



Capital Region Workforce Tech Forums:

Changing Occupations and Skills in an Automated World: Overview of Trends, Impacts, and Recommendations on the Future of Work

This research brief frames and informs four forums focused on the impact of technological changes in the economy and workforce, such as digitalization, automation, artificial intelligence, and other emerging trends, on job skills and occupations. The components of the research brief include:

- Impact of technology on workforce: drivers and trends
- Effect of digitalization on jobs and skills
- Perspectives on future impact of technological advancement
- Recommended strategies

The insights gained through the forums, related to current regional or local trends, assets, challenges, and recommended strategies, will be integrated and presented through a regional workforce summit in 2018.

These forums are supported by four regional Workforce Development Boards: Golden Sierra Workforce Development Board, North Central Counties Consortium, Sacramento Employment Training Agency (SETA), and Yolo Workforce Innovation Board; and managed by Valley Vision.

As part of the **Strong Workforce Program**, in partnership with the Los Rios Community College District and in collaboration with Sierra College and the Yuba Community College District, Valley Vision has been engaged to convene regional workforce advisory meetings for Career Education (CE) programs across ten industry sectors in 2017 and 2018. Regional advisory meetings are envisioned to provide timely information from employers on workforce needs, to improve the efficiency of the CE advisory process for educators and employers, and to broaden opportunities for more systemic engagement.

The Strong Workforce Program efforts build upon Valley Vision's partnership on a **Regional Planning** process with the region's four workforce innovations boards to streamline and strengthen employer participation in guiding education and workforce investments.

The Strong Workforce Program and Regional Planning efforts support the **Capital Region Workforce Action Plan**. Funded by JPMorgan Chase & Co., Next Economy cluster research was conducted in 2016 by Valley Vision and Los Rios Center of Excellence. Workforce assessments identified critical skills gaps, high-demand occupations, and investments needed to build a skilled and competitive workforce. Current implementation activities can be found on Valley Vision's website.

Capital Region Workforce Tech Forum: Changing Occupations and Skills in an Automated World

Nation and worldwide, there is widespread discussion, research and speculation about how automation, digitalization, and the disruption created by technological advances will impact jobs and workforce. Speculation ranges widely – will rapid digitalization, automation, and artificial intelligence result in the end of work for most people, or simply change occupational demand for most workers?

The following brief focuses on trends, recent perspectives, recommendations to better prepare the workforce, and discussion questions focused on our regional workforce.

How will technology impact our workforce?

Trends and Data: Current drivers of the changing nature of work

Demographic and Socio-economic Drivers of Change	Technological Drivers of Change
<ul style="list-style-type: none"> • Changing nature of work, flexible work • Growing lower and higher wage job opps • Shrinking middle income job opps • Consumer ethics, privacy issues • Longevity, ageing societies • Generational work values shift • Women’s economic power, aspirations • Climate change, natural resources 	<ul style="list-style-type: none"> • Rapid digitalization across most sectors • Mobile internet, cloud technology • Processing power, Big data • New energy supplies and technologies • Internet of Things • Sharing economy, crowdsourcing • Robotics, autonomous transport • Artificial intelligence • Advanced manufacturing, 3D printing • Advanced materials, biotechnology

World Economic Forum, 2016. The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution

Top Four Trends Impacting Workforce

<p>Technology is enabling an on-demand workforce</p> <p>This is fostering the further development of a “gig” economy.</p>	<p>Automation/digitalization is changing skill needs.</p> <p>Machines may complement or replace human capabilities.</p>
<p>Employers are Reinventing Talent Recruitment</p> <p>Employers are experiencing a mounting challenge in finding the right talent with increasing technology-enabled workplaces.</p>	<p>Varying Workplace Demographics Requires Different Strategies for Adoption.</p> <p>The extent of expected change differs by generation and is highest among younger workers; millennials.</p>

Top Four Trends Impacting the Workforce in 2018 and Beyond. The Guardian Workforce Benefits Study, 2017.

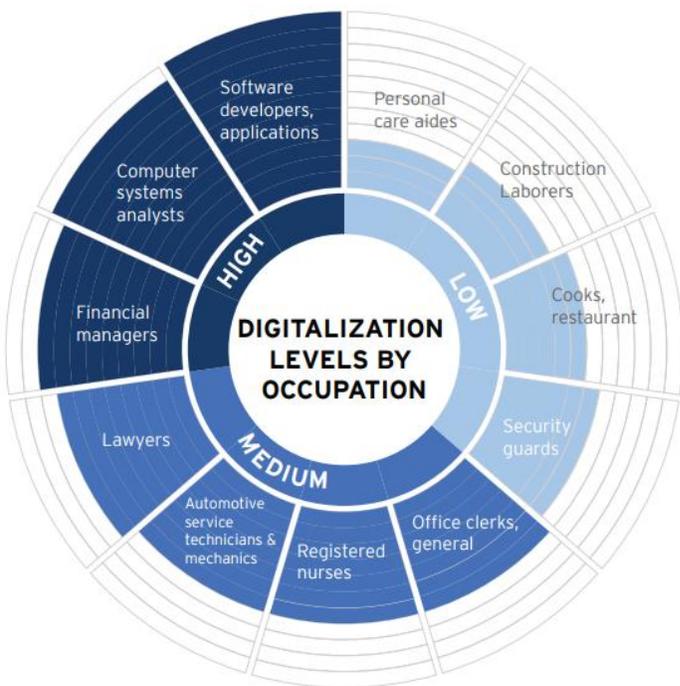
What effect does digitalization have on jobs?

Brookings recently conducted an extensive study on digitalization, or the process of employing digital technologies and information to transform business operations, from 2001-2016. They found that digitalization has transformed the workplace and skills required to be employed, and will likely correlate to sector vulnerability to future automation.

Other major findings from the Brookings report include:

- The degree and pace of digitalization vary widely across occupations and industries.
- Digitalization is associated with increased pay for many workers and reduced risk of automation, but is also helping to “hollow out” job creation and wages by favoring occupations at the high and low ends of the pay scale while disfavoring those in the middle.
- The extent of digitalization also varies widely across places and is strongly associated with variations in regional economic performance.
- Digitalization is changing the skills needed to access economic opportunity while creating new race- and gender-based access challenges.

Digitalization by Occupation



Average Earnings by Digitalization rate



Digitalization and the American Workforce. November 2017. Metropolitan Policy Program at Brookings.

Brookings ranked the top 100 metro-area by digitalization rate. **Sacramento-Roseville-Arden-Arcade ranked in the top quarter of metros** and had similar scores to Atlanta, GA; Dallas, TX; Des Moines, IA; and Madison, WI.

Middle skill, or “good” jobs, that offer opportunities for workers without a four-year college degree to earn enough to support themselves and socially advance are rapidly digitizing and therefore demanding more digital competency than in the past.

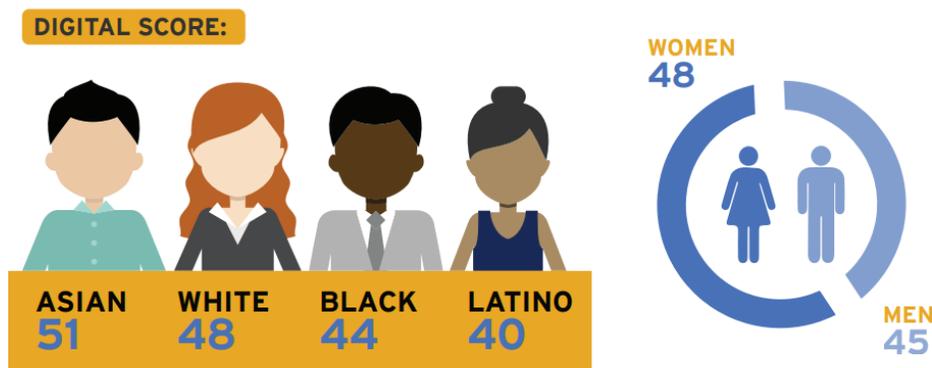
Where 49% of middle skill jobs required medium or high levels of digital literacy 15 years ago, 87% of them do now.

Many middle skill jobs today require training in basic Information Technology (IT) tools, such as:

- Standard health monitoring technology
- Computer numerical control equipment
- Basic enterprise management software
- Customer relationship management software like Salesforce
- Microsoft Suite like Excel

Tens of millions of jobs that provide the best routes toward economic inclusion for workers without a college degree turn out to be less and less accessible to workers who lack basic digital skills. However, if these workers can attain digital skills they could have access to over 2 million high-digital jobs that do not require college degrees.

Demographics also have a role in access to high-digital, high growth opportunities. Women, Blacks, and Latinos are under-represented in many high digital jobs.



- Whites are overrepresented in high-digital occupations like engineering and management.
- Asians are overrepresented in highly digital, high-pay, computer and math occupations.
- Blacks are overrepresented in medium-digital occupations like office and admin support and lower-digital jobs like transportation, and personal care.
- Latinos are overrepresented in lower-digital domains like farming, construction, and building and grounds maintenance.

Women have high digital scores, which indicate a high level of competency, yet are underrepresented in high-digital occupations, like Computer and Mathematical, Architecture and Engineering, and Management.

Digitalization and the American Workforce. November 2017. Metropolitan Policy Program at Brookings.

There is a wide spectrum of speculation about the impact of these technological changes on the workforce and economy. Below, the spectrum of perspectives is reflected on some key issues.

Perspectives on future impact of technological advancement...

...on # of jobs available

JOBS DECREASE

- We are already seeing disruption in particular industries – resulting more automation and less jobs for “routine” tasks. This effect will only increase in the future.
- Artificial Intelligence and automation may fundamentally change the nature of production and work and replace current skillsets.
- The economy might experience a large shock, with accelerating changes in the job market, and significantly more workers in need of assistance and retraining.

VARIABLE IMPACT

- Changes will differ significantly across skill levels, sectors and geographies. Geographies and sectors with lower digitalization scores are more vulnerable to automation.

NEW OPPORTUNITIES

- Work is not finite and assuming that automation will result in less work ignores the issue of the economic response to automation.
- The coming years will reflect the same basic workforce trends seen in recent decades —some which are positive, and others which are worrisome and may require policy changes.



...on the educational system

There is a broad consensus that technological progress, and artificial intelligence in particular, will require big changes in the way education is delivered, just as the Industrial Revolution did in the 19th century.

People will have to continuously learn new skills to stay current. We need more emphasis on vocational and technical education. Education will have to be interwoven with full-time work and the traditional apprenticeship model will have to be tweaked to be shorter and more adaptable. One example is “nanodegrees” which can be completed in a few months, alongside a job.

As on-the-job skills come and go, having a solid foundation of basic literacy and numeracy skills will become even more vital. “Soft” skills and “character skills”, such as perseverance, sociability, and curiosity, will be increasingly important.

...on populations who will be most impacted

- Research consistently finds that the jobs that are threatened by automation are highly concentrated among lower-paid, lower-skilled, and less-educated workers. This means that automation will continue to put downward pressure on demand for this group, putting downward pressure on wages and upward pressure on inequality.
- Current trends in the labor market, such as declining wages in the face of rising productivity, are indicative of a more drastic change in the distribution of economic benefits to come. Rather than everyone receiving at least some of the benefit, the vast majority of that value will go to a very small portion of the population.

...on the need for social supports.

Some support the idea of a universal basic income (UBI), or a dramatic simplification of the welfare system that involves paying a fixed amount (say, \$10,000 a year) to everyone, regardless of their situation, and doing away with all other welfare payments. UBI could provide a safety net to protect people from labor-market disruption.

Yes

No



- In a world of rapid technological change, a basic income could help ensure “a smooth transition to the jobs of the future”.
- The devil is in the details: Compared with existing welfare schemes, UBI could reduce income for the poorest, while giving the rich money they do not need. Negative income taxes or other strategies might work better.
- BUI could actually discourage some people from retraining, or working at all.
- BUI might attract lots of freeloaders from abroad and cause domestic taxpayers to flee.
- Focus should be on creating retraining opportunities, not assuming workforce is unemployable.

Strategy Recommendations

- **Expand the high-skill Information Technology (IT) talent pipeline.** Expand the regional pool of available IT talent in order to support growth and link workers to tech-sector employment, including jobs that are infused throughout a variety of “tech-using” industries that are creating sharp demand for skilled digital workers across the economy. Strategies could include:
 - Investing in upskilling for incumbent workers
 - Scale-up the use of certification and work-based training approaches for IT roles
 - Broaden the availability of tech “boot camps” and other accelerated learning solutions
 - Create career on-ramps, with an emphasis on underrepresented populations
 - Align and expand computer-science education
- **Expand basic digital literacy, especially among underrepresented groups.** Strategies could include:
 - Train and certify workers and students on “basic, everyday” software, such as Microsoft Excel or Salesforce
 - Develop marketing campaigns focused on the value of basic digital skills
- **Cultivate durable human qualities,** such as communication, problem-solving, emotional intelligence and other professional skills. Strategies could include:
 - Foster adaptability
 - Encourage a mindset of constant learning
 - Focus on enhancing interpersonal skills and emotional intelligence

How does this impact us locally and what strategies should we pursue?

1. How are technologies like digitalization, automation, and artificial intelligence impacting your company – generally and can you give a specific example?
2. What types of changes do you think will impact your industry the most?
3. What are the biggest challenges you are facing in terms of a ready workforce?
4. What are you doing to prepare for these coming changes?
5. What would you like to see education/workforce/community partners do in terms of preparing the workforce to be ready?
6. What else?

Resources

Reports

Artificial Intelligence, Automation, and the Economy. Executive Office of the President 2016.

<https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF>

The Digital Edge: Middle Skill Workers and Careers. September 2017. Capital One and Burning Glass.

<http://burning-glass.com/research/digital-skills-gap/>

Digitalization and the American Workforce. November 2017. Metropolitan Policy Program at Brookings.

<https://www.brookings.edu/research/digitalization-and-the-american-workforce/>

World Economic Forum, 2016. The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution:

<http://reports.weforum.org/future-of-jobs-2016/>

Articles

Automation and anxiety: will smarter machines cause mass unemployment? The Economist, June 25th, 2016. <https://www.economist.com/news/special-report/21700758-will-smarter-machines-cause-mass-unemployment-automation-and-anxiety>

The future of work: Death of the single skill set in the age of automation. Forbes, June 21st, 2017.

<https://www.forbes.com/sites/jeannemeister/2017/06/21/the-future-of-work-death-of-the-single-skill-set-in-the-age-of-automation/3/#7b52838664ee>

Leveraging the disruptive power of artificial intelligence for fairer opportunities. Brookings, November 16, 2017.

https://www.brookings.edu/blog/techtank/2017/11/16/leveraging-the-disruptive-power-of-artificial-intelligence-for-fairer-opportunities/?utm_campaign=Brookings%20Brief&utm_source=hs_email&utm_medium=email&utm_content=58575242

No that robot will not steal your job, New York Times, Oct 7th, 2017.

https://www.nytimes.com/2017/10/07/opinion/sunday/no-that-robot-will-not-steal-your-job.html?rref=collection%2Fcolumn%2Fchirisharma&action=click&contentCollection=opinion®ion=stream&module=stream_unit&version=latest&contentPlacement=1&pgtype=collection&r=1

Re-educating Rita, The Economist, June 25th, 2016.

<https://www.economist.com/news/special-report/21700760-artificial-intelligence-will-have-implications-policymakers-education-welfare-and>

A Robot makes a mean Caesar salad but will it cost jobs? New York Times, Oct. 6th, 2017.

https://www.nytimes.com/2017/10/06/business/robot-food-cost-jobs.html?rref=collection%2Fcolumn%2Fprototype&action=click&contentCollection=business®ion=stream&module=stream_unit&version=latest&contentPlacement=1&pgtype=collection

Top 4 Trends Impacting the Workforce in 2018 and Beyond. The Guardian Workplace Benefits Study.

2017. <https://www.guardiananytime.com/gafd/wps/portal/fdhome/insights-perspectives/emerging-trends/top-4-workforce-trends>

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Additional Resources from North State Building Industry Foundation

- A. The following two links feature a “job displacement by technology probability predictor.”
1. This is the article about the predictor <http://www.foxnews.com/tech/2017/05/31/will-robots-take-your-job-these-jobs-may-be-automated-in-future.html>
 2. This is the probability algorithm <https://willrobotstakemyjob.com/> Type in Cabinet makers and bench carpenters to see how it works.
- B. These links discuss the probability and nature of job displacement by technology and the effect on the meaning of work.
1. Derik Thompson, A World without Work <http://www.theatlantic.com/magazine/archive/2015/07/world-without-work/395294/>
 2. Smith and Anderson, AI Robots and the Future of Work <http://www.pewinternet.org/2014/08/06/future-of-jobs/>
 3. Gary E. Marchant, Yvonne A. Stevens and James M. Hennessy, Center for Law, Science & Innovation, Sandra Day O’Connor College of Law Technology, "Unemployment & Policy Options: Navigating the Transition to a Better World" <http://jetpress.org/v24/marchant.htm>
 4. Jacob Morgan, The Future of Work, <https://thefutureorganization.com/>
 5. Darrell West, What happens if robots take the jobs? The impact of emerging technologies on employment and public policy <https://www.brookings.edu/wp-content/uploads/2016/06/robotwork.pdf>
 6. Rainwater and Du Puis, “Welcome to the Future of Work” <https://techcrunch.com/2016/11/28/welcome-to-the-future-of-work/>
 7. World Economic Forum, “What is the Future of Work” <https://www.weforum.org/agenda/2016/01/what-is-the-future-of-work/>
 8. The Future of work, watch the video, <http://www.pwc.com/gx/en/issues/talent/future-of-work/journey-to-2022.html>
 9. Why the Coming Jobs Crisis is Bigger than you think, <http://knowledge.wharton.upenn.edu/article/why-the-coming-jobs-crisis-is-bigger-than-you-think/>
 10. David Autor: Why are there still so many jobs? https://www.ted.com/talks/david_autor_why_are_there_still_so_many_jobs/transcript?language=en

11. Barry Schwartz: The way we think about work is broken https://www.ted.com/talks/barry_schwartz_the_way_we_think_about_work_is_broken
12. Barry Schwartz: Our loss of wisdom https://www.ted.com/talks/barry_schwartz_on_our_loss_of_wisdom
13. Barry Schwartz: The paradox of choice https://www.ted.com/talks/barry_schwartz_on_the_paradox_of_choice
14. Sheena Iyengar: The art of choosing https://www.ted.com/talks/sheena_iyengar_on_the_art_of_choosing
15. Malcolm Gladwell: Choice, happiness and spaghetti sauce https://www.ted.com/talks/malcolm_gladwell_on_spaghetti_sauce
16. Ruth Chang: How to make hard choices https://www.ted.com/talks/ruth_chang_how_to_make_hard_choices
17. Dan Gilbert: Why we make bad decisions https://www.ted.com/talks/dan_gilbert_researches_happiness
18. Thomas Frey <http://www.futuristspeaker.com/business-trends/33-dramatic-predictions-for-2030/> and <http://www.futuristspeaker.com/business-trends/162-future-jobs-preparing-for-jobs-that-dont-yet-exist/>
19. Will Robots Take Your Job Prediction Game <http://www.foxnews.com/tech/2017/05/31/will-robots-take-your-job-these-jobs-may-be-automated-in-future.html>
20. Thomas Friedman, Thank You for Being Late: An Optimist's Guide to Thriving in the Age of Accelerations. Thomas Friedman speaking to the Commonwealth Club of California. <https://www.youtube.com/watch?v=Up7K5sRqllw>