PUBLIC SECTOR
TECHNOLOGY

Commercial feature

How Fujitsu is delivering on the UK's plan to become a scientific superpower

Science and innovation have taken their place at the heart of the UK's vision to become a global power. How can we seize the potential of exciting tech such as AI to solve some of our biggest challenges and prepare the UK for a post-Covid future?

Even before the pandemic, with R&D commitments at 3% of GDP, there was wide recognition that the UK would need to be a different kind of country to compete on a global level.

But when European nations were last inspected by the Confederation of Business Industry (CBI) on new-to-market innovations, the UK ranked 26th out of 28 countries. If the UK is to become a genuine global scientific superpower, it must climb to near the top of this table over the next decade, which means getting much better at commercialising research and operationalising innovation, exploiting the benefits faster than other nations and managing any of the associated risks.

The good news is that the UK is already a world leader in research into cognitive and advanced technologies, such as AI and quantum computing, which will be crucial to leapfrogging other major economies in the years ahead.

"The prime minister now chairs a science council to drive the UK science agenda. That didn't exist before the pandemic and I'm not sure it would have existed in quite the same form without it," says Dr Keith Dear, director of artificial intelligence innovation at Fujitsu, who was advising No. 10 when the pandemic struck. "We've also set up a space council which might not have happened with the same urgency either. And it empowered people like Sir Patrick Vallance, government chief scientific adviser, to have much more influence."

"It's remarkable how strong we are in research but there is a huge gap between our ability as a country to produce ideas and our ability to then turn those into products and services," says Dear. "We've got to close that gap, which first and foremost means now looking at our great capabilities in research and how we can reach the same level of competence in commercialising technologies by 2030. That will require significant co-creation across government and industry."

The UK's trade deal with Japan offers a timely opportunity to trailblaze this kind of co-creation. In the area of supercomputing Fujitsu is making the capabilities of Fugaku (which has just retained its position as the world's fastest supercomputer for the fourth consecutive time) available to government departments. This is set to offer a major boost in government capability across simulation, big data and AI. For example, it can predict coastal flooding from tsunamis in near real-time or

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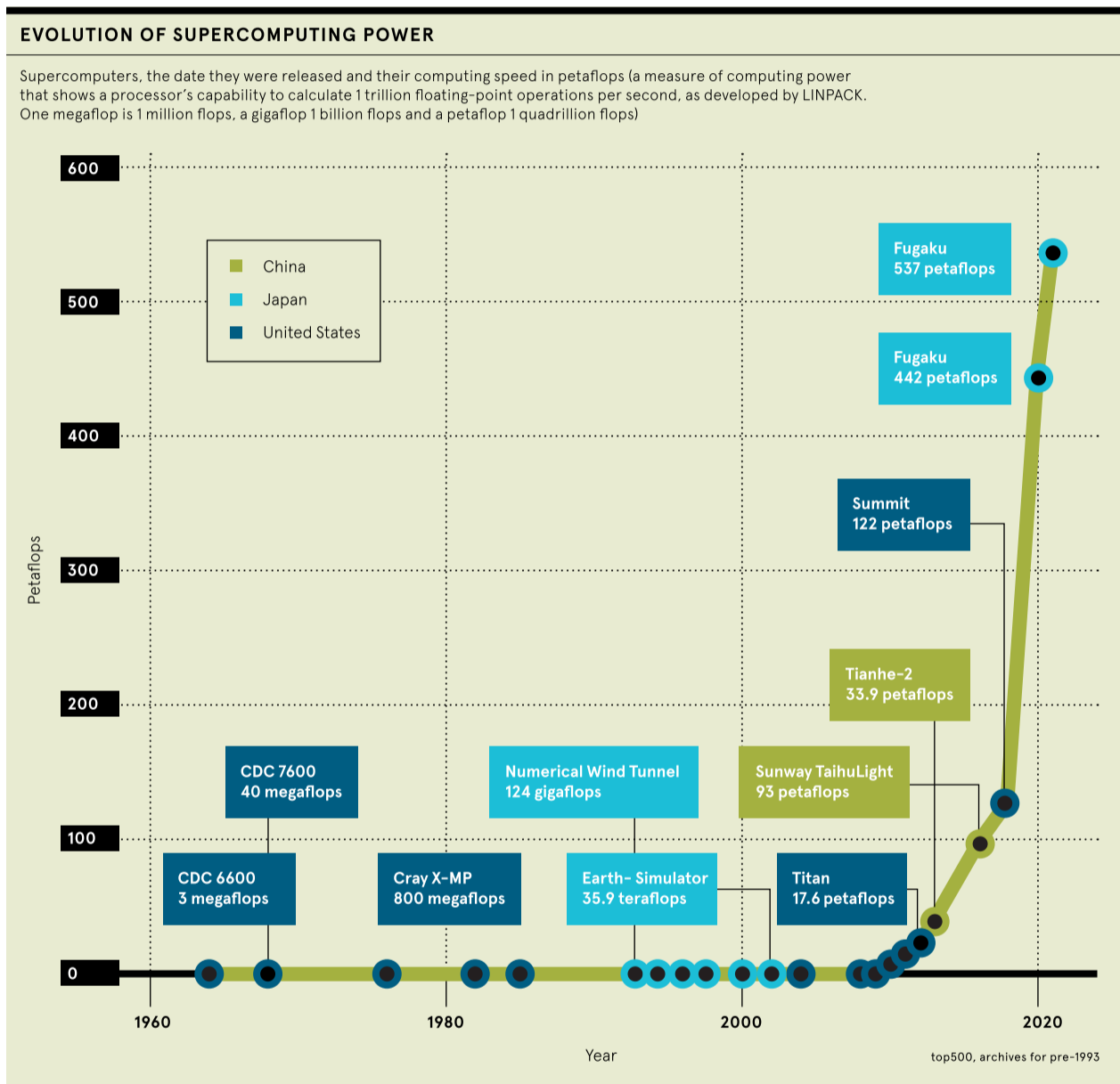
applying that to the UK, obtain detailed flooding forecasts and its effects on surrounding infrastructure more accurately and rapidly.

Quantum computing is another transformational technology, but it currently requires extreme cryogenic levels of cooling, putting the capability and ownership outside all but a very few organisations. To bridge the gap and make quantum computing more accessible, Fujitsu has developed an alternative called Digital Annealer that can perform the same parallel, real-time optimisation calculations at incredible speed and precision and on a scale that classical computing alone cannot.

Digital Annealer has already been successfully used where Fujitsu has been working with the UK Space Agency, Amazon Web Services, Astroscale and the University of Glasgow to address the challenge of space debris – 130 million objects travelling in orbit at 17,000 mph which could collide with satellites vital to services we use every day. Using Digital Annealer's quantum-inspired capabilities, the solution prioritises the most hazardous objects causing the greatest risk and plots the optimum route so that, in the future, a single spacecraft will be able to remove them more efficiently.

"While we are developing full quantum computing capability, we have the technology available today through Digital Annealer," says Cathy McCann, head of innovation and portfolio at Fujitsu. "This capability positions us at the heart of the quantum journey, as we co-create solutions to some highly complex and challenging problems both today and into the future."

These cognitive and advanced technologies have huge, wide-ranging potential to make the world a better place, from improving cancer diagnosis to tackling climate change, but it's essential that scientific advancements,

driven by the technology, are accessible for everybody and don't exacerbate a digital divide. Building trust in innovation will rely on embedding strong ethics in what is designed, as well as a diverse pool of talent building the algorithms in the first place.

Developing world-leading scientific capabilities is the beginning; commercialising them takes them into a completely new domain. New innovations bring enormous new opportunities, but those opportunities will naturally be skewed towards those who have the skills to benefit from the economic impact.

Therefore, for the UK to really benefit, new digital skills will be needed, and we are already facing a digital skills gap. Creating the right platforms to develop these skills across the UK will open up new possibilities for the technology industry and support the government's levelling up agenda.

"We cannot wait for the advent of full quantum computing to take action," says McCann. "We need to be building our expertise and skills today. Digital Annealer enables us to do

things ahead of time, principally testing quantum logic and providing application developers, computer scientists, and engineers with the tools to model and test designs before experimental implementation on quantum processors. This will enable the UK to build a bridge from what it can do today to where it wants to be in the future, and to be the scientific superpower it aspires to become."

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For more information, visit fujitsu.com/uk, or contact askfujitsu@uk.fujitsu.com

FUJITSU

EVOLUTION OF SUPERCOMPUTING POWER

Supercomputers, the date they were released and their computing speed in petaflops (a measure of computing power that shows a processor's capability to calculate 1 trillion floating-point operations per second, as developed by LINPACK. One megaflop is 1 million flops, a gigaflop 1 billion flops and a petaflop 1 quadrillion flops)

Legend:
- China
- Japan
- United States

Data points:
- Fugaku 537 petaflops
- Fugaku 442 petaflops
- Summit 122 petaflops
- Tianhe-2 33.9 petaflops
- Numerical Wind Tunnel 124 gigaflops
- Sunway TaihuLight 93 petaflops
- CDC 7600 40 megaflops
- CDC 6600 3 megaflops
- Cray X-MP 800 megaflops
- Earth-Simulator 35.9 teraflops
- Titan 17.6 petaflops

Y-axis: Petaflops (0, 100, 200, 300, 400, 500, 600)
X-axis: Year (1960, 1980, 2000, 2020)

top500, archives for pre-1993