Comment

Research infrastructure

From big science to big business

With the right help, Europe's science facilities can be innovation powerhouses

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In 1929, physicist Ernest Orlando Lawrence at the University of California, Berkeley, developed the cyclotron, one of the first particle accelerators. His invention, however, coincided with the Great Depression, and many research philanthropies were cutting funding for basic research.

But money for medical research was less constrained, and the cyclotron's ability to make radioactive isotopes at unprecedented rates piqued the interest of foundations seeking cancer treatments.

Lawrence rebranded the cyclotron to court funders intrigued by the therapeutic potential of radioactive isotopes. This income allowed him to discretely carry on his basic research—much of which later fed into the Manhattan project to build the atomic bomb.

Lawrence is often seen as the inventor of big, industrialised science, a forger of new relationships between scientific infrastructures and commerce. Out of the Manhattan project, this approach grew into a sometimes awkward relationship between science, the military and high-tech business.

Crucial in this has been the United States Defence Advanced Research Projects Agency. Darpa has influenced almost any digital product we might buy today—from the internet to global positioning systems to robotics. It has also driven the evolution of the Silicon Valley tech giants that shape our social-economic fabric.

Small wonder that European politicians have sought to create their own version of Darpa. But important to Darpa's success is a commercial environment driven by the demand-pull of the US Department of Defense's massive purchasing power.

Europe spends less on defence than the US. But it can boast some of the world's most sophisticated research infrastructures, including Cern, the European Molecular Biology Laboratory, European X-Ray Free-Electron Laser Facility, Institut Laue-Langevin and some 600 others.

These facilities conduct experiments with unprecedented technological specifications, requiring bespoke solutions to formidable engineering problems. In the process, like the US Department of Defense, Europe's scientific infrastructures pose challenges to technology suppliers that serve as incredible drivers of innovation.

Perhaps the most famous case of research technology impacting business is the world wide web, developed at Cern. But there are many others. One important example, called White Rabbit, also comes from Cern. White Rabbit was initiated in 2008, when engineers at the lab were trying to mitigate the problem of time delays in its geographically distributed computing network.

White Rabbit enables network engineers to eliminate the nano- or pico-second delays that corrupt scientific measurement across large distances. Beyond Cern, its first adopters were other research infrastructures. However, White Rabbit is now finding applications in settings such as financial services, electronics and other industries where split-second timing matters.

The technologies developed for advanced scientific measurement and analysis have tremendous potential for many other high-growth industries important for Europe. They include advanced manufacturing, medical devices, life sciences, sustainable energy, automation, microelectronics and ICT.

However, developing commercial products and services from these technologies poses substantial difficulties. Europe's research organisations are tasked with conducting groundbreaking scientific research. Their cultures and governance are not optimised for technology commercialisation. Fulfilling their innovative potential will take additional mechanisms to provide the demand-side pull on these frontier technologies.

A project called ATTRACT, funded by Horizon 2020, is a response to this challenge. It provides €17 million of initial funding for the development of breakthrough technologies originating from research infrastructures.

In 2018, ATTRACT received more than 1,200 proposals for projects in medicine, energy, security and other sectors. On 21 May, the 170 project winners were announced at Cern. Using technologies such as smart sensors and augmented reality, they offer potential applications in fields from health to environmental monitoring.

Each will be awarded €100,000 to produce a viable proof of concept within 12 months. Up to eight projects are expected to receive an additional round of public and private funding to scale up and get closer to the market.

With some 600 research infrastructures, Europe already possesses technological treasures that can seed the first stages of the innovation process. What is needed are mechanisms to transform these into world-class products and services, driving employment, economic growth and social impact.

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