

## Executive summary

**M**obility, cloud computing, the Internet of Things (IoT), artificial intelligence (AI) and big data analytics are among the most important technologies in the digital economy today. Collectively they are enabling a future of “smart everything”, and empowering businesses, consumers and society as a whole. The *OECD Science, Technology and Industry Scoreboard 2017* shows how the digital transformation is affecting science, innovation, the economy, and the way people work and live. It aims to help governments design more effective science, innovation and industry policies in the fast-changing digital era. Below are key insights from the report, with a specific focus on digital trends among all the other themes covered.

### The digital revolution continues apace

Over 2012-15, China, Chinese Taipei, Korea, Japan and the United States were responsible for developing between 70% and 100% of the top 20 cutting-edge ICT technologies, with Japan and Korea innovating across the whole spectrum of ICT technologies. AI technologies, as measured by inventions patented in the five top IP offices (IP5), increased by 6% per year on average between 2010 and 2015, twice the average annual growth rate observed for all patents. In 2015, 18 000 AI inventions were filed worldwide. Japan, Korea and the United States accounted for over 62% of those inventions. Up to 30% of patents filed on medical diagnostic include AI-related components.

### Scientific power-houses drive digital innovation

Over the past 15 years, China has tripled its high-impact scientific efforts – as measured by its share of top 10% most-cited publications (14%) – making it the second largest scientific powerhouse, behind the United States (25%). The United States leads in machine learning research, followed by China. India has also entered the game and now accounts for a third of papers published in this field, though ranking fourth behind the United Kingdom when adjusted for quality. Machine-to-machine communication (M2M) is key to enabling the IoT. In June 2017, China accounted for 44% of worldwide M2M sim card subscriptions – three times the share of the United States.

### Frontier technologies are highly concentrated

R&D is a highly concentrated activity: within economies a small number of firms are responsible for a large proportion of total business R&D. The 50 largest domestic R&D performers account for 40% of business R&D efforts in Canada and the United States, and for 55% in Germany and Japan. The headquarters of the top 2 000 R&D corporations worldwide are concentrated in just a few economies – notably the United States, Japan and China – and about 70% of their total R&D spending is concentrated in the top 200 firms.

These top 2 000 R&D firms lead in the development of digital technologies and own about 75% of global ICT-related patents, 55% of ICT-related designs and 75% of the IP5 patent families related to AI.

### **The digital transformation is not affecting every sector equally**

Much of the value added related to ICT production is generated elsewhere in the economy. The non-ICT industry value added embodied in global demand for ICT goods and services (e.g. the glass that makes up a smart phone's screen) contributed by the rest of the economy accounts for 19–34% of overall value added, rising to 41% in China. The digital transformation is now affecting all sectors of the economy, though to varying degrees. A new taxonomy of digital-intensive sectors shows that Telecommunications and IT services rank consistently at the top in terms of digital intensity, while Agriculture, Mining and Real estate are consistently at the bottom. Other sectors show more heterogeneity across the various indicators, pointing to different rates of transformation. While almost no business today is run without ICTs, their impact depends on the type and sophistication of ICT tools integrated into business processes. For example, while most companies in the OECD area have a broadband connection, only 25% reported using cloud computing services in 2016 – 22% of small firms and 47% of large ones.

### **Broad skill sets are required**

Creation, adoption and effective use of new technology require appropriate skills. Economies where workers use ICT more intensively at work (e.g. the Netherlands, Norway and New Zealand) also have a higher share of “non-routine jobs” involving relatively complex tasks. Workers in jobs that are 10% more ICT-intensive than the average job may earn hourly wages that are up to 4% higher. However, ICT skills alone are insufficient to thrive in the digital economy. Workers enjoy extra rewards when ICT and tasks requiring management and communication skills are performed together. Workers in digital-intensive industries exhibit both higher levels of cognitive skills (e.g. literacy, numeracy and problem solving), as well as non-cognitive and social skills (e.g. communication and creativity).

### **More people are being connected, but gaps remain**

The Internet and connected devices have become a crucial part of everyday life for most individuals, and are now reaching nearly 100% of individuals in several OECD countries. Over 50% of 16-74 year olds in Brazil, China and South Africa use the Internet today, and the gap with OECD countries is narrowing. As the cost of online access technology falls further and today's “digital natives” become adults, this gap will continue to decline. In the OECD area, 17% of students first accessed the Internet at or before the age of 6, reaching 30% in Denmark. However, significant differences remain in the uptake and use of digital technologies in a majority of OECD countries, including between younger and older generations, by educational background, urban and rural locations, and firms of different size.

### **Women lag in the digital transformation**

In the OECD area, approximately 30% of graduates in the natural sciences, engineering and ICTs are women. Only 22% of scientific authors are women, a figure that is even lower for subgroups of authors, such as those engaged in paid review or editorial activity, or

those fully dedicated to research. The proportion of patents featuring women inventors ranges between about 4% in Austria to over 15% in Portugal. At work, women often earn significantly less than men, even after individual and job-related characteristics are taken into consideration. Skills, in particular ICT skills, partially explain the gender wage gap across countries. Estimates suggest that, other things being equal, returns to ICT tasks are higher for women than for men. Training women and endowing them with additional ICT skills may therefore contribute to increasing their wages and help bridge the gender wage gap.





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