"Measuring the Digital Transformation: A Roadmap for the Future" provides new insights into the state of the digital transformation by mapping indicators across a range of areas – from education and innovation to trade and economic and social outcomes – against current digital policy issues, as presented in Going Digital: Shaping Policies, Improving Lives. In so doing, it also identifies measurement gaps and sets out a forward-looking measurement Roadmap.

Digital technologies can democratise innovation, but strong potential remains for wider diffusion

Mobility, cloud computing, the Internet of Things (IoT), artificial intelligence (AI) and Big data analytics are among the most important drivers of the digital transformation. Over 2013-16, five economies – China, Chinese Taipei, Japan, Korea and the United States – were responsible for developing between 70% and 100% of the top 25 cutting-edge digital technologies. Declining data storage and processing costs have facilitated the collection of large volumes of data and the adoption of Big data analytics which are now performed by 12% of businesses overall and one-third of large businesses. Data centres are becoming a critical infrastructure, and cloud computing – which provides users with on-demand access to the ICTs they need at any given time (rather than purchasing them outright) – enables companies, especially small, young and credit-constrained firms, to reduce the cost of experimenting with new technologies, scaling up and adapting technology use to the business cycle. Almost 26% of small businesses in the OECD reported purchasing cloud services in 2018.

More people are connected than ever before, but other gaps may emerge

In OECD countries, the share of people who use the Internet grew by 30 percentage points over the last ten years and more than doubled in Greece, Mexico and Turkey. Over half of individuals in Brazil, China and South Africa now use the Internet, narrowing the gap with OECD countries. In 2018, over three-quarters of individuals in the OECD area used the Internet every day. However, even in economies with almost universal Internet uptake, there is a divide in terms of the sophistication of Internet use, with many people carrying out relatively basic and limited activities online. Only in a number of Nordic countries does the share of Internet users carrying out the whole spectrum of activities measured reach as high as 45-60%. There are also generational differences in Internet use. In the majority of OECD countries nearly all 16-24 year-olds use the Internet on a daily basis – the median value was 96% in 2018 – while for individuals in the 55-74 age bracket the median stood at 55%, with very wide differences (about 50 percentage points) between leading and lagging countries.

As younger generations adopt an "always-on" lifestyle, attention should be paid to impacts on well-being

In the OECD area, 17% of students first accessed the Internet at or before the age of 6. In 2015, 43% of 15 year-olds spent between two and six hours per day online outside of school, up significantly from

30% in 2012. In Europe, the average individual allocated more than three hours per day to Internet usage in 2016, while on average people aged 14-24 spent a further 1.5 hours each day online. Across OECD countries, 90% of students enjoy using digital devices, with 61% reporting in 2015 that they forget the time when using them, and 55% indicating that they feel bad when no Internet connection is available. The latter figure reached 80% in countries such as France, Greece, Portugal and Sweden. Younger people are also more likely to provide personal information on the Internet than older individuals.

All firms and markets are affected by the digital transformation, although the pace of change differs

The scope and speed of the digital transformation varies across countries, sectors, organisations and places. Although almost no business today is run without digital technologies, they are often not used to their full potential. While broadband access has almost reached saturation in business, on average, only 20% of enterprises in OECD countries benefited from high-speed broadband (100 Mbps or greater) in 2018. A new OECD taxonomy reveals that highly digital-intensive sectors are often more dynamic and scale-up faster than other sectors of the economy, but have also experienced more significant declines in business dynamism and increases in market concentration over time. Firms in highly digital-intensive sectors enjoy 55% higher mark-ups – the wedge between the price a firm charges for its output and the cost the firm incurs to produce one extra unit of output – than firms in the rest of the economy, on average, and the gap has been increasing.

Firms in highly digital-intensive sectors are adding jobs, placing the spotlight on skills

A new OECD taxonomy reveals that highly digital-intensive sectors were responsible for the creation of around 40% of the 38 million jobs added in the OECD area between 2006 and 2016. Jobs differ in their ICT task intensity – the frequency with which ICT tasks are undertaken – ranging from around 40% in the Russian Federation and Turkey to nearly 60% in Scandinavian countries. While approximately 25% to 50% of employees in the information industries are ICT specialists, other industries employ around four people in other ICT task-intensive occupations for every one ICT specialist, on average. For every ten additional jobs created in Europe between 2011 and 2017, four were in ICT task-intensive occupations. In most OECD countries, women tend to work in jobs that are more ICT task intensive, on average, than men. Even so, in 2017, the majority of 16-24 year-old programmers in Europe were still men.

Broad skillsets are in demand and training is key

Navigating the digital transformation requires a combination of solid cognitive skills (mathematics and literacy) coupled with problem-solving skills, as well as non-cognitive and social skills (e.g. communication and creativity). However, 13% of 16-65 year-olds in the OECD area lack basic cognitive skills and less than 30% have a "well-rounded" cognitive skill set combining high levels of literacy, numeracy and problem-solving skills. The younger generation is doing better, with the share of young workers with good skills for problem solving in technology-rich environments almost five times that of the oldest workers. Training and upskilling are a must for thriving in the digital transformation. In 2018, 40% of workers in the European Union had to learn to use new software or ICT tools, and about 10% needed specific training to be able to cope with those changes. Low-skilled workers are most in need of training to adapt to a digitalising workplace but only 40% receive training on average, compared to almost 75% of high-skilled workers. OECD governments currently spend 0.13% of GDP on training for unemployed people and workers at-risk of involuntary unemployment; however, the digital transformation may require a significant increase.

As existing metrics and measurement tools struggle to keep up, it is imperative to act now

The international statistical community has made progress and further advances are in the pipeline, however more must be done to strengthen the evidence base needed to monitor and shape the digital transformation. The measurement work undertaken in the OECD Going Digital project has led to a set of nine proposed actions that, if prioritised and implemented, would substantially advance the capacity of countries to monitor the digital transformation and its impacts.

The first four overarching actions are directed towards building the next generation of data and indicators capable of dealing with the challenges of the digital transformation:

- Make the digital transformation visible in economic statistics.

- Understand the economic impacts of digital transformation.

- Measure well-being in the digital age.

- Design new approaches to data collection.

Five further actions are targeted to specific areas identified as requiring attention:

- Monitor transformative technologies (notably the Internet of Things, AI and Blockchain).

- Make sense of data and data flows.

- Define and measure the skills needed in the digital era.

- Measure trust in online environments.

- Assess governments' digital strengths.

By further building the evidence base, countries can prepare the ground for more robust policies to promote growth and well-being in the digital era. Action now will reap rewards in the future.

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