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CLOSING THE DIGITAL *SKILL* DIVIDE

THE PAYOFF FOR WORKERS, BUSINESS, AND THE ECONOMY

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ACKNOWLEDGEMENTS

This report was written by Amanda Bergson-Shilcock and Roderick Taylor of National Skills Coalition with data analysis by Nye Hodge, Federal Reserve Bank of Atlanta. The report team included Jeannine LaPrad and Rachel Unruh of National Skills Coalition and Sarah Miller, Federal Reserve Bank of Atlanta.

The opinions expressed in this report reflect those of the authors and do not necessarily reflect those of the Federal Reserve System or the Federal Reserve Bank of Atlanta.

About National Skills Coalition: Jobs that require skills training are the backbone of our economy. National Skills Coalition fights for a national commitment to inclusive, high-quality skills training so that more people have access to a better life, and more local businesses see sustained growth. Since 2000, through expert analysis and technical assistance, broad-based organizing, targeted advocacy, and cutting-edge communications, NSC has changed hundreds of state and federal skills policies that have changed thousands of lives and grown local businesses and economies.

About the Center for Workforce and Economic Opportunity at the Federal Reserve Bank of Atlanta: The Center for Workforce and Economic Opportunity focuses on employment policies and labor market issues that affect low- and moderate-income individuals. It acts as a bridge between research and practice, connecting researchers, businesses, and policymakers with innovative approaches to creating economic opportunity through education and employment. The center also contributes to economic research and monetary policy discussions by tracking labor market trends affecting low- and moderate-income workers.

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A note about terminology: This report uses *digital skills* and *technology skills* interchangeably.

TABLE OF CONTENTS

WHAT IS A DIGITAL SKILL?

Some digital skills are *foundational* skills such as email, simple spreadsheets, data entry, or timecard software. Others are *industry-specific* skills, such as bookkeepers using QuickBooks, manufacturing workers using AutoCAD, or home health aides using electronic medical records.

WHAT IS THE DIGITAL SKILL DIVIDE?

The digital *skill* divide is the space between those who have the robust access and support needed to engage in skill-building opportunities and those who do not. As technology evolves, the digital *skill* divide prevents equal participation and opportunity in all parts of life – including people's ability to get good jobs and advance in a career.[1]

CLOSING THE DIGITAL SKILL DIVIDE

THE PAYOFF FOR WORKERS, BUSINESS, AND THE ECONOMY

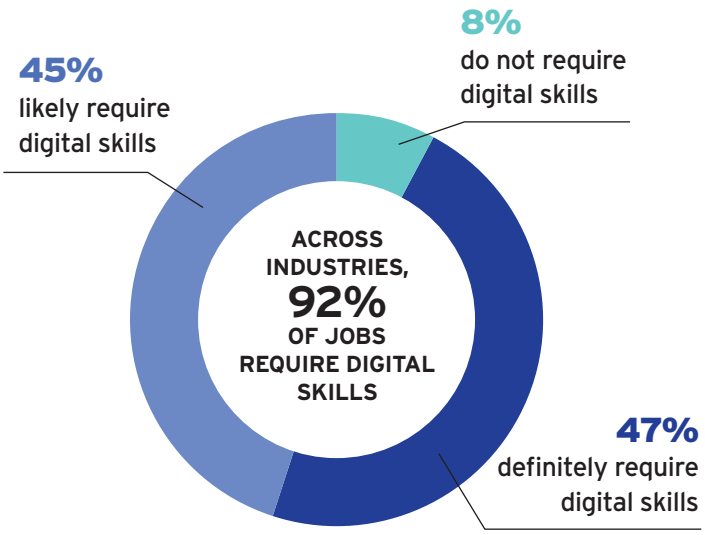
Even before the coronavirus pandemic struck in 2020, policymakers, businesses, and workforce advocates were already recognizing that workers were not being replaced by robots, but rather, being called upon to work hand-in-glove with rapidly evolving technology.

This new awareness brought home the importance of developing ***digital resilience***,[2] which equips workers and businesses to continuously adapt to changing technologies. At the same time, it spotlighted the stark economic costs caused by uneven investment in people's skills and new technologies — namely, decreased financial security and career opportunities for workers themselves, and reduced productivity for firms.[3]

A growing understanding of this digital skill divide also illuminated how the ripple effects of historical policies and structural racism continue to contribute to modern-day inequities in digital skills and access,[4] and the vital role of public policy and practice in remedying inequities caused by prior policies.[5]

When the pandemic struck, millions of businesses hustled to change how they served their customers. Nearly every worker suddenly had to contend with new digital demands — even those in frontline, essential roles. The impact of the digital skill divide became more acute, weighing disproportionately on some workers — including workers of color and low-wage workers — and smaller businesses struggling to survive a tumultuous economy.

Now — as leaders design labor market policies to drive a thriving and inclusive economy — it is imperative to understand this acceleration of digital transformation. The findings in this analysis are unequivocal: policymakers, business leaders, workforce advocates, educators, and training providers who gain perspective on this transformation and its impact on the digital skill divide (including population inequities within that divide), will be well-positioned to reap the economic payoff of closing the divide.



Key findings include:

- ***There is overwhelming demand for digital skills in the labor market,*** with 92 percent of all job ads requiring ***definitely digital*** or ***likely digital*** skills. This demand is robust across all industries, and holds true even for entry-level jobs that require zero to two years of experience or a high school diploma. And small businesses are just as likely as their larger peers to seek workers with technology skills.
- Yet, ***many workers have not had sufficient opportunity to build such skills***; earlier research found that nearly one-third of U.S. workers do not have foundational digital skills, and workers of color fall disproportionately into this category due to structural inequities.[6]
- Equipping workers with necessary skills requires action by both private employers and public policymakers. Notably, ***public investments in workforce development and education are especially vital*** given the unevenness of private investments and the prevalence of digital skill demands among smaller businesses. Small businesses employ 47 percent of private-sector workers[7] and rely more heavily on publicly funded

workforce development and education partners (rather than in-house programs) to upskill employees.

- Closing the digital skill divide has ***major payoffs for businesses.*** Prior research has shown that workers value upskilling opportunities and prefer working for employers who offer clear, well-defined pathways to advancement.[8] Because turnover has heavy costs for businesses — with estimates ranging from $25,000 for workers who leave within the first year to over $78,000 for workers who leave after five years,[9] averting or delaying turnover by ensuring that workers have upskilling opportunities can be economically significant.
- Public investments in closing the digital skill divide can also generate ***economic benefits for individual workers and the broader economy.*** People who qualify for jobs that require even *one* digital skill can earn an average of 23 percent more than those working in jobs requiring no digital skills — an increase of $8,000 per year for an individual worker.[10] These increased earnings could result in more state and federal tax revenue generated by each worker. Depending on the household size and composition, this could range from $1,363 to $2,879 per year.[11]

HOW THIS REPORT WAS PRODUCED

To produce this report, the research team analyzed 43 million online job postings published in 2021 and collected by Lightcast (formerly known as Emsi Burning Glass). The dataset assembled by Lightcast included information on the particular skills associated with each job posting.

The typical job ad required applicants to have 8 different skills. Across all ads, there were 15,000 distinct skills extracted and standardized by Lightcast from the universe of 2021 job ads. The authors of this report manually coded the top 50 percent of these skills — that is, the 7,500 skills that were most often requested in job ads. *(Notably, however, this top 50 percent accounted for 99.99 percent of job ads, while the remaining uncoded skills only accounted for .01 percent of jobs.)* This coding formed the basis for the original analysis and findings in this report.

The research team coded each skill according to whether it was ***definitely digital, likely digital,*** or ***not digital***. Knowledge of Salesforce software or the Python programming language were coded as ***definitely digital.*** An example of a ***likely digital*** skill would be survey design or bookkeeping — tasks that today are frequently accomplished with the use of a computer or other digital device, but *could* still be carried out in an old-fashioned analog fashion. An example of a ***not digital*** skill is changing diapers.

Further information is available in the Methodology section at the end of this report.

MISSING FROM THE DIGITAL DIVIDE DISCUSSION: SKILLS

The time is ripe for an analysis of this issue. In the past few years, vivid news stories of the "homework gap" coupled with images of people — often low-income families of color — trying to access wifi from parking lots and other makeshift setups have helped drive public awareness and urgency around solving the digital divide.

Policymakers at all levels of government have responded with initiatives to help individuals and businesses access high-speed internet, obtain digital devices, and otherwise equip themselves for full participation in today's increasingly digital society. Corporate leaders, philanthropists, educators, and worker advocates have been equally motivated to tackle these widespread challenges.

But, while the digital ***access*** divide has gotten high-profile coverage, the digital ***skill*** divide has a much lower profile. This has only recently begun to change with passage of the federal Digital Equity Act as part of the landmark Infrastructure Investment and Jobs Act in 2021. For the first time, Congress invested $2.75 billion in state and local efforts to help people build digital *skills* as well as obtain access to broadband and devices. Importantly, this legislation identifies a number of "covered populations" — including people of color, low-income individuals, rural residents, and veterans, among others — for whom states must specifically work to close equity gaps in digital access and skills.[12]

As implementation of the new law begins, stakeholders have a unique opportunity to build on the momentum of this trailblazing legislation, while also identifying the additional resources needed to fully address workers' and businesses' digital skill needs. This report **puts actionable data into the hands of elected officials, education and training providers, and corporate decisionmakers, positioning them to tackle the *skills* aspect of the digital divide.**

ALMOST ALL JOBS NOW REQUIRE DIGITAL SKILLS

The overwhelming majority of jobs in the U.S. labor market now require technology skills. **Fully 92 percent of the forty-three million online job ads analyzed for this study are seeking workers who have at least one *definitely digital* or *likely digital* skill.** More specifically, nearly half (47 percent) of all job ads list at least one skill that is ***definitely digital*** – that is, requiring job applicants to be able to use a software program like AutoCAD or QuickBooks. Another 45 percent of all job ads list at least one skill that *likely* requires digital capability, such as customer account review, making travel arrangements, or clerical support.

This high demand for technologically skilled workers is reflected across each of the fifty states, the District of Columbia, and Puerto Rico. Hawaii and Alaska are at the high end of the spectrum, with 93 percent of job postings in both states requiring workers with ***definitely digital*** or ***likely digital*** skills.[13] But even the state at the bottom of the list, Montana, still shows a robust 88 percent of all job ads seeking workers with ***definitely digital*** or ***likely digital*** skills.

This demand for technology skills stretches across every industry in the U.S., and nearly every occupation, including entry-level and frontline workers. Gone are the days when only software engineers or white collar workers needed digital skills. Today, job ads seeking janitors, food service workers, and agricultural workers also cite the need for digital skills.

The importance of workers having a baseline of foundational digital skills and experience with widely used software products is illustrated by their appearance as some of the most requested skills across all forty-three million job postings. Indeed, across all 15,000 skills captured in this dataset, Microsoft Excel was the ninth most requested skill, mentioned in more than 4.9 million postings, and the general skill of computer literacy was thirteenth on the list.

Even entry-level jobs increasingly demand digital skills.

Among job ads seeking workers with zero to two years of experience – primarily new entrants to the workforce[14] – fully 95 percent of ads required a ***definitely digital*** or ***likely digital*** skill. The numbers were only just barely higher for workers with more experience. (See Figure 1.)

However, there was a difference within the subset of ads requiring a ***definitely digital*** skill. Nearly half (49 percent) of jobs seeking entry-level workers with zero to two years of experience included a ***definitely digital*** skill. The number leapt to more than two-thirds (71 percent) of ads for workers with three to five years of experience. (Also shown in Figure 1.)

FIGURE 1: Digital skills are in high demand in job ads for entry-level workers (2021)

2021 job ads seeking:	Percentage of ads requiring a *likely digital* skill:	Percentage of ads requiring a *definitely digital* skill:
0-2 years of experience	95%	49%
3-5 years	98%	71%
6-8 years	99%	81%
9+ years	98%	75%

Note: Because not all job ads include a "years of experience" requirement, this finding reflects the universe of the 20 million job postings for which Lightcast was able to discern such a requirement

Some occupations have especially fast growing demand for digital skills.

While some occupations show slow but steady growth in the percentage of job ads that require digital skills, other occupations have shown a much quicker increase. For example, in 2019 just 15 percent of ads for oilfield/rig worker required a ***definitely digital*** skill. But just two years later, in 2021, that number had risen to 38 percent. Other jobs with rapid increases included diesel mechanic, community health worker, tool and die maker, and loss prevention/asset protection specialist. These examples show how rapidly the landscape is changing in certain segments of the labor market.

Even jobs that require limited education still demand digital skills.

Even positions that require workers to have relatively less education are still overwhelmingly likely to require digital skills. Fully 94 percent of job ads that require applicants to have a high school diploma or equivalent include at least one skill that is ***definitely digital*** or ***likely digital***. This number rises slightly for job ads requiring higher-level educational credentials. (See Figure 2.)

FIGURE 2: Digital skills are required for workers regardless of their educational level (2021)[15]

Education level required	Percentage of ads requiring a *likely digital* skill	Percentage of ads requiring a *definitely digital* skill
High School	94%	46%
Associate's	97%	47%
Bachelor's	99%	74%
Master's	97%	46%
PhD	97%	39%

Findings are similar among the subset of jobs that require at least one ***definitely digital*** skill. Forty-six percent of jobs requiring a high school diploma request such skills, as do forty-seven percent of jobs requiring an associate's degree.

SURPRISING BUT TRUE: YOUNGER WORKERS NEED DIGITAL SKILLS TOO.

While it is often assumed that younger workers are so-called "digital natives" who automatically know how to use technology, research shows this is often not the case. An earlier study by NSC found that fully 25 percent of workers with no foundational digital skills and 29 percent of those with very limited foundational skills were between the ages of sixteen to thirty-four.[16]

One reason behind this phenomenon is that younger workers — like their older peers — often have *fragmented knowledge*. That is, they are comfortable with some digital tasks, such as sending a text message or making a TikTok video, but not comfortable with others, such as creating a spreadsheet. For this reason, it's especially important that workforce and education programs provide opportunities for people to build from the skills they have to the skills they need.

Avoiding assumptions about younger workers — just like avoiding age-related stereotypes about older workers — is crucial to ensuring that policies and programs address the *real* rather than *perceived* needs of workers and businesses.

Many jobs require industry-specific digital skills, not just foundational skills.

Contrary to the assumption that simply acquiring baseline, foundational skills might be sufficient for most workers, there is robust demand for more sophisticated, industry-specific skills. Many employers sought these higher-level skills even for positions that required relatively little education or experience.

For example, 92 percent of all jobs requiring 0-2 years of experience required an industry-specific digital skill. Within the subset of jobs that required a ***definitely digital*** skill, nearly two-thirds, or 65 percent, required applicants to have an industry-specific digital skill, either alone or in combination with foundational digital skills. Only 35 percent of these job postings requested foundational skills *alone*.[17]

NINETY-TWO PERCENT OF ALL JOB ADS REQUIRE *DEFINITELY DIGITAL* OR *LIKELY DIGITAL* SKILLS. THE DEMAND IS ROBUST ACROSS ALL INDUSTRIES, EVEN FOR ENTRY-LEVEL JOBS.

Again, looking within the subset of jobs that required a ***definitely digital*** skill, there were somewhat similar trends by level of education. In this case, jobs requiring just a high school diploma were twice as likely to require *only* foundational digital skills as jobs requiring education or training beyond high school. But even then, a robust 43 percent of jobs requiring a high school education demanded industry-specific skills, either alone or in combination with foundational skills. (See Figure 3.) Examples include job postings for warehouse workers that require robotics skills, and ads for security officers that require digital video skills.

Full-time jobs are more likely to require digital skills, but part-timers still need technological expertise.

Fully 93 percent of ads seeking full-time workers sought people with ***definitely digital*** or ***likely digital*** skills, compared to 91 percent of ads seeking part-time workers. However, within the sub-category of job ads seeking workers with at least one ***definitely digital*** skill, there was a divide: Nearly half (48 percent) of ads for full-time workers required a ***definitely digital*** skill, compared to one-third (31 percent) of postings for part-time workers.

FIGURE 3: Many employers seek workers with industry-specific digital skills (2021)

Level of education required	Percentage of *definitely digital* jobs requiring **foundational** digital skills only	Percentage of *definitely digital* jobs requiring **industry-specific** digital skills only	Percentage requiring both **foundational and industry-specific** digital skills
High school diploma/equivalent	57%	16%	27%
Associate degree	33%	28%	40%
Bachelor degree	20%	39%	41%
Master degree	24%	49%	26%
Ph.D.	19%	62%	19%

FIGURE 4: The demand for technology skills is robust across every industry (2021)

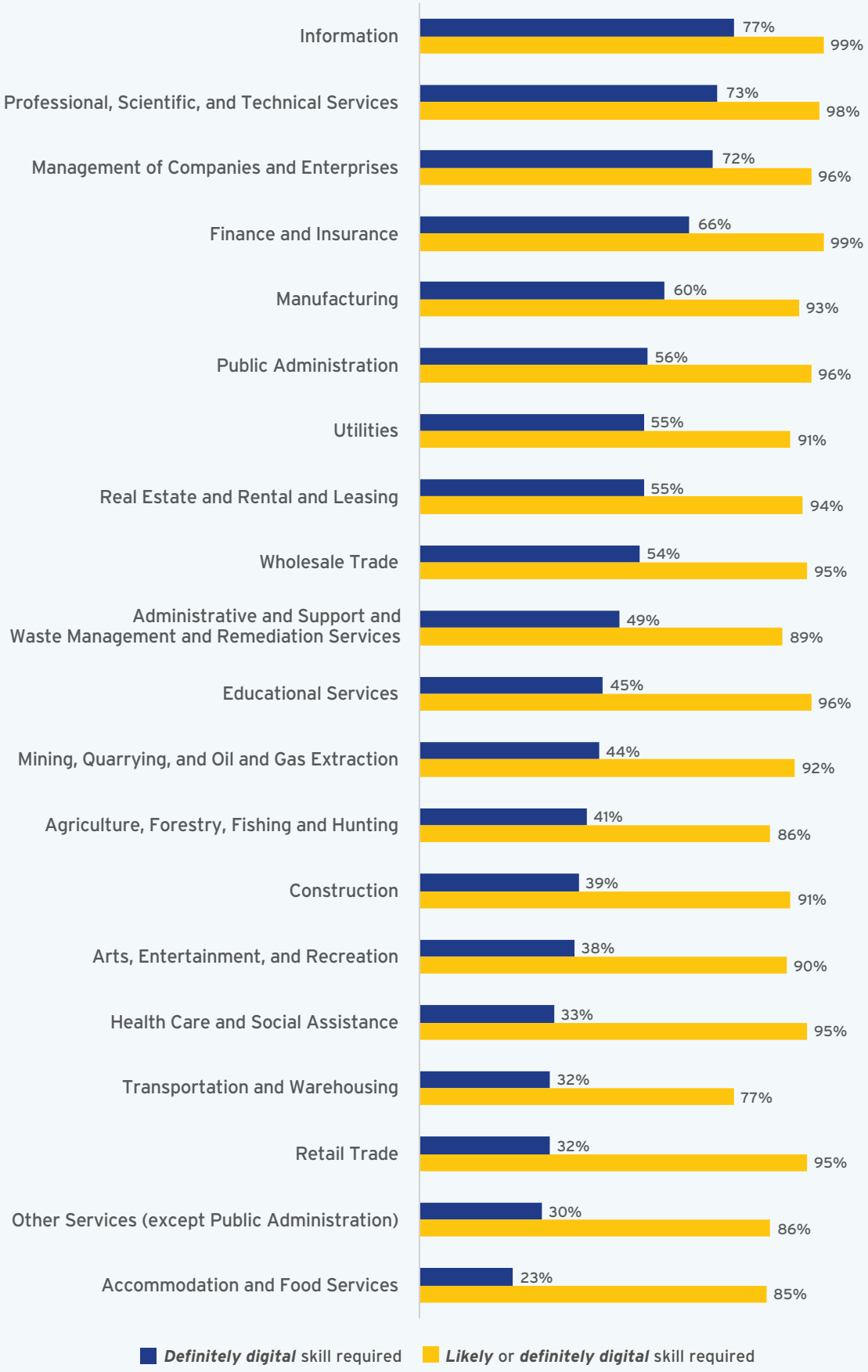
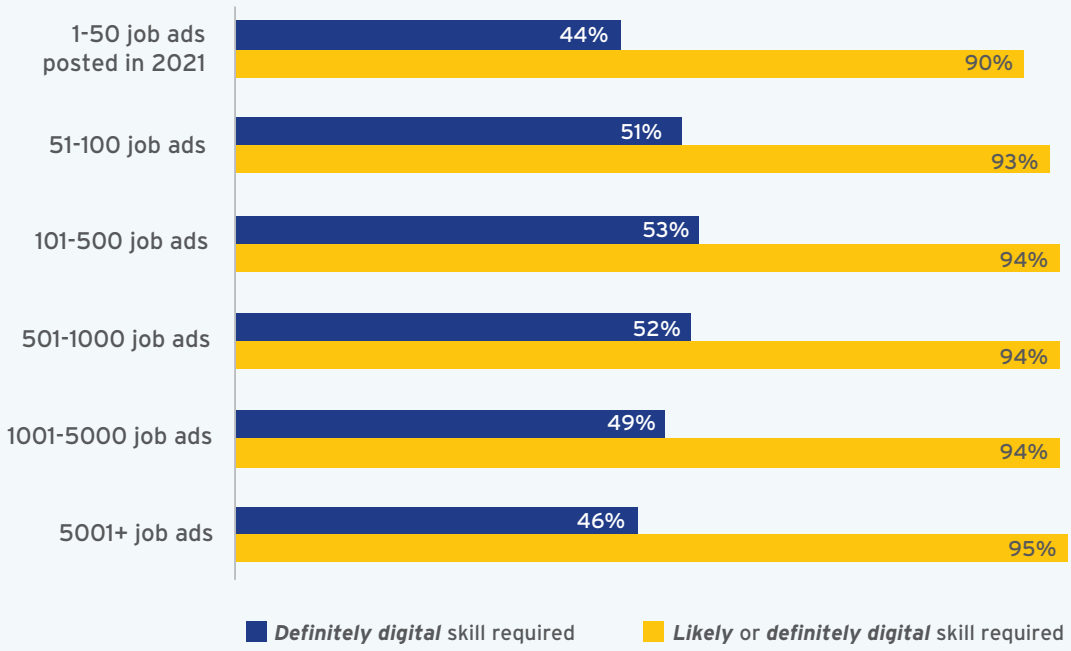


FIGURE 5: Small businesses are almost as likely to post job ads requiring digital skills as larger businesses (2021)



NOT JUST A SILICON VALLEY PROBLEM: THE DIGITAL SKILL DIVIDE SPANS EVERY INDUSTRY AND FIRM SIZE

Every industry shows strong demand for digital skills.

A common misconception is that digital skills are primarily required for information technology (IT) jobs or are only needed for certain industries. This study found that **digital skills are widely required across the entire range of industries in the U.S. economy.**

As shown in Figure 4, the percentage of job ads requiring ***definitely digital*** or ***likely digital*** skills ranges from a low of 77 percent among the transportation and warehousing industry sector to a high of 99 percent in the information and finance and insurance industries. That is, even in the industry sector at the lowest end of the scale, fully three-quarters of job ads seek workers with technology skills.

Even when the criteria are narrowed to include *only* those job ads that require a ***definitely digital*** skill (also shown in Figure 4), many industries still show more than half of all job ads demanding such skills. Here there is a wider spread between industries overall, with the high end still the information sector at 77 percent, and the low end now the accommodation and food services sector at 23 percent.[18]

Small businesses need technologically skilled workers too.

Smaller businesses have almost identical demand for workers with technology skills as larger businesses. While the dataset used for this analysis does not directly measure the size of a company, firm size can be roughly inferred based on the volume of job ads posted by the company in a year.[19]

Even among the smallest businesses — those that posted between one and fifty job ads per year — 90 percent of ads required workers to have a ***definitely digital*** or ***likely digital*** skill. (See Figure 5.) This is consistent with earlier research from NSC[20] that found that small businesses were nearly as likely as large ones to need workers with digital skills, but that smaller companies relied much more heavily on education and workforce partners to help upskill workers, rather than developing full-scale in-house upskilling programs.

A HIGH PERCENTAGE OF JOB POSTINGS IN MANUFACTURING CALL FOR WORKERS TO HAVE *DEFINITELY DIGITAL* (60 PERCENT) OR *LIKELY DIGITAL* (93 PERCENT) SKILLS.

INEQUITIES WITHIN THE DIGITAL SKILL DIVIDE

Some digitally-demanding industries employ fewer workers of color.

The long history of occupational segregation in the U.S. labor market means that workers of different demographic backgrounds, particularly different races and ethnicities, are often clustered in particular industries. Among the industries in this study with the highest demand for workers with digital skills (shown in Figure 4), several have a disproportionate concentration of white workers. This includes the information industry (65 percent white) and the finance and insurance industry (67 percent white).[21] While there are many factors behind the complex issue of occupational segregation — such as lack of access to quality education and training, language barriers, structural inequities, etc. — examples such as these are notable.[22] The relatively lower concentration of workers of color in these industries suggests that they are missing out on opportunities to earn higher wages, which can worsen existing racial inequities in income and wealth.

In occupations with many workers of color, a changing demand for digital skills.

Although workers of color are more concentrated in *industries* with slightly lower demand for digital skills, the landscape is changing rapidly within some specific *occupations*. For example, the percentage of job postings for community health workers that required digital skills increased by 28 percent from 2019 to 2021. Community health workers are disproportionately likely to be Black or Latino compared to the workforce as a whole.[23]

Industries that employ people with limited education nevertheless need workers with digital skills.

Close to half (43 percent) of workers in the manufacturing industry have a high school education or less,[24] a factor that is strongly correlated with limited digital skills.[25] Yet a high percentage of *job postings* in manufacturing call for workers to have ***definitely digital*** (60 percent) or ***likely digital*** (93 percent) skills. There is a similar phenomenon in the administrative and support and waste management and remediation industries, where 51 percent of workers have a high school education or less, while job postings call for workers with ***definitely*** (49 percent) or ***likely*** (89 percent) ***digital*** skills.

FIGURE 6: As more digital skills are required, median hourly wage rises (2021)

THE PAYOFF OF CLOSING THE DIGITAL SKILL DIVIDE

Despite the high demand for digital skills and the desire for skill-building opportunities among workers, many people have not had the opportunity to fully develop such skills.[26] This lack of access to digital skill training hits workers[27] and entrepreneurs[28] of color hardest. **Increasing public investments in digital skill building can help individual workers increase their incomes, allow businesses to thrive, and ultimately create positive economic spillover effects for local, state, and national economies.**

Closing the digital skill divide would catapult more workers into economic security.

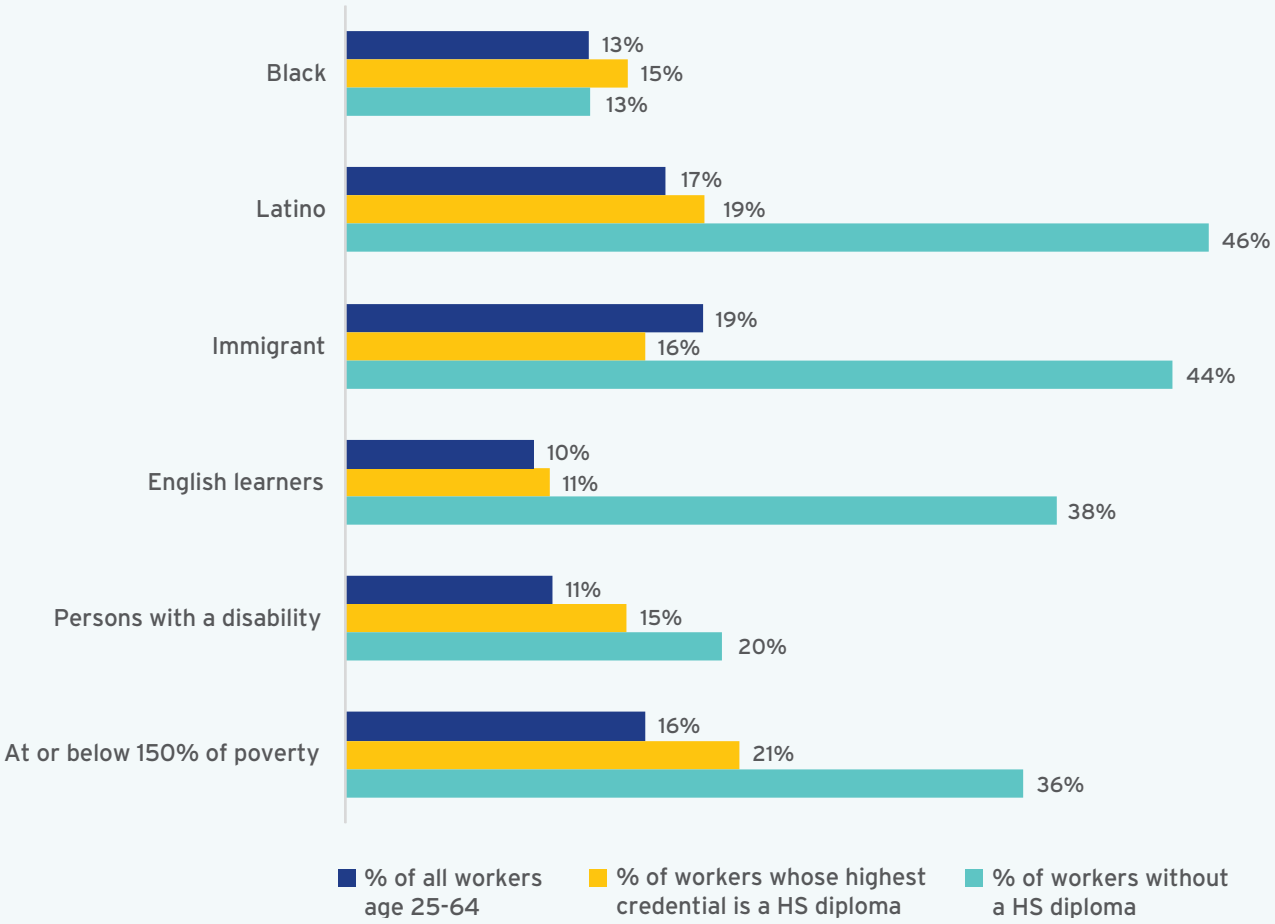
At the individual level, previous research from NSC has clearly established that having few or no foundational digital skills is closely correlated with lower earnings.[29] This study provides new evidence that jobs requiring digital skills have higher median wages than jobs that do not. Workers who have opportunities to build in-demand digital skills could potentially increase their earnings as they acquire new skills.[30]

If a worker who was previously employed in a job that requires zero digital skills was able to move into a job that requires a ***definitely digital*** skill, **their hourly wage would rise by 23 percent, or more than $8,000 per year**, assuming both jobs paid the median hourly wage for their respective skill levels.[31] This economic bump would be significant for individual workers and their families – and would be even higher if the worker acquired additional digital skills, as shown in Figure 6.

It is not unusual for jobs to require numerous digital skills; nearly a quarter (22 percent, or nearly ten million) of all job postings analyzed for this study required at least three different digital skills. Even the highest end – jobs requiring at least nine different digital skills – comprised 5 percent of total job postings, or roughly 2.1 million ads.

IF A WORKER WHO WAS PREVIOUSLY EMPLOYED IN A JOB THAT REQUIRES ZERO DIGITAL SKILLS WAS ABLE TO MOVE INTO A JOB THAT REQUIRES A *DEFINITELY DIGITAL* SKILL, THEIR HOURLY WAGE WOULD RISE BY 23 PERCENT, OR MORE THAN $8,000 PER YEAR

FIGURE 7: Investing in workers with limited education could close equity gaps (2021)



Investing in entry-level workers can help close equity gaps.

As previously described, jobs that require *no* digital skills offer substantially lower median wages than jobs that *do* require such skills. Given this study's finding that 94 percent of job ads seeking workers with a high school diploma require digital or likely skills, as well as earlier research documenting that workers with few or no digital skills are more likely to have low levels of education, policymakers could prioritize upskilling these workers as one element of closing equity gaps.

An analysis of The Census Bureau American Community Survey data[32] shows that several of the "covered populations" under the federal Digital Equity Act are over-represented among workers with a high school education or less, as shown in Figure 7. These workers could benefit from focused investment in their digital (and other) skills. (See Figure 7.)

Closing the digital skill divide would support small businesses and aid business economic vitality.

Businesses face numerous costs associated with the digital skill divide, which could be reduced if more workers had access to learning necessary skills. Specifically, earlier research by NSC found that having a workforce with insufficient access to digital skills functions as an invisible drag on productivity, especially when the people who lack digital skills are supervisors themselves, because supervisors can serve as a bottleneck limiting the productivity of other workers.[33]

Public policy investments in workforce development and education, such as the Digital Equity Act, are a key tactic in addressing these challenges. Such policies are an especially important support for *small* business, because small businesses employ 47 percent of private-sector workers,[34] and rely more heavily on publicly funded

BECAUSE TURNOVER HAS HEAVY COSTS FOR BUSINESSES – WITH ESTIMATES RANGING FROM $25,000 TO $78,000 – AVERTING OR DELAYING TURNOVER BY ENSURING THAT WORKERS HAVE UPSKILLING OPPORTUNITIES CAN BE ECONOMICALLY SIGNIFICANT.

workforce development and education partners (rather than in-house programs) to upskill employees.

In addition, state and federal programs that support the upskilling of incumbent workers can foster business vitality.[35] Prior research has shown that workers value upskilling opportunities and prefer working for employers who offer clear, well-defined pathways to advancement.[36] Because turnover has heavy costs for businesses – with estimates ranging from $25,000 for workers who quit within the first year to over $78,000 for workers who quit after five years, averting or delaying turnover by ensuring that workers have upskilling opportunities can be economically significant.[37]

Closing the digital skill divide would create positive spillover effects for the broader economy.

Public investments in closing the digital skill divide can also generate economic benefits for the broader economy. As noted above, people who qualify for jobs that require even *one* digital skill can earn an average of $8,000 more per year than those working in jobs requiring no digital skills.[38]

These increased earnings could result in more state and federal tax revenue generated by each worker. Depending on the household size and composition, this could range from $1,363 to $2,879 per year, as illustrated in Figure 8.[39] (Note: The states chosen here for illustrative purposes, North Carolina and Illinois, are also profiled in detail in the Appendix of this report.)

All of this increased economic activity for workers and businesses would have additional positive spillover effects for the communities in which they are located. As workers earn more money, they are able to purchase additional goods and services. As businesses increase their revenue and profits, they are able to invest further in expansion, pay dividends to shareholders, and increase wages.

FIGURE 8: Increased economic impact (combined Federal and State tax revenue) generated if workers move from a job that requires no digital skills to a job that requires one digital skill[40]

Household composition	Increased economic impact: NORTH CAROLINA	Increased economic impact: ILLINOIS
Single Adult, No Children	$1,387 per year	$1,363 per year
Single Adult, One Child	$2,693 per year	$2,879 per year
Two Adults, No Children	$2,774 per year	$2,726 per year
Two Adults, Two Children	$2,816 per year	$2,726 per year

Note: Calculations in this table assume each working adult is earning the median hourly wage as described above, and working 40 hours per week, 50 weeks per year.

RECOMMENDATIONS

The findings outlined in this report are clear and unequivocal: The labor market is moving quickly and inexorably toward greater digital skills requirements across every industry and nearly every occupation. At the same time, the impact of the digital skill divide disproportionately falls on some workers, including workers of color and those without education beyond high school.

Ensuring that public investments are intentionally focused to remedy inequities facing individuals and communities is vital to the economic success of states and the country as a whole.[41] As the federal Digital Equity Act (part of the Infrastructure Investment and Jobs Act passed by Congress in 2021) is implemented in states, policymakers will have a powerful opportunity to close gaps in racial, gender, age and geographic equity. Similarly, as officials work to update landmark policies such as WIOA and other workforce and education policies, it is crucial to incorporate the latest findings on how to close the digital skill divide.

Given the findings laid out in this report, there are three overarching recommendations to guide leaders' decisionmaking:

A DIGITAL SKILL FOUNDATION FOR ALL.

All workers need the opportunity to develop broad-based, flexible, digital problem-solving skills for current technologies and ongoing technological shifts.

Policymakers can support this goal by ensuring that policies targeting workers' access to digital skills meet workers — and the education and workforce development system — where they are. In particular, policymakers can use federal Digital Equity Act and Broadband Equity, Access, and Deployment (BEAD) funds to improve access to free or low-cost digital skills training for workers, and to ensure that workforce development and education providers are equipped to provide high-quality upskilling services. This should include providing high-quality professional development and technical assistance to aid workforce and education providers in designing demand-driven digital skill-building programs.

Workforce and education advocates and providers can support this goal by speaking up for digital equity investments that support people's goals and aspirations, and helping policymakers connect the dots from federal policies to specific opportunities in their own states and localities.

For example, providers may have gathered valuable data on the digital skill needs of workers and businesses that can inform policy implementation. In particular, individuals often identify "getting a job" or "getting a better job" as their primary reason for enrolling in skill-building opportunities. Similarly, providers have often developed robust relationships with small businesses and industry sector partnerships that can help identify opportunities to support individuals' digital skill-building aspirations while also responding to local labor market demand.

Corporate decisionmakers and influencers can use their platforms to ensure that *skills* are central to digital divide discussions in the public and policymaking spheres. The data provided in this report can help to amplify opportunities in particular industries as well as to shift public conversation more generally to include a skills lens.

ONGOING UPSKILLING FOR EVERY WORKER IN EVERY WORKPLACE.

Workers in every industry need the opportunity to develop industry- and occupation-specific digital skills to adapt and advance in their careers.

Policymakers can support this goal by investing in industry sector partnerships[42] that can collaborate with community colleges and other training providers to ensure that the talent development process is connected to industry-specific skill needs and jobs. These partnerships can be specifically designed to help close racial, gender, and other equity gaps[43] that have served to limit some workers' access to jobs that require technology skills.

Workforce and education advocates and providers can encourage policymakers to embed digital problem-solving skills as allowable or required activities under existing workforce development, adult education, and higher education policies, as well as digital equity[44] policies. For example, 30 states have incumbent worker training funds that could be used to support digital skill building.[45]

Corporate decisionmakers and influencers can implement policies and practices that support digital upskilling for workers at every level of their organizations. Smaller businesses can participate in regional industry partnerships that support these efforts across small businesses at scale.

RAPID RESKILLING FOR RAPID RE-EMPLOYMENT.

We need to be ready for sudden disruptions to the labor market or specific industries. Policies should support rapid reskilling so workers can move from one industry to another.

Policymakers can support this goal by supporting access to skills for workers who have lost their jobs, including those transitioning to a new industry. This includes ensuring that student financial aid policies match the reality of how digital skills are acquired. This could entail increasing financial aid for competency-based programs. Policies could also support enrollment in high quality, short-term programs that lead to employment and articulate to further educational pathways. These two solutions would create meaningful on-ramps for individuals who might otherwise never pursue postsecondary credentials. It could also include providing workers with the supports necessary to succeed in a training program – supporting costs of childcare, transportation and other costs associated with job loss that can stand in the way of someone being able to access the skill-building opportunity they need.

Workforce and education advocates and providers can support this goal by sharing their expertise with policymakers and answering questions such as: What has your organization observed regarding digital skill needs among staff, jobseekers, and learners? What policies have been most helpful in addressing digital skill needs? What policies are getting in the way of addressing digital skill needs? What strategies and tactics have been most effective in closing racial equity gaps in access to digital skills?

Influencers and corporate decisionmakers *can* educate state and federal policymakers about the skills mismatches they are experiencing and the kinds of technology skills their companies need to be successful, which some elected officials may not fully understand. Promoting state and federal public policies that support the development of industry partnerships provides another avenue for employers to help build training programs in collaboration with local community colleges and training providers.

ENDNOTES

1 This definition builds on the definition of the digital divide used by the nonprofit National Digital Inclusion Alliance, viewable at: https://www.digitalinclusion.org/definitions/

2 The nonprofit Digital US coalition defines ***digital resilience*** as: "having the awareness, skills, agility, and confidence to be empowered users of new technologies and adapt to changing digital skill demands. Digital resilience improves capacity to problem-solve and upskill, navigate digital transformations, and be active participants in society and the economy."

3 The New Landscape of Digital Literacy (National Skills Coalition, 2020.)

4 Examples of such inequities include digital redlining that limits the availability of high-speed internet in some communities; underfunded educational institutions that are unable to provide their students with robust digital technologies for learning; and barriers to access that limit students' and workers' ability to build digital skills and businesses' ability to advance into the digital age. In addition, limited income and limited access to capital handicaps digital access and skill-building opportunities, often exacerbated by the wealth gap and disproportionately affecting workers and entrepreneurs of color.

5 For more on the role of public policy in remedying inequities, see *The Roadmap to Racial Equity: An Imperative for Workforce Development Advocates* (National Skills Coalition, 2019.)

6 *The New Landscape of Digital Literacy* (National Skills Coalition, 2020.)

7 Frequently Asked Questions (U.S. Small Business Administration, October 2020.)

8 "How to improve the engagement and retention of young hourly workers," Kimberly Gilsdorf et al. (*Harvard Business Review*, December 6, 2017.)

9 Roberts, Pasha. "The CFO and CHRO Guide to Employee Attrition." *Workforce Solutions Review* 6, no. 1 (January 2015): 8–10.

10 As detailed later in this report, in the Lightcast dataset used for this analysis, jobs that require no digital skills had an average median hourly wage of $17.62, compared to $21.64 for jobs that require one definitely digital skill.

11 Feenberg, Daniel Richard, and Elizabeth Coutts, An Introduction to the TAXSIM Model, Journal of Policy Analysis and Management vol 12 no 1, Winter 1993, pages 189-194. Shane Orr (2022). usincometaxes: Calculate Federal and State Income Taxes in the United States. R package version 0.5.4. https://cran.r-project.org/package=usincometaxes

12 Learn more about the Digital Equity Act's covered populations via the U.S. Commerce Department's official InternetForAll.gov site, and NSC's fact sheet.

13 For a full listing of state demand for digital skills, see the Appendix.

14 The Lightcast dataset used for this report also includes some job postings that required workers to have zero to two years of experience in a particular role; those workers might not be new entrants to the workforce at large.

15 *Note for this figure:* Data refers to the subset of 24 million job ads (out of the total 43 million in this study) for which Lightcast was able to discern an educational level.

16 *The New Landscape of Digital Literacy* (National Skills Coalition, 2020.)

17 It is unclear from this dataset whether higher-level jobs are genuinely less likely to require foundational skills, or simply less likely to spell them out in their job descriptions. Preliminary indications from qualitative interviews suggest that employers may assume that workers with greater education have acquired basic digital competence – even if that assumption is not always borne out in reality – and thus do not bother to spell out the requirement in a job description.

18 Qualitative interviews conducted by NSC suggest that part of the story here is that smaller and more economically fragile businesses are slower to digitize, meaning that their 'likely digital' tasks (such as order processing or inventory management) may still be manual or analog, while larger and better-resourced businesses have already moved those functions to software systems.

19 Notably, this is only an approximate measure, because there is substantial variation in the "churn" rate of turnover across different companies and industries, and thus the volume of job postings that might be posted in a given time period.

20 *Boosting Digital Literacy in the Workplace* (National Skills Coalition, 2020.)

21 Demographic data throughout this section comes from the U.S. Census Bureau American Community Survey 5-year estimates (2016-2020.)

22 For example, see: *The Evolution of Occupational Segregation in the United States, 1940–2010: Gains and Losses of Gender–Race/Ethnicity Groups* (Demography, 2015); The extent of occupational segregation *in the* US: Differences by race, ethnicity, and gender (Society for the Study of Economic Inequity, 2010); and *Racism and the Economy: Focus on Employment* (Federal Reserve Bank of Atlanta, 2020.)

23 *Community Health Worker National Workforce Survey* (U.S. Department of Health and Human Services, 2007.)

24 Demographic data comes from the U.S. Census Bureau American Community Survey 5-year estimates (2016-2020.)

25 *The New Landscape of Digital Literacy* (National Skills Coalition, 2020.)

26 *Applying a Racial Equity Lens to Digital Literacy* (National Skills Coalition, 2020.)

27 Multiple factors combine to create these challenges. For example, Black and Latino workers are less likely to have bachelor's degrees, and employers invest 58 percent of their upskilling dollars in workers at that educational level, compared to just 17 percent of training dollars provided to workers with high school diplomas or less. See *Training: The Role of Employer-Provided Training in the American Postsecondary Education and Training System* (Georgetown University Center on Education and the Workforce, 2015). For more on related issues, see Applying a Racial Equity Lens to Digital Literacy (National Skills Coalition, 2020) and *The Roadmap to Racial Equity: An Imperative for Workforce Development Advocates* (National Skills Coalition, 2019.)

28 For an example of the disproportionate headwinds faced by entrepreneurs of color, see: "Which small businesses are most vulnerable to COVID-19—and when" (McKinsey & Company, June 18, 2020.)

29 Earlier research conducted by National Skills Coalition (*The New Landscape of Digital Literacy*, 2020) found that fully 31 percent of employed U.S. adults had few or no foundational digital skills. Workers without digital skills had lower incomes and less formal education compared to peers with stronger digital skills. Because this data was drawn from the Survey of Adult Skills (also known as the PIAAC), it reflects a direct, actual test of workers' skills, not merely a self-reported survey or other indirect measure. Additional informal research conducted since the pandemic

– including qualitative interviews with employers as well as direct assessment of incumbent workers using the Northstar Digital Literacy Assessment – indicates that the 31 percent number may even be conservative. Workers reported spending significant time and effort covering for and compensating for their digital skill gaps.

30 It is important to note that correlation is not causation. Simply acquiring a digital skill is not a guarantee that a worker will be able to move into a better-paying job. However, research indicates that in general, workers with greater skills are indeed able to command more opportunities in the labor market. In addition, earlier research has shown that the U.S. generally has stronger returns to foundational skills than other developed countries. ***Returns to Skills Around the World: Evidence from the PIAAC***. (Hoover Institution, 2013.)

31 Median wage of $17.62 an hour for jobs with no digital skills compared to $21.64 an hour for jobs requiring a definitely digital skill. Calculation assumes full-time, year-round employment of 40 hours a week, 50 weeks a year.

32 All data in this section comes from the American Community Survey 2016-2020 five-year estimates.

33 NSC's research found that between one-fifth and one-third of people with few or no foundational digital skills are nevertheless supervising other workers. See: ***The New Landscape of Digital Literacy*** (National Skills Coalition, 2020.)

34 ***Frequently Asked Questions*** (U.S. Small Business Administration, October 2020.)

35 ***Funding Resilience*** (National Skills Coalition, 2021.)

36 "**How to improve the engagement and retention of young hourly workers**," Kimberly Gilsdorf et al. (*Harvard Business Review*, December 6, 2017.)

37 Roberts, Pasha. "The CFO and CHRO Guide to Employee Attrition." Workforce Solutions Review 6, no. 1 (January 2015): 8–10.

38 In the Lightcast dataset used for this analysis, jobs that require no digital skills had an average median hourly wage of $17.62, compared to $21.64 for jobs that require one definitely digital skill.

39 Feenberg, Daniel Richard, and Elizabeth Coutts, An Introduction to the TAXSIM Model, Journal of Policy Analysis and Management vol 12 no 1, Winter 1993, pages 189-194. Shane Orr (2022). usincometaxes: Calculate Federal and State Income Taxes in the United States. R package version 0.5.4. **https://cran.r-project.org/package=usincometaxes**

40 *Ibid.* Note also: Tax liabilities are estimated based on rule year 2022. Federal tax liabilities represent total taxes minus applicable tax credits for a household (Child Tax Credit and Earned Income Tax Credit).

41 ***The Roadmap to Racial Equity: An Imperative for Workforce Development Advocates*** (National Skills Coalition, 2019.)

42 Learn more about industry sector partnerships in the ***Sector Partnerships Policy Toolkit*** (National Skills Coalition, 2015) and on the **NSC website**.

43 ***The Roadmap to Racial Equity: An Imperative for Workforce Development Advocates*** (National Skills Coalition, 2019.)

44 For example, see, ***Expanding Digital Inclusion via the Bipartisan Infrastructure Law*** (National Skills Coalition, 2022.)

45 ***Funding Resilience*** (National Skills Coalition, 2021.)

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