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Scientific service companies seek to unite science and industry

A summary report of the CAROTS project's final conference

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Introduction

Europe boasts some of the world's most important scientific infrastructures. As well as putting Europe at the forefront of scientific research, these resources could enhance the competitiveness of European industries, such as petrochemicals and pharmaceuticals.

In recent decades, specialised businesses have grown up around these facilities, providing highly-targeted scientific services to industry. Scientific service companies (SSCs) aim to provide a bridge between the precise measurements and rigorous analysis of the scientific world and the product and service innovation of the industrial world. SSCs tend to be located in the immediate vicinity of the scientific infrastructures they focus on, forming part of a local economy with ground-breaking science at the centre. At the same time, they help solve industrial problems by transferring knowledge to less innovative regions in Europe and beyond and getting new ideas onto the market faster, as well as creating revenue for advanced scientific infrastructure.

As SSCs are little-known, Europe may not be realising their potential to quickly transfer basic science research into the market. And because

of SSCs' strong link to scientific infrastructures, businesses in some regions of Europe enjoy better access to SSCs than in others.

Funded by the EU's regional development fund (Interreg Baltic Sea Region) and the Russian government, the CAROTS project aims to build support networks for SSCs, while helping new SSCs get off the ground and reach new industrial clients throughout Europe.

On 21 September, CAROTS participants presented the results of their work in an online conference organised with Science|Business. The event showcased examples of how SSCs have helped industrial clients make breakthroughs: turning waste products into synthetic fuel, and solving errors in pharmaceutical production. CAROTS also presented the success stories of its start-up school, which coaches scientific entrepreneurs in how to found their own SSCs. Guests from the European Commission and from industry also contributed to a discussion of how SSCs could fill gaps in Europe's innovation ecosystem and help make the European Research Area a reality, especially in underserved regions.

About this report:

This report is based on the CAROTS project's final conference Innovation cohesion: A new approach to support industrial R&D held online on 21 September 2021.

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SSCs are privately owned and profit-oriented, so compared to a research technology organisation, they are not supported by government.

Uwe Sassenberg, CAROTS
Project Leader



Scientific service networks can fuel public-private collaboration

EU R&D funding bodies often use public money to encourage joint time-limited projects between science and industry. But scientific service companies (SSCs) can help support more organic, long term and flexible cooperation, underpinned by free market dynamics. SSCs “are privately owned and profit-oriented, so compared to a research technology organisation, they are not supported by government,” and that makes them more sustainable, said Uwe Sassenberg, CAROTS project leader and scientific officer at the German Electron Synchrotron (DESY) in Hamburg. Sassenberg said that around a quarter of DESY’s collaborations involve industrial partners, typically in conjunction with academia. “We would like to have more direct contact,” he said, and the hope is that SSCs could help make that happen.

However, “the problem at the moment is that scientific service companies are not visible in Europe, and we would like to improve the visibility,” Sassenberg added. SSCs are hard to find even if you understand what they are, said Ron Dekker, project leader for European Open Science Cloud Future at Technopolis, a consultancy hired by CAROTS to research the market for SSCs. The highly specialised nature of these companies means even a committed market researcher faces a challenge when trying to find them. “They are all in different [NACE] industry codes¹, so if you try to find them by sector, that’s already difficult,” he said.

A survey by Technopolis found that SSCs also spend little on marketing. “Most of them have a website and do some marketing,” said Dekker. “But being really interactive, for example, on social media? It’s less than half, and only one third mentioned that they have or are working on a strategy to improve visibility.”

¹ An EU standard for classifying businesses

If SSCs could become more visible and grow larger, they may be better placed to serve European businesses, with knock-on benefits for the wider EU economy. But because SSCs provide services, not products, their growth is limited by the maximum available time of qualified staff. Scaling up means hiring a lot more people with rare expertise, which requires not just money, but a great deal of time and perseverance.

CAROTS believes better networking among SSCs could help, so that firms with different specialisations can learn from one another and become more effective in finding new clients and hiring new staff. SSCs survive by providing niche services that fall outside the standard services that scientific infrastructures already offer, or that industry can handle in-house, Dekker said. That means they could benefit by collaborating with other firms in different niches—and almost 90% of survey respondents said they worked with partners. “We think governments and the European Commission could stimulate [this sector] by setting up joint projects with scientific service companies, industries and research infrastructures,” Dekker added.

The impact of scientific service companies

One example of that ethos in action is the MIXN network, an association of 11 scientific service companies in Europe brought together through the CAROTS project. “All of us work with X-rays and neutrons for industry, which is the reason we formed this network,” explained Anna Stenstam, CEO of CR Competence, an SSC based in Lund, Sweden. “We are all using these facilities [large scientific infrastructures] for industries, to solve problems for industry, and all of us are engaged in helping out, so that the workflows between us and the facilities are improved,” she said. “We decided it would be very good to speak with one voice towards those facilities.”

Gerd Datzman, CEO of Datzman Interact & Innovate, another member of the MIXN network, presented two examples of the impact SSCs in the MIXN network have on industry.

Finden helps BP turn waste into synthetic fuel

Datzman highlighted Finden, an SSC founded in 2012 and based at the Harwell Campus in Oxfordshire, the site of the Diamond Light Source, the United Kingdom's national synchrotron facility. Finden was asked by oil and gas giant BP to help perfect its method for turning waste into synthetic hydrocarbon fuels, such as kerosene. Specifically, BP wanted to identify the optimal nanostructure of the catalyst used in the process.

Finden used the European Synchrotron Radiation Facility in Grenoble, the largest synchrotron in the world, to identify the perfect catalyst. "Their in-situ measurements revealed that there is a sweet spot for the size of the nano-crystallites in the catalyst—not too large, and not too small, where the chemical process works most efficiently," said Datzman. "These findings have a large impact on the creation of an economically feasible case for the conversion of waste into synthetic fuel."

Excelsus solves mysterious drug production errors for Novartis

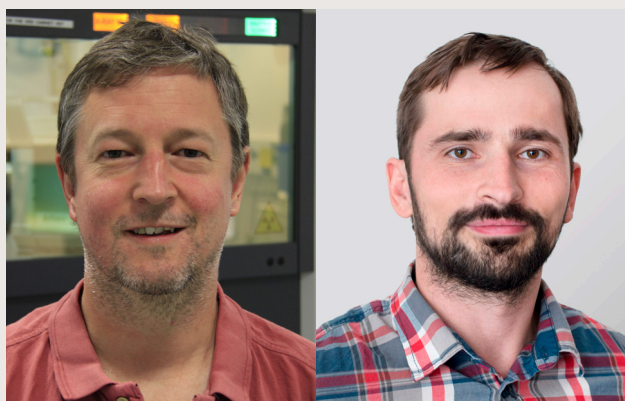
Another SSC flagged by Datzman was Excelsus Structural Solutions, which was spun-out from Switzerland's Paul Scherrer Institute (PSI). The company conducts most of its activities at the Swiss Light Source (SLS), a synchrotron facility at the PSI in Villigen, about 20 miles northwest of Zurich. The firm "is offering powerful synchrotron radiation-based analytical services, specifically optimised for industrial applications," said Datzman, who added that its CEO, Fabia Gozzo, is a former beam-line scientist at the SLS.

Excelsus was hired by drug company Novartis to find the source of a deviation in its production of a pharmaceutical component. "The chemical analysis with methods [Novartis] hosted in their own laboratories did not show clear and distinct results for solving that," said Datzman.

"[Excelsus] discussed the topic with Novartis and suggested measurements with X-ray powder diffraction at the Swiss Light Source," he went on. "By performing the measurements at the Paul Scherrer Institute and interpreting them with their expertise in the field, Excelsus was able to identify the cause for the deviation in the pharmaceutical component." Datzman said this information allowed Novartis to quickly change their processes and solve the problem.



The MIXN Network



Finden Chief Science Officer Andy Beale (left) and Xploraytion CEO Bernhard Hesse shared their experience as coaches in the CAROTS Startup School.

The CAROTS Startup School

SSCs help European industry make the most of the continent's scientific infrastructures, but there needs to be more of them to cope with the volume and diversity of expected demand. To that end, CAROTS established a "start-up school" where entrepreneurs can create new scientific service companies while benefiting from the advice of CEOs running already well-established SSCs.

"We recruited six CEOs, alongside an entrepreneurial e-learning team, and through a Europe-wide ad campaign, we attracted 48 applications [and] we awarded 11 places to the best business ideas," said Elizabeth Harmstorf, who runs the CAROTS start-up school as a project manager for market research, innovation and technology transfer at DESY.

With most of Europe locked-down in an attempt to contain the spread of COVID-19, coaching took place online—hence the e-learning team. "We delivered five webinars in entrepreneurial mindset, business model canvas, financial management, marketing, and an additional module in storytelling," Harmstorf said. "Each of our students received two one-on-one coaching sessions with their CEO, and at the end of the school, the students had to pitch their business idea." One start-up school team has already founded a company—Scatterin—and four more are on the way, said Harmstorf.

Scatterin: using synchrotron X-ray and neutron facilities to make better materials

The first company born of the CAROTS Startup School, Scatterin focuses on materials engineering. "We offer streamlined access to the synchrotron X-ray and neutron facilities to develop, test and validate products," said Ahmet Bahadir Yildiz, Scatterin CEO and PhD candidate at KTH Royal Institute of Technology in Sweden.



Ahmet Bahadir Yildiz, Scatterin CEO.

Yildiz explained there are four stages to Scatterin's workflow. First is defining the problem to be solved. For example, an industrial partner "may need to understand how does the structure of their material evolve during service." Second, "we then choose the most suitable solution - neutrons, X-rays or maybe you can solve the problem at the lab. We also help with preparations, including the sample environment," he said. Stage three is the measurements themselves. "Finally we do the analysis and interpretation of the data. For specific cases, we can do all four steps within one to three months."

CrispyAI: making crisps crispier

Another CAROTS Startup School project is now morphing into a company called CrispyAI. It aims to make crisps crispier. "It can be hard for food companies to provide a crispy product while meeting an acceptable price, sustainability standards, and reducing food waste. There is no practical way to measure crispiness during development and production," said Solange Sanahuja, CEO of CrispyAI.



Solange Sanahuja, CEO of CrispyAI.

“We support quality, R&D and production managers with a measurement method that gives a clear check for in-out quality of food crispiness,” she said.

It does that by crushing crisps in a machine and using AI to analyse the sound and predict the sensations the consumer will experience. “This methodology can be also applied to measure other food, cosmetics and medical product properties, or to understand and sort any complex data: for example, for maintenance with predictions of machine failure, or for diagnosis of patient sicknesses,” said Sanahuja. The team is starting with the crispiness of crisps because it’s extremely difficult to standardise, in part, because no two potatoes are the same, she added.

CAROTS School helps new SSCs learn from others’ experiences

Yildiz and Sanahuja were coached one-on-one by experienced SSC leaders Bernhard Hesse, CEO of X-ray analytics firm Xploraytion, and Andrew Beale, chief science officer of the aforementioned Finden, respectively.

“I think we saved some months and probably years of experience, thanks to the start-up school.” said Yildiz. “It was really in-detail, it included everything we need, from finding customers and being customer-oriented to practicalities, like cashflow—things you don’t normally think about very much in the beginning,” he said.

“It felt like I moved back in time, because they had the same questions that we had in mind when we

started our company five years ago,” added Hesse. “If I had these kind of discussions five years ago, we would have been a bit faster by now.” Beale noted that coaching at the CAROTS school provided a “refresher” for him and his colleagues.

Could SSCs be the ‘mortar’ for European R&D ecosystems?

Helping SSCs get off the ground is one thing, plugging them into a R&D market that—for the most part—has never heard of them, is another matter entirely. Participants in the online conference discussed the role SSCs could play in the European Commission’s attempts to strengthen industrial R&D throughout Europe, including in regions where R&D performance is weak, by building decentralised “ecosystems” of R&D actors in different fields.

Europe has “a wealth of data and knowledge produced in multiple domains,” said Apostolia Karamali, head of unit for R&I Actors and Research Careers, DG RTD at the European Commission. But Europe’s overall R&D spending remains well below its three per cent target, she said. That’s why the Commission is pushing “place-based growth”—that is, developing a place’s existing advantages, specialisms and capabilities. “We need to bring in the results from research into the economy, bridging between research and industrial policies,” explained Karamali. That means building ecosystems—networks of different actors across Europe—to “increase opportunities for local actors,” she added.



I think that we are catalysts—we are definitely helping others to become unicorns.

Anna Stenstam,
CEO of CR Competence



Some progress has already been made on that front, said Stenstam, who presented the MIXN network earlier in the day. “It is definitely getting



Connecting the dots: Rethinking the role of industrial R&D in innovation ecosystems

11:10 - 11:55



A view of the final panel during the Carots final conference

better and I'm really happy to hear how ecosystems and networks are looked upon now," she said. In Stenstam's view, Europe's SSCs could cement a pan-European innovation ecosystem together. "I think it's important to see the ecosystems as having these big blocks," such as industry and major scientific infrastructures, "but also the mortar between them," meaning the SSCs. While SSCs might not become unicorns (a start-up valued at more than US\$1 billion), "I think that we are catalysts—we are definitely helping others to become unicorns," Stenstam contended.

Innovation players are a very important part of the [industrial] ecosystem.

Ulla Engelmann,
Acting Director of Network
and Governance, DG GROW,
European Commission.



The Commission looks at innovation and industry as distinct sets of ecosystems, said Ulla Engelmann, acting director of network and governance at the Commission's department for economic growth,

"but you need to have a holistic view, meaning you look at the different businesses, [...] the social partners, [...] the innovation actors, but also public authorities. Nevertheless, "innovation players are a very important part of the [industrial] ecosystem."

There are different conditions in each European country that can make it easier or harder for SSCs to become that mortar between science and industry. For example, SSCs in Greece need to look beyond their country's borders due to a lack of local R&D-intensive industry, but "we need a lot of effort to convince companies to trust us," said Sotiris Kokkinos, CEO of FEAC Engineering, an Athens-based SSC. "It is difficult to make people understand what we provide," he said.

Another problem, added Kokkinos, is that Greek scientific infrastructures are largely closed to forprofit businesses. "We weren't able to use the infrastructure provided by the government, it was only for academia. This is something that is now under discussion."

Even Sweden, home of Stenstam's CR Competence, presents challenges. "I come from a country where there is a bit of a dualistic approach," Stenstam said.

“On one side, companies and entrepreneurship like ours is valued and talked a lot about and appreciated in many ways,” she explained. “But at the same time, large funds and structures are promoting larger, more state-owned infrastructures.”

Stenstam and Kokkinos stressed that however valuable their role may be, SSCs don’t have a God-given right to success. It’s their responsibility to find customers and demonstrate that their services are worth paying for, both CEOs noted. As time goes by, that could become more difficult if large firms start to improve their own scientific capabilities, said Magnus Fredriksson, industrial relations manager at Alfa Laval—a Swedish manufacturer of products for heating, cooling, separating and transporting substances used in heavy industry. “That’s why we need to be at the really state-of-the-art front, because many companies will have their own competence and their own expertise,” Stenstam added. “I think it’s a very important challenge: we can get started, but how can we stay relevant?”

If companies are under strong competitive pressure to be innovative and original, that’s generally good for the wider economy. But a competitive knowledge economy demands highskilled workers, which is also the main bottleneck for SSCs’ growth. That’s why the Commission wants to encourage academics to broaden their horizons and consider other roles. “Part of the problem is many of them have expectations to continue their career within academia,” said Karamali of the Commission. “Inter-sectoral mobility” needs to be promoted and valued more, she added.

Still, there are hopes that more joint projects between universities and businesses will help academics to expand their skills. And ultimately that will help SSCs bridge the gap between research and industry. SSCs say acknowledgement and support from the EU Commission and member states are highly welcome to increase their visibility as catalysts for deep tech with faster access to research infrastructures, and to promote a joint development of measurement methods for industry, as well as the still small, yet important, SSC market for the innovation ecosystem.

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