Large-scale computing market set to grow to £38bn: Is Cambridge and the UK ready to cash in?

Having witnessed the exponential growth in High-Performance Computing (HPC), artificial intelligence (AI) and cloud consumption, and the importance for power-hungry, data-driven sectors to be sustainably responsible, it is clear that any tech predictions for 2022 will need to cover off the recent guidance given by our government.

In its recent report, 'Large-scale Computing: The Case for Greater UK Coordination', the Government Office for Science focuses on key concepts for large-scale computing, the users, the uses and how to best achieve the UK's potential in this field.

The UK is, after all, a global leader in several computing domains, particularly in areas of software development, computational modelling, data analytics, cybersecurity, AI and machine learning.

Large-scale computing – HPC and data-intensive High-Throughput Computing (HTC) – is critical for many of the fields in which the UK (and especially Cambridge as the UK's Centre for Science, Tech and Innovation) has comparative strength: bioinformatics, life sciences, climate research, materials science and pharmaceuticals – all sectors requiring increasingly vast amounts of data and storage.

And yet, in the UK, the large-scale computing infrastructure to support this ever-increasing activity is lagging behind other major global economies and would benefit from what the Office for Science describes as a "refreshed, longer-term

focus.”

Large-scale computing is an enabling tool for research and development. The HPC system today is already 175,000 times more powerful than the largest system 20 years ago and underpins our innovation, helping us to achieve ambitious ‘moonshot’ challenges such as zero emission air travel.

It helps us tackle major societal challenges and enhances the UK’s global influence. Take, for example, the UK’s involvement in the COVID-19 High Performance Computing Consortium, the international initiative which pools computational capacity to support projects addressing the challenges of the pandemic and recovery.

It is therefore vital that academic and industrial fields address and update their computing capabilities now to ensure access to leading-edge computing in the future. This in turn will ensure we are able to maintain both international competitiveness and our leader position.

Large-scale computing is also being increasingly employed across a range of newer disciplines in which the UK is emerging as an early world leader eg quantum computing – and so it has never been more relevant for us to focus, both nationally and locally, on creating a large-scale computing ecosystem in the UK to ensure we keep pacing one step ahead.

Projects are already underway around the world to develop exascale computing which will deliver systems approximately 140 times faster than the UK’s current fastest system.

And, as suggested, Quantum computing, which is increasingly becoming a reality, will mark another considerable step change in capabilities which we should already be preparing for.

Whatever technology leads, it is certain that we are entering an era of unprecedented hardware diversification and with large-scale computing a fast-changing, ever-evolving field, we

need to ensure there is suitable infrastructure in the UK to support this.

To this end, the Government Office for Science outlines the key building blocks required for creating a thriving large-scale computing ecosystem – which includes improving national coordination, minimising energy consumption, maintaining the right mix of hardware, software and skills, as well as a buoyant and functioning UK supply chain.

Clearly the need for national coordination relies on a rolling long-term roadmap to provide policy leadership on large-scale computing going forwards, as well as to improve resource sharing between organisations and establish a conduit for industry engagement.

It needs to meet the diverse requirements of all users – that is, provide targeted support for SMEs to access large-scale computing as well as take steps to ensure that the UK marketplace for cloud computing is competitive. And, importantly, any developments or steps taken need to be done with sustainability and environmental impact front of mind.

Here, in Cambridge, this has been an important conversation which Business Weekly instigated last year in conjunction with Kao Data, a specialist data centre just south of Cambridge, which has been specifically engineered to cater for advanced supercomputing, HPC and intensive AI deployments.

Together, we hosted a roundtable discussion, attended by some of the most influential thought leaders from Cambridge's foremost technology businesses, to consider the upcoming challenges around strategic growth, power, connectivity, digital infrastructure, resilience, cloud adoption and expanding storage requirements across Cambridge's computing ecosystem.

These are especially important issues for Cambridge with its glut of power-hungry life science, AI and technology companies

– and Kao Data has continued to drive this move for an HPC roadmap for the city, the results of which will be a key adoption in 2022 as society and business continue to generate more and more data and the realisation of exascale and Quantum computing beckons and builds.

Of course, large-scale computers require vast amounts of power to process data and for cooling systems – and, with data storage and networking, the combined demands are substantial.

ARCHER, the UK's National Supercomputing Service, draws just under 2 MW of power when running at full capacity, equivalent to around 4,700 homes. A single exascale system in the 40MW range would consume roughly 0.1 per cent of the UK's current electricity supply, the equivalent of the domestic consumption of around 94,000 homes.

The enormous energy requirements additionally place limits on where large systems can be built, which has contributed to the exponential rise in demand for industrial scale colocation data centres like Kao Data in recent times.

However, any advances in computing must comply with green electricity targets. The UK has a commitment to achieve net zero emissions by 2050, and so sustainability as well as power and energy go hand-in-hand.

Of course, it is not going to be effective for every company to be able to do this themselves which is why so many are outsourcing to colocation data centres – and certainly these data centres will be key to any technological advancements made in the future.

Kao Data, located in Harlow at the heart of the Innovation Corridor, remains the nearest specialist HPC data centre to Cambridge. Undoubtedly much of its success relies on the fact that it recognises that large-scale computing users come in all sizes – conglomerates and hyperscalers through to startups and scaleups.

It has focused on building a class computing ecosystem with the coordination mechanisms to support this, striking deals with companies like Civo, Megaport, Instadeep and NVIDIA to broaden its service offerings to suit different hardware requirements, access and computes.

However, Kao Data's green credentials hold equally strong appeal, and it has been widely applauded for leading the way on green and sustainable practices.

The Harlow campus uses 100 per cent certified renewable energy, 100 per cent free-cooling and boasts an exceptionally low PUE rating of 1.2, even at partial loads, which it is able to pass on to its customers.

In a pioneering move last July, it also became the first data centre to transition from using diesel to renewable HVO fuel in its back-up generators, setting an impactful example for its industry sector.

Kao Data has taken a leading role in developing the future field of large-scale computing on a local level – understanding the need for better coordination, minimising energy consumption and balancing power and accessibility with sustainability.

The global market for large-scale computing is forecast to grow to £38 billion by 2027. The UK and Cambridge tech community will need to follow suit and rethink their capabilities ahead of future tech advancements and innovations in order to be in a position to capitalise on this growth.