees** in last 12 months:

83%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

50%

Figure 1. Compared to last year, most energy survey stakeholders cite the same level of or more difficulty in finding qualified applicants



Key occupations in demand

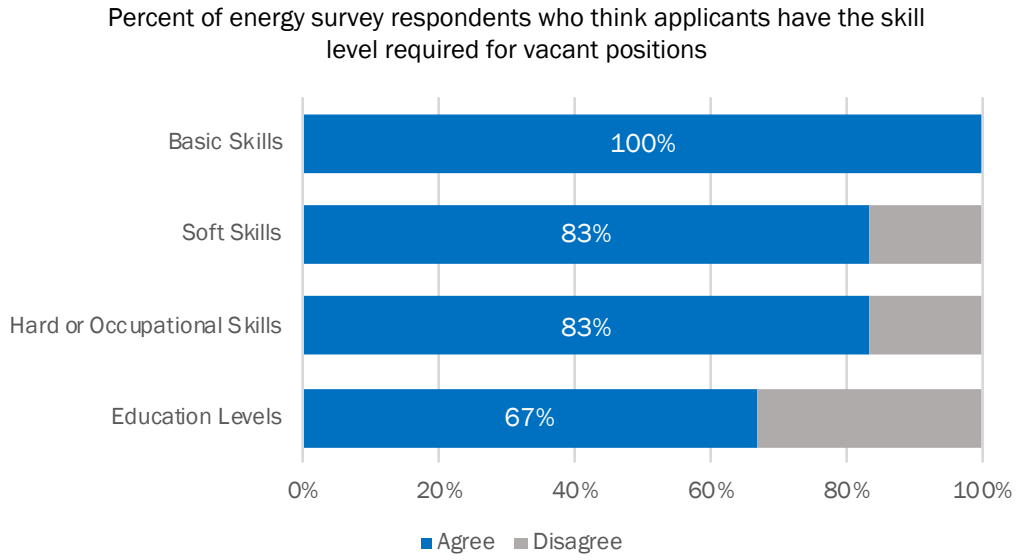
Business leaders interviewed in the energy industry cited the following occupations as in-demand:

- Utility line workers
- Engineers:
  - Chemical
  - Electrical
- IT/cybersecurity workers

"If you are a certified licensed line worker, you can pretty much write your own ticket."

Key skills in demand

Figure 2. Energy survey respondents noted that applicants have the required skills for vacant positions



Interviews and survey results revealed the following in-demand skills and/or shortage of skills in the energy industry:

- **Education level.** While most (67 percent) energy industry survey respondents felt that applicants had the necessary level of education, this was the lowest performing skill set among the four surveyed. Interviewees indicate that they seek out engineers with college degrees or higher, as well as work experience, but find that they sometimes have to go out-of-state to find a qualified candidate. Within the energy industry trades, interviewees cited a dramatically insufficient supply of apprentice and journeyman utility line workers.
- **Basic skills.** All six survey respondents within the energy industry felt that the applicants for their vacant positions had the necessary basic skills. Interviewees did not cite problems finding candidates with basic skills.
- **Hard skills.** Nearly all survey respondents felt that applicants had the required hard skills for the job. Interviewees indicated that the hard skills most in demand were critical thinking and problem-solving, cybersecurity, computer science, and computer-aided machinery.
- **Soft skills.** Similar to hard skills, nearly all survey respondents felt that applicants had the needed soft skills. Interviewees reported that soft skills are in demand but are usually present in later-career applicants, which is the preferred labor pool for the energy sector employers interviewed.
- **Work experience.** Small energy firms may avoid hiring new graduates because they lack practical experience and require a significant investment before they are productive. Large utilities rarely hire recent graduates because they don't have to; large utilities are a desirable workplace and typically receive more experienced applicants for their needs. The exception is line workers, which are in high demand. However, line workers must come in licensed, so they arrive with several years of experience as an apprentice and journeyman.
- **Clear criminal background.** No energy survey respondents thought that applicants' disqualification due to failure to pass a background check made it harder for them to fill positions.

- **Clean drug screen.** No energy survey respondents thought that applicants' disqualification due to failure to pass a drug screening made it harder for them to fill positions.
- **Other.** Energy sector representatives within public utilities cited demand for increased racial, ethnic, and gender diversity within the labor pool.

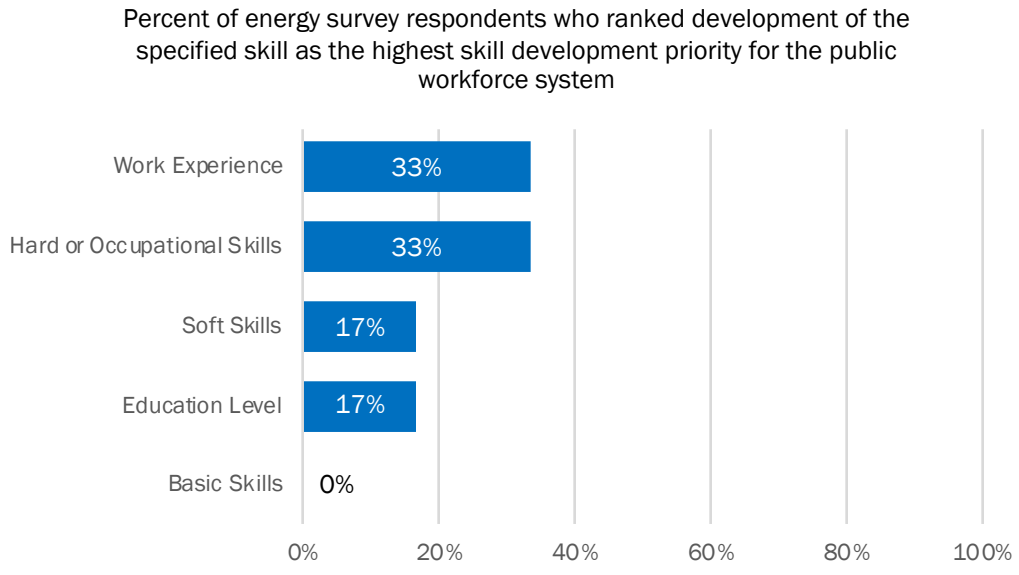
Responses to skill development needs

Energy stakeholders reported heavy reliance on internal training to develop the hard or occupational skills needed in their workforce, with most citing on-the-job training and industry, business, or professional organizations. Businesses felt it was their job to support their employees' skill development in this area because of the specialized nature of their business.

Business leaders felt the education sector's role is to develop work-ready workers with essential skills, basic math and writing, computer skills, and the ability to work on teams. Students need to graduate knowing how to transfer their learned skills to the workplace. Interviewees discussed examples of collaboration between industry and postsecondary institutions including shaping curriculum to meet industry needs and internship programs.

In terms of the government's role, survey respondents wanted to see the public workforce development system prioritize work experience and hard or occupational skill development. Interviewees discussed integrating work experience at younger ages so high school graduates have work experience on their resumes, which would also build hard/occupational skills. Interviewees also reflected on the need to invest more funding into K-16 public school options and want to see governmental leadership in the collaborative effort to develop talent in Oregon's workforce.

Figure 3. Work experience and hard skills were ranked as the highest skill development priority for the public workforce system



Industry: Food and beverage

Key findings

The food and beverage industry, similar to advanced manufacturing, requires a mixed skillset for its workforce, including people adept in skilled trades, equipment use, and administrative work. Negative stigmas associated with working in the trades and relatively low wages create challenges in recruiting employees. Employers rely heavily on internal training mechanisms for their employees.

The food and beverage survey respondent sample size of 24 may not represent broader industry trends. An additional eight individuals were engaged through a focus group and interviews. We also engaged with food and beverage stakeholders at the talent summit breakout sessions.

FOOD AND BEVERAGE

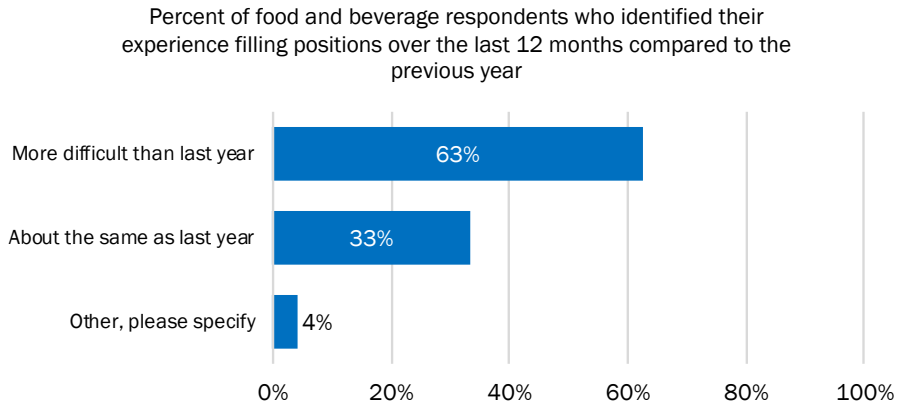
Percent reporting they had **hired new employees** in last 12 months:

96%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

88%

Figure 1. Compared to last year, most food and beverage survey stakeholders cite more difficulty in finding qualified applicants



Key occupations in demand

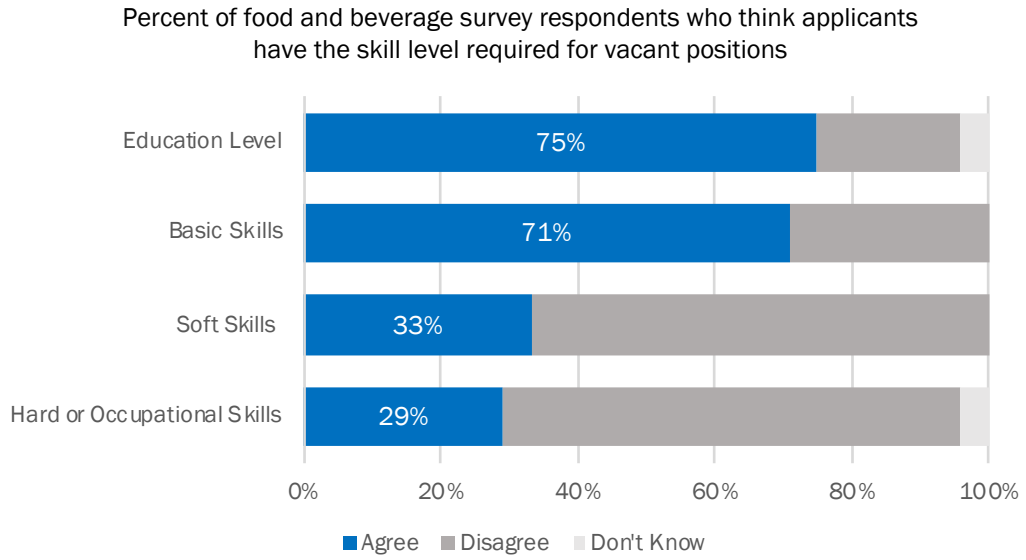
Business leaders interviewed in the food and beverage industry cited the following occupations as in-demand:

- Heavy machinery operators (e.g., fork lift)
- Production line and machine operators
- Maintenance supervisors
- Truck drivers
- Human resources admins
- Marketing & sales admins
- Skilled trades/maintenance:
  - HVAC workers
  - Electricians
  - Mechanics
  - Millwright
  - Machinist
- Accountants
- Engineers (food science)
- Managers (food processing and quality assurance)
- Sanitation workers
- Food safety workers
- Warehouse operators
- Field laborers

"Automation is huge – from robots, to speaker systems, automatic doors, infrared systems, hands-free restrooms, conference calls, etcetera. We need people who understand how the technology operates, how we can maintain it, how can we troubleshoot, how do we use it."

Key skills in demand

Figure 2. Food and beverage survey respondents noted that applicants have the education level and basic skills required, but lack hard and soft skills



Interviewees, focus group participants, and the key stakeholder survey results revealed the following in-demand skills and/or shortage of skills in the food and beverage industry:

- **Education level.** High school education is viewed as the baseline, with trade school for engineering or a National Career Readiness Certificate regarded as value added. Bachelor's degrees were not viewed as needed for most jobs. The quality of graduates for jobs in the wine industry requiring a bachelor's—such as a viticulture degree from Oregon State—is high and the number of graduates matches demand. The wine industry sees a shortage of local graduates in marketing, administration, and sales; they need to import these workers from California. Survey responses largely reflect these sentiments as well, with most responding that applicants had the education level needed for vacant positions.
- **Basic skills.** Seventy percent of survey respondents felt that applicants had the basic skills needed for vacant positions. Interviewees did not indicate that basic skills were an issue.
- **Hard skills.** Survey respondents generally did not feel applicants had the hard skills needed to fill vacant positions. Interviewed stakeholders shared that production line work is increasingly analytical, often requiring the ability to operate automated machinery, conduct quality control, prioritize sanitation, and interpret charts and graphs. Specialized skills for particular food and beverage industries are also in demand, such as viticulture, skilled field labor, and business management. Employers thought recent high school graduates lacked critical thinking and problem-solving skills, and had limited exposure to diverse career opportunities in various industries.
- **Soft skills.** Most survey respondents did not think applicants had the soft skills needed to fill vacant positions, and this finding is supported by the interviews and focus group with representatives from this industry. Employers cited a need for motivation, customer service, communication, dependability, teamwork, and grooming, indicating that these skills and traits are so important and hard to find that they may trump training in some circumstances; they will train the right person.
- **Work experience.** Some interviewees indicated that they look for relevant work experience first, including some experience in warehousing and grocery distribution. While most applicants have

experience, employers encounter "job-hoppers" and are wary of investing in an employee who won't stay. Internships, job shadowing or mentorships are also valued in the industry.

- **Clear criminal background.** Fewer than half of food and beverage survey respondents thought that applicants' disqualification due to failure to pass a background check (42 percent) made it harder for them to fill positions. Approximately one third thought these issues did make it harder to fill positions, and one quarter did not know or the question was not applicable.
- **Clean drug screen.** Less than half of food and beverage survey respondents thought that applicants' disqualification due to drug screening (46 percent) made it harder for them to fill positions. Approximately one third thought these issues did make it harder to fill positions, and one quarter did not know or the question was not applicable.
- **Other.** Some employers cited difficulties attracting employees to rural areas.

Responses to skill development needs

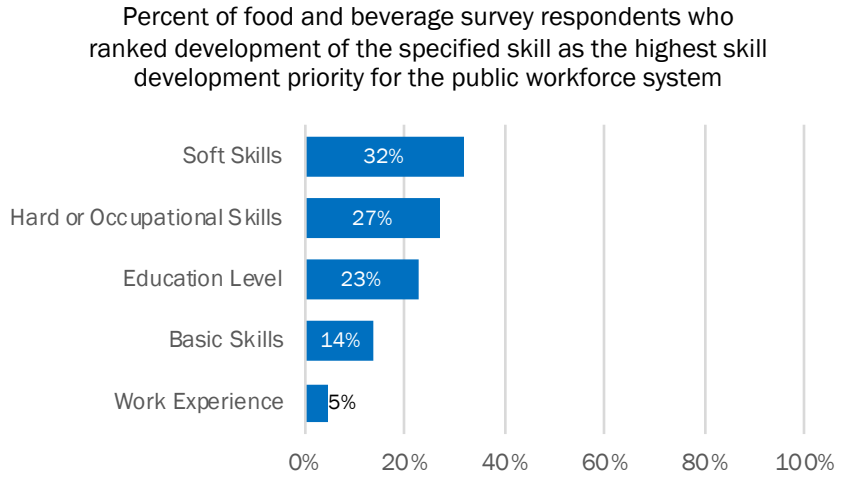
Food and beverage industry stakeholders discussed recruitment challenges associated with relatively low wages paid in their sector because of consumer demands for low food prices. Survey respondents said that in response to their difficulty finding qualified applicants, they most commonly increase recruiting (91 percent), increase overtime hours for current employees (67 percent), and/or hire a less qualified applicant (62 percent). This represents the highest industry response for using overtime or hiring less qualified applicants.

Business leaders discussed the need to reduce the negative stigma associated with working in the trades and manufacturing and hoped that increased exposure could reduce the stigma. Some businesses are implementing externships and plant tours to educate educators about the work they do in the food and beverage industry. One high school principal who toured a plant reinvented school attendance expectations as a result of hearing about absenteeism issues in the workforce.

The food and beverage industry relies heavily on internal training to develop the specialized skillsets needed in their workforce, with almost all survey respondents using on-the-job training (92 percent), 79 percent using in-house staff, and three quarters using industry, business, or professional associations. Stakeholders wanted to see a stronger focus on developing hard or occupational skills and work experience through career and technical education (CTE) programs, trade schools, and work-based learning opportunities. Some businesses are focusing on internships with postsecondary education programs, including the Portland State University Food Leadership Program and the University of Portland.

Survey respondents reflected on the desire to see the public workforce system focus on developing soft and hard/occupational skills in their workforce.

Figure 3. Development of soft skills, occupational skills, and education level were selected by the most food and beverage respondents as the first skill development priority for the public workforce system



Industry: Healthcare

Key findings

Healthcare industry stakeholders cite a shortage of healthcare providers at all levels, particularly in rural areas and certain specialties, such as general surgery and primary care. Employers are seeking candidates with strong critical thinking skills, communication skills, and the necessary training and degree for the job.

The healthcare survey respondent sample of 30 may not represent broader industry trends. An additional five individuals were engaged through interviews. We also engaged with healthcare stakeholders at the talent summit breakout sessions.

HEALTHCARE

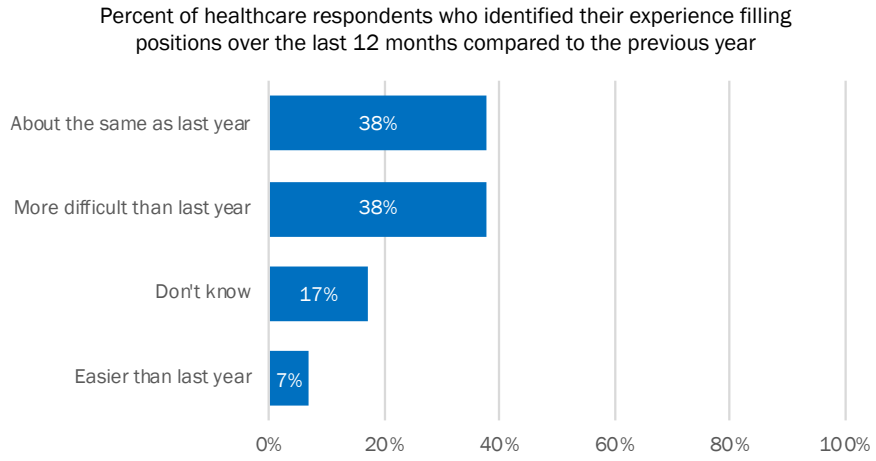
Percent reporting they had **hired new employees** in last 12 months:

97%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

83%

Figure 1. Compared to last year, most healthcare survey stakeholders cite about the same level of or more difficulty in finding qualified applicants



Key occupations in demand

Business leaders interviewed in the healthcare industry cited the following occupations as in-demand:

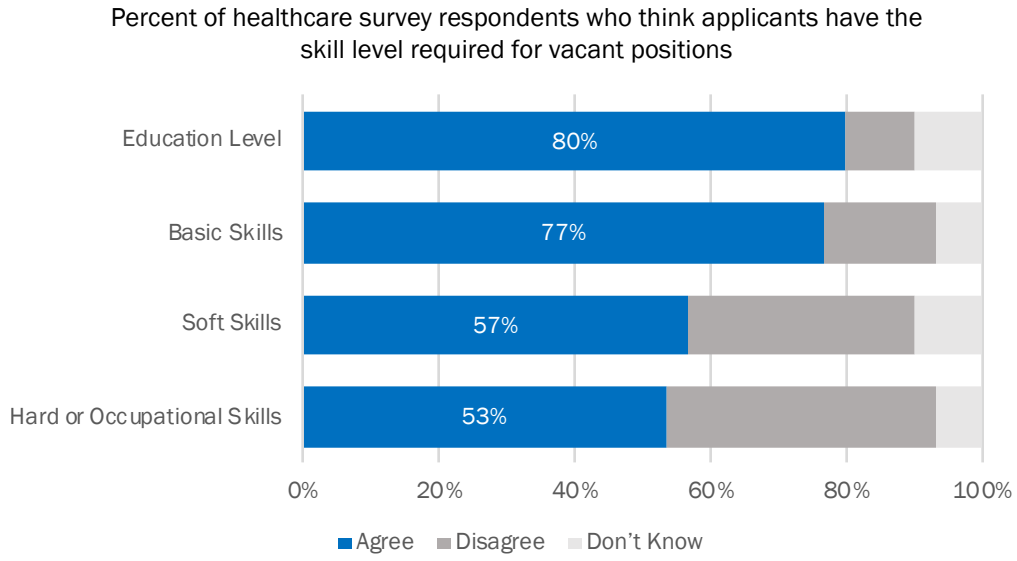
- Medical assistants
- Certified nursing assistants
- Registered nurses (RN/BSN))
- Nurse practitioners
- Physician assistants
- Psychologists/counselors
- Home health specialists
- Medical billing/collections
- Pulmonary specialists/ respiratory therapists
- Occupational therapists
- Physical therapists
- Catheterization lab techs
- Physicians:
  - General Practitioners
  - Psychiatrists
  - General Surgeons
  - Obstetricians
  - Intensivists
  - Hospitalists
  - Oncologists

Nearly all levels of healthcare practitioners are continuously in demand, from medical assistants to physicians with hard-to-find specialties. Specific specialized skills are also in demand, such as catheterization lab technicians, respiratory therapists, and occupational or physical therapists.

Healthcare employers face challenges finding experienced medical assistants and certified nurse assistants because many view the degree as a stepping stone to nursing school. Consequently, many recent community college graduates in these professions do not have hands-on experience.

Key skills in demand

Figure 2. Most healthcare survey respondents noted that applicants have the skills required for vacant positions, especially related to education level and basic skills



Employer interviews and the key stakeholder survey revealed the following in-demand skills and/or shortage of skills in the healthcare industry:

> "Employers are looking for nurses that have a high level of education and a high level of critical thinking skills. Ideally, they are looking for 'plug and play' new hires."

- **Education level.** Healthcare interviewees reported that education level drives hiring within their industry. While most (80 percent) healthcare survey respondents felt that their applicants had the necessary education for vacant positions, 83 percent reported they had difficulty finding qualified applicants, pointing to a shortage of trained healthcare providers. Driving some of the demand for nurses with bachelor's degrees (BSN) is the Joint Commission on Accreditation of Healthcare Organizations and U.S. News and World Report rankings that weight a BSN over a nurse with an associate degree, as well as the Institute of Medicine's Future of Nursing report, which has been backed by the Organization for Associate Degree Nursing (OADN) and the American Nurses Association (ANA), recommending that 80 percent of nurses be educated to the Bachelor of Science in Nursing (BSN) degree level by 2020. Consequently, nurses with associate degrees (Registered Nurses) are now incentivized by their employer to get a BSN.
- **Basic skills.** In general, stakeholders did not view basic skills as problematic in new hires.
- **Hard skills.** Survey respondents were most likely to indicate that hard skills were the skill set most lacking in applicants for vacant positions. Healthcare interviewees emphasized the value of critical thinking skills in all health-related occupations. They also emphasized the value of trained, competent candidates with a working knowledge of medical vocabulary, information technology systems, and who are ready to work.
- **Soft skills.** Nurses with the ability to manage complex needs are in demand. Interviewees indicated only moderate challenges finding candidates with the needed soft skills.

- **Work experience.** Interviewees indicated that nurses with surgical experience and medical assistants and certified nursing assistants with work experience were in demand.
- **Clear criminal background.** Most healthcare survey respondents (73 percent) did not think that applicants' disqualification due to failure to pass a background check made it harder for them to fill positions. Approximately ten percent thought these issues did make it harder to fill positions, and roughly 20 percent did not know. Issues with criminal background did not come up in interviews with healthcare industry interviewees.
- **Clean drug screen.** Most healthcare survey respondents (67 percent) did not think that applicants' disqualification due to a failed drug screening made it harder for them to fill positions. Approximately ten percent thought these issues did make it harder to fill positions, and roughly 20 percent did not know. A clean drug screen was identified as a moderate issue by one healthcare industry interviewee.
- **Other.** Stakeholders discussed challenges associated with recruiting and retaining talent in rural areas.

Responses to skill development needs

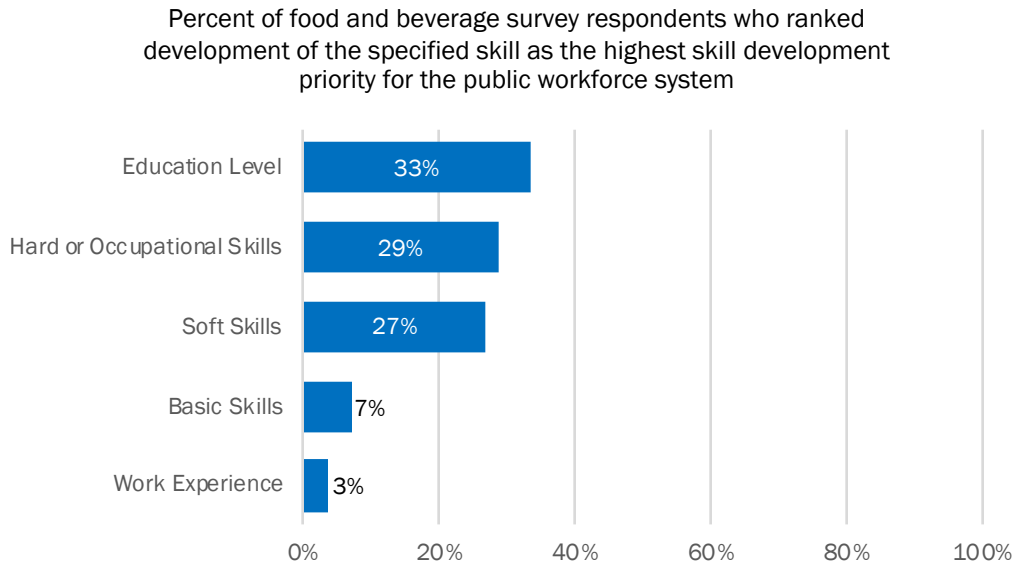
> "Employers need to start investing even more in education. Employers need to be involved in addressing student costs, faculty issues, and clinical placements. Employers need to get really involved."

Healthcare survey respondents cited internal training in terms of on-the job training (83 percent) and in-house staff (80 percent) as well as self-study/online training (70 percent) as the most common resources used to strengthen their workforce's skills. Stakeholders felt that employers had to play a larger role in educating healthcare workers to alleviate the deficits found in higher education. Finding faculty and clinical placements is the challenge for nursing programs. To teach at the BSN level, individuals must have an advanced degree (master's or PhD). Educational institutions are not able to compensate faculty comparably to salaries made working in the healthcare industry, resulting in faculty shortages and fewer "slots" available in nursing school. In part to address this issue, the Oregon Consortium of Nursing Education (OCNE) developed a program to help RNs with associate degrees reach the BSN level by taking senior-level coursework required for the degree through the OHSU Portland campus or via online delivery. With the online options, OCNE students can complete the coursework for the BSN without leaving their home community.

Oregon Health and Science University is also working with employers in rural areas to bring providers in training or recently out of school to underserved, rural areas. Employers and government are also using loan repayment programs and signing bonuses to incentivize healthcare professionals to live and work in rural areas.

Survey respondents felt the public workforce system should focus on developing soft and hard/occupational skills in the healthcare workforce. Interviewees discussed successful conversations facilitated by WorkSource regarding medical assistants and certified nurse assistants, to learn from employers about changing hard/occupational skills needed, so they could respond with appropriate training.

Figure 3. Development of education level, occupation skills, and soft skills were selected by the most healthcare respondents as the first skill development priority for the public workforce system



Industry: Maritime

Key findings

While stakeholders find that applicants generally have the needed skills, the industry faces a shortage of talent because of competition from oil rigs in the Gulf of Mexico, which can pay much more for fewer weeks of work. Similarly, research vessels can struggle to find talent because seaman jobs on commercial fishing boats have more competitive pay and schedules.

The maritime survey respondent sample of three may not represent broader industry trends. An additional three individuals were engaged through interviews.

MARITIME

2 out of 3 survey respondents reported they had **hired new employees** in last 12 months

2 out of 3 reported they had **difficulty finding qualified applicants** in last 12 months

Key occupations in demand

Business leaders interviewed in the maritime industry cited the following occupations as in-demand:

- Seamen/fishermen
- Welders
- Engineers (marine)
- Mechanics (diesel)
- Supply chain and logistics managers

Key skills in demand

Employer interviews and the key stakeholder survey revealed the following in-demand skills and/or shortage of skills in the maritime industry:

- **Education level.** All three maritime survey respondents felt that applicants had the education level required for open positions. Interviewees reported that the in-demand education level within the maritime industry included Coast Guard certifications and bachelor's degrees for survey technician positions and marine engineers. Interviewees reported that Washington-trained seaman are more common because there is a community college program in Washington.
- **Basic skills.** All three maritime survey respondents felt that applicants had the basic skills required for open positions and it did not come up in interviews as an in-demand skillset.
- **Hard skills.** All three maritime survey respondents felt that applicants had the hard skills required for open positions. However, interviewees expressed difficulty finding boat operators. Employers face substantial competition for skilled seamen and other on-boat positions with employers on oil rigs in the Gulf of Mexico. Research vessel operators have trouble competing with the pay and schedule offered by fishing vessels. The hard skills identified as most in-demand by maritime interviewees included boat skills, seamanship skills, fishing skills, and firefighting. An interviewee also discussed the need for financial management skills to help the workforce manage the cyclical nature and finances of the work.
- **Soft skills.** Finding applicants with the necessary soft skills was generally not an issue for most maritime stakeholders. Two out of three survey respondents felt that applicants also had the required soft skills and interviewees viewed it as not a problem or only a moderate problem.
- **Work experience.** Interviewees reported difficulties retaining people with commercial fishing experience, but otherwise work experience was not cited as a key in-demand attribute.

- **Clear criminal background.** Maritime survey respondents did not know about the impact of disqualification due to criminal background on hiring. It was also not identified as an issue in interviews.
- **Clean drug screen.** Maritime survey respondents did not know about the impact of disqualification due to drug screening issues on hiring. It was also not identified as an issue in interviews.
- **Other.** Industry respondents noted the challenge of attaching maritime workforce to an address, and the implications for both workers, who are not recognized by Workforce Investment if they report to work out of state, and for the economic and workforce departments, who can count the maritime employers, but do not have a method for counting maritime employees working for out of state companies. Additionally, stakeholders noted that most of the clusters in the sector are not recognized in the industry codes and are therefore undercounted in workforce figures. Finally, maritime work is seasonal and cyclical, which affects a worker's ability to sustain a salary over the course of the year, and an employer's ability to retain skilled staff during the off-season.

Responses to skill development needs

Community or technical colleges were the most commonly cited recruiting resource by survey respondents (67 percent). In-house staff was the most commonly used training resource (67 percent). Interviewees spoke about the need for in-house training on safety and specialized maritime procedures.

Interviewees discussed the need for young people to understand the pathway associated with a career in the maritime industry. Stakeholders feel responsible for telling students and educators about the career options, associated pay, necessary skills, and the pathway to connect to a job in the industry. Interviewees discussed relationships at the postsecondary level with the Oregon State University (OSU) marine operations program, OSU's Hinsdale Wave Facility, OSU's Marine Studies Initiative, and the Clatsop Community College's Marine and Environmental Research and Training Station. Some expressed a desire to see credits more easily transfer between educational institutions and programs to better support skill development over a lifetime.

Two out of three maritime respondents felt the public workforce system should prioritize hard or occupational skills, and one person identified soft skills as the highest priority skill development service for the system. Interviewees felt that workforce development agencies do not know the skills needed in the maritime industry.

Industry: Outdoor gear and apparel

Key findings

Hard/occupational and soft skills were broadly considered to be lacking among applicants within the outdoor gear and apparel industry. The industry seeks candidates that have both creative and technical skills: designers, engineers, people who can work with their hands, and people who have training or experience in manufacturing. They look for employees who will be team players, motivated, self-directed, and contribute positively to the company culture. Significant work has been done by businesses to shape postsecondary programs to support outdoor industry talent development.

The outdoor industry survey respondent sample of six may not represent broader industry trends. An additional 14 individuals were engaged through interviews and focus groups. We also engaged with outdoor industry stakeholders at the talent summit breakout sessions.

OUTDOOR GEAR AND APPAREL

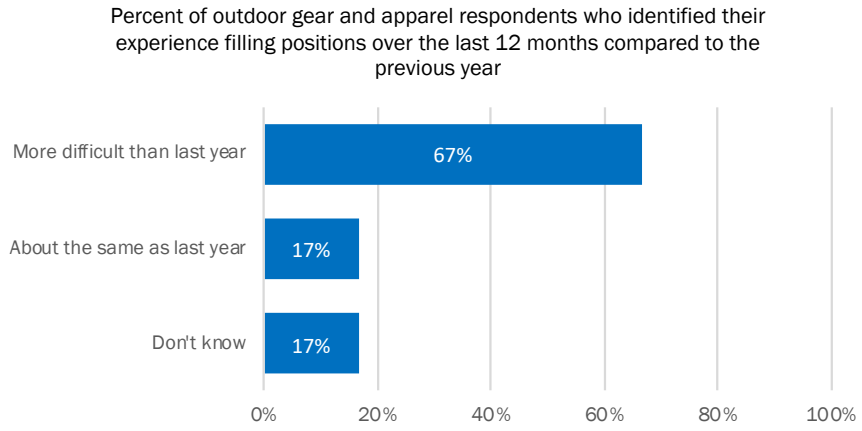
Percent reporting they had **hired new employees** in last 12 months:

83%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

83%

Figure 1. Compared to last year, most outdoor gear and apparel survey stakeholders cite more difficulty in finding qualified applicants



Key occupations in demand

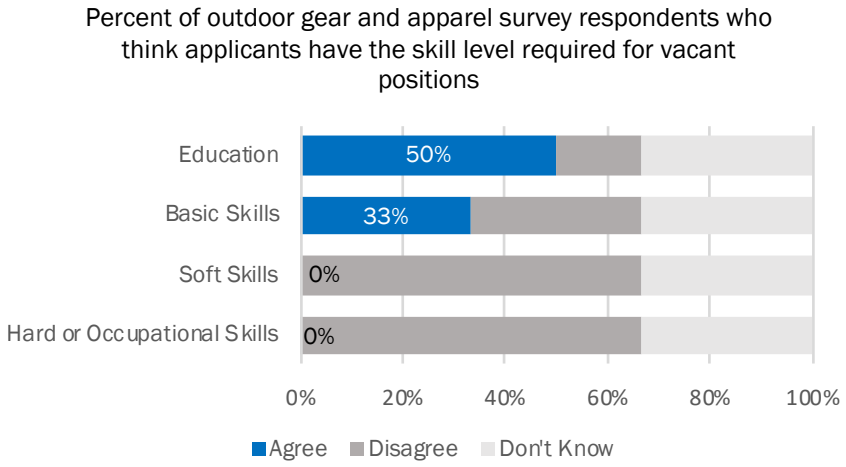
Outdoor gear and apparel industry business leaders engaged through interviews and focus groups cited the following occupations as in-demand:

- Project managers
- Production line managers
- Production line laborers
- Sustainability managers
- Human resources admins
- Supply chain and logistics analysts
- Engineers:
  - Mechanical
  - Industrial
  - Material/Textile
- Mechanics (diesel)
- Data analysts
- Industrial/product designers
- Marketing administrators
- Customer service professionals
- Drafters
- Inventory managers
- Event coordinators

Outdoor gear and apparel stakeholders indicated a growing demand for workers versed in environmental and civic sustainability business practices. The retailers selling their products, as well as some consumers, are wanting reports on production sustainability, including labor practices and material sources.

Key skills in demand

Figure 2. Most outdoor gear and apparel survey respondents noted that applicants lack the soft skills and occupation skills required for vacant positions



Interview and focus group participants and the key stakeholder survey revealed the following in-demand skills and/or shortage of skills in the outdoor gear and apparel industry:

- **Education level.** Of the four skill sets surveyed, outdoor industry respondents were more likely to think that applicants had the appropriate education for vacant positions than the other three skill sets. However, education was identified as in-demand by some stakeholders, particularly mechanical and industrial engineering degrees. Some industry representatives report they currently recruit out-of-state for engineers.
- **Basic skills** About half of survey respondents felt applicants had the necessary basic skills. Math and science skills were cited as in-demand.
- **Hard skills.** No survey respondents felt applicants had the hard skills needed for vacant positions. Interviewees cited the desire for "makers" – people who can create things with their hands, using skills such as sewing, or more generally "jacks of all trades." Employers in the outdoor industry indicated they commonly have to go off-shore for these skills. Specialized skills for particular companies were also hard to find, such as optical manufacturing and fabrication skills. Broader cross-industry skillsets that were cited as hard to find include inventory management, front line production, OSHA training, supply chain analytics, and lean production training. Employers in this industry also value general problem-solving skills.
- **Soft skills.** Similar to hard skills, no survey respondents felt that applicants had the needed soft skills. Interviewees and focus group participants highlighted hiring for the right fit or good chemistry, which in this industry generally translates to collaboration, teamwork, and motivation. Production line managers that have leadership and communication skills, as well as the needed technical skills, are in-demand and hard to find.
- **Work experience.** Many stakeholders felt that people with work experience were valued and hard to find, particularly people with manufacturing experience.
- **Clear criminal background.** Regarding applicants' disqualification due to failure to pass a drug screening, most outdoor gear and apparel survey respondents (67 percent) did not know or viewed the question as not applicable to their situation.
- **Clean drug screen.** No outdoor gear and apparel survey respondents thought that applicants' disqualification due to failure to pass a drug screening made it harder for them to fill positions.

- **Other.** Industry representatives expressed that racial and ethnic diversity is lacking in the field.

Responses to skill development needs

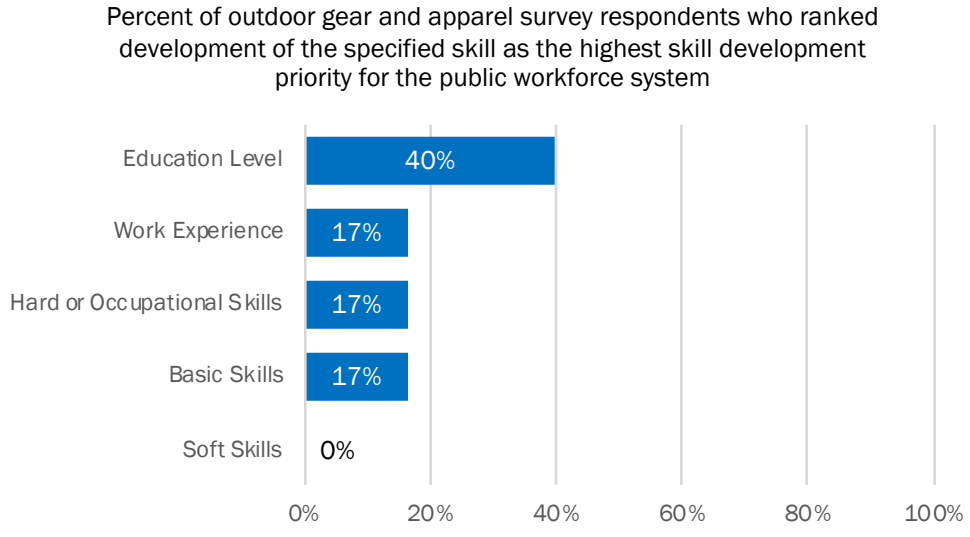
Survey respondents cited in-house training and industry, business, or professional organizations as the most commonly used resources to strengthen workforce skills (80 percent each). Interviewees and focus group participants concurred that internal resources were used widely, particularly for specific manufacturing skills, as well as emerging and quickly evolving skillsets. Industry leaders also see it as their role to define what opportunities exist and the associated skills and career path.

Stakeholders discussed the increasing use of postsecondary education and training resources in the outdoor industry, especially in specialized skillsets such as athletic footwear design. Programs include Portland State University's Athletic and Outdoor Industry Certificate; University of Oregon's Sports Product Management programs; the Pensole Footwear Design Academy; and OSU Cascades Tourism, Recreation, and Adventure Leadership program. Business leaders also talked about the OSU-Cascades outdoor products' major launching in fall of 2018, as focusing on more generalizable skills needed in the outdoor industry. Businesses actively collaborate with postsecondary institutions to define curriculum and support work-based learning opportunities for students participating in these programs.

Many stakeholders wanted to see work-based learning opportunities earlier in a student's learning career. Some business owners are actively working with high schools to implement internship programs. Others would like to, but feel they need support to effectively plan and implement internship programs.

The outdoor industry is increasing its visibility with the public workforce system as it grows as an economic driver in the state. The recently established Oregon Outdoor Alliance and the Oregon Office Outdoor Recreation are organizing collaborative efforts between industry, government, and the education sector. The largest proportion of survey respondents felt the public workforce system should focus on helping to support education in the outdoor industry workforce. This aligns with the significant work being done to shape postsecondary programs to support talent development for the outdoor sector.

Figure 3. The largest share of outdoor gear and apparel survey respondents identified development of education level as the highest skill development priority for the public workforce system



Industry: Technology and software development

Key findings

The technology and software development industry is seeking employees with all skill sets, ranging from basic skills in math, to hard skills in computer science, user interface/user experience (UI/UX), and network administration. Higher level education in software engineering and technology fields, in general, are also in demand, especially coupled with business operations knowledge (Dev-Ops). Business leaders saw the importance of work-based learning opportunities, ongoing incumbent worker training, and displaced worker training in continuing to develop talent in the technology workforce.

The technology and software development survey respondent sample of 89 may not represent broader industry trends. An additional six individuals were interviewed, and other technology industry stakeholders were engaged at the talent summit.

TECHNOLOGY AND SOFTWARE DEVELOPMENT

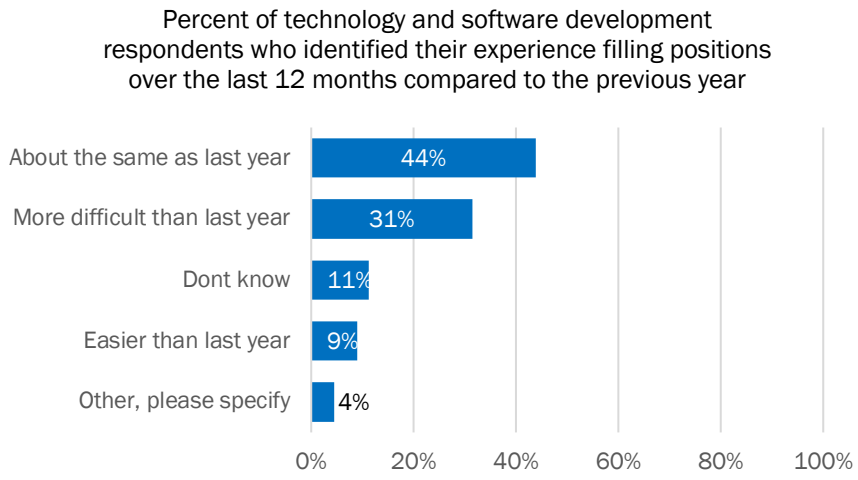
Percent reporting they had **hired new employees** in last 12 months:

88%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

72%

Figure 1. Compared to last year, most technology survey stakeholders cite about the same level of or more difficulty in finding qualified applicants



Key occupations in demand

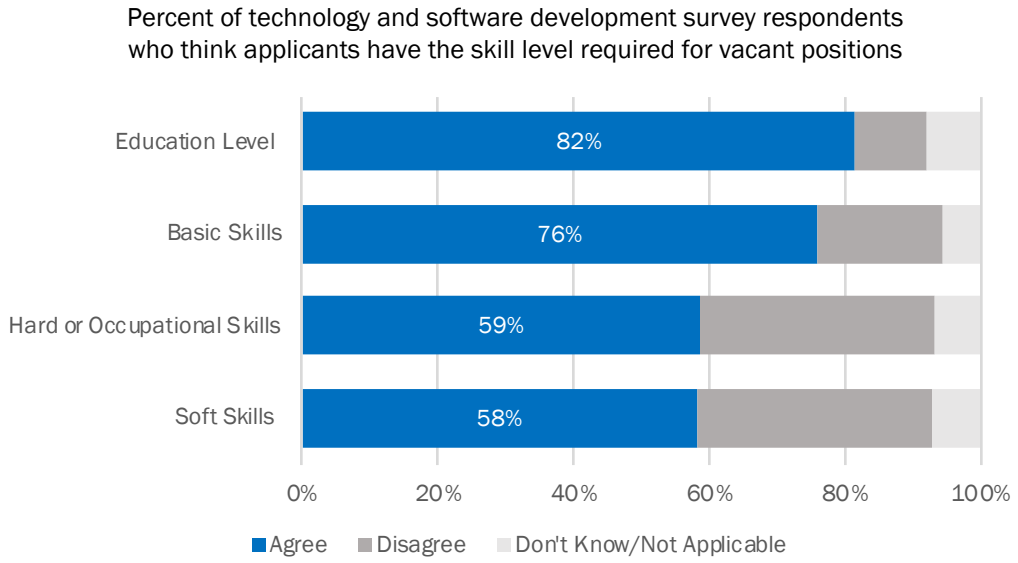
Business leaders interviewed in the technology and software development industry cited the following occupations as in-demand:

- Software developers
- User interface/user experience (UI/UX) designers
- Project/product managers
- Development-operations managers (dev-ops)
- Engineers:
  - Mechanical
  - Electrical
  - Software
- Network security admins
- Web developers
- Chief technology/information officers
- Manufacturing operations technicians
- Manufacturing operations managers
- Salespeople
- Quality assurance analysts
- Database admins

Some technology stakeholders indicated they are seeking engineers with knowledge or experience with machine learning, artificial intelligence, and robotics.

Key skills in demand

Figure 2. Most technology and software development survey respondents noted that applicants have the education level, basic skills, occupation skills, and soft skills required for vacant positions



Interview and focus group participants and the key stakeholder survey revealed the following in-demand skills and/or shortage of skills in the technology and software development industry:

- **Education level**. Of the four skill sets surveyed, technology respondents felt more applicants had the necessary education level for vacant positions than the three other skill sets. Interviewees said they seek applicants with bachelor's or master's degrees in software and electrical engineering, but some stakeholders report that the degrees are too limited for real-world business operations needs, or the degrees are quickly outdated due to rapid changes in technology. Some technology employers shared that they have to recruit out of the country for master's-level electrical or computer engineering candidates.
- **Basic skills.** Most survey respondents also felt that applicants had the basic skills required for the job. Basic math skills and the ability to read spreadsheets were cited by interviewees as the most in-demand and hard to find basic skills.
- **Hard skills.** Survey respondents were less positive about hard skills, but still over half (58 percent) felt that their applicants had the necessary hard skills for vacant positions. Interviewees reported demand for workers with computer science skills, cloud and desktop software platforms, UI/UX design, programming skills, network administration skills, and critical thinking. One technology employer indicated that they always have an opening for a UI/UX position.
- **Soft skills.** Like hard skills, 58 percent of survey respondents felt their applicants had the necessary soft skills. The in-demand and hard to find soft skills cited by interviewees were communication and time management skills (meeting deadlines).
- **Work experience.** All technology industry interviewees placed substantial value on work experience through apprenticeships and internships.
- **Clear Criminal Background:** Two-thirds of technology survey respondents did not feel that applicants' disqualification due to failure to pass a background check made it harder for them to fill positions;

roughly one quarter indicated Don't Know/Not Applicable. Criminal background did not come up in the interviews as a barrier to hiring in this industry.

- **Clean drug screen.** Two-thirds of technology survey respondents did not feel that applicants' disqualification due to failure to pass a drug screening made it harder for them to fill positions. Roughly one quarter indicated Don't Know/Not Applicable. Drug screen failure did not come up in the interviews as a barrier to hiring in this industry.
- **Other.** Technology industry leaders articulated a need to increase diversity in the workforce.

Responses to skill development needs

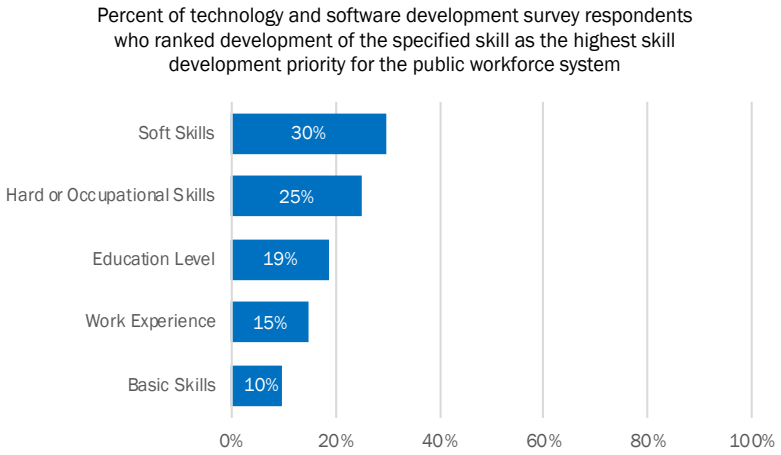
Survey respondents most commonly cited using on-the-job training (76 percent), self-study/online training (74 percent), industry associations (70 percent), and in-house staff (69 percent) to augment the skillsets of their workforce. Interviewees discussed how internal training was required because many students leaving school did not have the necessary skills to succeed at their jobs. Business leaders referenced the important role postsecondary training programs and associated work-based learning opportunities play in training prospective, incumbent, and displaced workers. Many saw a role for businesses to work more closely with postsecondary programs to ensure the curriculum aligns with skill needs. Internships and apprenticeships were seen as vital for helping prospective employees and businesses shape skill building while in school and assess fit for potential employment. An example of an effective and system-wide internship program referenced by multiple people is MECOP (formerly known as Multiple Engineering Cooperative Program), which coordinates engineering internships from Oregon's four large universities.

Many stakeholders talked about the importance of ongoing skill building over a working lifetime, particularly in the quickly evolving technology sector. Interviewees discussed the importance of boot camps and other short-term training programs in helping incumbent workers advance in their careers.

Interviewees remarked on the significant role of the Technology Association of Oregon (TAO) in workforce training and collaboration with the education and government sectors in talent development. Two TAO programs discussed were Apprenti and Elevate. The Apprenti program focuses on training displaced workers—primarily women, minorities, and veterans—for technology occupations across multiple industries in Lane and Deschutes counties. Lane County TAO's Elevate programming helps students get exposure to local career options in technology, advanced manufacturing, and healthcare through organized bus tours of local businesses. Interviewees also cited Benson High School—a polytechnic school with a focus on technology, engineering, and bioscience—as providing students with hands-on experience with equipment.

Survey respondents felt the public workforce system should focus primarily on developing soft and occupational skills in the technology workforce. This aligns with the work being done by county workforce investment boards in TAO initiatives.

Figure 3. The largest share of technology survey respondents identified development of soft skills as the highest skill development priority for the public workforce system



Industry: Forest and wood products

Key findings

The forest and wood industry, similar to advanced manufacturing, requires a mixed skillset for its workforce, including people adept in skilled trades and equipment use, as well as administrative work. The stigma associated with working in the trades creates recruitment challenges. Employers rely heavily on internal training mechanisms for their employees. Mill owners also invest substantially in training and educating future and incumbent workers through paid internships, apprenticeships, and tuition reimbursement. Businesses struggle to find employees with needed soft skills and would like to see additional support from education and public workforce stakeholders in this realm.

The forest and wood products industry survey respondent sample of 13 may not represent broader industry trends. Four additional industry leaders were interviewed.

FOREST AND WOOD PRODUCTS

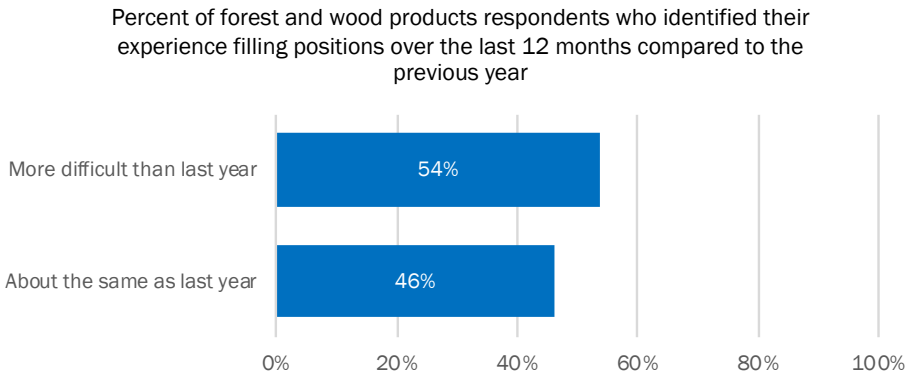
Percent reporting they had **hired new employees** in last 12 months:

100%

Percent reporting they had **difficulty finding qualified applicants** in last 12 months:

85%

Figure 1. Compared to last year, wood products survey stakeholders cite about the same level of or more difficulty in finding qualified applicants



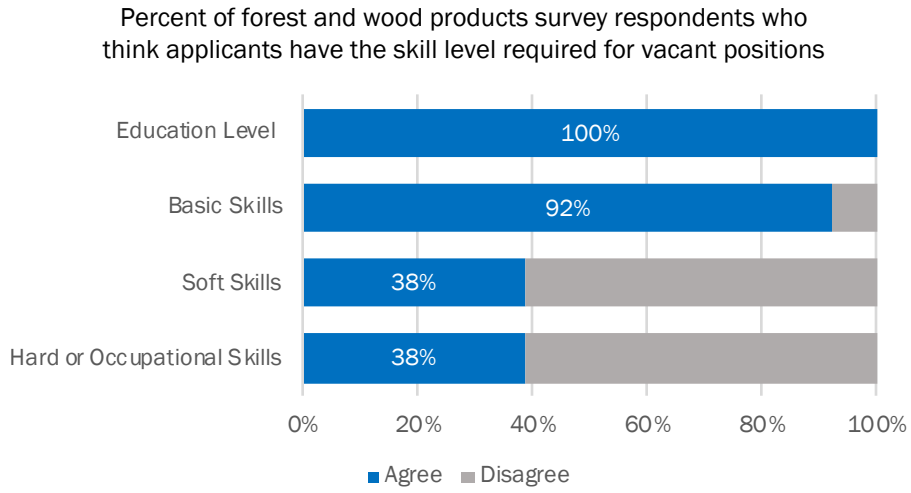
Key occupations in demand

Business leaders interviewed in the forest and wood products industry cited the following occupations as in-demand:

- Engineers:
  - Process
  - Mechanical
- Mill laborers (entry level)
- Skilled trades:
  - Electricians
  - Millwrights
  - Plumbers
  - Pipefitters
  - Machinists
  - Maintenance workers
  - Graders
  - Kiln operators
  - Boiler operators

Key skills in demand

Figure 2. Most forest and wood product survey respondents noted that applicants have the education level and basic skills required for vacant positions



Employer interviews and the key stakeholder survey revealed the following in-demand skills and/or shortage of skills in the forest and wood products industry:

- **Education level.** While survey respondents indicated that their candidates had the education level needed for the job, several interviewees cited the need for high school level CTE and postsecondary training, apprenticeships, or on-the-job training. For example, mills currently have a low supply of electricians and millwrights and are in need of more. However, because of the need for appropriate journeyman-to-apprentice ratios, mills are restricted in their ability to apprentice new electricians or millwrights to increase the supply.
- **Basic skills.** Interviewees indicated that basic math and mechanical aptitude were skills needed for all levels of employment and education, from hourly workers to salaried administrators. Survey results suggest that most candidates have these basic skills.
- **Hard skills.** The industry sees a substantial shortage of hard skills, including critical thinking and problem-solving, skilled trades, and specialized skills for the industry (e.g., graders, kiln operators). Interviewees talked about how the increasing technological complexity of wood processing requires increasing occupational skills for employees. Stakeholders cited difficulties importing electricians and millwrights from other states to meet their employment needs due to stricter licensing standards in Oregon and reciprocal relationships with only a handful of states.
- **Soft skills.** Written and oral communication skills, interpersonal skills, and teamwork were noted as essential for success in the industry. Forest and wood products stakeholders indicated that although it can be hard to find people with the necessary hard or occupational skills, it is often harder to find entry-level laborers with a desire to work.
- **Work experience.** Interviewees discussed how the specialized nature of the work means previous job experience may not be transferable to another company. However, most stakeholders felt it was important for students to participate in work-based learning opportunities to assess interest in a career in wood products and learn related skills.

- **Clear criminal background**. Ninety-two percent of wood products survey respondents did not feel that applicants' disqualification due to failure to pass a background check made it harder for them to fill positions. Interviewees also did not identify this as an issue.
- **Clean drug screen.** Almost half (46 percent) of forest and wood products respondents felt that applicant disqualification for failure to pass a drug screening affected the company's ability to fill positions. Interviewees also cited challenges with failed drug screens.
- **Other.** Rural areas face challenges attracting young workers with technical skills because these workers can often find better pay in urban areas.

Responses to skill development needs

Wood and forest product businesses cited a heavy reliance on internal training to train their workforce. Survey respondents most commonly noted industry, business, or professional organizations (100 percent), in-house staff (85 percent), and on-the-job training (77 percent) as training resources. Interviewees stressed the primacy of the industry training their workforce because of the unique nature of the work and the focus on safety.

Other commonly used training resources are self-study/online training (54 percent) and apprenticeships (46 percent). Apprenticeships were discussed in depth by interviewees, who reflected on various capacity constraints limiting the number of skilled and licensed trade workers who would be able to take over jobs from journeymen/women as they retire. Stakeholders representing mills invest heavily in educating and training their workforce through apprenticeships, tuition reimbursement, paid internships with lodging provisions, and internally provided training. Interviewees also discussed the importance of using a career path in their companies to retain their workforce and grow employee skillsets.

Like stakeholders from other trade-heavy industries, the forest and wood products industry stakeholders discussed the stigma associated with employment in their sector. Oregon Forest Resources Institute and wood products companies are conducting rebranding efforts and reaching out to younger students and educators through a variety of education and awareness campaigns. Interviewees wanted to see more career and technical education programs and work-based learning opportunities available for younger students. Beyond increasing support for technical tradeswork, interviewees also wanted to see the education sector do more to develop soft and basic work skills in students.

Business leaders cited challenges collaborating with education programs and the public workforce system, including poor communication and the slow, complex nature of government. Forest and wood products survey respondents felt the public workforce system should focus on developing soft skills in Oregon's workforce, which aligns with their experiences of skills gaps in the industry.

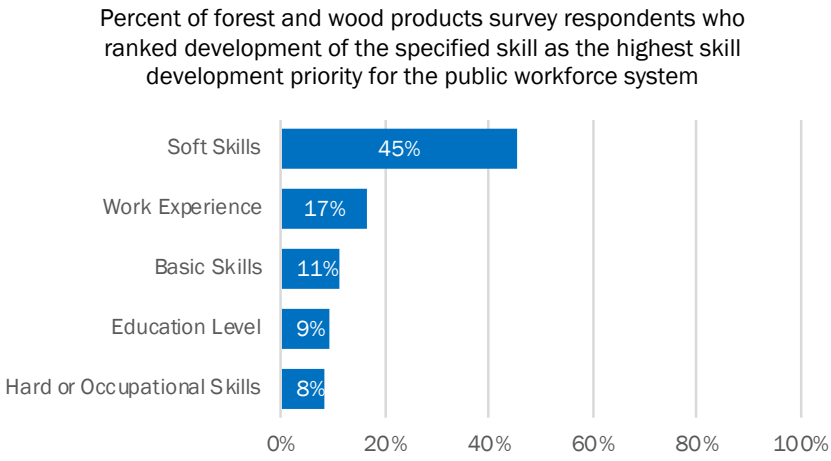



Figure 3. The largest share of wood products survey respondents identified development of soft skills as the highest skill development priority for the public workforce system