Research:
Modeling to Inform the Future of Work

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Proprietary Research in Collaboration with Oxford Economics Explores How Technology Will Affect Jobs in the U.S. Over the Next 10 Years

Cisco Corporate Social Responsibility (CSR) has worked with Oxford Economics to better understand how rapid technological change could impact the future of work. Despite the concern that technology will displace workers, history and our research shows new jobs emerge as existing job tasks are automated. What we can expect is a shift in the nature—and potentially the quality—of work. By looking beyond which of today's occupations are most vulnerable to automation, Internet of Things, and AI, and determining the types of skills workers will need to transition to new jobs, we can proactively help prepare the workforce of the next decade.

Understanding the Displacement and Income Effects of Technology

To explore how the labor market will evolve over the next decade and shed light on the challenges ahead in a more comprehensive way, we estimated the impact of technology on every occupation in the U.S. This model enables us to provide not just an assessment of the risks of automation for the workforce (the Displacement Effect), but also the opportunities presented by automation (the Income Effect). Finally, this study identifies the jobs and industries at risk, forecasts the new jobs that will appear, and identifies the skills the workforce will need to be ready for the future (the Skills Shortfall).

The Displacement Effect reveals that the workers most vulnerable to disruption from technological change over the next decade are those whose jobs involve routine and repetitive tasks, including both cognitive and physical tasks. Jobs that tend to require tasks that are susceptible to automation, building interpersonal relationships and creative thinking, will be the least disrupted.

Displacement Effect: Top 3 Tasks

- Routine Administration
- Capturing & Monitoring Information
- Routine Communication

Displacement Effect: Top 3 Industries

- Transportation and Warehousing
- Agriculture, Forestry, Fishing, and Hunting
- Mining

The Income Effect arises from an increase in spending power and is in opposition to the Displacement Effect. The Income Effect takes into account many factors. Labor saving innovations from technology results in lower production costs. In a competitive economy, these cuts are passed on to the consumer through lower prices which leads to an increase in their spending power. As they spend this money, it generates demand for employment elsewhere in the economy; thus, by 2027, the research suggests a positive impression from the Income Effect on the U.S. labor market overall. This insight is part of our desire to catalyze the conversation across the ecosystem for policymakers, the private sector, nonprofit organizations, educators and others during this period of change.

Income Effect: Top 3 Industries

- Health Care and Social Assistance
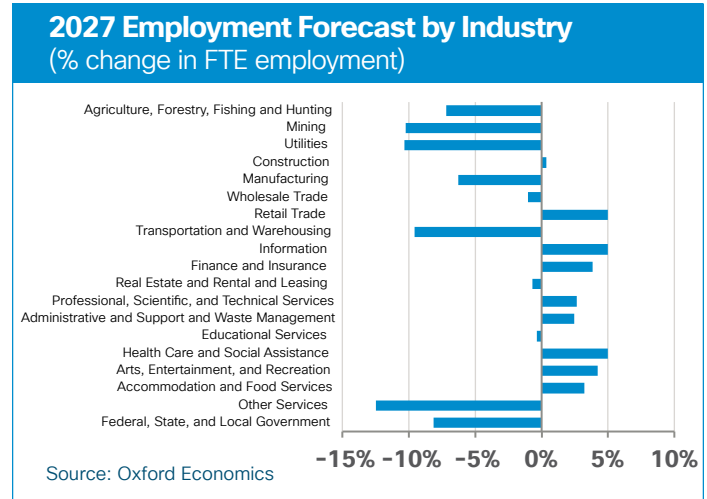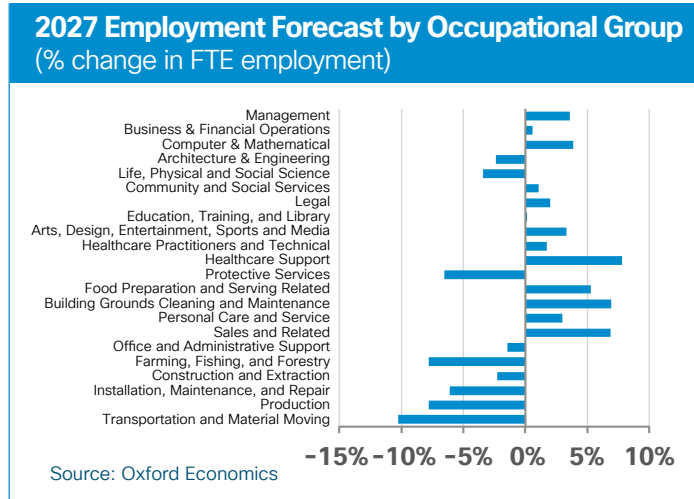- Construction
- Information
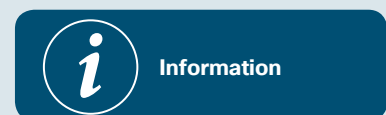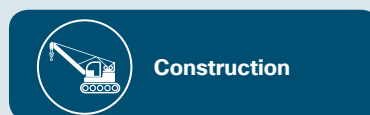
Our analysis shows a significant transformation ahead but one that is in line with what we have seen over the past twenty years:

4.3M workers [3% of the workforce] will be displaced...

...plus an additional **2.2M workers** will be disrupted...

...resulting in a total of **6.5M job moves by 2027.**

2027 Employment Forecast by Occupational Group
(% change in FTE employment)

Management
Business & Financial Operations
Computer & Mathematical
Architecture & Engineering
Life, Physical and Social Science
Community and Social Services
Legal
Education, Training, and Library
Arts, Design, Entertainment, Sports and Media
Healthcare Practitioners and Technical
Healthcare Support
Protective Services
Food Preparation and Serving Related
Building Grounds Cleaning and Maintenance
Personal Care and Service
Sales and Related
Office and Administrative Support
Farming, Fishing, and Forestry
Construction and Extraction
Installation, Maintenance, and Repair
Production
Transportation and Material Moving

−15% −10% −5% 0% 5% 10%

Source: Oxford Economics

2027 Employment Forecast by Industry
(% change in FTE employment)

Agriculture, Forestry, Fishing and Hunting
Mining
Utilities
Construction
Manufacturing
Wholesale Trade
Retail Trade
Transportation and Warehousing
Information
Finance and Insurance
Real Estate and Rental and Leasing
Professional, Scientific, and Technical Services
Administrative and Support and Waste Management
Educational Services
Health Care and Social Assistance
Arts, Entertainment, and Recreation
Accommodation and Food Services
Other Services
Federal, State, and Local Government

−15% −10% −5% 0% 5% 10%
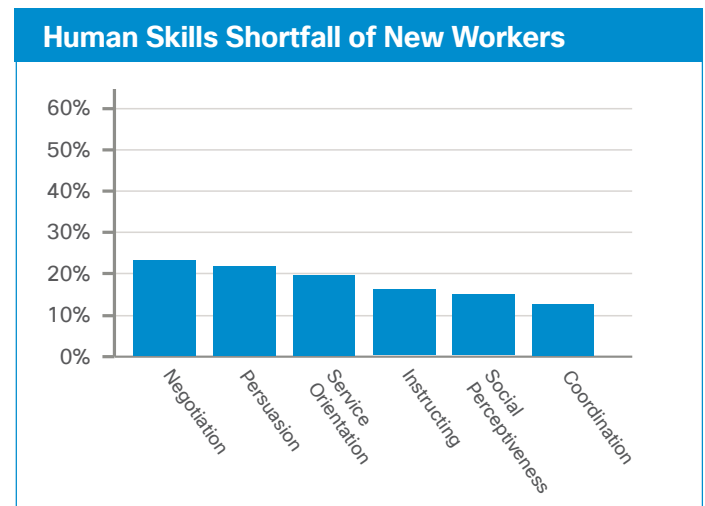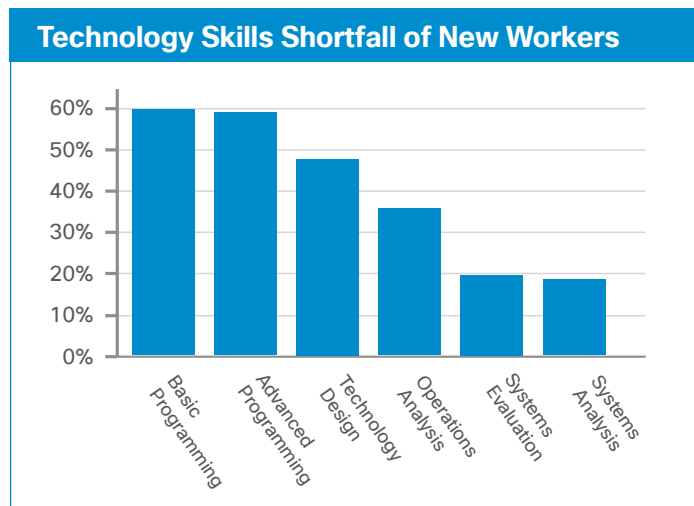
Source: Oxford Economics

Analyzing the Technical Skills Shortfalls

Displaced workers will have real opportunities to continue to add value by filling vacancies elsewhere in the economy, but only if they can bridge the relevant skills gap and make the transition to a new occupation. Tracing the moves these 6.5 million workers may make enables us to measure the "skills shortfalls" they will have to bridge in order to perform in their new jobs. By contrasting the skills requirements of workers' original occupations with those of their new occupations in 2027, we can measure the ground they will have to make up to meet the skills demanded by their new jobs.

Over the next 10 years, the research forecasts a considerable reconfiguration of the U.S. labor market. The model does not forecast large-scale unemployment; rather, the research predicts a labor-market that is transformed. Roughly half of

industries will see decreased demand, leading to displaced workers. At the same time, the other half of industries will see increased demand for workers, providing new opportunities for these displaced workers.

The skills shortfall in technology-related skills is particularly pronounced. This is because technology jobs require high levels of specialized skills that are already rare in today's labor market. Thus, workers likely to fill these vacancies are presently underqualified for their future roles. This technology skills shortfall, however, is not exclusive to specialists, or one area of the economy. Workers across the economy will require new skills as technology becomes an increasingly integral part of the job.

Technology Skills Shortfall of New Workers

60%
50%
40%
30%
20%
10%
0%

Basic Programming
Advanced Programming
Technology Design
Operations Analysis
Systems Evaluation
Systems Analysis

Human Skills Shortfall of New Workers

60%
50%
40%
30%
20%
10%
0%

Negotiation
Persuasion
Service Orientation
Instructing
Social Perceptiveness
Coordination

To learn more, read the full report, **The A.I. Paradox: How Robots Will Make Work More Human.** For more information on this and other Cisco CSR research, please contact Amanda Cumberland at acumberl@cisco.com or Mary De Wysocki at mdewysoc@cisco.com.

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Addressing the Human Skills Shortfall is Just as Critical

As technology becomes more powerful and capable, it is the rise in demand for "human skills" that ultimately helps define the transition to the 2027 labor market. Human skills embody workers' ability to make the best use of technological innovations on a large scale.

The way each worker is affected will depend on her specific balance of skills and how well she will adapt to the changing needs of the labor market. Workers whose core purpose is critical and creative thinking and making human connections, will thrive. These workers will define themselves by their ability to use and work creatively with technology, rather than compete against it.

It is the development of these "human skills" that constitutes the greatest reskilling challenge. In fact, 32% of the total skills gap facing the U.S. economy by 2027 is in human skills. These human skills combined with technology skills will be critical for individuals to take advantage of the transformation technology will bring.
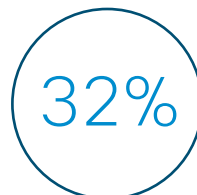
32% of the total skills gap facing the U.S. economy by 2027 is in **human skills**

The U.S. Economy Faces a Significant Reskilling Challenge

To prepare and equip the workforce for the demands of the 2027 economy, policymakers, the private sector, nonprofit organizations, and educators, need to know where the skills shortfalls will be and how to focus their human capital development efforts to smooth the transition. Stakeholders across the ecosystem will need to focus on equipping those in jobs and those displaced by new technologies with the skills that will matter most in the decade ahead if we are to make the most of the opportunities the technological progress presents.

Cisco CSR: Turning Insights into Action

To help take advantage of the opportunities technology brings—informed by research such as this—our new and evolving programs, grants, and services are working toward empowering a human network of global problem solvers.

We believe that global problem solvers—individuals who innovate as technologists, think as entrepreneurs, and act as social change agents—will be key to fueling an inclusive digital economy.

Cisco CSR has a commitment to positively impact 1 billion people via technology by 2025. Though we don't fully know what the future holds, if we inspire people to become global problem solvers and prepare them with the right skills, we can help them participate in the global economy and create economic opportunity for all.