digital skills:

unlock opportunities for all.

randstad

human forward.

Digital technologies such as artificial intelligence (AI), robotics and cloud computing are reshaping the way we work.

The rapid adoption of these technologies, in everything from manufacturing to healthcare, is opening up new opportunities for workers with the skills needed to thrive in the digital economy.

In the US, for example, online job postings for digital roles increased by 24% between 2018 and 2021, led by a 116% increase in the number of listings seeking data engineers. Postings for computer scientists rose by 72%, followed by increases of 70% in adverts for chief investment officers and directors of IT, 63% for data scientists and 55% for marketing specialists.

This means continuous investments in the digitalization of the labor market should be a priority. Identifying the occupations that will thrive as the market evolves — and the skills needed to perform these roles — will allow policymakers and employers to focus education and training on the skills and tools that workers need to succeed.

For company leaders, tracking the development of the labor market will help them future-proof their businesses and lead the race to hire and retain the best talent. This vital task will require detailed, up-to-date information on the most relevant labor market trends related to the adoption of digital technologies.

A new report from the Organisation for Economic Co-operation and Development (OECD), supported by Randstad, aims to help provide this essential information. The report, entitled *Skills for the Digital Transition: Assessing Recent Trends Using Big Data*, applies AI and machine learning techniques to analysis of the information contained in job postings published online, with the aim of highlighting the occupations and skills that are most in demand in labor markets. It also shows how to identify effective reskilling pathways for those in jobs that are threatened by the digital transformation, helping to prepare them for the careers of tomorrow.

Digital technologies are likely to have the biggest impact on roles requiring lower levels of education and training, especially in areas that are more vulnerable to computerization. Driverless vehicles, for example, could displace millions of commercial drivers around the world, while other technologies are expected to gradually replace humans in certain manual and cognitive tasks.

But workers in these and a wide range of other sectors already have skills that they can adapt and transfer to new digital roles.

how information was gathered.

The report is based on analysis of 417 million online job postings over a period of 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 categories of digital occupations: computer and data analysts and administrators; software developers, programmers and engineers; information & communications technology (ICT) technicians and data-entry clerks; and ICT and HR managers and marketing specialists.

big data analysis of:

417 million online job postings

10-year period

10 countries

four broad categories of digital occupations:

computer and data analysts and administrators

software developers, programmers and engineers

ICT technicians and data-entry clerks

ICT and HR managers and marketing specialists

digitalizing
the workplace.

Companies in sectors as diverse as auto repair and agriculture are adopting new technologies and harnessing big data to improve decision-making.

Data warehousing skills, for example, are central to a wide variety of business decisions. With the collection of more data from different sources, firms need to find ways to store and analyze the data to plan marketing strategies or production processes. That could be creating reports about patients in the healthcare sector, or examining the profitability of different routes for airlines.

Elsewhere, industrial robotics are being applied to narrow and repetitive manufacturing tasks, AI-powered natural language processing is helping identify disease from the description of symptoms, and computer vision, sensor fusion and deep learning are automatically detecting when products are taken from the shelves of a store, allowing customers to exit without passing through a checkout.

Technology can replace workers in tasks that are easy to automate. It can also complement workers in tasks requiring creativity, problem-solving and cognitive skills — those human traits that set us apart and which are expected to become increasingly important in labor markets as AI is more deeply integrated into the workplace.

Rapid changes are already underway and are being reflected in the jobs that employers need to fill. That means digital jobs are accounting for a significant share of all vacancies posted online.

This is borne out by the data in online job postings from the 10 countries included in the report.

The chart below shows what percentage of all online job postings are, on average, for digital occupations.

Legend:
- Belgium
- Canada
- France
- Germany
- Italy
- Netherlands
- Singapore
- Spain
- UK
- US
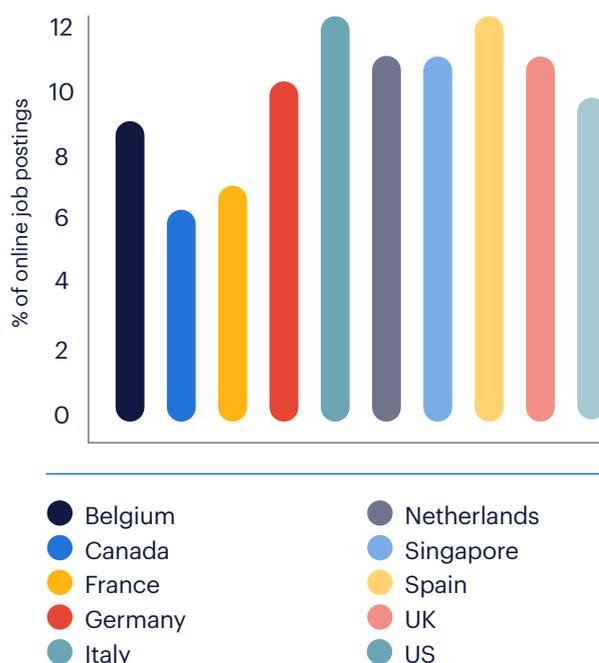
see Chapter Four of the report for a full list of digital roles considered in the analysis

job transformation case study: broadband technician

A central part of a broadband technician's job has been to help customers with the installation, configuration, troubleshooting or maintenance of devices. Now, AI-enabled virtual assistants are increasingly taking on this work. Broadband technicians share a range of skills with computer-support specialists, which remain in great demand. Upskilling would be needed in internet and border gateway protocols, as well as helpdesk support and IT management.
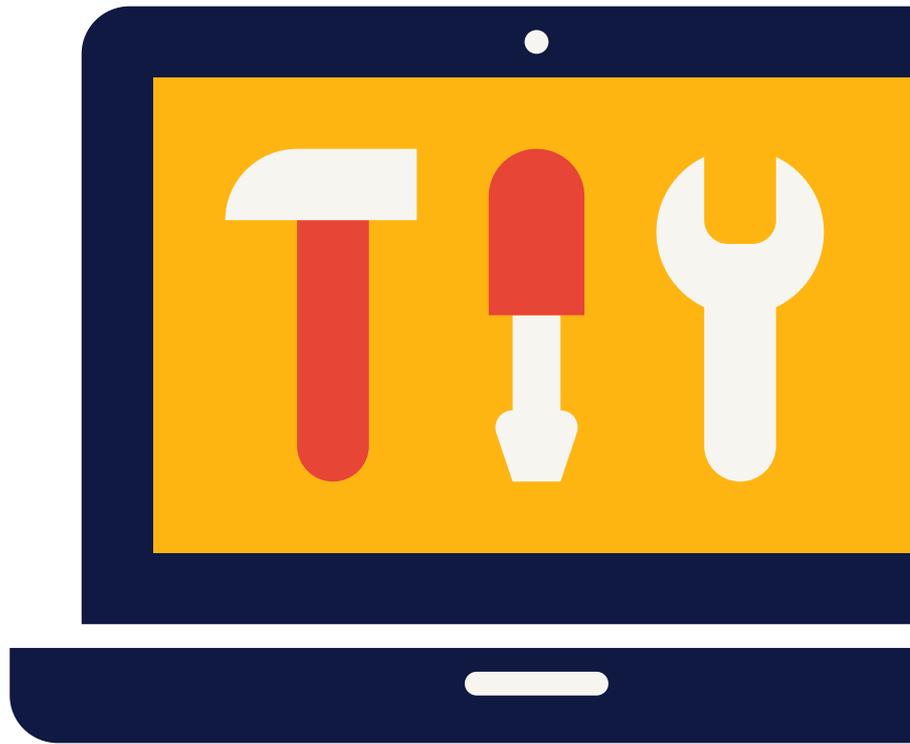
Within the digital postings included in the report, software developers, programmers and engineers are in high demand.

In the UK, for instance, approximately two in every three online job postings for digital professionals are seeking software developers and programmers. In the US, software developers and engineers account for 56% of the postings for digital professionals, while the figure is close to 50% in Spain, Canada and Singapore. In Germany and France, the share of job postings for software developers and programmers is slightly lower, but still considerable, at 37% and 36% respectively.

Computer and data analysts or administrators are also in significant demand, representing one in every five of the selected digital occupations across the 10 countries analyzed.

Jobs such as ICT technicians and data entry clerks are less in demand, however, and represent a smaller fraction of overall online job postings in all countries. In fact, these are below 20% for all countries, and as low as 7% in Germany and 9% in Belgium.

a rapidly changing landscape.

Leveraging data is of paramount importance for firms wanting to recruit the right talent at the right time.

key changes in demand for digital jobs

- Online job postings for data scientists in Canada, the UK and the US increased more than 40 times between 2012 and 2021.
- Demand for cybersecurity professionals has boomed in recent years as more firms gather data to inform decision-making.
- Demand for IT professionals and technicians to manage IT infrastructures is rising across all countries, partly due to the increase in connectivity of all types of businesses and activities.
- Software developers and engineers are more in demand thanks to the rise of e-commerce, online sales and the use of apps.
- In Canada, the number of job postings for user interface and user experience designers was three times larger in 2021 than it was in 2012.

## dramatic rise in demand for certain skills

- The knowledge of machine learning, data science and data visualization is spreading extremely quickly across roles and sectors. In the US, demand for advanced data analysis skills spread more than 15 times faster than demand for the average skill between 2012 and 2021.
- A rapidly rising number of businesses are looking for people with social media management skills. In the UK and the US, the demand for social media skills spread up to 14 times faster than the demand for average skills between 2012 and 2021.
- Digital jobs require a mix of technical and high-level cognitive skills.
- Among the technical knowledge areas in strong demand are programming languages such as Java and computer-aided engineering (CAE) software, which relates to automation.
- Knowledge of web analytics tools is also in strong demand, thanks to the expansion of e-commerce.
- High-level cognitive skills are also needed to know how to interpret data.

a digital evolution.

market share

Jobs involving digital skills have seen huge growth in the last decade across all regions.

The examples below show digital occupations as a share of total job postings in the US, Italy and Singapore since 2012.

US
7.25
92.75

Italy
11.43
88.57

Singapore
10.61
89.39

share of total postings (%), average for all years

● digital occupations
● other occupations
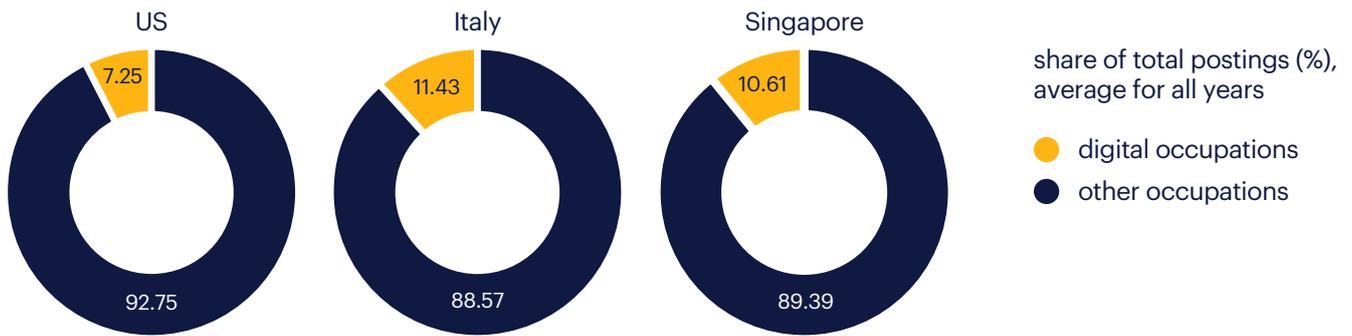
Software developers, programmers and engineers are in particularly high demand in all three countries.

US	23	56	12	9
Italy	21	44	15	21
Singapore	22	49	13	16

% share of online job postings for digital jobs

● computer and data analysts/administrators
● software developers, programmers and engineers
○ ICT technicians and data entry clerks
● ICT and HR managers/marketing specialists
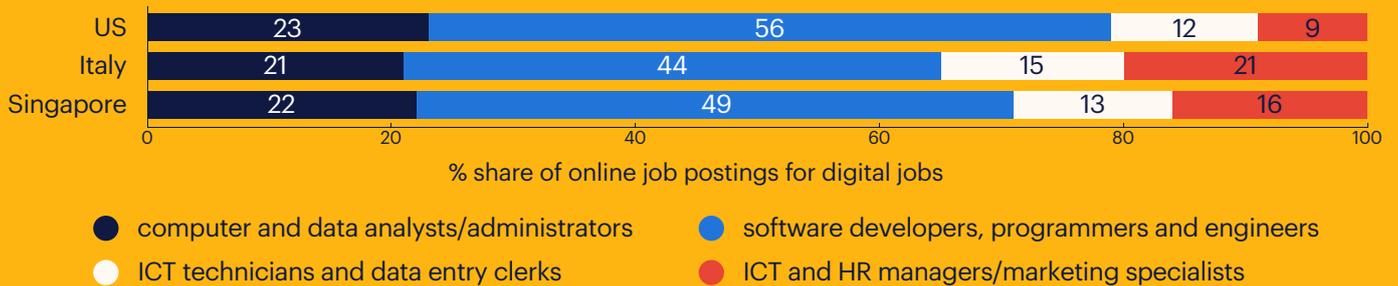
regional variations

There has been growth in digital-related job postings in all regions included in the report, but demand for specific roles is varied.

These examples from the US, Italy and Singapore show significant geographical differences in demand for particular skills.
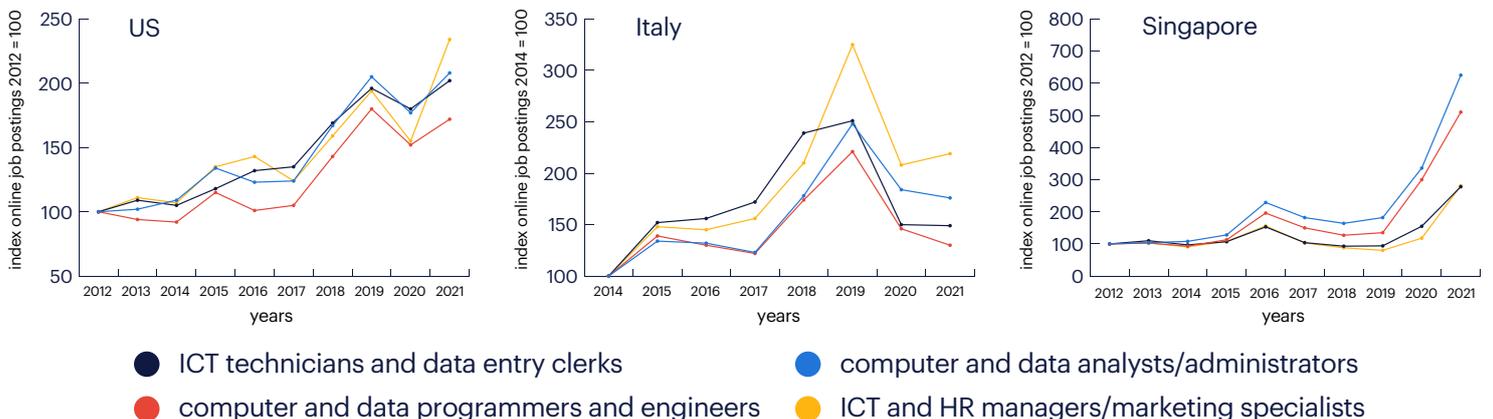
US
index online job postings 2012 = 100
years

Italy
index online job postings 2014 = 100
years

Singapore
index online job postings 2012 = 100
years

● ICT technicians and data entry clerks
● computer and data analysts/administrators
● computer and data programmers and engineers
● ICT and HR managers/marketing specialists

labor market trends.

Clear trends are emerging in the four job categories that the report explores, but the results for specific jobs vary between countries. Demand for data engineers and scientists has grown significantly in Canada, the UK and the US in recent years, but the picture is mixed in Belgium, Germany and the Netherlands.

Online job postings for computer and data analysts and administrators have trended steadily higher. This is a result of the private and public sectors becoming increasingly reliant on interconnected devices to collect and store vast amounts of data to improve decision-making — a shift that in turn increases the risk they face from cyberattacks, and creates a steady increase in demand for cyber/information security engineers and architects.

Some of the biggest growth in digital jobs is in software development, programming and engineering. In Canada, online job postings for these areas were more than three times higher in 2021 than in 2012.

Indeed, this is the biggest category for online job postings. Two in three job adverts for digital professionals in the UK are for software developers and programmers.

ICT technicians and data-entry clerks are essential for ICT infrastructures to work properly, so they are also in high demand as countries and companies transition to a fully digital environment. However, the long-term outlook in this category is potentially negative because of the more routine-intensive, lower-skilled nature of these jobs.

On the other hand, vacancies for highly skilled digital professionals such as CIOs, IT directors, HR managers and marketing specialists have soared in the four English-speaking countries covered in the report. Postings for marketing specialists have increased more than fourfold in Canada since 2012, while in the US demand fell off in 2020, during the pandemic, before bouncing back the following year.

job transformation case study: data clerk

Recent developments in speech-recognition technologies allow individuals to use note-taking software that is more accurate and rapid than well-trained humans taking dictation. Word processors and typists will probably need to learn how to interact with machines and software programs to "teach" them new terms and flag the most difficult words.

skills for the digital economy

The pace of the digital transformation is driving more than just demand for professionals in digital occupations. It is also changing the skill sets that workers will need to thrive in these jobs.

Digital technologies will fundamentally change the types of skills workers need in two ways. First, workers will need to acquire adequate digital and cognitive skills to interact with emerging technologies. Secondly, digital technologies will free up workers to focus on tasks that AI isn't capable of performing effectively. This means socio-emotional skills and human traits such as empathy, intuition and creativity will grow in importance as AI is adopted more broadly.

Identifying the skill profiles of in-demand occupations is a key challenge for business leaders and policymakers. The OECD study provides a more granular analysis of online job postings than previously available, and highlights the most relevant requirements for various digital roles.

data is driving digital jobs

The demand for typical digital skills has far outpaced demand for other skills over the past decade, analysis of online job postings shows. Assessing the speed at which demand for various skills is increasing across the labor market is essential for business leaders as they look to stay ahead of competitors, retain staff and prepare workers for the changing workplace landscape.

job transformation case study: advertising sales agents

The ability to automate digital ad placement and the use of ad blockers by digital users could limit employment demand for advertising sales agents. Advertising sales agents could upskill into marketing specialists with knowledge of web analytics, online marketing and search engine optimization techniques.

The report looks at the speed at which five digital skills categories have filtered into the jobs market.

advanced data analytics

Advanced data analysis skills are not only mentioned in online job postings much more frequently than a decade ago, but they also appear in a much wider range of job and work contexts. This signals that their use has spread from narrow contexts such as the IT sector to a varied range of sectors and jobs. The wider availability of a range of data sets means this trend is likely to continue.

The fastest growth is for advanced data analysis, demand for which has spread 15.5 times more quickly than the average for all skills. In the US, the pace is 15 times faster than for average skills, while in Singapore it is nearly five times faster. Within this category, demand for skills related to data science has diffused 18 times faster than average, while machine learning has spread 17 times faster.

cybersecurity

The mounting risk of cyberattacks has sparked increasing investment in security and risk management, and this has in turn driven an increase in the hiring of workers with cybersecurity skills. Demand in the US is spreading more than 10 times faster than for the average skill, while in the UK the pace is 6.6 times faster.

programming

Programming skills are also in high demand because they play a key role in a variety of fast-growing job categories. In the US and UK, the pace at which the demand has diffused is between six and nine times faster than for the average skill, while it's slower in Canada and Singapore. Among the sub-skills that go into programming, demand for scripting language skills has spread far faster than the average — particularly in the US, where it has climbed 17 times faster.

automation and the Internet of Things

Skills related to automation and the IoT are diffusing as much as six times quicker on average than demand for other skills, fueled by the growing popularity of products for smart homes, and of smart wearables such as watches. The pace has been especially quick in the UK and US, happening six and seven times faster than the average skill, respectively. This demand will continue to grow as automation accelerates and the IoT expands to cities and sectors such as agriculture.

digital skills related to business and sales

With digital technologies in use in nearly all productive sectors of the economy, there are rising needs for a range of related skills. The number of online job postings listing digital skills connected to business and sales has diffused across jobs 8.5 times faster than the average, with the strongest growth in social media skills. Demand for programming skills shot up eight times faster than the average, while growth in demand for IT automation skills spread six times faster.

a new way forward.

Four steps organizations can take to guide employees in declining roles into thriving ones.

step 1

use big data to identify declining and thriving roles in your organization

The US Bureau of Labor Statistics provides publicly available data set that can show the expected decline or growth in job types. It projects that roles for advertising sales agents will dip by 18.7% between 2020-2030, while digital marketing specialist roles are projected to grow 22.1%.

advertising sales agents
-18.7%
projected employment growth (2020-2030)

digital marketing speciallist
22.1%
projected employment growth (2020-2030)

step 2

identify similarities between the roles

By looking at the skills sets in different roles, you can see which positions offer the closest match. OECD calculations indicate that there is a high degree of skill overlap between advertising sales agents and digital marketing specialists.

declining constellation

account manager/ representative

advertising sales agents

business development/ sales manager

sales assistant

sales representative

thriving constellation

marketing manager

digital marketing specialist

marketing assistant/ associate

media planner /buyer

public relations/com. specialist

copywriter

step 3

offer colleagues a clear retraining plan

When offering colleagues the opportunity to transition into new roles, ensure you offer transparent, data-led training plans to fill any knowledge gaps. In our example, the data shows that an advertising sales agent would need to boost knowledge of web analytics and online marketing in order to transition to a digital marketing role.

skill distance from origin to destination

furthest

web analytics
online marketing
semrush
online sales
SEO copywriting
brand management
advertising
marketing management
online advertising
pardot

closest

step 4

support them in their transition

Changing professions, even within the same organization can be challenging. Offer colleagues switching roles the same support as new joiners. Induction processes, regular check-ins with line managers and introductions to their new colleagues can all help them to settle in faster.

preparing for
the future.

The digital revolution could create millions of jobs but also displace many workers as a result of the shifting division of labor between humans and machines.

It is transforming the labor market, and the pace of change is increasing. This is the time for business leaders and policymakers to plan for the transition. Leveraging big data allows business leaders to identify the jobs most likely to thrive in the new economy, as well as the most effective pathways for reskilling workers. Applying this approach can help put employers and employees on the path to success.

Preparing for this fundamental change in the labor market is a priority for business leaders and workers. This means ensuring that workers have the skills they need to transition into occupations that are expected to grow in the digital economy.
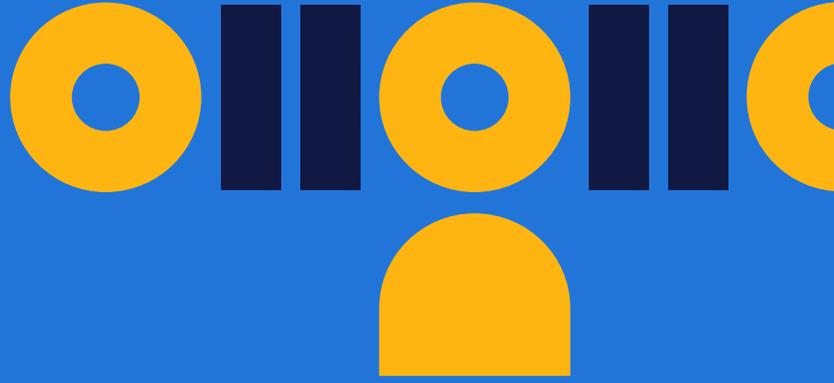
Randstad's take on digital transformation.

prioritize learning at all career stages

Employers lacking a reskilling and upskilling strategy for in-demand and emerging skills are at a significant competitive disadvantage. This trend is driven by evolving business needs, as shown by a McKinsey survey which found that 64% of companies said they need to build new digital businesses to stay economically viable by 2023. Through a more targeted learning and development strategy that can repurpose people with adjacent skills, companies can help their employees stay marketable and relevant to a highly dynamic labor market.

embrace a new social contract with employees

To ensure business has access to hard-to-find skills, it's important to prioritize the talent experience. The pandemic has changed the social contract workers have with employers, and expectations are for companies to provide more than a job and a paycheck. Recent research from Randstad shows that talent want empathetic employers to focus on workplace wellness, provide a pleasant work environment, and offer career mobility and meaningful work.

## shape policy to encourage studies in future skills

STEM skills will become even more important as digitalization accelerates in the global economy. Engineers, mathematicians and data scientists will be the backbone of a tech-driven society, so giving people guidance and incentives will help develop a relevant workforce.

flexible employment becomes the status quo

The global labor market will adapt to a more flexible way of working. Remote work and flexible schedules have become the norm during the pandemic, and the trend is expected to persist. Governments and companies will need to refine their policies and practices to empower digital natives and nomads to work in new and alternative ways.
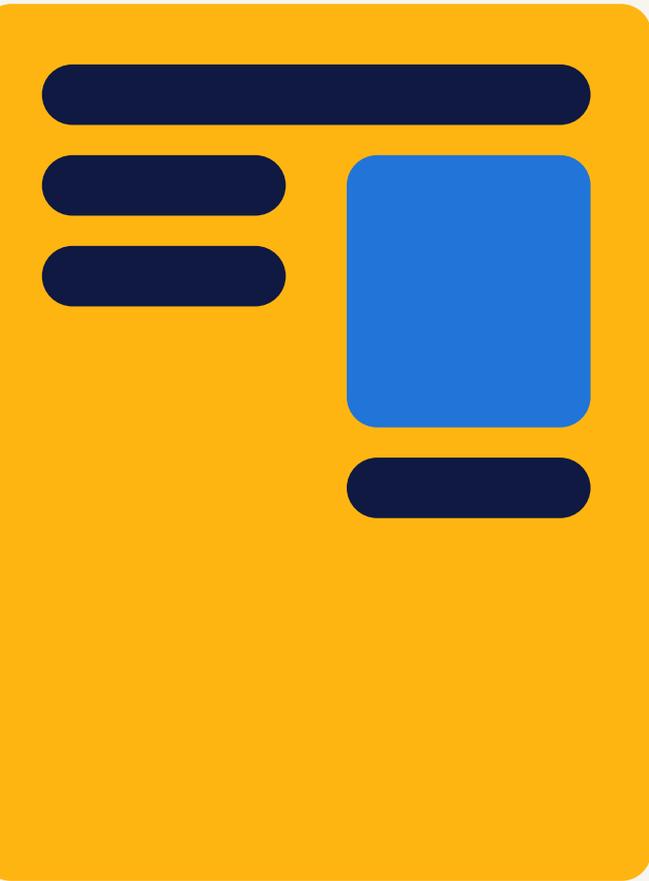
about the report

The new report from the Organisation for Economic Co-operation and Development (OECD), in partnership with Randstad, aims to provide business leaders with essential information. The new report is sponsored by Randstad and uses Big Data to identify the occupations and skills most in demand in today's workplace. It also shows how to identify effective reskilling pathways to help people transition into the careers of tomorrow.

It is based on analysis of 417 million online job postings over a period of 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 categories of digital occupations: computer and data analysts and administrators; software developers, programmers and engineers; ICT technicians and data-entry clerks; and ICT and HR managers and marketing specialists (see Chapter Four of the report for a full list of digital roles considered in the analysis).

www.oecd.org/employment/skills-for-the-digital-transition-38c36777-en.htm

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