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# GEN Z'S ROLE IN SHAPING THE DIGITAL ECONOMY

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# FOREWORD

We believe that this generation of young people will play a vital role in driving the post-pandemic recovery and digital economy and find many reasons to be optimistic about their future.

We know this runs contrary to popular opinion. It is abundantly clear the pandemic has exacerbated many of the challenges this generation faces. Their education has been disrupted, university courses have been postponed and they've had to struggle through disjointed, remote learning. There is a shrinking pool of entry-level jobs and uncertainty about what the future of work will look like. They are missing out on interaction with other young people for months at a time and there are concerns about the impact on their mental health and wellbeing.

All of this has led to the commonly held view that the future for 'Generation COVID' is likely to be much more challenging than for previous generations.

While for now the pandemic has arguably disrupted this group more than any other, we are inspired by the world that they are trying to create and our experience at Snap is at odds with the prevailing narrative. All the time we see the ingenuity and huge potential of Generation Z - from our youngest colleagues to people who use the platform every day - their approach to challenges and problem-solving, their creativity, adaptability and drive to use technology for good, is an inspiration.

At Snap, we see a hugely activist generation who care deeply about the world they live in and the impact of their actions on others. A group who thrive on disruption, change and fast-paced living; who don't believe in one-size-fits-all approaches on everything from gender identity to learning and careers. And, as we're seeing around the world, they are also an increasingly positive force in our democratic systems; it was youth-led movements which drove mass action on the climate crisis and which, last summer, held corporations and institutions to account on issues such as diversity, representation and inequality.

For this report we have partnered with Oxford Economics, to reach behind the negative headlines and build an evidence-based view of what the future looks like for young people today. We have included insights from policy experts across education, industry, the labour market, technology & the future of work. We have analysed a range of data sources and carried out our own field research. From this, a new picture has emerged, which shows clearly how the unique qualities Gen Z possess will equip them well for the seismic changes we're all living through.

By recognising and understanding these trends, we hope to raise awareness both at Snap and across the wider tech industry about Gen Z's unique capabilities and how we can capitalise on the creativity and adaptability of young people, in particular, to drive the recovery and the digital economy in the future.

To get there, our research indicates that policymakers must, in the short term, prioritise plugging the educational attainment gap, either through small group learning or programmes specifically targeting disadvantaged children. More broadly, we'll highlight in the report, the need to retool our education systems to be fit for the Fourth Industrial Revolution, while supporting people to adapt to the permanent and exciting shifts in our economy.

Crucially, as our work shows, far from being a generation lost to COVID-19, the very nature of the changes brought about by the pandemic neatly fit into Gen Z's existing aptitudes. The labour market is evolving towards jobs that demand more digital skills, not fewer. Meanwhile burgeoning technologies like Augmented Reality - in greater demand than ever due to social restrictions - are set to become more ingrained into our daily lives. These are trends Generation Z are poised to lead on. And, combined with their unique attributes, the digital acceleration brought about by the pandemic, we might just see them taking the lead sooner than any of us would have thought possible.

I speak for all of Snap when I say we are hugely excited to see where they take us.

**Claire Valoti,**  
**VP International, Snap Inc.**



# EXECUTIVE SUMMARY

We have set out to understand how the evolution of the labour market and the changes caused by the COVID-19 pandemic can be expected to shape future demand for aptitudes and skills and what this means for Gen Z—the latest fully fledged generational cohort encompassing those born between the mid-1990s and 2010. Recent estimates suggest that Gen Z is now the world's largest cohort, accounting for roughly a third of the global population.<sup>1</sup>

We have collected evidence and analysed trends across six markets: Australia, France, Germany, the Netherlands, the United Kingdom (UK), and the United States (US). The stories told and the conclusions drawn are, therefore, most relevant to these countries but are broadly applicable across the OECD.



## WHO IS GEN Z?

Particularly in more advanced economies, Gen Zers are currently on the periphery of the labour market. Over the next 10 years, they will become an engine of economic growth. Our modelling projects that the number in work across markets covered will roughly treble to 87 million by 2030. Moreover, the combination of more experience and a switch to more full-time working patterns will see this group command higher salaries—our forecasts suggest a 150% increase in average earnings by 2030 in real terms.

These dynamics will see Gen Z become a significantly more important independent source of consumer spending. Our projections indicate that they will support over \$3.0 trillion of spending in 2030 across our six focus markets, an approximate six-fold increase on 2019.

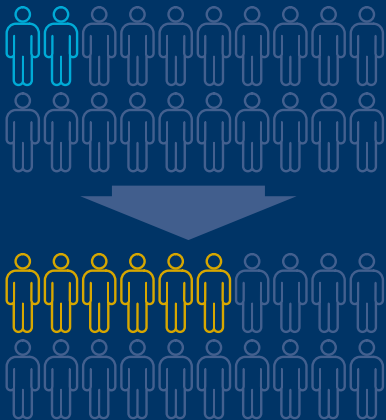
Much has been made of the fact that Gen Z will be the first wholly digitally native generation. Our survey research indicates that, compared to older generations, this is associated with a greater familiarity with, and aptitude for using, digital technology in everyday settings.

# GEN Z TO PLAY A SIGNIFICANT ROLE IN THE ECONOMY BY 2030\*



## By 2030, Gen Z will make up almost a third of the workforce

Gen Z's share of total employment will rise rapidly, from **10%** in **2019** to **30%** in **2030**.



## Their incomes will balloon over the next 10 years

Gen Z disposable incomes will increase almost **seven-fold**, from around **\$460 billion** in **2019** to **\$3.2 trillion** in **2030**.



## They will become the engine of consumer spending

Gen Z's consumer spending will increase more than **six-fold**, from **\$467 billion** in **2019** to **\$3.0 trillion** in **2030**, equivalent to **11%** of total household spending.



\*Figures are combined totals for all six markets: Australia, France, Germany, the Netherlands, UK, and US

Collating information from a wide range of knowledge-based questions, we have developed a digital competence index measure. Pooling responses across our survey, Gen Z's average competence score was 2.5% higher than Millennials and over 8% higher than Gen X.

Beyond digital aptitude, our research has highlighted three Gen Z traits that we think are likely to serve them well in the future workplace:

- Agility:** in interviews with technology entrepreneurs, a recurring theme was that Gen Z workers tend to be adept at absorbing information and reacting to new challenges as they occur.
- Creativity:** past surveys have persistently found that Gen Z are significantly more likely to describe themselves as creative and undertake creative activities compared to elder cohorts.<sup>2</sup> Our research shines light on the digital element of this, with Gen Z significantly more likely to know how to create and design various types of digital content.
- Curiosity:** whether a product of their youth or a genuine cohort effect, Gen Zers were significantly more likely to report that they were engaging in various forms of informal learning.

<sup>2</sup> <https://theharrispoll.com/generation-create-gen-z-might-be-the-most-creative-generation-yet-poll-says/>

## TECHNOLOGY AND THE LABOUR MARKET

Throughout modern history, technology and the labour market have been intertwined. One principal channel through which this has occurred is automation—the process through which machines and new technology take on workplace tasks previously performed by humans.

Previous research has demonstrated that the next wave of automation, led by advances in artificial intelligence (AI) and data analytics, will heighten the premium on advanced cognitive skills such as creativity and critical thinking. Whereas the previous wave of digital automation primarily affected tasks that required routine manual and cognitive skills, AI has the potential to be much more pervasive, affecting, if not displacing, the role of many high-skilled occupations.<sup>3</sup> The upshot is that being able to challenge orthodoxy and develop original solutions are traits which will be increasingly valued by firms. By extension, the importance of lifelong learning is set to rise with workers required to adapt to more rapidly evolving demands.

Beyond automation, digital technology is a major driver of skills due to its pervasive influence on so many aspects of how we live—entertainment, travel, communication, shopping etc. A prime example in the past decade was social media. As membership of social platforms grew exponentially, the importance of this medium for firms to engage with and influence their customers rose accordingly. Moreover, this trend had spillover consequences with the associated proliferation of data contributing to the wider need for data analytics skills within organisations and the increased need for infrastructure which can securely house this information. These trends were all borne out by our analysis of jobs postings data covering Australia, the UK, and the US.

This example demonstrates that the technological changes which might drive digital skills demand over the next decade will be those which will fundamentally change our everyday lives, but which may be relatively nascent today.

## STRUCTURAL IMPLICATIONS OF COVID-19

The coronavirus pandemic has already had a very visible impact on the labour market, pushing millions into unemployment or temporary inactivity. However, longer-term, our research has identified the following structural trends that will form an important part of the labour market *legacy* of COVID-19:

- **An educational attainment gap:** in many advanced economies, the pandemic has forced a temporary shift to online learning. This change has been particularly disruptive for children from disadvantaged households who lack access to the requisite digital technology, with early evidence suggesting that it has led to lower attainment levels.
- **A digital accelerant:** the imposition of social distancing has heightened the importance of digital technology. This change has been ubiquitous—touching on the way we communicate, shop, work, exercise, learn, and entertain ourselves.
- **A spur to automation:** it is said that necessity is the mother of invention, and this is certainly the case with automation. Past research has demonstrated that recession periods can account for a large majority of this activity, so COVID-19 is likely to trigger a new wave of automation.
- **A sectoral disrupter:** more so than previous recessions, COVID-19 will disrupt previous sectoral patterns of production. Across markets studied, 2020 saw greater variation in sectoral performance compared to the previous recession.

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6 <sup>3</sup>Marguerita and Saint-Martin, Anne Lane, "The Impact of Artificial Intelligence on the Labour Market: what do we know so far?" (OECD Social, Employment and Migration Working Paper, No. 256, OECD, January 2021), 61.



## PUTTING THIS ALL TOGETHER

The forces unleashed by the latest wave of digital technology, and accelerated by COVID-19, will be highly disruptive in the workplace. These changes will place a higher premium on technological know-how and cognitive skills such as creativity and critical thinking. Workers needing to switch careers and those whose responsibilities are fundamentally altered by AI will need to adapt, upgrading and potentially learning new skills. As shown, such structural trends play to the relative attributes of Gen Z: agility; creativity; curiosity; and digital competence.

## AUGMENTED REALITY: A TECHNOLOGY THAT WILL EXEMPLIFY THIS STORY

Augmented Reality (AR) technology has the potential to symbolise this process. It allows digital content and information to be overlaid on the physical world. Although its initial applications predominantly lay in the world of entertainment, it has increasingly become a tool for change among more innovative businesses, a trend that has been accelerated by the pandemic.

Market research studies highlight the enormous potential of AR, with the market projected to expand four-fold by 2023. Longer-term, a combination of enablers seem can be expected to underpin a continued steep growth trajectory for which would see AR become a mainstream aspect of the workplace:

- **Revolutionising retail:** one key driver for the pick-up in AR adoption over the past 12 months has been consumer brands leveraging the technology to replicate parts of the in-store experience. AR's expansion into this burgeoning market can be an important pillar of growth for the next decade.

- **Widespread business utility:** as we demonstrate in this report, AR's applications extend well beyond e-commerce with companies, from agriculture to education, already deriving utility from the technology across multiple business functions.
- **5G-enhanced:** the rollout of the next generation of mobile communication technology will substantially improve 5G utility, facilitating richer and more immersive experiences on the go.
- **Low adoption barriers:** with many applications available by a Web Browser or smartphone App, consumers have near-universal access to AR experiences and, in contrast to VR, need not invest in additional equipment.
- **Transforming marketing strategy:** AR offers a unique platform to engage with customers, in a style that resonates and helps to build an emotional connection. Taken together with the above drivers, this will be increasingly achieved at scale, a potent mix for marketing and brand building.

Moreover, as the leading users of open source AR platforms such as Lens Studio, this cohort have a much stronger natural affinity with this technology, a point confirmed by our analysis. Gen Z's average AR competence score was 17% higher than Millennials and 34% higher than Gen X.

## A BLUEPRINT FOR THE FUTURE

Our research has struck a relatively optimistic tone. Clearly though the pandemic, together with the next wave of technological change, will create major challenges for society. Supported by discussions with a range of experts, we have generated a call to action centred around the five themes set out below. More specific recommendations around each theme can be found in section six of this document.

- **Plugging the educational attainment gap:** the disruption to Gen Z's formal education represents COVID-19's biggest structural threat to their this cohort's prosperity—action to correct this associated attainment gap is urgently required.
- **Supporting economic recovery whilst not impeding structural adjustment:** policymakers face a delicate balancing act in the near-term in trying to minimise labour market scarring. Timing the transition from employment-protection to hiring incentive and re-skilling-based programmes will be crucial.
- **Maximising the potential of digital technology to meet the re-skilling challenge:** despite being the root cause of the problem, digital technology can be fundamental to the solution. AR, massive open online courses (MOOCs), and crowd-based tools can become important contributors to re-skilling.
- **Achieving a mindset shift around lifelong learning:** according to survey data, a majority of adults across the OECD do not want to engage in further training. There is no silver bullet to achieving a substantial shift in this mindset but governments can assist and section six identifies a set of principles which should inform policy design.
- **Refitting education to the new Industrial age:** more broadly, without reform, the formal education system will become increasingly out-of-step with the workplace. Structural reform that promotes problem-based learning, student agency and reduces the emphasis on standardised testing is required.



# 1. INTRODUCTION

The outbreak of the coronavirus pandemic in early 2020, and the deep global recession triggered by measures to contain its spread, have had a hugely detrimental impact on society. The downturn has been notable for its unevenness, landing disproportionately on industries which rely on social contact such as hospitality, live entertainment, and physical non-essential retail.

This has led to concerns that the economic impact will land heavily on younger workers, who were more reliant on these sectors for jobs coming into the crisis. Moreover, it will certainly be more difficult for new graduates to secure

roles in an environment where the economy is operating well below full capacity. The fear is that they will suffer from what economists call “scarring”—persistent negative impacts on their potential earnings power and future employment prospects.<sup>4</sup>

However, all this discussion neglects the role of COVID-19 as a disruptor and digital accelerant. When evaluating the long-term implications of any event for a group in the labour market, understanding such structural effects is key. Moreover, judging by past recessions, 2020 is also likely to bring forward the latest wave of automation technologies.

To create a more rounded picture, this study has investigated how these trends will affect demand for skills and how they match up to the relative attributes of Gen Z. This has involved a multi-pronged research programme (described below) focused around six markets: Australia, France, Germany, the Netherlands, the United Kingdom, and the United States. For the purpose of this report, we have considered them as a collective. At times, we refer to the aggregate evidence pooled across these six countries as ‘global’ but would, of course, acknowledge that the findings should only be generalised to other high-income economies.

## HOW HAVE WE DONE THIS?

The question we have sought to address is challenging and complex. As such, we have called upon evidence from a wide variety of sources as part of work, including:

- **Job postings data** purchased from Burning Glass (BG) covering the period between 2014 and 2019.
- **A consumer survey** of individuals across all six markets in scope. Quota sampling was used to ensure a broadly even mix between different generations, defined as those aged 16 to 24 (Gen Z), 25 to 39 (Millennials), and 40 to 55 (Gen X).
- **Interviews** with 13 AR experts working across the markets in our study.
- **Web scraping** techniques to help collect information on the current size and economic contribution of the AR sector globally.
- **Desk-based** research including a literature review and the collection of official data to help support and validate our propositions which lie outside the scope of the above.
- **Discussions** with experts from various fields including economics, education, skills, and industrial policy. These have informed our calls to action.

The objective of this report is to document the major findings and draw out the most salient implications of our research. As such, we have only provided light methodological detail across the report. However, a comprehensive methodology report can also be found online for interested readers.



## 2. WHO IS GEN Z?

### OVERVIEW

- Gen Z is the first **wholly digitally native** generational cohort. Reflecting their youth most of this cohort are on the periphery of the labour market but this is set to change.
- Our projections across the six markets imply that those **in-work will triple to almost 90 million** by 2030. As they gain more **experience, knowledge, and skills** and transition increasingly to full-time work, the **average earnings** of this group will **grow by 250%** in real terms.
- This will drive a massive uplift in their independent **disposable income** which we expect to hit **\$3.2 trillion by 2030**—equivalent to 11% of these economies' total.
- Gen Z display a **higher level of digital competence** compared to older cohorts who currently dominate the workforce, stemming from being more accomplished in the areas of content creation, communication, and understanding of lenses and filters.
- Gen Z's attributes seem ideally tailored to a **post-pandemic work environment** that will be more digitally charged and dynamic. Their **agility, curiosity, and creativity** are traits that seem set to be in demand in future workplace.



Gen Z is generally described as those born between the mid-1990s and 2010. Recent estimates have suggested that they are now the largest generational cohort on earth, accounting for almost one-third of the global population in 2019. Across the six markets covered in our study, Gen Z's population share is much lower, but they still numbered some 106 million in 2019.

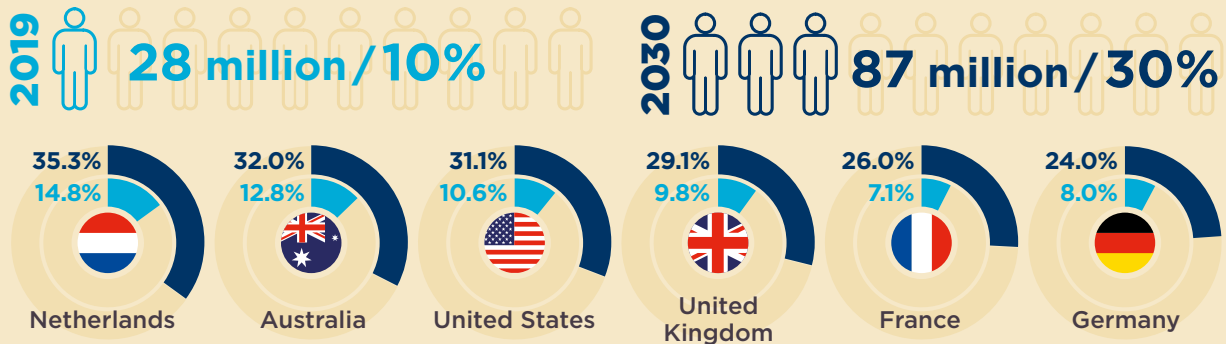
Gen Z is the first wholly digitally native generation—those brought up from birth to use digital technologies and social platforms as the primary means of communication, entertainment, and consumption. They have increasingly attracted the attention of researchers, as they start to mature into the workforce. This chapter explores how this cohort

is set to become a driving force of the economy and describes the attitudes and characteristics which set them apart from preceding generations.

# GEN Z WILL MATURE INTO ENGINE OF GROWTH

## FUTURE POWERHOUSE OF THE GLOBAL WORKFORCE

Gen Z's share of total employment will nearly **treble** over the next ten years.



## KEY DRIVER OF INCOME GROWTH

Gen Z incomes will increase almost **seven-fold** by 2030.



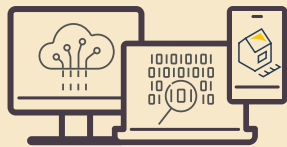
Their consumer spending will increase more than **six-fold**, from **\$467 billion** in 2019 to **\$3.0 trillion** in 2030.



This is equivalent to **11%** of total household spending.



## HIGH LEVELS OF DIGITAL COMPETENCE



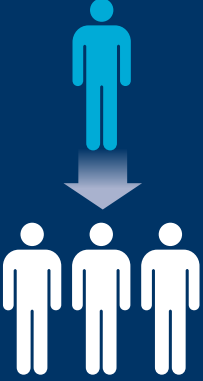
Gen Z show higher levels of digital competence than their elders.

(index, global average = 100)



**x3**

Gen Z employment is forecast to more than treble by 2030, with this group accounting for 30% of total jobs compared to just 10% today.



## 2.1 GEN Z WILL MATURE INTO AN ENGINE OF GROWTH


As the majority of our Gen Z cohort join the workforce, our forecasts imply that the number of Gen Z in employment will more than treble to 87 million people by 2030 in the six markets. This means that Gen Z are forecast to account for 30% of total employment in 2030, up from just over 10% in 2019.

With greater experience, knowledge and skills will also come greater earnings power. Indeed, workers, on average, enjoy faster wage growth during the early years of their career. Based on past trends and projected macroeconomic changes, we expect the average earnings of Gen Z to increase by almost 250% by 2030 to over \$42,000.

Putting these trends in employment and earnings together, the forecasts show that Gen Z's income from work will balloon from \$440 billion to more than \$3.5 trillion by 2030. To put this in context, their share of economy-wide earnings will rise from less than 3% in 2019 to 20% in 2030. Even after paying tax on their incomes, Gen Z will have a disposable income of \$3.2 trillion in 2030, seven times the \$460 billion in 2019. Accounting for the likely savings that Gen Z workers will make, their total consumer spending will be \$3.0 trillion—equivalent to 11% of total household spending across the six economies.

**\$3.0 trillion**

Forecast independent spending power of Gen Z in 2030 compared to \$460 billion in 2019.



## 2.2 CHARACTERISTICS OF GEN Z

Our survey of members of the three generations either in or entering the labour market identifies some important differences in attitudes and aptitudes. These are examined in more depth below.

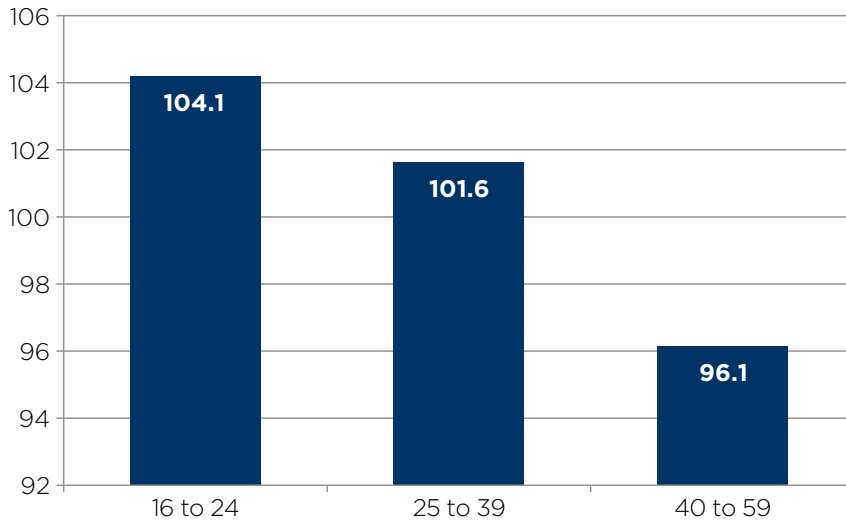
### Gen Z possess higher levels of digital competence

We used the results of our survey to create a measure of digital competence based on respondents' evaluations of their own knowledge and understanding of everyday digital tasks. A wide range of questions were used to

collect information on the respondent's knowledge and understanding of digital technology across six broad themes. Answers to each question have been normalised and aggregated into an index where a score of 100 corresponds to the average of all respondents across the seven markets. Based on this measure, Gen Z's overall level of digital competence is higher, on average, than both Gen X and Millennials, as shown in Fig. 1.



**Fig. 1: Digital competence index by age cohort: global sample**  
Index, global average = 100

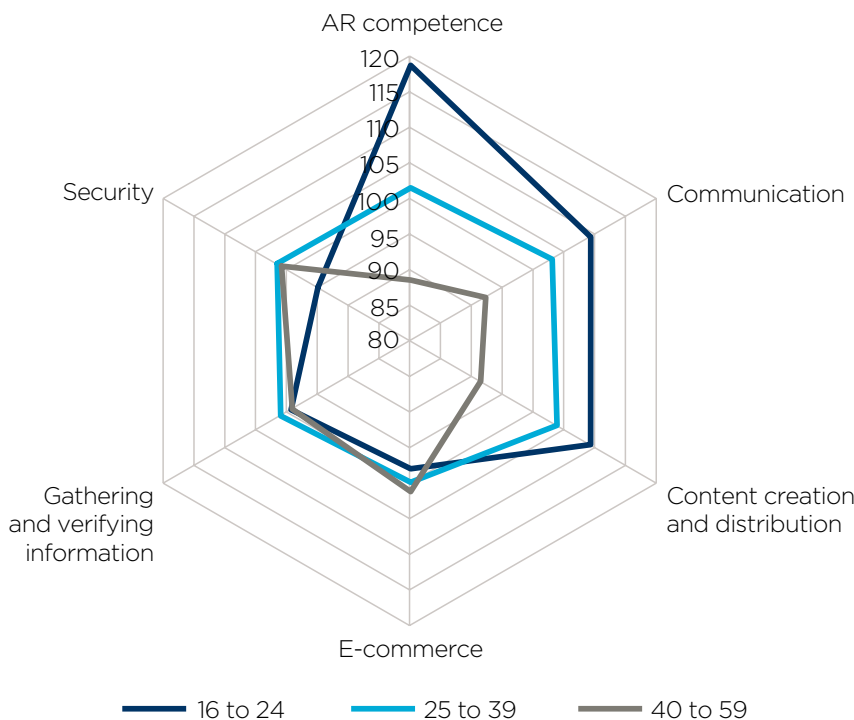


Source: YouGov data, Oxford Economics analysis

Digging deeper, the outperformance of Gen Z was driven by three main areas: AR, communication and content creation. On the other hand, older respondents in our survey tended to report that they had more advanced knowledge and understanding of topics related to information security. Generational differences were much more modest across the other two components of our digital index: buying and selling online (e-commerce) and gathering and verifying information.

This fits with earlier research exercises such as work carried out by Dell Technologies in 2018. Its survey of 12,000 Gen Z secondary and post-secondary students in 17 countries found that almost all had used technology as part of their formal education while 80% wanted to work with cutting-edge technology in their future careers. Seventy-three per cent rated their technology literacy as good or excellent and 68% said they had above-average coding skills.<sup>5</sup>

**Fig. 2: Digital competence score by age cohort: global sample**  
Index, global average = 100



Source: YouGov data, Oxford Economics analysis

<sup>5</sup> Dell Technologies. Gen Z: The future has arrived. <https://www.delltechnologies.com/en-us/perspectives/gen-z.htm?linkId=58995076>

## Gen Z are creative

Creativity is the key driving factor behind Gen Z's digital strengths. Online platforms give Gen Z an outlet for their creativity, and Gen Z have in turn adapted well to the technology. Using an arsenal of digital tools such as AR lenses, filters, emojis, face swaps, and short videos, Gen Z not only express themselves and communicate with others, but also use these tools and platforms creatively for advocacy, art, and entrepreneurship.

“ Gen Z express themselves differently to older generations, tend to be agile, and are much more open to change. Projects can sometimes change, and the work done needs to change to accommodate this. ”

“ Gen Z are good at picking up new software and technology as they have grown up around it. Gen Z also understand how to build concepts for other members of Gen Z which makes them very useful. ”

Various studies indicate that Gen Z consider themselves more creative than other generations. A new study by JWT Intelligence and Snap Inc. finds that half (51%) of Gen Z believe their generation is more creative than previous generations. A more recent study by Cassandra research on behalf of Snap Inc. finds that 76% of global Gen Z say they are creative, significantly more than older generations.

Further, Gen Z's digital creativity has a counterpart in the analogue world too: 77% of Gen Z in the JWT study indicated that they spend free time offline drawing, journaling, or playing an instrument.

## Gen Z are agile

Moving beyond our survey, our case study interviews, focused on the AR sector, have also provided us with an opportunity to understand more about the distinguishing generational characteristics of Gen Z.

The easy-to-use infrastructure that AR platforms provide means companies can look for staff with soft skills as well as those with formal training. Many entrepreneurs said that this favoured Gen Z who had picked up a range of skills at school and through friends.

For example, Tess Inglis and Antoine Vu at Paris-based Atomic Digital Design say Gen Z express themselves differently than older generations, tend to be more agile, and are much more open to change. Projects can sometimes change, and the work done needs to change to accommodate this. They say it is generally the younger generations who are more able to accept this change while those from older cohorts may take change more personally and find it harder.<sup>6</sup>

Mike Khouri, managing director of Tactical, a full-service agency based in Dubai, says Gen Z are born into the culture of digital media, and are native users of AR meaning they are open to innovation. He adds that Gen Z will be some of the quickest to learn from the current pandemic and their behaviours will adapt accordingly.<sup>7</sup> Berlin-based digital artist Aaron Jablonski, who uses AR and face tracking technology in his daily work, agrees Gen Z are the first generation to grow up immersed in social networks. He says they are constantly surrounded by information which seems to have influenced how they operate in the workplace.<sup>8</sup>

Although the main decision makers at Hamburg-based immersive agency Headraft are Gen X, the team members from Gen Z play a critical role in terms of creative work

<sup>6</sup> <https://atomicdigital.design/>

<sup>7</sup> <https://www.wearetactical.com/>

<sup>8</sup> <https://exitsimulation.com/>

with AR video effects, says founder Julian Weiss. They can absorb lots of information fast which is important given the volume of data available. He adds younger generations are more in touch with what other people in their demographic want, which makes them able to adapt their ideas to suit people of their own age.<sup>9</sup> David Loughnan at Australia's immersive technology creative agency Unbnd, says Gen Z have been exposed to smartphones and software their entire lives and have an instinctive understanding of technology. They have a better understanding of how to design mobile products and services for their own demographic.<sup>10</sup>

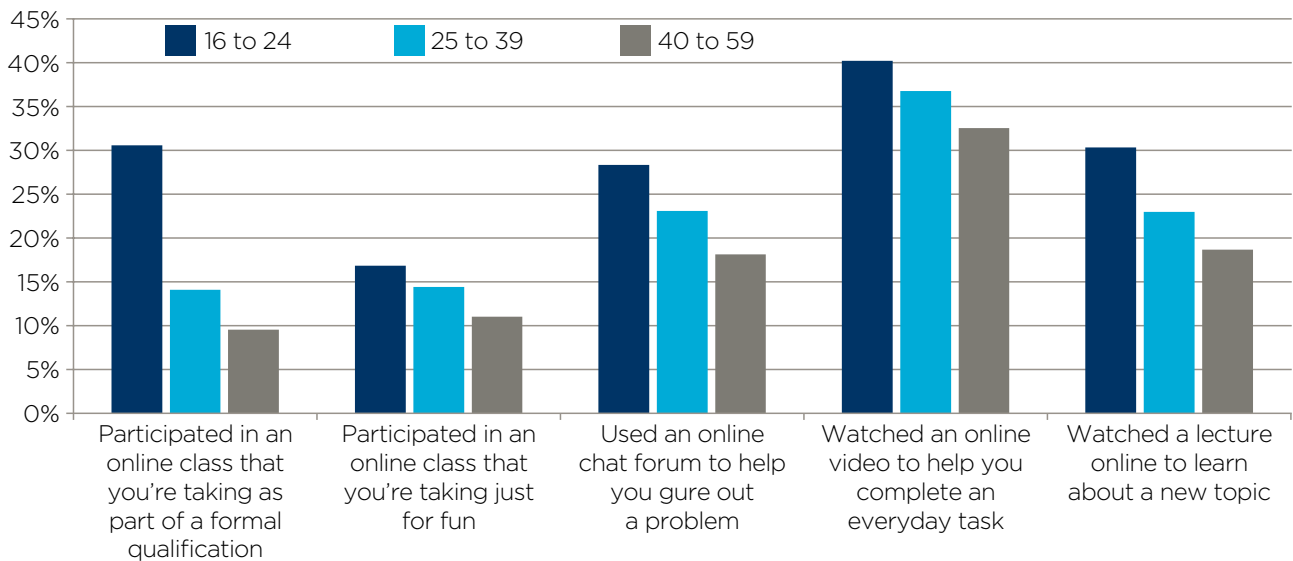
**Gen Z are eager to maximise the opportunities afforded by digital learning tools**

Our survey shows that members of Gen Z are much more likely to embrace digital technology for both formal learning and more personal self-education. Unsurprisingly, the number of Gen Z who took part in formal online classes was much greater than Gen X or Millennials, as the former were more likely to be in full time education. More than half had undertaken distance learning compared with around a third of the other two cohorts. While more than 60% of those were taking part in secondary or undergraduate education, 15% were doing postgraduate education online while 13% were taking professional qualifications.

When it comes to informal learning rather than organised education, as Fig. 3 shows, Gen Z were more likely to take part in a wide range of informal online lessons or to find information using digital technology. Almost one in five participated in an online class that they were taking just for their personal edification. They were also more likely to use an online chat forum to help them solve a problem and to watch a lecture online.

**Fig. 3: Participation in online learning by age cohort: global sample**

Share of respondents by age



Source: YouGov data, Oxford Economics analysis

<sup>9</sup> <https://www.headraft.com/>

<sup>10</sup> <https://unbnd.com.au/>

# 3. TECHNOLOGY AND THE LABOUR MARKET



## OVERVIEW

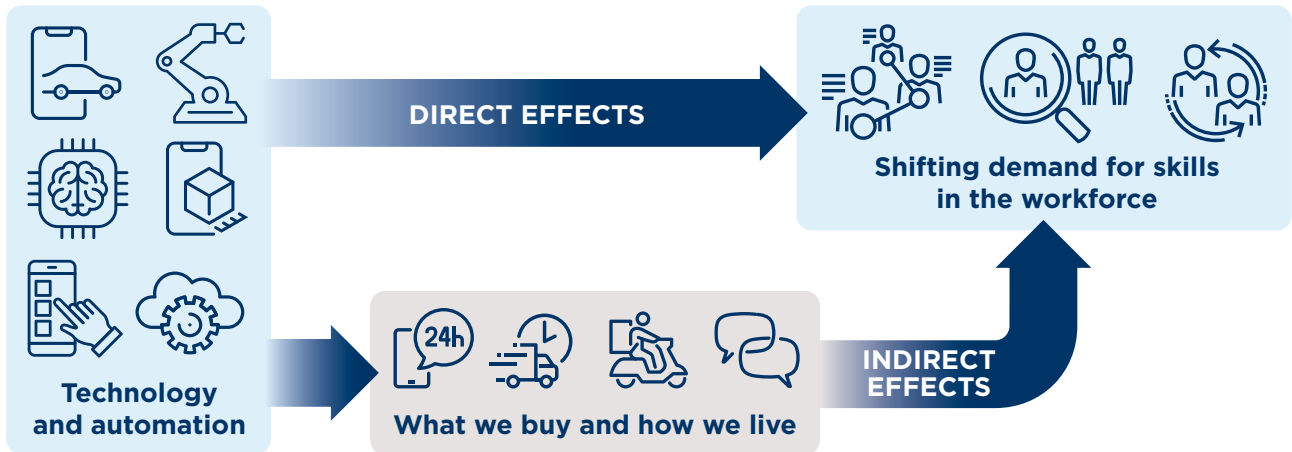
- Throughout modern history technological advances have major structural effects on skills demand through the process of automation.
- The **next wave of automation** is set to heighten the premium on advanced cognitive skills such as **creativity** and **critical thinking**.
- By extension, the importance of **lifelong learning** is set to rise with workers required to adapt to more rapidly evolving demands.
- Over the past decade, the growth of **social platforms**, and the associated **proliferation of data**, have had substantial spillover effects for demand for digital skills. Jobs postings data covering Australia, the United States, and the UK over the past five years bears this out.
- **'Social media', 'Cloud solutions'** and various skill clusters related to **data analysis** have been among the **most important contributors** to the **growth in demand for digital skills** during this period.
- This suggests that the **technological changes** which might **drive digital demand in the labour market over the next decade** may be those with the potential to **transcend everyday life**, but which are relatively nascent today.

Throughout modern history, the labour market and technological change have been inextricably linked. More often this relationship is framed within the context of the world of work. Notably, technology supports 'automation'—

the replacement of certain human tasks by machines. These 'direct' effects are, of course, highly influential. Demand for skills, however, is also sensitive to the 'indirect' channels through which technological progress transforms how we live.

As a result, firms continually adapt the way that they deliver products and services to their customers with knock-on effects for what they require from their staff.

**Fig. 4: How technology influences the way we work**

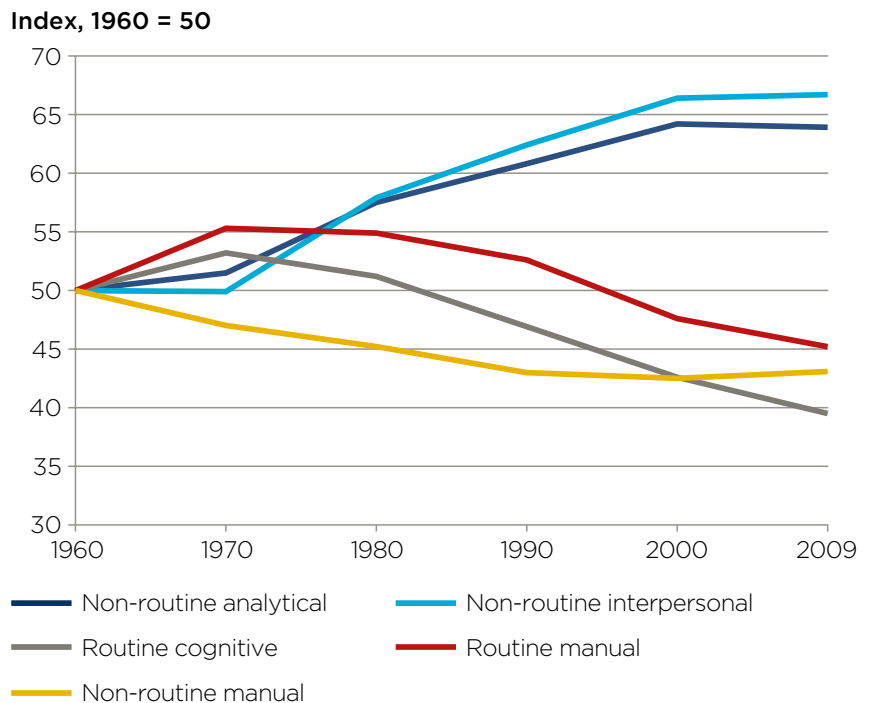


**3.1 THE CHANGING FACE OF AUTOMATION**

Digital technology has already driven major changes. As computers in the workplace have proliferated during the 'ICT revolution', firms found that they no longer needed workers to perform a range of repetitive tasks. This led to a structural decline in demand for more routine jobs and an associated swing in favour of roles which require more advanced analytical and interpersonal skills.

The rate of change has slowed recently. The past decade, however, has seen significant advances in the fields of artificial intelligence (AI), additive manufacturing, and robotics which seem set to unleash a further surge in automation. Indeed, one prominent study estimated that almost half of all US jobs might be at "high risk" over the next two decades.<sup>11</sup>

**Fig. 5: Changes in demand for task type in the US: 1960 - 2009**



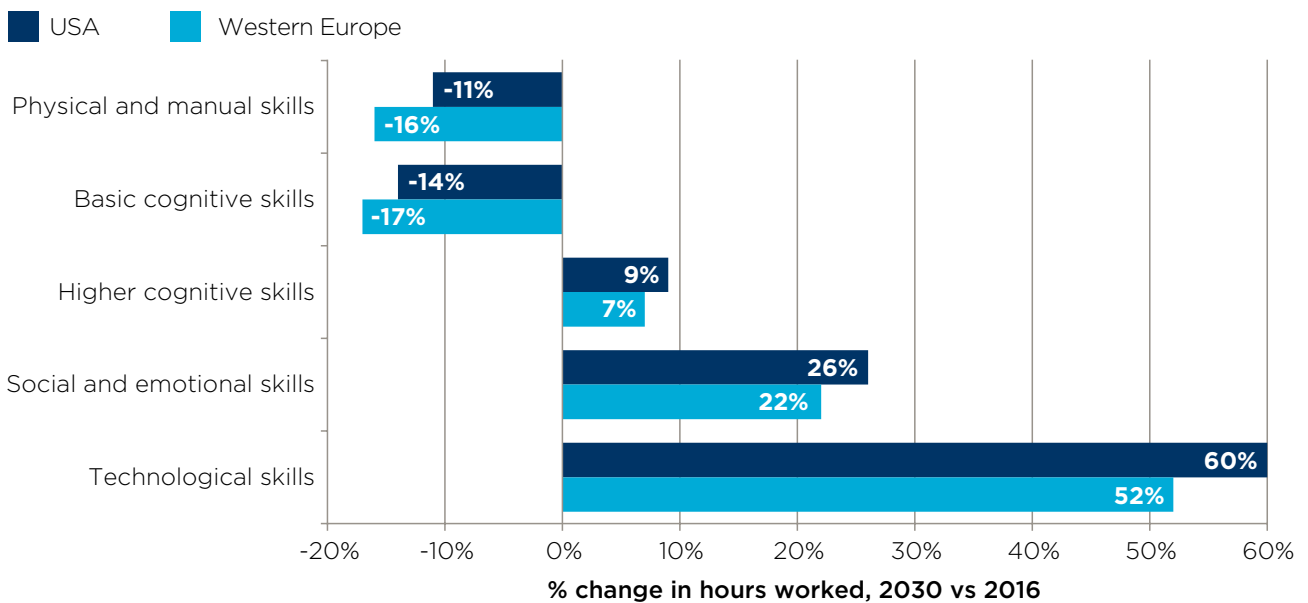
Source: Autor and Price (2013)

<sup>11</sup> C and Osborne, M Frey, "The Future of Employment: How Susceptible are Jobs to Computerisation?" (Oxford Martin School Working Paper, 2013).

Together with other megatrends such as population ageing, this suggests that the next decade is set to be marked by a further decisive shift towards demand for more advanced cognitive, social, and technological skills (Fig. 6). This view was underscored by the OECD in their *Skills for 2030* report which highlighted the integral role of creativity and critical thinking to future work. Being able to challenge orthodoxy and develop original solutions are traits which will be increasingly valued by firms.<sup>12</sup>

By extension, the importance of lifelong learning is also set to rise, with workers required to adapt to more rapidly evolving tasks.<sup>13</sup> In this sense, digital technology will also be a vital complement. Thanks to the Internet, we have never had such a vast array of information and learning tools at our fingertips. Being able to maximise the opportunities afforded by this resource will be vital for individuals in order to thrive in the increasingly dynamic workplace of the 2020s.

**Fig. 6: Projected change in demand for skills: 2030 vs 2016<sup>14</sup>**



Source: McKinsey Global Institute

<sup>12</sup> T and Frey, C Berger, "Future Shocks and Shifts: Challenges for the Global Workforce and Skills Development" (OECD report, 2015).

<sup>13</sup> Organisation for Economic Cooperation and Development, "OECD Future of Education and Skills 2030" (Concept note, 2018).

<sup>14</sup> It is important to note that these changes will not solely be driven by advanced digital technology. For example, an important driver for the increase demand for social and emotional skills is the increased need for caring as a result of ageing populations.

### 3.2 DIGITAL SOCIETY AND THE LABOUR MARKET OVER THE PAST DECADE

Over the past decade, the way we connect has been revolutionised by the explosive growth of social platforms. The volume of active accounts grew by around 1,500% between 2008 and 2018 with increasingly diverse offerings designed to appeal more directly with specific demographic groups.

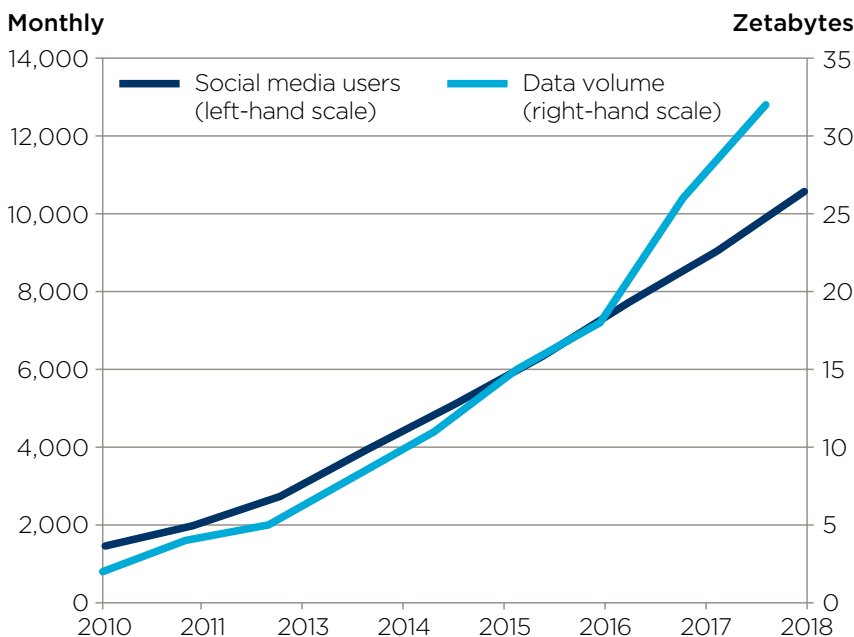
For businesses, this trend has been hugely important. These platforms provide a means for firms to directly engage with and influence customers. Understanding how to leverage social platforms to market, network, and recruit has become an increasingly important driver of corporate success.

A related knock-on effect of this growth, but more broadly the rise of the information society, has been the proliferation of data (Fig. 7). The rate of increase shows no signs of abating with the volume of data estimated to be doubling every two years. The commercial consequences of this development have been enormous, with firms able to realise value by offering more targeted marketing services. In parallel, firms have also become increasingly aware of the value that can be brought to their own organisations through the analysis of internal data.

And, in turn, as the commercial importance of processing and understanding data has steadily risen, the need for technological infrastructure which can support the associated increased demand on computing power and data storage has become paramount. The key organisational change that has underpinned this shift, particularly for smaller businesses, has been the widespread adoption of cloud computing technology.

These trends are borne out by our analysis of job postings data.<sup>15</sup> Overleaf, word clouds describe the trends in the volume of job postings in various markets within scope with terms grouped by skill clusters (Fig. 8).

**Fig. 7: Social media accounts and global volume of data: 2010 - 2018**



Source: Our World in Data, Oxford Economics

This analysis shows that social media-related terms were the largest absolute contributor to the increase in the demand for digital skills between 2014 and 2019 in Australia and the UK, and the sixth largest in the United States. Similarly, the rising importance of data is captured by a plethora of related skill clusters such as 'machine learning', 'data science', and 'data analysis', whilst 'Cloud solutions' was one of the top five contributors to growth across all markets.

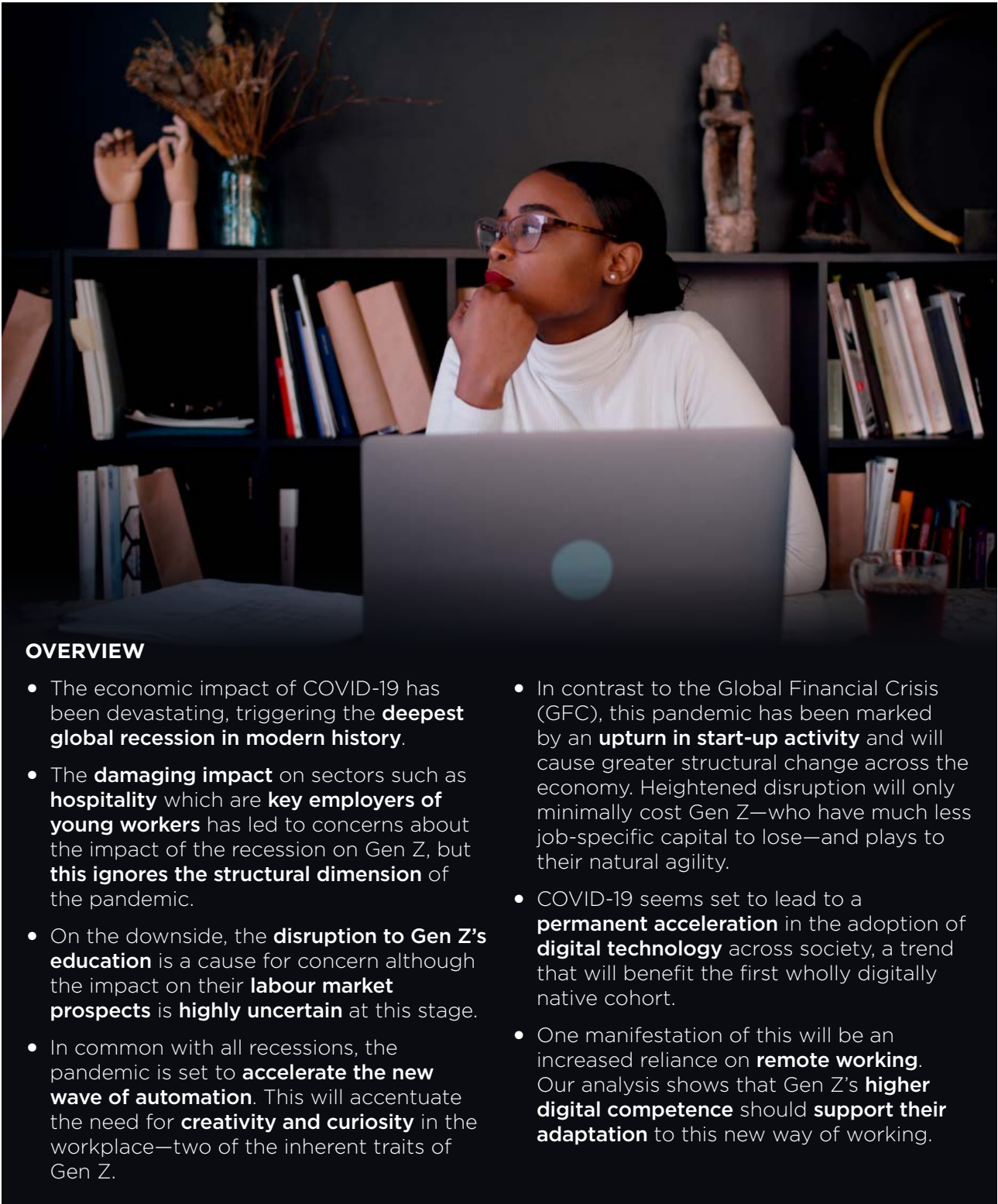
<sup>15</sup> As noted, our dataset contained information on job postings across all six markets in scope. However, the data for Australia, the US, and the UK offered a more comprehensive view of labour market trends over a sustained period: 2014 to 2019.







## 4. IMPLICATIONS OF COVID-19 FOR GEN Z



### OVERVIEW

- The economic impact of COVID-19 has been devastating, triggering the **deepest global recession in modern history**.
- The **damaging impact** on sectors such as **hospitality** which are **key employers of young workers** has led to concerns about the impact of the recession on Gen Z, but **this ignores the structural dimension** of the pandemic.
- On the downside, the **disruption to Gen Z's education** is a cause for concern although the impact on their **labour market prospects** is **highly uncertain** at this stage.
- In common with all recessions, the pandemic is set to **accelerate the new wave of automation**. This will accentuate the need for **creativity and curiosity** in the workplace—two of the inherent traits of Gen Z.
- In contrast to the Global Financial Crisis (GFC), this pandemic has been marked by an **upturn in start-up activity** and will cause greater structural change across the economy. Heightened disruption will only minimally cost Gen Z—who have much less job-specific capital to lose—and plays to their natural agility.
- COVID-19 seems set to lead to a **permanent acceleration** in the adoption of **digital technology** across society, a trend that will benefit the first wholly digitally native cohort.
- One manifestation of this will be an increased reliance on **remote working**. Our analysis shows that Gen Z's **higher digital competence** should **support their adaptation** to this new way of working.

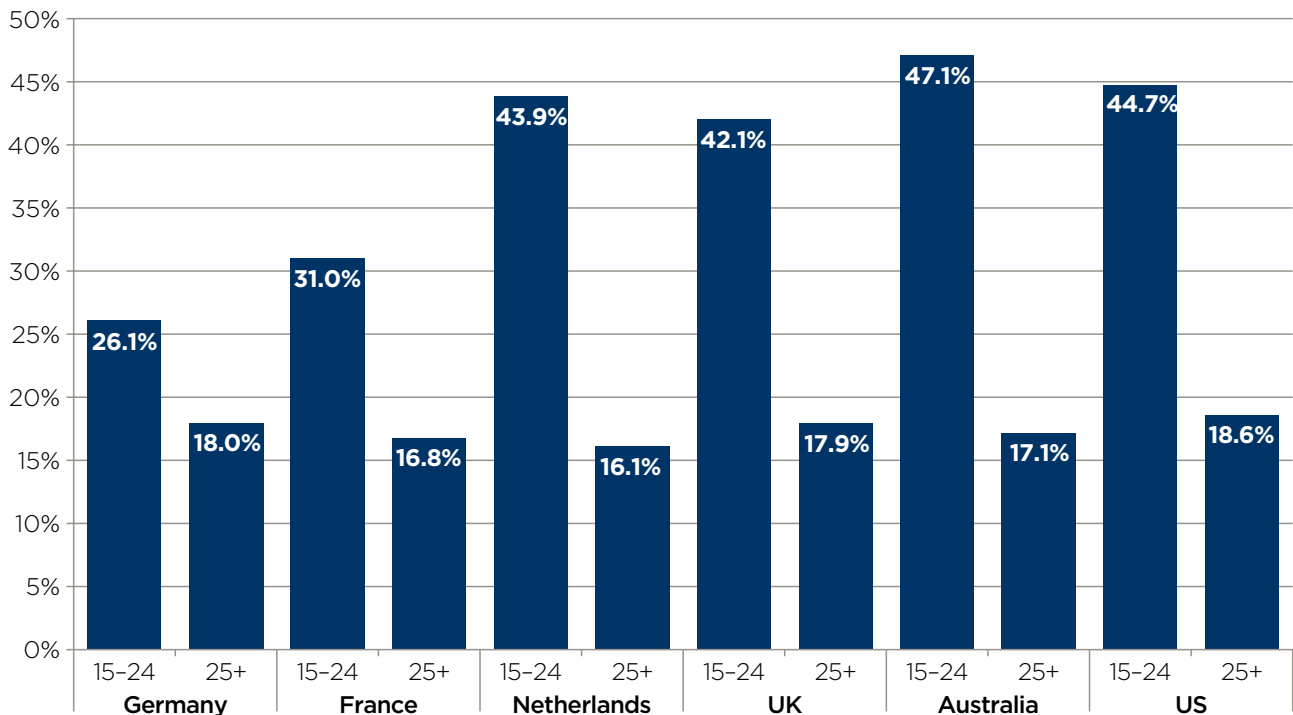
### 4.1 THE IMMEDIATE ECONOMIC IMPACT OF COVID-19

The pandemic triggered the deepest global recession in modern history. Alongside the scale of the economic contraction, the COVID-19 recession has been noteworthy for its deeply uneven sectoral effects. Across most advanced economies, businesses in industries reliant on social contact have been either mandated to shut down or seen demand severely constrained by health-related anxieties.

Sectors which have borne the brunt of the COVID-19 shock are a disproportionately important source of employment for Gen Z (Fig. 9). Looking across the six labour markets in our study, Gen Z employment in retail trade, hospitality, and leisure accounted for almost 40% of Gen Z jobs in 2019, more than double the share of older workers.<sup>16</sup> Such a gloomy prognosis has dominated much of the rhetoric associated with the crisis and young adults.

**Fig. 9: Dependence on jobs in retail, hospitality, and leisure: Gen Z vs older workers**

Share of total employment by age



Source: National statistic agency data, Oxford Economics analysis

<sup>16</sup> Technically these sectors are referred to as “wholesale and retail trade”, “accommodation and food service activities” and “arts, entertainment and recreation” in the sectoral accounts that are used to estimate GDP.

## 4.2 RECESSIONS AND YOUNG WORKERS

The view that economic downturns disproportionately affect young workers is far from new. Evidence from cohort studies—those which follow the same group of students over time—consistently find that entering the labour market during a recession has a negative impact on earnings and employment rates.<sup>17</sup> Certain groups also appear more at risk including:

- Graduates from less prestigious universities and those obtaining degrees which are associated with lower career earnings, on average, are more at risk.<sup>18</sup>
- There is some evidence that the recession-entry effects are more significant for females.<sup>19</sup>

These effects have typically been found to be temporary with the impact disappearing within 10 years. Despite being temporary, these costs will be significant to the affected individuals. On the other hand, it does suggest that, should countries manage to avoid a permanent increase in the unemployment rate,<sup>20</sup> these much-touted scarring effects are unlikely to have a material impact on the earnings power and employment prospects of Gen Z *in 2030*.

So, to what extent will the pandemic affect the *long-term* prospects of Gen Z? In our view, to answer this question it is appropriate to assess the likely structural implications of COVID-19. It is to this that we turn next.

## 4.3 THE STRUCTURAL IMPLICATIONS OF COVID-19

### A loss of educational value

Compared to the temporary loss of job opportunities in hospitality, in our view, a much more pressing concern relates to the disruption to Gen Z's education caused by the pandemic. The shift to online learning has been particularly problematic for children from disadvantaged households with less or no access to the

required technology. Given the importance of education to labour market outcomes, it is likely that this aspect of COVID-19 will diminish the economic prospects of Gen Z.

Although a handful of studies have attempted to assess the potential impact of this change on future earnings, we consider this cost to be highly uncertain and have not

attempted to quantify it here.<sup>21</sup> This should not be interpreted as an attempt to downplay the potential significance of this issue. Indeed, in chapter six of this report we explore some potential remedies in more depth.

<sup>17</sup> H and von Wachter, T Schwandt, "Unlucky Cohorts: Estimating the Long-Term effects of entering the Labor Market in a recession in Large Cross-Sectional Data Sets", *Journal of Labor Economics*, 51(7) (2019): 161-98.

<sup>18</sup> D, Deutscher, N, Hambur, J and Hansell, D Andrews, "The Career Effects of Labour Market Conditions at Entry" (Treasury Working Paper, Australian Government: the Treasury, 2020).

<sup>19</sup> Ibid.

<sup>20</sup> An extensive literature has explored the extent to which negative shocks can have a permanent impact on the unemployment rate—a phenomenon known as hysteresis. Whilst there have certainly been high-profile examples significant encouragement can be taken from the path of unemployment in most OECD markets following the GFC.

<sup>21</sup> Eric and Woessmann, Ludger Hanushek, "The Economic Impact of Learning Losses" (OECD research report, September 2020), 24.

### Disruption on a new scale

Whilst recessions have always had uneven effects on different sectors of the economy, the impact of the COVID-19 pandemic is likely to be more pronounced, in this respect.<sup>22</sup> Indeed, our analysis suggests that the variation in output growth in 2020 was, on average, 80% higher than during 2009 across the six markets in scope. Moreover, even post-pandemic, the extreme events of the past 12 months may well shape our behaviour and, as a result, sectoral demand.

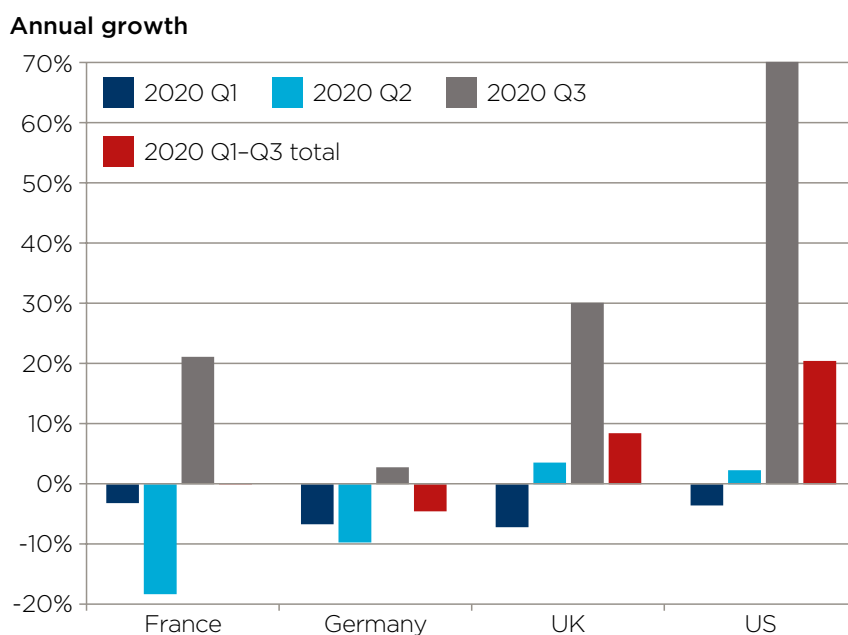
What are the labour market implications of such increased disruption? At an aggregate level they point to the imperative of retraining and reskilling—a theme on which we elaborate in chapter six. Workers will increasingly need to adapt to new demands within their existing roles or to completely reset their career path. The costs to Gen Z of these changes will be relatively minor—by definition, they will have much less job-specific capital to lose than older workers. Moreover, as shown in chapter two, Gen Z workers' natural agility will serve them well in adapting to such evolving demands.

### A trigger to new enterprise and automation

It is said that necessity is the mother of invention, and this is certainly the case with automation. For example, past research has shown that *all* the automation associated with the ICT revolution in Canada took place during the past three recessions, whilst an equivalent study covering the United States suggested this figure was almost 90%.<sup>23,24</sup> Therefore, it seems certain that COVID-19 will lead to a major leap forward in the next wave of automation. As described in the previous chapter, these technological advances are expected to lead to a larger premium in the workplace on attributes such as creativity, problem solving, and agile thinking—a trend that should play to the inherent strengths of Gen Z.

Tangentially, whilst recessions are periods where many firms fail, they also often act as a spur to new ways of doing business. In this sense, downturns can be viewed as a necessary evil which help to root out less efficient firms and working practices. Looking across markets in scope where data are available (Fig. 10), the number of new start-ups was higher in three out of four countries during the first three-quarters of 2020 despite the logistical problems created for new business registration.

**Fig. 10: Start-up growth in 2020 in selected markets**



Source: Oxford Economics

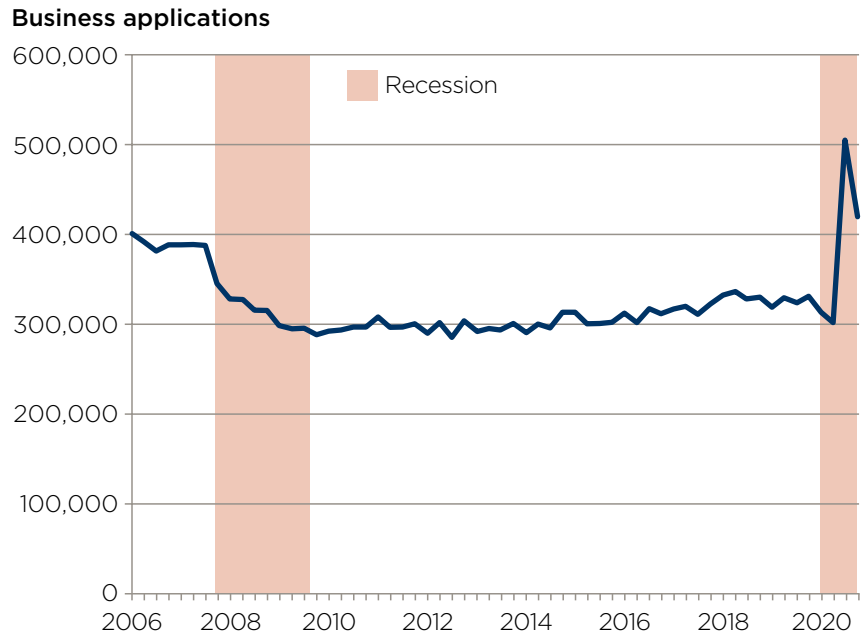
<sup>22</sup> J. Bloom, N. and Davis, S. Barrero, "COVID-19 is also a Reallocation Shock" (Working Paper 2020-59, Becker Friedman Institute, June 2020), 60.

<sup>23</sup> J. Blit, "Automation and Reallocation: Will COVID-19 Usher in the Future of Work?" (Canadian Public Policy Brief, August 2020), 11.

<sup>24</sup> N. and Siu, H. Jaimovich, "Job Polarization and Jobless Recoveries", Review of Economics and Statistics, 102 (1) (2020): 129 - 147.

Start-up growth has been strongest in the United States. As shown in Fig. 11, the GFC was characterised by a slump in new enterprise formation which remained a permanent feature of the next decade. The experience of COVID-19 has been a complete opposite, with the unprecedented disruption sparking a new wave of enterprise. New business applications rocketed to an unprecedented level during the second half of 2020, well in excess of any levels recorded over the past 15 years.

**Fig. 11: High-propensity business applications in the US: 2006 - 2020<sup>25</sup>**



Source: United States Census Bureau, Oxford Economics analysis

**Accelerating the shift towards a more digital economy**

Although there is no consolidated information regarding the activities of new enterprises that sprang up in 2020, it seems certain that many will be connected to the digital economy. The necessary shift away from social contact in the workplace and in interactions with customers has heightened the premium for businesses of a digital competitive advantage.

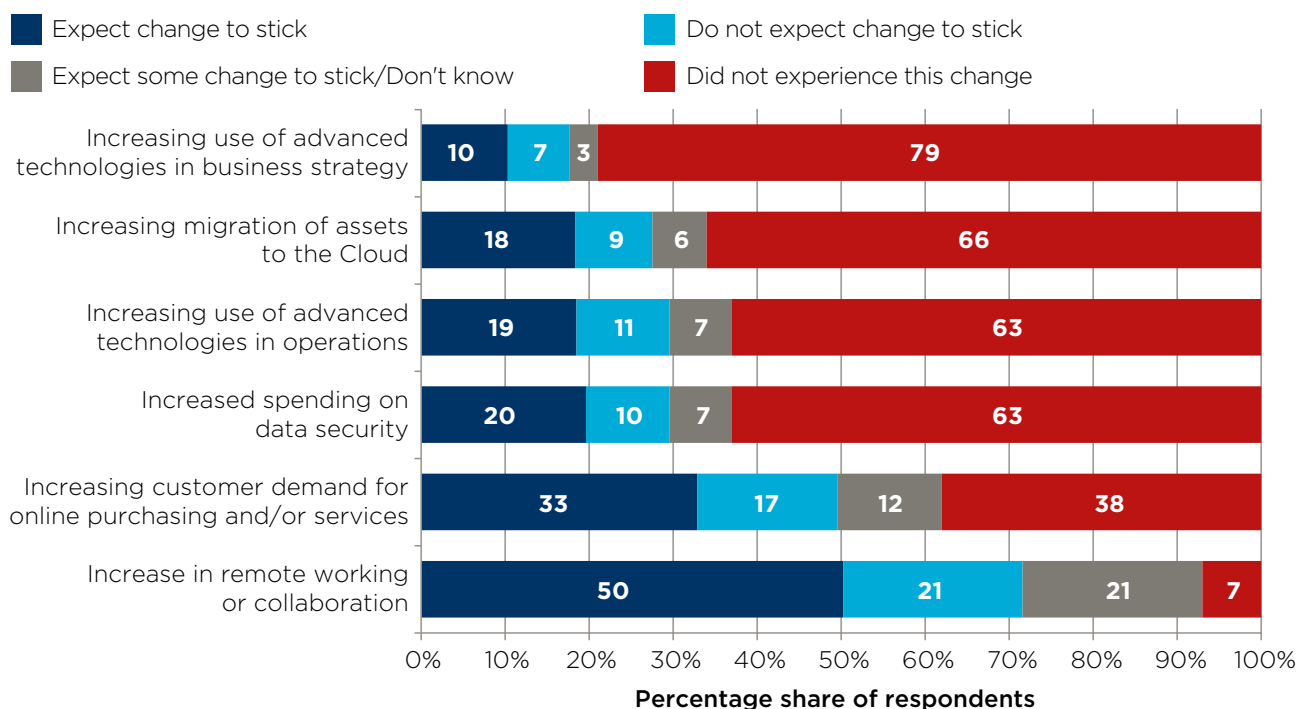
This, in turn, has turbocharged the adoption and integration of digital technology across corporations. Indeed, based on an survey of executives, McKinsey have estimated that COVID-19 will accelerate digital adoption by seven years, on average, among firms surveyed.<sup>26</sup> The study also highlighted a step-change in businesses' mindset with just one-in-ten respondents indicating that they regarded technology 'primarily as a source of cost savings' compared to almost half pre-crisis.

Within this change, increased use of remote working or collaboration and adapting to increased customer demand online were identified as the two areas where executives felt that practical changes implemented during COVID-19 were likely to become permanent (Fig. 12).

<sup>25</sup> High-propensity business applications are those which are judged to have a high probability of creating jobs, based on a set of defined conditions. Further detail can be found here.

<sup>26</sup> D Seiler, "How COVID-19 has pushed companies over the technology tipping point - and transformed business forever" (McKinsey Research Report, October 2020).

**Fig. 12: Share of businesses reporting that they have changed features as a result of COVID-19**



Source: McKinsey Executive survey

### The rise of remote working—a mixed blessing for Gen Z?

The likelihood of a widespread permanent shift towards a more hybrid model of remote work has been underscored by a recent academic study (Fig. 13). This showed that US firms expected ‘working from home’ days to rise to just over 20% post-COVID compared to less than 5%.<sup>27</sup> Moreover, polling of workers suggests their preferences may be even stronger—drawing on a consumer survey, the same study indicated that, among employees who could, post-COVID these individuals wanted to work from home around 50% of the time.

In terms of the consequences for Gen Z, increased reliance on digital technology as a means of communication should play to the strengths of these digital natives. Indeed, research by Milkround, a UK graduate careers website, showed that Gen Z workers had adapted better to the challenges presented by remote working such as increased reliance on video conferencing technology.<sup>28</sup>

As part of our consumer survey, we asked participants about their experience of remote working during 2019,

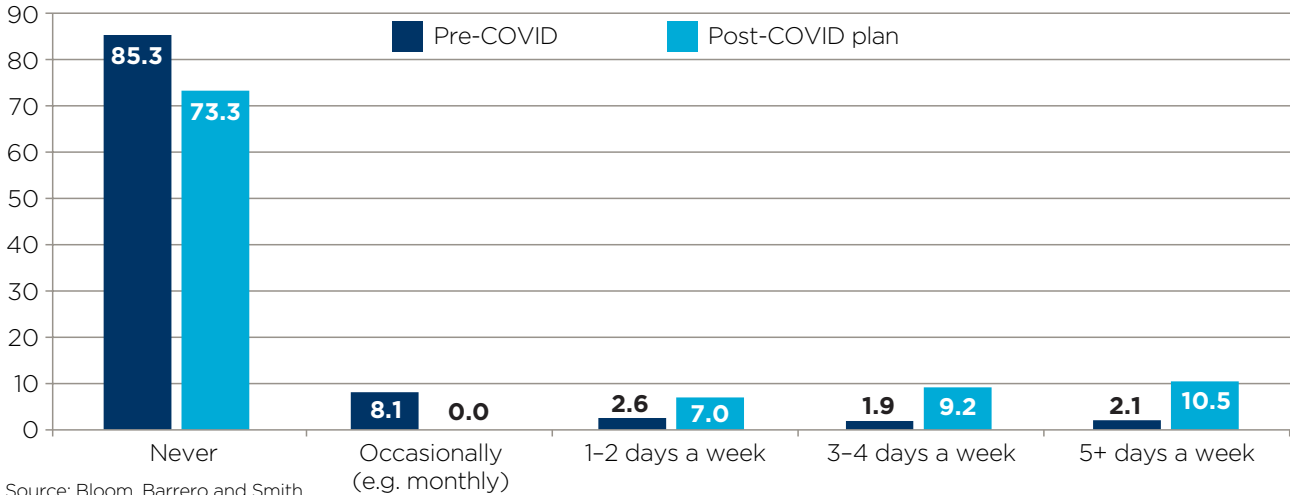
where applicable. The self-reported impact—measured on a scale from ‘very negative’ to ‘very positive’—was described across a wide range of aspects of job performance such as meeting deadlines, creativity and communication. We also collected information on various factors that could have influenced reported performance, such as the difference in the quality and reliability of the person’s internet connection, prior experience working from home, occupational role, and general digital competence (as described in chapter two).

<sup>27</sup> J. Bloom, N and Davis, S Barrero, “COVID-19 is also a Reallocation Shock” (Working Paper No. 2020-59, Becker Friedman Institute, 2020), 60.

<sup>28</sup> <https://advice.milkround.com/reverse-mentors-press-release>

**Fig. 13: Firms' expectations on propensity of working from home pre- and post-COVID**

Percentage share of respondents



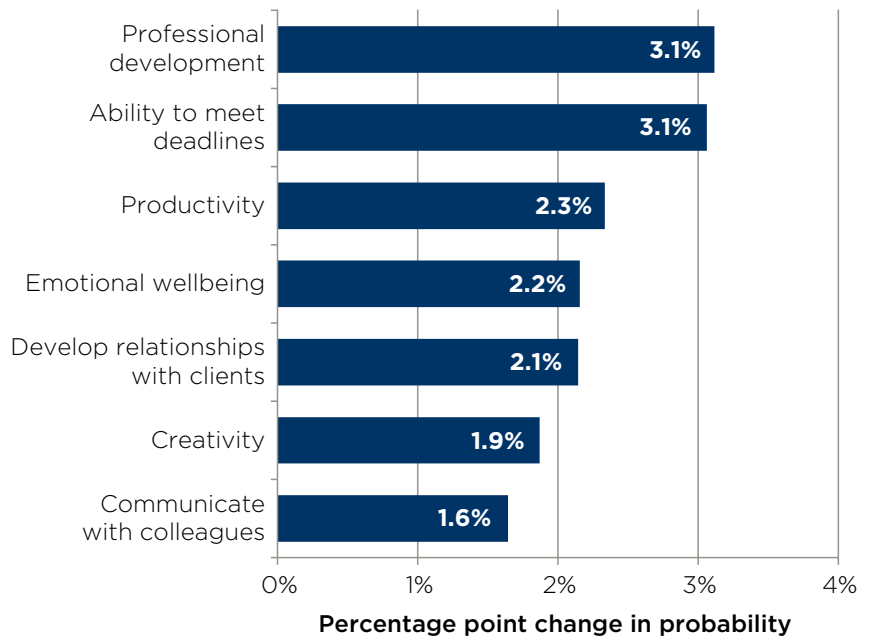
Source: Bloom, Barrero and Smith

As shown in Fig. 14, our analysis indicates that individuals with a higher level of digital competence were more likely to report a positive impact from remote working, all else being equal. This relationship held across all aspects of reported performance. As we have seen, Gen Z, on average, reported a higher level of digital competence than older cohorts, indicating that, in this respect, they will be better placed to fit into the new normal.

However, whilst the innate technological aptitude of Gen Z will stand them in good stead for a future more dependent on remote working, we would also provide a note of caution. For young workers, on-the-job training is critical to career development and learning.

To the extent that distance between workers inhibits this process, the consequences are likely to be disproportionately felt by Gen Z.

**Fig. 14: Impact of a 10% increase in digital competence on the reported impact of remote working by area of performance<sup>29</sup>**



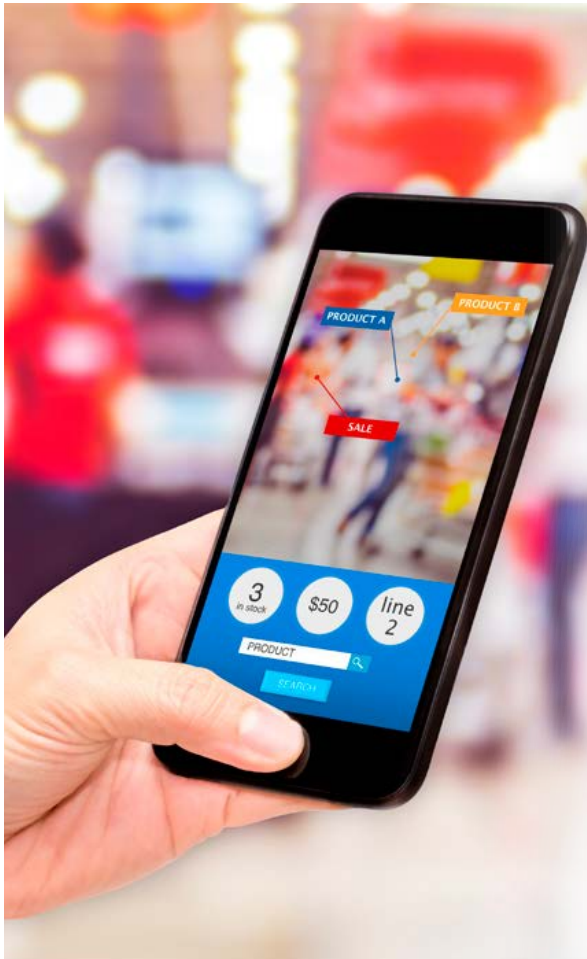
Source: Oxford Economics

<sup>29</sup> The chart shows the results from probability-based regression analysis. The model predicted the likelihood that an individual reported a negative, neutral or positive impact of remote working according to their responses to other questions. The results in the chart display the change in the likelihood that someone would have reported that remote working had had a positive impact on their reported performance if their digital competence score was 10% higher, controlling for other factors.





# 5. HOW AUGMENTED REALITY IS CHANGING OUR FUTURE



## OVERVIEW

- AR emerged as one of the **fastest growing digital technologies** in the pandemic, providing people with a **new platform** for **expression, entertainment, utility, and information**.
- The characteristics of AR mean that it has the potential to **drive demand for digital skills** in the next decade, similar to the effect of social media platforms in the 2010s.
- Its vast growth potential is underpinned by three key factors:
- AR's **immersive qualities** is transforming the retail experience.
- Beyond the consumer economy, AR has **widespread potential applications across industry** that can help to support operations.
- AR offers a **unique marketing opportunity** for brands through its capacity to **attract attention and connect emotionally at scale**.
- Most promisingly for Gen Z, **AR entrepreneurs highly value** the soft skills inherent to Gen Z including **creativity, agility, and an eagerness to learn**.

The analysis in the previous two chapters has highlighted two important forces at play:

- The trends that will become dominant drivers of demand for digital skills by 2030 may be those which are nascent today, but which have the potential to transcend everyday life; and
- COVID-19 will act as a significant disruptor, accelerating shifts towards a more digital society and promoting changes that will transform the world of work.

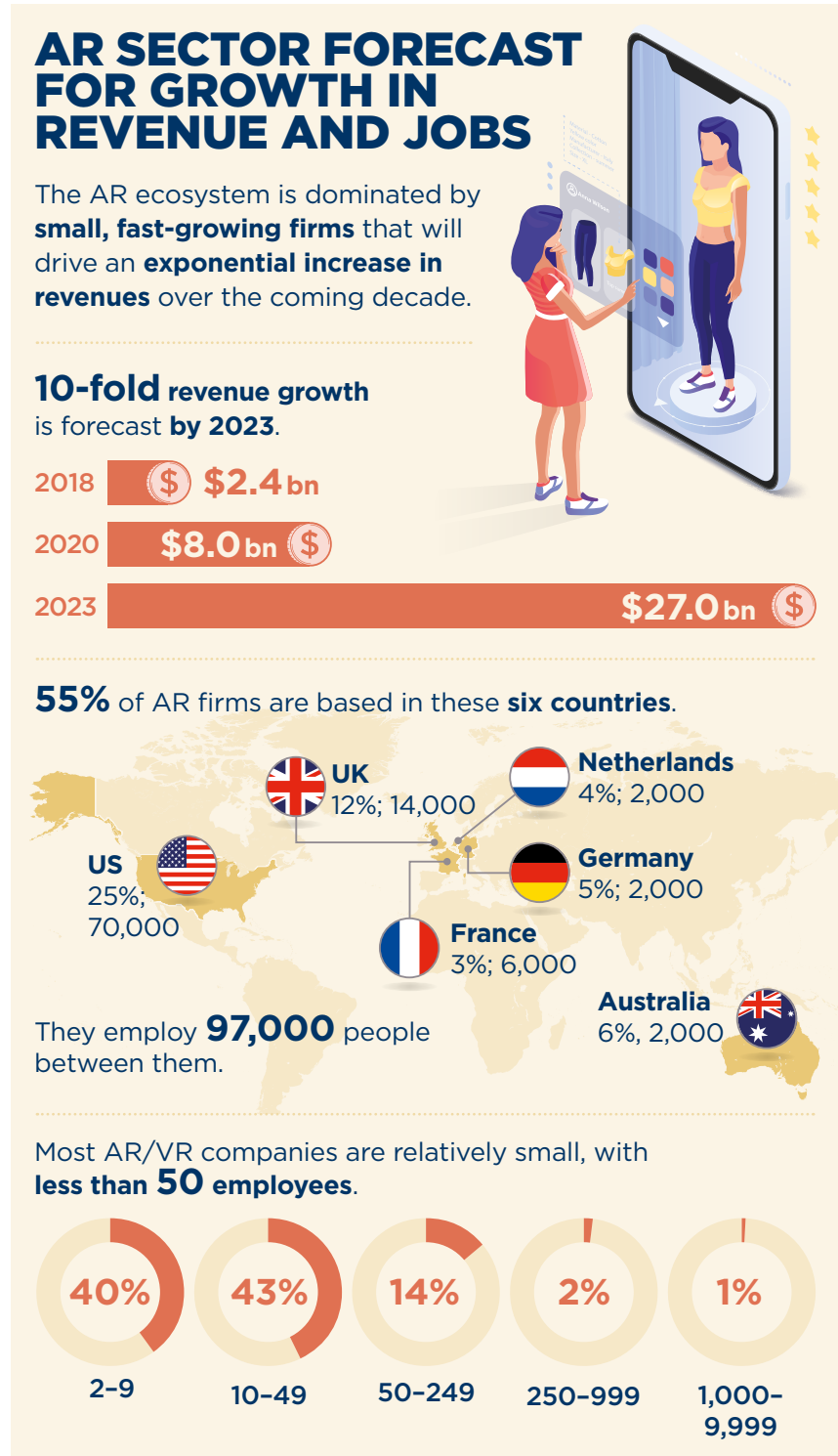
Augmented Reality (AR) technology allows digital content and information to be overlaid on the physical world. Although its initial applications predominantly lay in the world of entertainment, it has increasingly become a tool for change among more innovative businesses. Over the past 12 months, it has emerged as one of the fastest growing digital technologies in the world, providing people and brands with a new platform for expression, entertainment,

utility, and information. As such, it provides perfect case study material to exemplify these trends. To assist with our research, we undertook 13 interviews with AR experts spread across our six markets, complemented by desk-based research. Our findings underscore the transformative potential of AR.

**5.1 AR'S EMERGING ROLE AS AN ENGINE FOR CHANGE**

To understand the current shape of the industry, we have scraped information from online sources covering over 2,600 firms to identify the geographic distribution and scale of activity (see infographic, right). It is important to note that this analysis only covers firms whose primary activity is AR.

This research suggests that around one-in-four AR companies are located in the US, whilst the remainder of our 'focus markets' were all among the world's top 10 in terms of volume of AR companies. A large majority (97%) of the firms identified were SMEs consistent with AR's status as an emerging technology and, therefore, home to a vibrant start-up scene.



## 5.2 AR'S STEEP GROWTH POTENTIAL

The AR industry is on a steep growth path, according to industry forecasts. For example, ARtillery Intelligence found that the sector has been growing rapidly since 2018 and is set for a meteoric rise over the next three years.<sup>30</sup> It estimates global AR market revenue nearly quadrupled between 2018 and 2020. The next three years are expected to be marked by a similar trend implying a 10-fold increase by 2023 from 2018. In contrast, global GDP is only expected to increase by 24% in the same period in nominal terms.<sup>31</sup>

Clearly, it is impossible to predict the growth trajectory of an emerging industry over a 10-year period with any certainty. However, our research has confirmed that the growth potential of AR is vast. We see this happening through three major channels which are discussed in turn:

- AR will increasingly be deployed to enhance consumers' retail experience, a trend that has been accelerated by the pandemic.
- The technology's tremendous versatility means that it can be applied by businesses across the economy in a wide range of functions.
- AR holds the key for consumer brands seeking to develop and enhance their relationships with customers.

### Transforming the retail experience

What really defines the potential of AR in retail is its utility. More sophisticated body tracking and mesh technologies applied to AR are increasingly allowing customers to gain an interactive experience of a product.

AR allows users to visualise how the article of clothing, cosmetic, or accessory would look like in real life on them—such as a shade of nail paint on a customer's exact skin tone. This application extends well beyond these segments and has already been deployed in areas such as entertainment, hospitality (such as restaurants), and car sales. For example, AR can create an interactive preview of a film, a virtual tour around a restaurant, or even allow a user to “see” what a new car would look like on their driveway.

The effectiveness of this feature is apparent in the data. According to research by Shopify, interactions with AR/3D showed 94% more conversion to sales (compared to non-AR channels).<sup>32</sup> Survey evidence from the US conducted on behalf of Threekit, a product visualisation platform shows that 3D/AR visuals helps consumers make more confident decisions: 66% of respondents said they would

be more interested in online shopping if 3D/AR were offered and would be more confident in their purchase. In the same poll, 42% said they would pay more for a product if they could see it in 3D/AR.<sup>33</sup>

Moreover, with the alternative real life ‘try on’ in physical stores less of an option for consumers over the past year, there has been a corporate rush to embrace the power of AR. Fashion brands such as Gucci, Dior, Kohl's, and Levi's have launched AR experiences in response to the pandemic, following furniture brands such as Ikea and Wayfair who had already rolled out their AR experiences. Transformation in the beauty sector has been particularly noteworthy in this regard and is explored in more detail in the case study overleaf.

<sup>30</sup> ARtillery Intelligence, “AR Global Revenue Forecast: 2018 - 2023,” <https://artillery.co/artillery-intelligence/ar-global-revenue-forecast-2018-2023/> \ | “: -: text=ARtillery%20Intelligence%E2%80%A6,percent%20compound%20annual%20growth%20rate.&text=AR%20Headsets%20will%20grow%20in,units%20in%20market%20by%202023

<sup>31</sup> Based on Oxford Economics' proprietary data and forecasts at the time of writing.

<sup>32</sup> Harvard Business Review, “How AR is redefining retail in the pandemic”, 7 October 2020.

<sup>33</sup> <https://www.globenewswire.com/news-release/2020/09/01/2087088/0/en/Survey-60-of-Online-Shoppers-Say-They-re-More-Likely-to-Buy-a-Product-If-It-s-Shown-in-3D-or-Augmented-Reality.html>

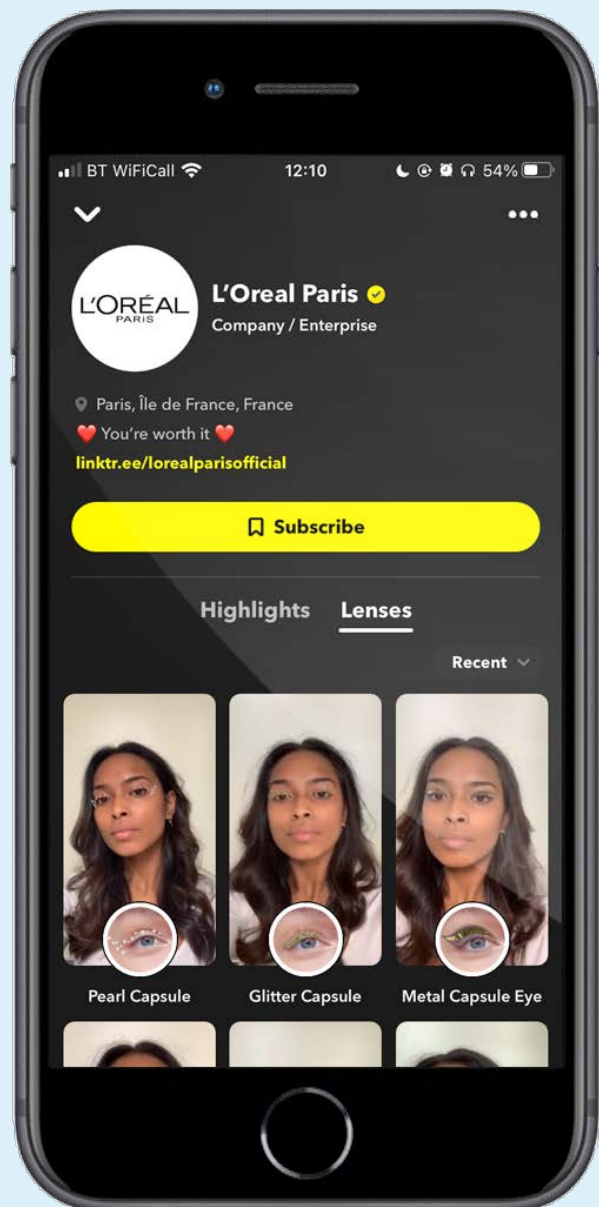
## HOW AR IS TRANSFORMING THE ONLINE BEAUTY EXPERIENCE

The global beauty industry had a very challenging year in 2020.<sup>34</sup> In contrast to the resilience seen in 2009, the restrictions on physical retail imposed across many major markets badly affected sales for products that rely heavily on a full sensual experience—touch, sight and smell.

AR provided brands with the perfect solution to this problem—virtual makeup try-ons. Many brands such as Sephora, L’Oreal Paris, and MAC cosmetics have responded by using AR-enabled make-up effects to create interactive and personalised virtual experiences. Using these AR effects, consumers can ‘try on’ a range of different products and shades of cosmetics virtually before making their purchase.

In fact, as our lives have become more virtual, AR is being used to create new virtual avatars by augmenting and enhancing the way we look on video calls. The cosmetics industry is leading the path with make-up specifically for our virtual selves. L’Oreal Paris launched its AR collection of make-up lenses, Signature Faces, that allows users to use ‘virtual’ make up to create 10 different looks on their video calls.

### L’Oreal Paris AR make-up lens for virtual calls on Snap



Source: L’Oreal Paris, [www.loreal-paris.co.uk/signature-faces](http://www.loreal-paris.co.uk/signature-faces)

<sup>34</sup> <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/how-covid-19-is-changing-the-world-of-beauty>

## Creating value for businesses across the industrial spectrum

AR's role in the consumer economy is, therefore, set to grow and grow. However, an emphasis on this theme is unhelpfully narrow when trying to understand AR's growth potential. In this section, we identify examples of AR-applications across a variety of sectors. This list is by no means comprehensive but does demonstrate the technology's incredible versatility that is set to be increasingly put to work across some of the world's oldest professions in the next decade. Moreover, across these sectors the same themes tend to reoccur. Essentially, AR can be deployed to streamline operational processes, reduce errors, and support more effective and less expensive training. In short, worthy impacts in any line of business.

**Agriculture:** despite its ancient origins, agriculture remains an industry which is at the frontier of technological innovation. AR has been identified as having high promise to join a cluster of technologies which support the process of precision farming.<sup>35</sup> It has already been practically used to enable night-time farming with AR glasses used to support tractor navigation. Other applications have been devised to support the process of soil sampling and pest tracking.<sup>36</sup>

**Construction:** construction and engineering firms are increasingly turning to AR to enhance their operations. Indeed, in a survey of more than 2,700 construction leaders, one-in-six indicated that they used AR devices, a significant rise from just two years ago.<sup>37</sup> Applications extend well beyond the obvious line of creating enhanced and more immersive visual designs. For example, it can also be used to assist with quality control and deliver enormous productivity boosts when dealing with the problematic issue of change orders.<sup>38</sup> Project modifications are often costly but AR gives engineers the opportunity to see how a change to the planned layout will interact with other features of the structure and then update plans in real-time.

**Education and training:** the potential of AR as a tool for learning has been long-recognised.<sup>39</sup> Extrapolating from the line of argument used in the previous section, the more immersive learning experience offered by AR can become a highly effective means to motivate and engage digitally native students.<sup>40</sup> Applications to help build spatial understanding and artistic talents are clear but AR can also be deployed to assist teachers in much more sober subject fields such as the physical sciences,

with students now able to conduct experiments outside of the confines of the laboratory. Moreover, AR's pedagogical role need not be limited to formal education. Businesses are likely to increasingly turn to AR to improve the quality and efficiency of their training. Health and safety procedures are a primary example of this.<sup>41</sup>

**Manufacturing:** over time, manufacturing processes have become ever more complex with production in advanced economies more likely to require the assembly of thousands of, often miniature, parts. Appropriately applied, AR can help to streamline these tasks. A fine example is Boeing's use of wearable technology underpinned by AR to assist technicians with wiring tasks which has helped to reduce associated production time by 25% and virtually eliminate errors.<sup>42</sup> Another important utility channel is via increasing the speed and efficiency of maintenance work. By donning an AR device, maintenance teams will be able to monitor relevant information across the factory-floor facilitating more targeted monitoring and repair services. AR also offers firms with a technological solution to certain skill gaps with expert technicians able to support on-the-ground staff from afar.<sup>43</sup>

<sup>35</sup> Michal Cupial, "Augmented reality in agriculture," in *Farm machinery and process management in sustainable agriculture*, ed. E. Uziak, J. and Huyghebaert, B. Lorencowicz (Lublin: Department of Machinery Exploitation and Management in Agricultural Engineering, 2011).

<sup>36</sup> Janna and Oksanen, Timo Huuskonen, "Soil sampling with drones and augmented reality in precision agriculture", *Computers and Electronics in Agriculture*, 154 (2018): 25 - 35.

<sup>37</sup> JB Knowledge, "2019 Construction Technology Report" (Research report).

<sup>38</sup> "Augmented Reality in Architecture, <https://virtualist.app/augmented-reality-ar-in-architecture/>

<sup>39</sup> "Augmented Reality: an Overview and Five Directions for AR in Education", *Journal of Educational Technology Development and Exchange*, 4(1) (2011).

<sup>40</sup> Susan Fournane, "Augmented Reality: the future of education," <https://interestingengineering.com/augmented-reality-the-future-of-education>

<sup>41</sup> "Augmented Reality in Architecture," <https://virtualist.app/augmented-reality-ar-in-architecture/>

<sup>42</sup> <https://blog.thomasnet.com/augmented-reality-manufacturing>

<sup>43</sup> Engineering.com, "What Can Augmented Reality Do for Manufacturing", 2020 <https://www.engineering.com/story/what-can-augmented-reality-do-for-manufacturing>

### A means to engage and win customer loyalty

The rising importance of AR in e-commerce will undoubtedly be an important driver of adoption growth. However, potentially more transformative, is the role that AR will play in marketing and brand-building. This process can be understood through the three-pillar structure described in Fig. 15.

Taking these in turn, necessary to any successful marketing drive is to make the audience take notice. In the past decade, the growth of social platforms and personal data has revolutionised the advertising sector by facilitating more targeted campaigns. AR technology has the potential to lead the next transformation in the next 10 years by allowing brands to provide a

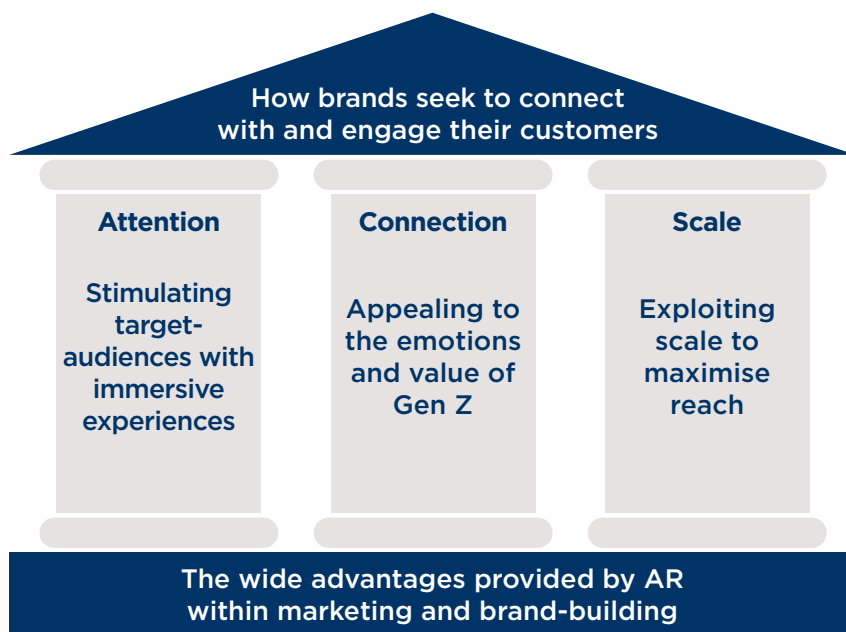
more immersive experience exploiting a wider range of senses to capture the attention of customers. Indeed, research by Mintel showed that nearly two-thirds of AR users would be more willing to click through to an online advert because it had online features such as virtual try-on.<sup>44</sup>

Next, building an emotional connection with customers has always been fundamental to businesses' marketing strategies. Going forward, more traditional forms of digital marketing are likely to increasingly struggle to gain traction as advertisement blockers on websites proliferate and it becomes easier to turn off targeted online adverts. On the other hand, companies

will be able to leverage AR's immersive qualities to share a unique experience which can help to build this relationship. Firms can use the technology to articulate 'their story' in a style that can more effectively resonate with consumers.

Finally, these inherent advantages will mean little if brands cannot reach a mass audience—scale will remain imperative. Familiarity with different aspects of AR has become increasingly widespread in recent years with a substantial fraction of the population having experience with AR in some shape of form. For example, across the six markets in focus in our survey, 83% of respondents indicated that they knew how to “use new lenses, filters or digital effects” in at least one everyday task. Looking ahead there are three enablers which will underpin mass utilisation of AR across a broad range of functions:

**Fig. 15: Attention, connection, and scale: how AR can help companies to grow their brand**



- 1. Open source platforms** such as Len Studio have helped to democratise content creation and will remain an important driver of scale. For example, as part of their fourth quarter financial results, Snap announced that over 200 million people engage with AR every day via their platform, with the number of daily active users having increased by 22% over the past year to 265 million.<sup>45</sup>

<sup>44</sup> Mintel, “Augmented Reality UK” (research report, November 2019).

<sup>45</sup> Snap Inc. Announces Fourth Quarter 2020 Financial Results. 4 February 2021

2. In common with other Industrial 4.0 technologies, AR utility will be significantly enhanced by **the rollout of 5G**. The increased bandwidth and reduced latency associated with the next generation of mobile technology will enable users to enjoy richer and more immersive experiences via AR. Similarly, **advances in ML and improved hardware** (such as Lidar) has meant that everyday users can easily execute complex tasks such as identifying a foot to try on a shoe, or identifying skin tone and applying an appropriate shade of makeup.

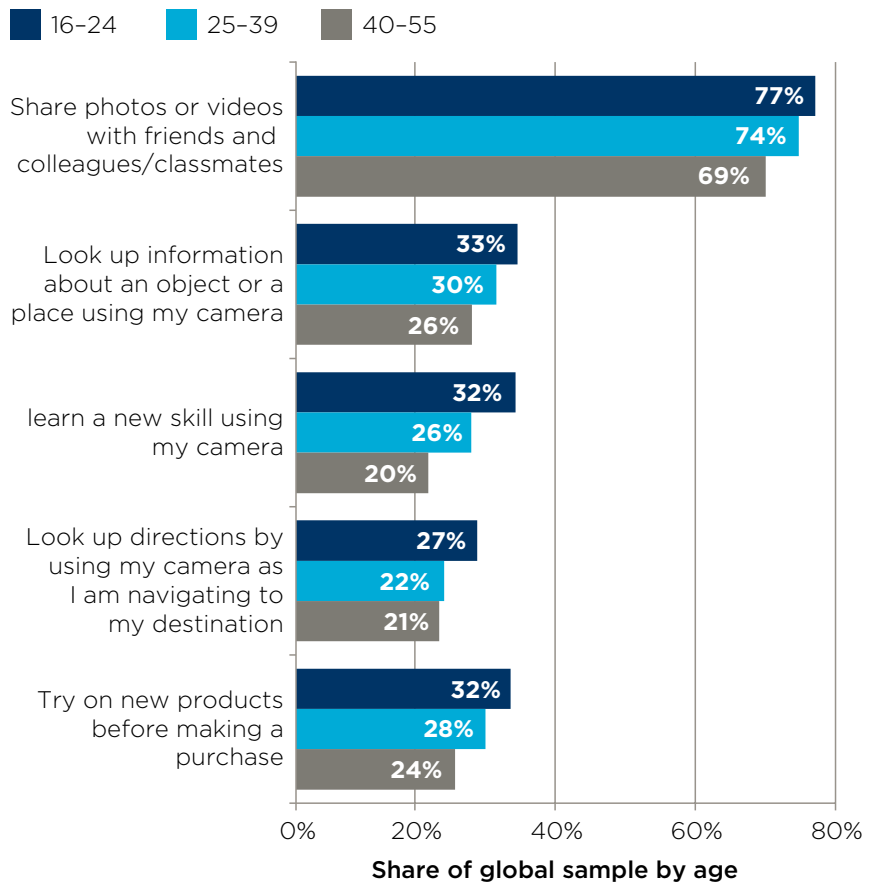
3. Finally, AR enjoys the inherent advantage that experiences can be accessed through devices which, for most consumers in advanced economies, are already *in situ*. In contrast to VR, AR does not require consumers to purchase an additional piece of equipment, given the near ubiquity of smartphones and tablets.

### 5.3 WHICH SKILLS WILL BE KEY TO THRIVING IN THE AR-ENABLED WORKPLACE?

On the face of it, Gen Z appear ideally positioned to exploit this trend given their far superior familiarity and understanding of this technology. As shown in Fig. 16, compared to other adults, a significantly higher share of Gen Z reported that they could use filters, lenses and other digital effects to support everyday tasks such as sharing content, trying on new products and navigating to their destination.

Whilst the growth of AR will certainly be accompanied by a rise in demand for certain technical skills such as visualisation and deep learning, our interviews with experts and entrepreneurs have emphasised the importance of a group of softer skills to thriving in *this* workplace. It is to these that we turn next.

**Fig. 16: Share of respondents answering that they knew how to “use filters, lenses or other digital effects to...”**



Source: YouGov data, Oxford Economic analysis



### **Creativity is key**

The ability of AR to transform volumes of data and analytics into images or animations that are overlaid on the real world has opened the door to a wave of creativity. Often these can be very simple, such as the “dog filter” or “puppy face filter” that has proved to be one of the exceedingly popular on Snapchat.

Kugali is a London-based media company that tells stories inspired by African culture using comic books, art, animation, and AR. In December 2020 it announced a partnership with Disney Animation to create an all-new science fiction series, *Iwájú*, that will come to DisneyPlus in 2022. Hamid Ibrahim, creative director and co-founder of Kugali, says the company needs people with creativity skills for the stories and the artwork as well as technical skills such as coding, 3D modelling, and graphic design.<sup>46</sup>

Creativity was central to the career of Lebanese Lens creator Georgio Copter, who gained fame through Snapchat, creating monsters partially inspired from some of Walt Disney's creations. He won best Snapchat artist of the year in 2016. He often works with brands that give him full freedom to exploit his own creativity. He says AR technologies help with communication of emotion by being able to express a range of moods from sadness to hunger.<sup>47</sup>

Blk is a US-based social AR company focusing on creating interactive experiences for music labels. Founder Michael Nicoll says the music industry, like other creative industries, is happy to try a new technology like AR to connect emotionally with listeners. AR lenses weave content from music videos and allow the users to interact with them personally.<sup>48</sup> This is echoed by Tim van der Weil, the 22-year-old founder of Amsterdam-based GoSpooky, which “reimagines storytelling for social-changing perspectives”. He says brands are looking for newer and more effective ways to communicate their story.<sup>49</sup>

### **Agility and an ability to embrace on-the-job learning**

Many entrepreneurs we spoke to learned to code by looking up videos and forums while they were coding. This is an aptitude or “soft skill” they value in the people they recruit or collaborate with.

Hamad Saleh Al-Othaimin, 33, a Saudi Arabian-based developer says that his beginnings in the design and development field involved designing and modifying photos using Photoshop for friends and relatives, which enabled him to develop his skills in the field. After that, he developed 3D logos, designs, and videos for YouTubers using Blender and C4D, then branched out, learning how to use design programs such as Photoshop, InDesign,

Illustrator, Blender, and C4D. He channelled his passion for design and innovation into designing virtual reality lenses for Snapchat and has contributed to improving Snapchat's lenses and filters by providing advice and educating its community.

Abbas Sajad, a Lens creator based in Sydney, Australia, says his journey with AR started with Snapchat lenses and filters and as time went on, he says he became obsessed with improving his lenses and filters, enabling him “make a career out of this creativeness”. He cites Blender and YouTube as two platforms that helped develop his understanding of AR. Even today, YouTube continues to provide knowledge along with Gumroad and Skillshare, an online learning platform.<sup>50</sup> This is echoed by Ines Alpha, 36, a Parisian-based digital artist working on 3D makeup projects with brands who has taught herself the skills she uses. She says the Internet provides an excellent base to learn while there are many YouTube videos explaining how to use different software programs that makes it accessible to anyone working online.<sup>51</sup>

<sup>46</sup> <https://kugali.com/>

<sup>47</sup> <https://www.facebook.com/georgio.copter/>

<sup>48</sup> <https://www.blkdigital.com/>

<sup>49</sup> <https://gospooky.com/>

<sup>50</sup> <https://www.abbassajad.com/>

<sup>51</sup> <https://inesalpha.com/>

## 6. A BLUEPRINT FOR THE FUTURE

Compared to much current discourse this report has painted a relatively optimistic picture. However, clearly the consequences of the pandemic are not positive for Gen Z, or, indeed, any generation. To round off our research, informed by discussions with a group of independent experts, we discuss how different stakeholders might best confront challenges and exploit the opportunities presented by the events of 2020.



### PLUGGING THE EDUCATIONAL ATTAINMENT GAP

As noted in section four, one of the most adverse consequences of COVID-19, for the long-term prospects of Gen Z, will be due to its disruption on formal education. Despite very positive developments

related to a vaccine, this disruption is likely to last for at least a year in Europe and North America with a recent estimate from the Institute for Fiscal Studies (IFS) indicating that, in the UK, this is likely to

equate to at least 5% of in-person teaching time over a school lifetime.<sup>52</sup> Moreover, the initial evidence suggests that this has had a material impact on student attainment.<sup>53,54</sup>

<sup>52</sup> Luke Sibiet, "The Crisis in Lost Learning calls for a Massive National Policy Response," February 2021 <https://www.ifs.org.uk/publications/15291>

<sup>53</sup> Per, Frey, Arun and Verhagen, Mark Engzell, "Learning Inequality During the COVID-19 Pandemic" (Research report, Centre for Open Science, 2020).

<sup>54</sup> Susan, Twist, Liz, Lord, Pippa, Rutt, Simon, Badr, Karim, Hope, Chris and Styles, Ben Rose, "Impact of school closures and subsequent support strategies on attainment and socio-emotional wellbeing in Key Stage 1" (Research Report, Education Endowment Foundation, 2021).

If unaddressed, the societal costs of this 'attainment gap' may be enormous but will take a long period to be fully realised.<sup>55</sup> Moreover, much of the cost will fall on individuals who are not yet eligible to vote. These features will naturally create an incentive for politicians to underinvest when correcting this issue. This urge needs to be resisted and pressure applied via the promotion of the overwhelming long-run investment case.

Apart from securing adequate funding, there are many open questions about how this can be used to ameliorate the impact on the next generation's aptitude most effectively. In terms of how this funding could be used, the following principles should be applied:

- Small group (up to five) short tuition classes would provide a faster means for 'catch up' compared to more generic solutions such as shortening school holidays.<sup>56</sup>
- Programmes which target children from disadvantaged households, who have lacked access to the requisite digital technology during the pandemic, are preferable from the perspective of efficacy.
- It will be important to draw from a wide pool of expertise across the education sector. For example, the UK's National Tutoring Programme will draw on a wide approved list of partners from which school leaders can individually select.<sup>57</sup>

## SUPPORTING THE ECONOMIC RECOVERY WHILST NOT IMPEDING STRUCTURAL ADJUSTMENT

As noted in section four, the pandemic has triggered a downturn that has been unprecedented in scale and unevenness. Most businesses in the worst-affected industries have had to take on more debt which will diminish their capacity to operate profitably even when social restrictions have been removed and society has returned to normal.

accelerate the decline of 'high street' retail whilst enhancing demand for logistics and delivery services. Likewise, a permanent shift towards remote working together with the non-return of a section of international business travel, that has proven to be superfluous during the pandemic, will have a structural impact on demand for transport services.

However, it will also be essential to facilitate occupational mobility and to avoid propping up roles which are no longer viable. In this respect, timing the transition from employment-protection to hiring incentive and re-skilling-based programmes will be crucial.<sup>58</sup>

Moreover, potential *permanent* behavioural shifts may mean that the activities of a swathe of businesses may be less viable even when the economic recovery is entrenched. For example, if the e-commerce leap were to become permanent it would

Policymakers, therefore, face a very delicate balancing act. Preventing a very sharp increase in unemployment should be a priority for policymakers given the well-established trend for temporary shocks to breed long-term joblessness.

<sup>55</sup> Eric and Woessmann, Ludger Hanushek, "The Economic Impacts of Learning Losses" (OECD report, 2020), 24.

<sup>56</sup> Economics Observatory, "How can we make up for the learning losses from lockdown?," June 2020 <https://www.economicsobservatory.com/how-can-we-make-learning-losses-lockdown>

<sup>57</sup> <https://educationendowmentfoundation.org.uk/covid-19-resources/national-tutoring-programme/>

<sup>58</sup> International Labour Organisation, "Macro policy options to stimulate pandemic-hit economies" (ILO Brief, 2020), 9.

## MAXIMISING THE POTENTIAL OF DIGITAL TECHNOLOGY TO MEET THE RE-SKILLING CHALLENGE

The next decade has, for some time, been identified as a period that will present a considerable re-skilling challenge that will need to be met head-on by all stakeholders—firms, policymakers, and workers. COVID-19 will accelerate and exacerbate this challenge. Although digital technology is at the root of this issue it can also be fundamental to the solution. Some of the most promising avenues include:

- The potential of AR as a tool for learning was documented in section 5.2.3 and educational institutions should exploit its potential to revolutionise teaching through wearable devices.<sup>59</sup> Indeed, Ernst Ekkehard, Chief Macroeconomist at the ILO, remarked that “strengthening resilience by leveraging the potential of AI and AR to identify and deliver new competences and skills will be key for Gen Z’s successful integration into the labour market”. Scientific and technical subjects are particularly amenable to this technology, given AR’s capacity to recreate a ‘virtual laboratory’ environment, a development which may also have a positive spillover effect on social mobility by widening access to technical education facilities.
- The education market is being disrupted by massive open online courses (MOOCs) led by platforms such as Coursera and edX, with over 180 million students enrolled on courses in 2020, up by 1000% on five years earlier.<sup>60</sup> Promoting remote learning opportunities has the potential to overcome two of the most frequently cited barriers to adult learning: the time/place inconvenience of the relevant course, and childcare or other familial responsibilities.<sup>61</sup>
- Beyond the strictures of a teacher-student model, the potential for open source learning is vast. This message was underscored by Andreas Schleicher, Director for Education and Skills at the OECD, who considers that co-creation, crowdsourcing and crowd curation represent the future of learning.

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<sup>59</sup>Bo and Marwala, Tshilidizi Xing, “Implications for the Fourth Industrial Age on Higher Education”, *The Thinker*, Issue 73 (2017).

<sup>60</sup>Dhawal Shah, “By the Numbers: MOOCs in 2020,” <https://www.classcentral.com/report/mooc-stats-2020/>

<sup>61</sup>Based on analysis of the adult education and learning database at [https://stats.oecd.org/Index.aspx?DataSetCode=EAG\\_AL](https://stats.oecd.org/Index.aspx?DataSetCode=EAG_AL).

## ACHIEVING A MINDSET SHIFT AROUND LIFELONG LEARNING

Although technology can play a role, encouraging an attitudinal shift will also be paramount. Looking across the OECD, the lack of appetite among adults for further learning is notable. For example, survey data show that only roughly one-in-four adults wanted to participate in learning, and in no country did this rate exceed 40%. Speaking to Rebecca Taber, co-founder of Merit America and educational policy expert, one interesting point that emerged was the potential role that businesses could play in this process. As things stand, many firms remain wedded to a system where formal educational attainment remains the cornerstone of entry requirements. Although unintentional, this reinforces the perception that informal courses are less valuable.

The OECD recently concluded research which identified best practice reform by evaluating policies implemented in six countries which have achieved a significant uplift in adult learning rates.<sup>62</sup> As remarked, this is clearly not an area where a 'magic bullet' exists and, in reality, the optimal approach will vary across countries. Nevertheless, certain clear messages emerged in terms of policy design in the context of increasing participation:

- An iterative process that allows the relevant stakeholders a voice in shaping the structure of the reform characterised many successful programmes. This type of network governance structure was a common feature of many successful programmes that were reviewed.
- It is essential to avoid a dogmatic mindset. Most successful reforms were altered compared to their initial design highlighting the need for flexibility and to continually learn lessons.
- Most successful programmes stayed relevant by establishing mechanisms to update consistent with changing patterns of demand and skill gaps in the local economy.

<sup>62</sup> OECD, "Increasing Adult Learning Participation: learning from successful reforms" (Getting Skills Right).

## REFITTING EDUCATION TO THE NEW INDUSTRIAL AGE

Our research has highlighted that our approach to formal education has become increasingly out-of-step with the demands of the new age. Via the Internet, a wealth of information is now freely available. Despite this, formal education remains centred around the accumulation of knowledge rather than developing the type of cognitive skills which will be at a premium in the next decade.

As noted by Andreas Schleicher, the so-called 'Fourth Industrial Revolution' will unleash a set of technologies with incredible power to extrapolate information from relatively narrow domains. On the other hand, the ability to reconcile different perspectives will remain essentially human. However, this trend runs contrary to common practice in both education and the workplace which has seen an inexorable increase in the specialisation of knowledge.

Achieving such a paradigm shift will clearly be a substantial challenge but our research suggests that the following high-level principles can support:

- **A shift towards problem-based learning:** to promote creativity and critical thinking it will be essential to shift towards a problem-based rather than a process-based approach to teaching. Rather than rote learning centred around facts and formulas, students need to be challenged to solve problems in real-world situations.
- **A shift away from standardised testing:** the conventional method of student assessment has been important for generating accountability and transparency. However, they can impose an unintended straitjacket on students' curiosity and critical thinking skills. Finland, might offer a useful benchmark here with a system that does not rely on standardised testing, but rather pools samples of children to evaluate learning.<sup>63</sup>
- **Empowering students:** by promoting student choice and agency, the educational system can promote curiosity and hence entrench a culture of lifelong learning amongst the next generation. Focusing on more inquiry-based methods would involve students creating iterative solutions to open-ended questions. Such an approach will encourage students to seek to continually improve their work as opposed to identifying a single correct answer.

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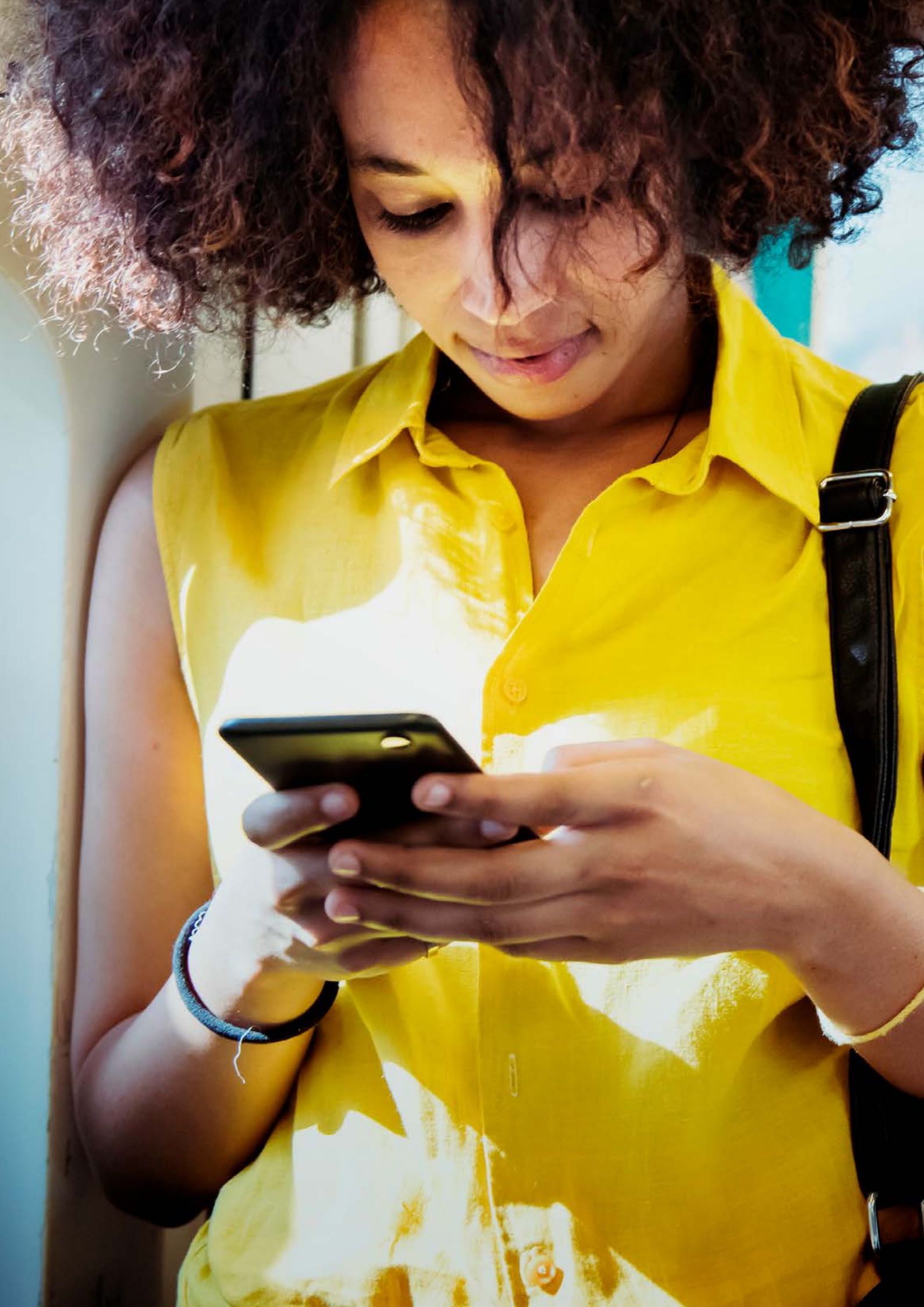
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