

# BROOKINGS

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## DIGITALIZATION AND THE AMERICAN WORKFORCE

How the flow of digital technologies into nearly every business, workplace, and pocket continues to remake and disrupt the U.S. economy.



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Software is eating the world.

So rapid are the developments, in fact, that while the “digitalization of everything” has become a hallmark of tech’s promise of individual and business empowerment so has it begun to prompt anxiety, including among workers who worry about their future in a world of brilliant machines.

And yet, for all of the evidence that big changes are underway, surprisingly little data exists to track the spread of digital adoption. In the absence of such information, the digitalization trend, as prominent as it is, remains diffuse and hard to pin down.

Which is why the Metro Program at Brookings has just released a new report on the labor-market effects of “digitalization”—the diffusion of digital technology into nearly every business, workplace, and pocket in the U.S.

What have we found? Here are five takeaways:

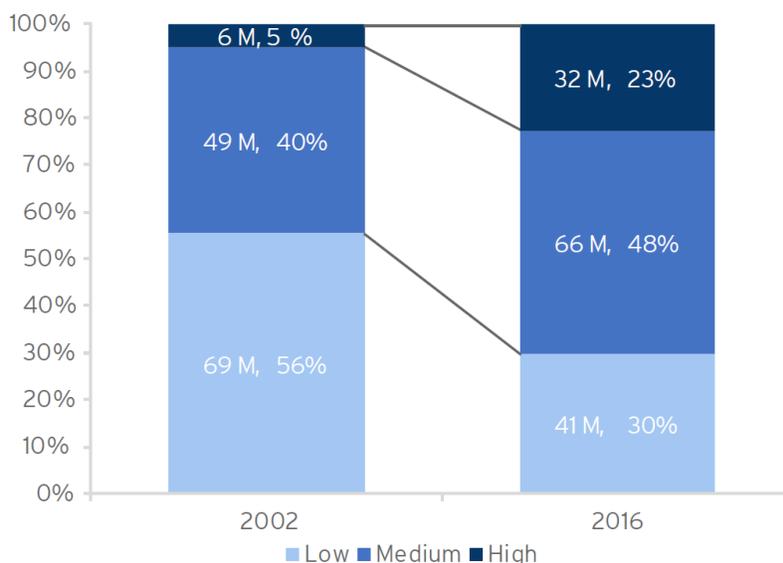
### **1. The U.S. economy is digitalizing at hyper-speed**

Driven primarily by the increasing digital content of existing occupations, the share of U.S. jobs requiring substantial digital knowledge has increased rapidly in the last fifteen years. Since 2002, high and medium digital occupations as a share of national employment have surged from 45 to 71 percent of the total. Since 2010, meanwhile, nearly 4 million of the nation’s 13 million new jobs created—30 percent of them—have required high-level digital skills.

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## Employment by levels of job digitalization

2002 and 2016



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Source: Brookings analysis of O\*NET and OES data

## 2. The degree and pace of digitalization varies widely among occupations and industries

While the average digitalization score across all occupations rose from 29 in 2002 to 46 in 2016, the most significant computerization occurred around the lower and middle tiers of the digital scale. Underlying this is the adoption of basic tech tools in industries which had previously been relative latecomers. For example, construction managers, tool and die makers, and meeting, convention, and event planners all saw digital score increases of over 40 points.

### Selected occupations by 2016 digital score

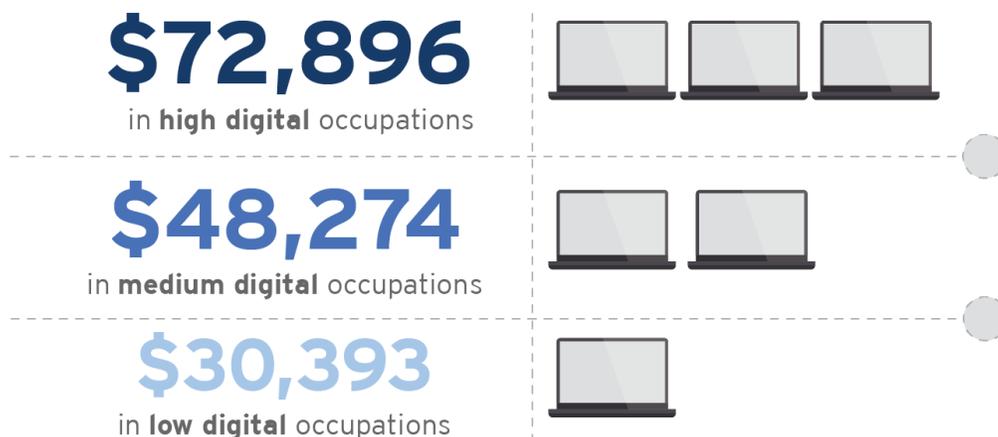
Occupation	Digital score, 2002	Digital score, 2016	Score change, 2002-2016
Software Developers, Applications	97	94	-3
Financial Managers	41	61	+20
Construction Managers	17	60	+43
Human Resources Specialists	37	60	+22
Lawyers	34	58	+23
Automotive Service Technicians and Mechanics	39	55	+17
Registered Nurses	38	55	+17
Office Clerks, General	53	55	+2
Tool and Die Makers	3	51	+48
Security Guards	28	31	+3
Welders, Cutters, Solderers, and Brazers	3	23	+20
Construction Laborers	2	17	+15
Personal Care Aides	16	14	-2

Source: Brookings analysis of O\*NET and OES data

### 3. Digitalization is associated with increased pay, job resiliency, but also labor market polarization

Digitalization is a key pathway to increased earnings. All across the skills continuum, employees are rewarded for the depth and breadth of their digital skills through increased wages. Workers in occupations with medium or high digital skills in 2016 were paid significantly more than those in low-digital occupations.

Focusing on patterns of job creation, the digitalization of the U.S. economy appears to be contributing to the hollowing out and polarization of the labor market, as employment growth in both low and high digital occupation groups have outpaced those in the middle of the digital skills continuum.

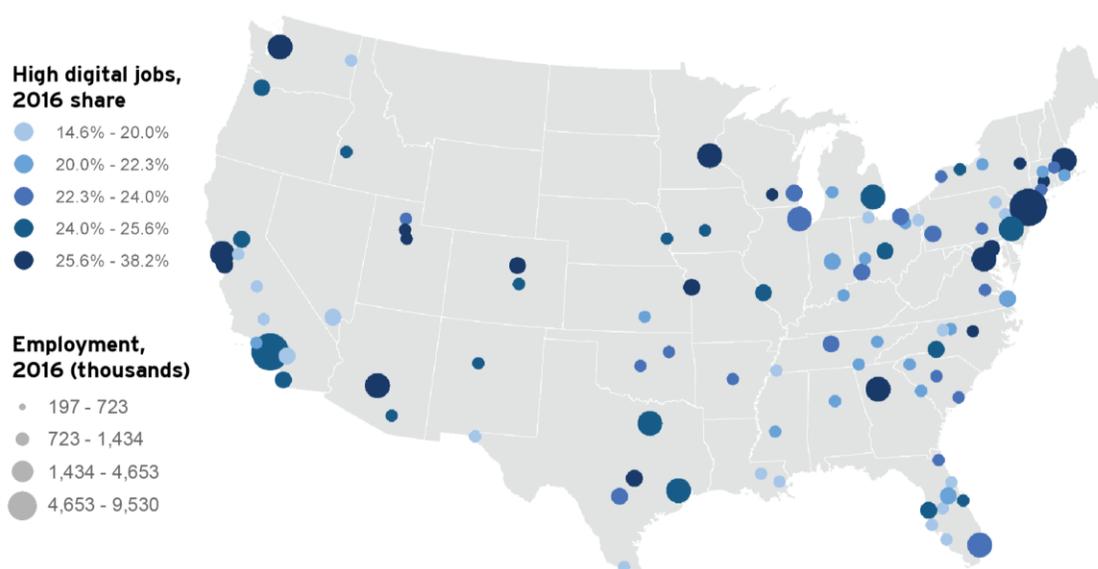


## 4. The extent of digitalization varies widely by place with important implications for regional economic performance

In geographical terms, digitalization is happening everywhere, but its progress varies widely across the map. In almost all cases, metros saw their mean digitalization score increase by 12 to 18 points meaning that for the most part, lagging metros were catching up to the digital leaders in terms of their aggregate digital scores, allowing for metro digital scores to converge somewhat.

With that said, when mapped for their shares of employment in critical *highly*-digital occupations, metros' digital skills vary far more widely and are in fact diverging. In this regard, the digital rich are getting richer. Given that these trends reflect underlying variation in the digital capabilities of regional labor forces, digitalization may very well be contributing to the evident unevenness of cities' economic fortunes and prospects.

Top 100 metros by labor market size and high digital job share



Source: Brookings analysis of O\*NET and OES data.

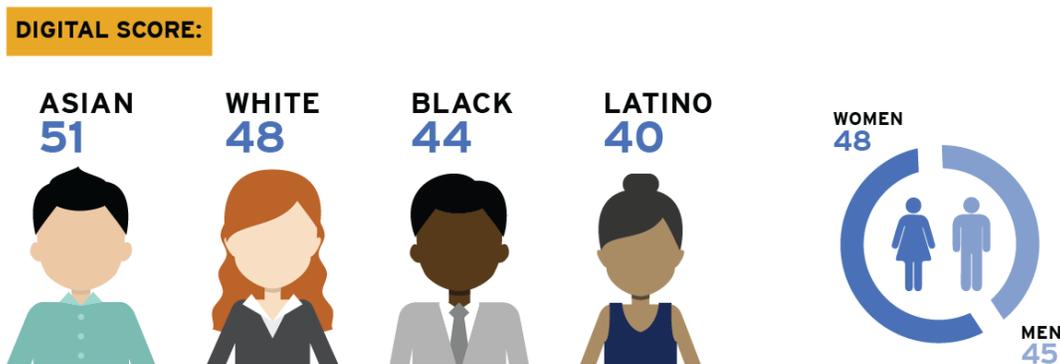
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## 5. The skills workers need to access economic opportunity are changing, creating new race- and gender-based disparities

Digitalization, as it proceeds, is changing the skills less-advantaged workers need to secure good jobs. Our analysis of America's 14 million "opportunity jobs"—those that do not require a bachelor's degree, yet pay more than the national average wage—corroborates this. We found

that the mean digital score for these 89 occupations rose from 29 to 50 between 2002 and 2016, and that 88 percent of opportunity employment now requires medium or high digital skills.

Moreover, the mean skills ratings of the jobs occupied by workers in major demographic groups vary in ways that almost certainly contribute to those groups' uneven access to opportunity.



Women, with slightly higher aggregate scores as a group than men, dominate employment in many of the largest medium-digital occupational groups, such as in health professions—but by contrast, remain significantly underrepresented in such highly digital positions as computer and mathematical occupations and engineering. Equally sharp variation characterizes the employment profiles of the nation's racial and ethnic groups.

While digitalization holds out significant opportunities for less-educated or historically marginalized workers or groups to move up the employment ladder, too few of them as yet appear to be attaining that progress.

## Strategies for adjustment

In response to digitalization, two distinct priorities (and one cross-cutting vision) appear urgent: **expand the high-skill IT talent pipelines** and **improve digital literacy, especially among underrepresented groups**. Beyond that workers of every stripe in every city are going to need to **cultivate durable human qualities** that complement digital technologies, while doing what the machines cannot.

To date, the nation's most high-profile, extensive, and creative digital skills training efforts (whether through coding courses, boot camps, or other accelerated learning models) are geared almost entirely to the already digitally savvy and highly educated. In contrast, many more millions of workers at the lower end of the skills continuum are grappling with even faster digital change—change that challenges their ability to land even low-tier, decent-paying jobs.

As such, policymakers and stakeholders must seek to invest in and scale up incumbent worker training and accelerated learning programs that keep pace with cutting-edge digital technologies, while also exposing students and young workers to basic office productivity tools and establishing credentialing systems that will allow them to certify their foundational knowledge in the labor market.

America's education system and workforce development strategies should also reflect the changing nature of work in a digitizing economy and foster traits like adaptability, commitment to lifelong learning, and social and emotional intelligence that will continue to be humans' comparative advantages over our brilliant new machines in the years to come.

### **For more information:**

To access the full Brookings report, check out cool animations, and obtain information for your city go here:

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

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