



data insights on
building a workforce

for a digital future –
a U.S. view


randstad

human forward.



From AI and automation to cloud computing, digital technologies are changing the way we work. And if the adoption of tech was accelerating pre-pandemic, it now has rocket boosters attached.

From supply chain and logistics to the customer experience and interface, companies are rapidly having to adapt to new technologies and evolving customer expectations.

New skills are in demand as companies rise to meet this challenge. New digital roles are being created. And the need for some other more traditional roles is waning. Digital jobs now account for 10 percent of all online job postings – increasing by nearly a quarter in the past four years.

In the U.S., roles for data scientists have increased by over 3,000 percent since 2012, and data engineers by over 2,000 percent. Hiring and nurturing the right talent for these in-demand roles requires a shift in focus. Detailed and up-to-date information on labor market trends, as well as an in-depth understanding of the skill sets already within their business, will be necessary to ensure companies remain on the front foot.

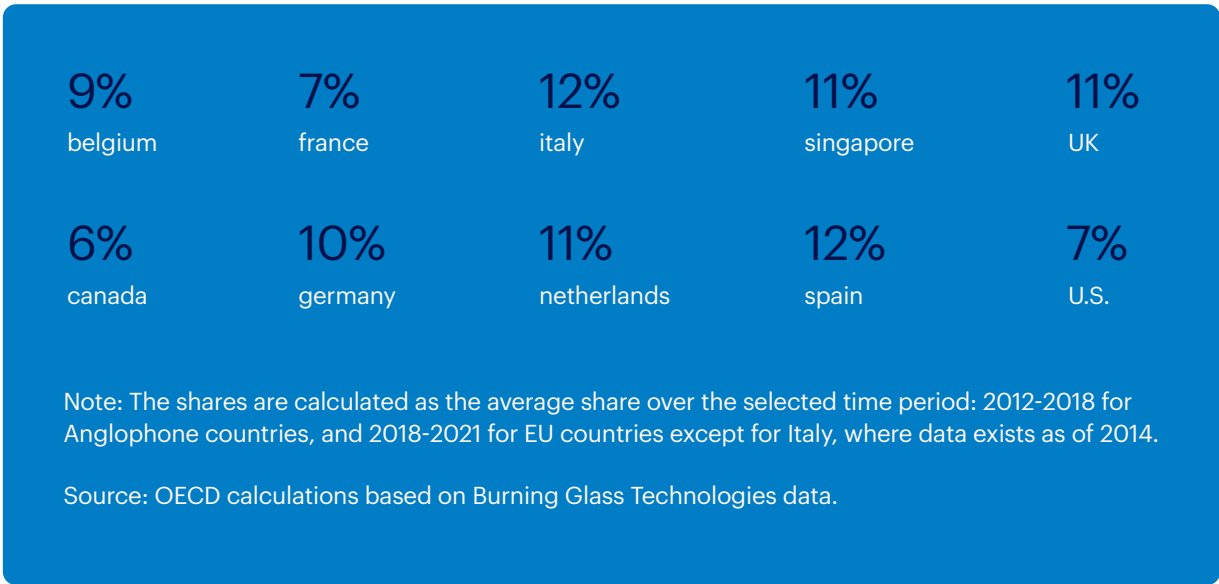
The recent Randstad and OECD report, [New Insights on Digital Skill Demands Using Big Data](#), analyzes 417 million online job postings over 10 years in 10 countries - Belgium, Canada, France, Italy, Germany, the Netherlands, Singapore, Spain, the United Kingdom and the United States. It looks at four broad groups of digital occupations: computer and data analysts and administrators; software developers, programmers and engineers; information and communications technology (ICT) technicians and data-entry clerks; and IT and HR managers and marketing specialists. By using AI and machine learning technology, it identifies the digital jobs and skills that are most in demand. It also identifies routes to requalification from jobs which are fading to those which are thriving.

But what can U.S. employers learn from the data?

the digitalization of the workplace

Digital transformation is moving at a rapid pace. Digital technologies are not an adjunct to the way we work – they are embedded in how we work, changing what we are able to do, as well as how we do it.

The table below demonstrates how digital jobs are expanding, showing the proportion of jobs advertised that were digital in each of the 10 countries.



Digital tools can replace humans in routine tasks and are increasingly being used to complement humans in problem solving and cognitive skills.

“Digital technology is increasingly an enabler for jobs of all types,” says Alisia Genzler, Group President and Chief Client Officer of Randstad Technologies. “Used effectively, it can allow some tasks to be automated while also complementing the social and innovation skills of colleagues. This can allow workers to focus on more creative problem solving within their roles.”

This rolling wave of transformation touches every part of a business, from raw materials management to inventory control, to last-mile delivery. And you don’t have to be sitting at a desk with a computer to have a job that uses digital technologies – many jobs not traditionally thought of as digital now have digital elements.

Cargo-handling vehicles and forklift trucks are increasingly computerized. And semi-autonomous warehouses are becoming more commonplace, with fast and dexterous robots performing much of the work, and algorithms dictating many of the activities.

Alongside this, companies are also coupling digital technologies with data insights to help inform their decisions and improve their systems and processes. As businesses generate more data about themselves and the markets they operate in, they also need secure ways to store and analyze that data.

Roles such as business intelligence architects are becoming increasingly key positions as companies wake up to the power their own data can offer them in planning and making strategic decisions. Indeed, postings for this role have almost tripled between 2012 and 2021.

the creation of a skills gap

The pandemic has, of course, played a role too. It has fast forwarded the adoption of digital technology by years and reinforced the need for digital transformation. Businesses can't risk being left behind.

"Everyone is scared of seeing their business model become defunct," says Terry O'Leary, Executive Vice President, Randstad Technologies. "And as new technology is brought on board, a skills gap is created within companies."

Some companies choose to hire in anticipation of this gap; others come to appreciate the need to fill it as their transformation evolves. What companies mustn't do is ignore it.

And as new technology causes ripples elsewhere around the business, roles continue to be adapted and the number of digital jobs continues to expand.

It is not just internal facing roles that are affected. One area in particular many companies are having to play catch-up with is the customer experience. Often, UX/UI considerations were undervalued in the face of the need for rapid digitalization.

"On top of this, many companies are also trying to meet a generational shift in expectations," O'Leary adds. "It is becoming increasingly normal among all generations to buy clothes without setting foot in a shop. But younger people now think little of trying on clothes digitally, for example. Companies need to build interfaces and backends with this in mind."

Evidence of this can be seen clearly in hiring trends. In the U.S., there has been a marked growth in online vacancies for UI/UX designers/developers, particularly between 2017 and 2019. Even though the number of job postings took a hit during the height of the pandemic as much hiring was paused, numbers are now back up to their highest pre-pandemic level. In 2021, there were over 70,000 postings for these roles in the U.S. alone.

breakdown of digital occupations advertised in the U.S. by group



software developers,
programmers, and
engineers



computer and
data analysts/
administrators



ICT technicians and
data entry clerks



ICT and HR
managers/marketing
specialists

Note: The shares are calculated as the average share over 2012-2018.
Source: OECD calculations based on Emsi Burning Glass data.

Recruiting for these roles requires an in-depth understanding of market trends and an appreciation of where your business fits within the bigger picture. This further underlines the need for a solid internal data gathering and analysis function.

It is also worth noting that roles requiring lower levels of skills and training are those most likely to be impacted by digitalization. Routine and low-skilled tasks will increasingly become fully or partially

automated. Given that the roles tend to also be lower paid, there is a risk that existing inequalities will be exacerbated by digitalization.

Workers will need to transition away from these declining roles into areas that are thriving. And companies have an important role in supporting and driving this transition: many skills currently being used in declining roles could also be put to use in new roles.

digital roles coming to the fore

As Box 1 shows, the digital occupations analyzed in the report represent more than 7 percent of all online job postings in the U.S. Interestingly, this is a smaller portion than seen in other countries, particularly within Europe.

“The U.S. is normally considered among the vanguard for the adoption of digital technologies, and in many ways the recruitment market reflects this,” Genzler explains. “To some extent, companies can learn from the hiring experiences of U.S. businesses. But it is also important to remember that each market will continue to have its own quirks and trends.”

However, there are some roles which are notably more prevalent than others. Among the digital jobs analyzed, software developers and engineers are in high demand. This is particularly the case in the UK, where they account for about two-thirds of job postings for digital professionals. In the U.S., this figure is slightly smaller, with 56 percent of all digital jobs posted being for software developers and engineers.

trends in digital professions by group

computer/data analyst trends

- Computer and data analysts/administrators account for a fifth of the digital occupations analyzed.
- As we become ever-more reliant on interconnected devices, and increasing amounts of sensitive data are stored and analyzed, cybersecurity is a growing concern for businesses.
- With this in mind, companies are investing in cybersecurity and IT risk management, which is driving greater demand for these roles
- In the U.S., job postings have been rising steadily since 2012 and with 176,000 new online postings for cyber/information security engineers/architects in 2021 they are at their highest level to date
- Online vacancies for data mining analysts have also climbed steeply, reaching a record level of 94,000 in 2021. The skill sets required by this job – analyzing large datasets, and using statistical techniques and programming software to identify trends – are key to firms’ ability to plan strategically.

software developers, programmers and engineers trends

- Software developers, programmers and engineers have seen some of the most notable growth rates among all digital occupations.
- Growth in the U.S. is particularly marked and outstrips what has been seen in the EU, which, for the most part, has yet to return to pre-pandemic recruitment peaks for this role.

IT technicians and data entry clerks trends

- Although many of the roles within this group are more routine than other digital roles, they are also critical to IT infrastructures working properly.
- Roles such as data entry clerks may be particularly relevant in sectors that are still digitalizing. So, despite the low-skilled, repetitive nature of these jobs, they remain on the rise.
- In the U.S., job postings for data entry clerks have grown over 170 percent to 68,000 from 2012 to 2021. However, this trend has not been replicated across all the other countries analyzed.

IT and HR managers trends

- Demand for highly skilled digital professionals such as chief information officers, directors of IT, human resources managers and marketing specialists has increased significantly in the U.S.
- There were 126,000 postings for marketing specialists alone in the U.S. in 2021, having recovered strongly from a pandemic dip.
- This trend was mirrored in the report's other Anglophone countries of Canada, the UK and Singapore.

Within the U.S. labor market specifically, however, the biggest growth has been for data scientist roles. Postings for this role have spiked from 1,260 in 2012 to over 50,000 in 2021 – over 40 times as many. A similar growth story is seen for data engineer roles, which have leapt 3,000 percent from 2012, to reach 47,000 in 2021.

This growth is rooted in the central part that these roles play in every sector in collecting and analyzing data. The business intelligence they bring is being used for everything from reducing mistakes in production to informing cost savings through automation.

In a similar vein, the demand for business intelligence architects/developers has also multiplied. Like data scientists and engineers, they are using data to provide insight that informs businesses' tactical and strategic decisions. Postings for this position in the U.S. have tripled since 2012.

Another role that has experienced strong growth in the U.S. is database architects. This role can include strategy and design of enterprise databases, multi-dimensional networks and warehouse systems. It also can involve designing databases and models to optimize infrastructure and workflow. Postings for this role have nearly doubled since 2012.

Mobile application developers, who create, program, test and maintain apps for mobile phones, have also doubled over the period. And as apps become a standard way to deliver services in sectors from banking to retail to education, it is likely that this growth will continue.

Jobs for technology consultants, who advise on how businesses should restructure, are also on the rise. This role has evolved from being purely about improving processes and reducing costs to one that encompasses digital strategy. Postings have tripled since 2012 to 46,000 in 2021.

Data warehousing specialist jobs have more than doubled in the nine-year period to almost 32,000 in 2021. Tasks under their remit include developing data management processes and procedures, and creating software for this purpose. Given companies' growing data mountain, further recruitment in this area is inevitable.

Percentage-wise, search engine optimization (SEO) specialists have also seen a significant leap in demand, growing over 300 percent over the period. Companies' online positioning will continue to be a crucial driver in creating and maintaining business.

digital occupations in high demand in the U.S. – percentage growth between 2012 and 2019

3,260

data
scientist

2,320

data
engineer

238

SEO
specialist

178

business intelligence
architect/developer

126

mobile applications
developer

111

database
architect

111

technology
consultant

108

data warehousing
specialist

Source: OECD calculations based on Burning Glass Technologies data.

In contrast to the rapid growth seen in the roles above, there are some digital roles within the States which have remained largely static, or even declined. These include webmaster/administrators, which have declined in popularity between 2012 and 2019 – although more recently demand has been climbing again. Telecommunications engineering specialists have also seen only a modest increase in posting volumes.

Network and systems administrators have experienced a volatile jobs market, and have been hit quite heavily by the pandemic. There has been some recovery since that point, but the U.S. Bureau of Labor Statistics estimates growth of 5 percent between 2020 and 2030 – slower than the average for all occupations.

Computer programmer roles were in decline between 2012 and 2017, but since that point have started to climb significantly. There is the risk of a bottleneck in the labor market if the demand is not met by sufficient numbers of skilled workers to fill the roles.

digital occupations with low or stable demand in the U.S. – percentage growth between 2012 and 2019

computer
programmer

36

network/systems
administrator

24

telecommunications
engineering specialist

16

webmaster/
administrator

17

Source: OECD calculations based on Burning Glass Technologies data.



new digital skill sets in demand

Technology is not just changing the number of digital roles required, but it is also changing the skills needed within existing roles.

As new technologies emerge, workers will need to develop adequate digital and cognitive skills to interact with them. Alongside this, AI and automation mean digital technologies will increasingly replace humans in specific cognitive tasks. However, AI does not operate in a vacuum, and its success and helpfulness will be dictated by the way humans are able to interact with it.

Businesses need employees to adapt to these changes and continuously learn new digital skills throughout their careers. And 'human' traits such as creativity, empathy and intuition – which are hard to artificially emulate – will become more valued.

“Companies mustn’t just hire with only digital skills in mind – strong social and creative skills must be equally as valued,” underlines Genzler. “These so-called ‘soft’ skills need to be nurtured, starting in the education system and continuing in the workplace.”

In addition, firms – and policymakers too – need to be able to identify the digital skill profiles of the roles within their business and those that they will need in the future. Many digital roles require a mix of technical skills and high-level cognitive skills. Take as an example database management and data analytics skills, which are often required hand-in-hand.

What presents a particular challenge for companies, though, is the demand for cross-sector expertise.

“It’s no longer about just hiring a technology role,” O’Leary explains. “These roles have to be integrated within the business. So companies are looking for a technologist with expertise within banking or pharma, for example.”

Assessing the speed at which the demand for digital skills is growing across the economy is also crucial to preparing workers and identifying trends created by new digital technologies..

The report identifies five key skills which have become particularly diffused throughout the job market: advanced data analytics; programming skills; automation and internet of things (IoT); cybersecurity; and business sales and data skills.

1. advanced data analytics

Of these, advanced data analytics have experienced the biggest spike in demand. Skills covered by this grouping include big data, artificial intelligence, machine learning, data science and data visualization.

These advanced data skills have far outpaced demand for the average skill between 2012 and 2021: in the U.S., growth in demand is 15 times greater than for the average skill. This has largely been driven by data science and visualization skills.

2. programming skills

Programming skills are diffusing at a particularly rapid rate in the UK and U.S. – between six and nine times faster than the average skills. The growth seen over the past decade is expected to accelerate, given that programming skills are a fundamental part of a variety of jobs.

Within this skills group, scripting language skills are particularly called for. In the U.S., ability to code in Python, Ruby, JavaScript or other languages has permeated the marketplace at 17 times the pace of the average skill.

3. automation and IoT

The roll-out of digital technologies and the progression of automation and IoT technologies are strongly linked. As an increasing number of roles use these skills, daily tasks are changing. For example, automated hotel check-in is freeing up staff from reception desks, who are instead able to use cognitive skills to help guests in other ways.

This skill set has diffused particularly rapidly in the U.S. and UK, at just over six times the speed of the average skill. Compared to advanced data analysis or programming skills, however, a smaller array of jobs require automation and IoT skills.

4. cybersecurity

The proliferation of connected devices and the increasing reliance of sensitive data to inform decisions means that cybersecurity is a growing concern for businesses and governments.

The rapid growth in demand for cybersecurity workers is expected to continue and commentators expect bottlenecks in the job market as the skills in the market lag behind.

Of the countries analyzed, these skills have diffused fastest in the U.S., where they are demanded more than 10 times as frequently as the average skill.

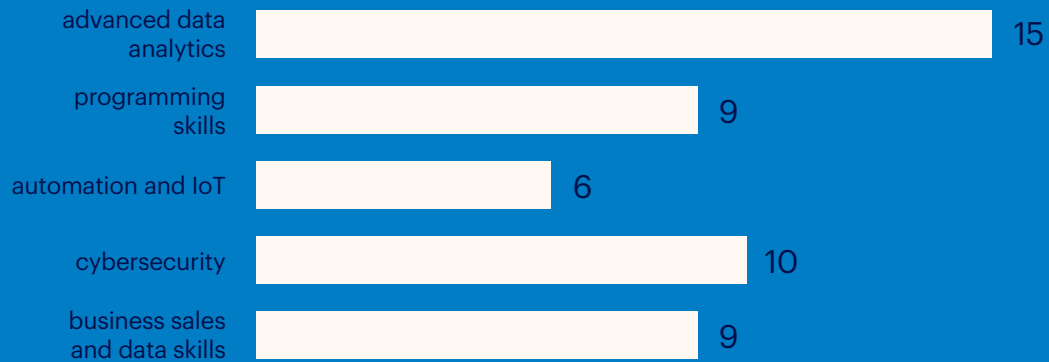
5. business sales and data skills

Digital skills have become a key part of how businesses manage a whole range of functions from productivity to sales funnels. They can streamline accounting systems, offer business intelligence to add to support sales, and enable social media channels to cultivate and maintain customer bases. As a group, these skills are around nine times more in demand than the average skill in the U.S. – a significantly higher level than seen in the other Anglophone countries in the report.

Much of this is driven by social media management skills, which are particularly called for in the U.S., becoming almost 14 times more diffused than the average skill. Accounting and finance software skills are also heavily in demand.



number of times faster the most in-demand skills in the U.S. have diffused in relation to the average skill between 2012 and 2021



Source OECD calculations based on Emsi Burning Glass data on online job postings.

securing the best talent

Digitalization has already fundamentally shifted employment. And its influence is only going to become more felt. Now is the time for companies to prepare for the transformation of the labor market. This means using data and insights to track trends to future-proof their business and keep ahead of the curve in the search for talent.

COVID-19 has taken away a lot of borders in the hunt for talent, with companies more able to recruit further from home. But there is still a significant skills shortage, particularly in highly specialized areas like security.

“The pandemic certainly highlighted the skills gap and accelerated the need for new skills within the workforce more broadly. But this has yet to filter through to policies, education and available experience in the labor market,” Genzler says.

The reality is that the demand for some digital jobs and specific skill sets is already outpacing what the market is able to supply. As part of this, there needs to be a marked shift in the graduate marketplace to ensure it is being populated with the right skills and experience at the rate the corporate market demands.

“It is hard for graduates, because you can’t just be a coder, you have to understand the workflow too,” says O’Leary. “It is not just about knowing technology – companies are looking for real-world application and industry experience. And that is a big demand for people so early in their careers under our current structures.”



Part of this is down to developing new policies that help ensure that the skills needed for tomorrow's workforce – in particular, STEM skills – are developed.

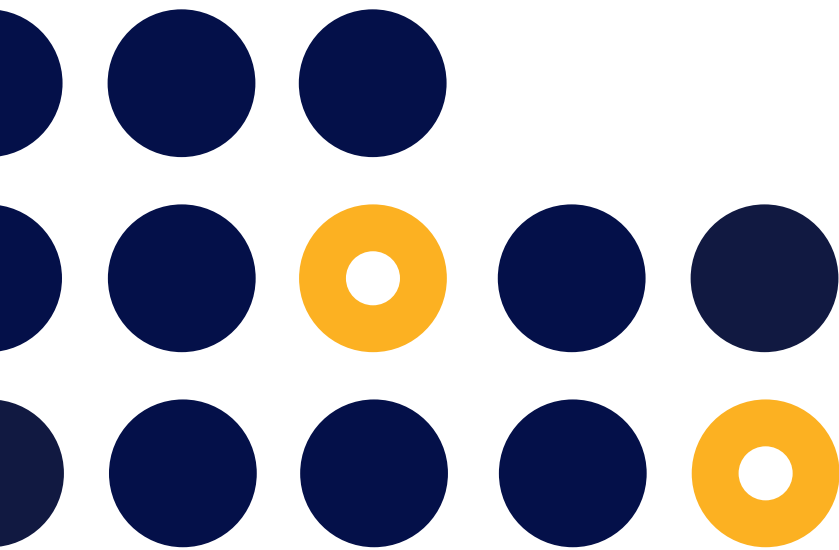
But on top of this, companies need to acknowledge there is a cost to building a talent development program that captures all of this. Many existing hiring programs are not set up to capture or nurture the talent that companies will increasingly need further down the line.

Building a talent pipeline isn't just about a good college recruiting program and skilled hiring managers. Organizations need to invest in talent development, too.

Here, digital technologies can help, providing insight into the skills that need to be built up. But this relies on companies making data-driven decisions and making sure they are consciously mining and using their data.

"Companies should ask themselves, 'Do I trust my data enough to cross the street during rush hour?' The answer is probably not because it is too backwards facing," says O'Leary. "It's about capturing the right data in the right way and understanding what it is telling you."

Recruitment needs to bring a team forwards – it is not just about replacing who has left. It is about filling a skills gap and enabling continuous skills evolution.



a changing labor force

It is clear that the pandemic has re-written the employer-employee contract. Employees have more control than before and demand more flexibility. There is an expectation from many that remote working will be on offer.

But, particularly among the younger generation, there is also a greater focus on values: “People want to work somewhere where they believe in the mission, and that mission isn’t just to make money,” O’Leary confirms.

This means a company’s ethos needs to come through clearly and be reflected in its recruitment process. There also needs to be transparency and commitment to that messaging.

“We can all smell out when the winds of change push a company to get behind a certain thing, but the company doesn’t really buy into it,” O’Leary says.

reskilling the workforce

There is no getting around the fact that many workers will be displaced by digital technologies. Eighty-five million jobs will be disrupted by 2025 as a consequence of the shift in the division of labor between humans and machines, according to the [World Economic Forum’s 2020 Future of Jobs Report](#).

However, many new roles will also be created. The metaverse, IoT, wearables and security are among the biggest drivers for change, and will continue to shape the skills that are in demand.

Companies and policymakers need to take the opportunity now to plan for this and smooth the transition.

Many of the skills needed in the digital jobs of the future are already being used in roles today. Part of the transition will be about identifying these crossovers and then reskilling people for the parts of the job they are not currently doing.

The report identifies a couple of example pathways from jobs that are in decline to those which are thriving.

Three possible paths suggested within the U.S. jobs market are from advertising sales agents or account executives to digital marketing specialist; from satellite/broadband technician to computer support specialist; and from customer service manager to data engineer.

pathways from declining occupations to thriving digital occupations in the U.S.

origin job	projected decline in origin job	destination job	projected growth in destination job	similarity between origin and destination job
advertising sales agents/account executive	-18.7%	digital marketing specialist	22.1%	0.46
satellite/broadband technician	-1.1%	computer support specialist	8.9%	0.32
customer service manager	-1.5%	data engineer	7.8%	0.29

Note: The job similarity is calculated using a formula which gauges similarity between 0 and 1, with higher values meaning jobs have greater similarity.

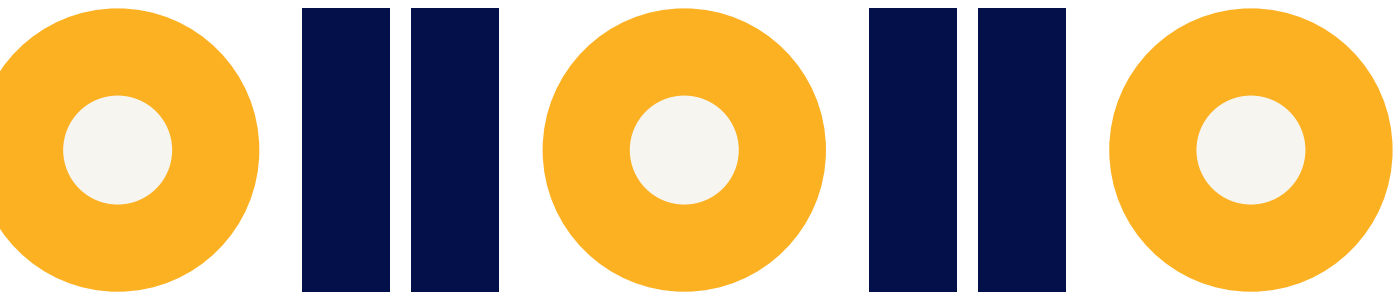
Source: OECD calculations based on Emsi Burning Glass data and U.S. Bureau of Labor Statistics projections.

Analysis shows that advertising sales agents wishing to become digital marketing specialists would have to fill a skills gap on web analytics and online marketing in particular. Other skills that will need to be added include developing an understanding of Semrush – a platform used for keyword research and measurement – SEO, and online sales.

The biggest skills gaps for satellite/broadband technicians looking to retrain are around help desk support, internet protocols and IT management.

And for customer service managers transitioning to new roles as data engineers, there are some notable knowledge gaps around distributed computing, data warehousing and big data in general. It is worth noting that the occupations which are most obviously similar to customer service managers – such as call center managers, sales supervisors, recruiters and marketing managers – are also roles that are set to decline in demand.

Companies must support workers as they transition into new roles, and be aware that any move needs to be mutually beneficial. In order to make new roles work, they must set clear goals and establish an explicit transition pathway.



“Organizations need to encourage lateral movement,” says O’Leary. “They need to take the people that understand the business and drive innovation in their skills to fill their needs, rather than looking externally for a quick fix.”

A key piece of the skills gap puzzle is lifelong learning. Employers need to create reskilling and upskilling strategies for in-demand and emerging skills. And this needs to span the width of an employee’s working career.

“Technology will continue to change the way we work,” explains Genzler. “The most successful companies will respond to this by keep on challenging what they accept as the norm and supporting their employees in evolving their skills.”

Technology is going to continue to change the way we work. If your organization wants to keep up with the unrelenting pace of change, you have to be ready to adapt to the great demand of digital roles. Hiring and nurturing the right talent for these in-demand roles requires a shift in focus. The great news is, you don’t have to go it alone.

Whether you need a high-level hire, a team of contractors for a pressing project, or an entire Managed Service solution, Randstad Technologies is here to help. And if you’re not quite sure what you need, our team of experts is always on hand to guide you.

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