Open Innovation in Science (OIS) models as a mechanism for bolstering collaboration between European research infrastructures and industry

Report

Academic report from the Danish Centre for Studies in Research and Research Policy (CFA), Department of Political Science, Aarhus BSS, Aarhus University

Authors	Amalie Due Svendsen, Anna Vigsø Pedersen, Maria Theresa Norn & Carter Bloch
Department	Danish Centre for Studies in Research and Research Policy, Department of Political Science

Publisher	Aarhus University
Year of publication	2025
Financial support	This work was supported by a grant from the Novo Nordisk Foundation, grant no. NNF25SA0103436

Contents

Executive summary

Europe's investment in cutting-edge Research Infrastructures (RIs) is critical to maintaining scientific leadership and tackling major societal challenges. However, these investments do not automatically translate into innovation. Strengthening collaboration between RIs and industry is essential to unlocking the full value of RIs, but persistent barriers – including lengthy IP negotiations, bureaucratic hurdles, and cultural divides – often hinder effective engagement.

This exploratory study examines whether the Danish Open Innovation in Science (OIS) model – an IP-free, pre-competitive collaboration framework – could serve as a productive tool for enhancing RI-industry collaboration across Europe. Drawing on a literature review and interviews with selected stakeholders, the study identifies clear potential for OIS to complement existing mechanisms by offering low-friction entry points for industry engagement. The OIS model can also be seen as part of a toolkit of approaches that promotes openness in RI-industry collaboration.

The Danish OIS platforms ODIN and Plant2Food have demonstrated that the OIS model lowers transaction costs, supports trust-based co-creation, and attracts a diverse mix of industry partners—from large firms to R&D-intensive startups. However, sectoral, national, and organizational contexts matter, and flexibility in how openness is implemented is key.

The report recommends exploring the potential of OIS-inspired models in selected RIs, with a focus on problem-oriented, low-TRL research areas where RIs and industry stand to benefit from shared knowledge, methods and tools. Pilot initiatives could be considered to further explore the catalytic role that OIS could play in fostering faster, more open, and more impactful innovation from European research infrastructures.

Introduction

Europe faces major societal, economic, and environmental challenges in the coming years, underscoring the need to accelerate European research and innovation (R&I) to foster new and ground-breaking technological solutions (EFIS Centre, 2023). As outlined in her mission letter, the Commissioner for Startups, Research, and Innovation Ekatarina Zaharieva has been tasked with prioritizing "the foundations that foster knowledge and innovation, notably through a long-term strategy to boost European Research Infrastructure, with the aim of creating a pan-European ecosystem of research infrastructures and services." This objective aligns with the EU's and Member States' substantial strategic investments in high-tech, pan-European Research Infrastructures (RIs) – highly specialized facilities and services that support world-class research and innovation (ESFRI, 2011). The scale of these investments is reflected in the large number of such facilities across Europe, which now include more than 1,000 international and national RIs (Li-Ying et al., 2021).

What are Research Infrastructures?

EFIS Centre defines RIs as "single-sited, virtual or distributed resources and services for the research communities to conduct research and foster innovation in their fields, essential to achieve excellence in R&I, unique in nature and open to external users. They include the associated human resources, major equipment or sets of instruments; knowledge-related facilities such as collections, archives or scientific data infrastructures; computing systems, communication networks and any other infrastructure." (EFIS Centre 2023). As such, RIs occupy a significant role in the innovation ecosystem, as they are situated in a space where innovation and industry meet. This makes them significant drivers in the circle of innovation (ESFRI 2018).

Public funding plays a crucial role in the construction, maintenance, and operation of most European research infrastructures. However, RIs depend on a diverse mix of funding sources, including EU funding, national and regional contributions, membership fees, and project-based support (ESFRI 2025).

Through investments in research infrastructures (RIs), Europe has succeeded in establishing cutting-edge research environments. However, scientific excellence does not automatically translate into innovation. A well-functioning ecosystem is needed to support this process by fostering strong links with the private sector, as industry actors are crucial for breakthrough innovation and the scaling of critical technologies (EFIS Centre, 2023). Consequently, a strong European focus on strengthening productive interactions between RIs and industry is essential to boost competitiveness and ensure a higher return on public investment.

Since 2020, Aarhus University and the Novo Nordisk Foundation have developed Open Innovation in Science (OIS) as an IP-free university-industry collaboration model. The OIS model aligns with a broader trend of open university-industry collaboration platforms known as Open Science Partnerships (Ali-Khan et al., 2018a; Ali-Khan et al., 2018b; Gold, 2021; Gold et al., 2019). Through pre-competitive, open research collaborations, the OIS model accelerates the commercial utilization of university research that typically falls outside traditional tech transfer efforts. The Danish OIS model has been adopted so far in two larger collaborative research funding programs: ODIN (focused on biomedical research, and including five Danish universities), and Plant2Food (focused on plant-based foods, and including three Danish and one Dutch university). These models have proven effective in fostering co-creation of projects

and deeper engagement between academia and firms, including large companies as well as SMEs and science-based startups, as a supplement to a wider range of mechanisms to support academia-industry collaboration (Norn et al., 2024; Norn & Ramos-Vielba, 2025).

The OIS model or potential variations thereof may be well-suited for RIs, as a tool to increase engagement with industry while adhering to the open science norms that lie at the heart of many RIs. RIs are at the cutting edge for research and testing within many fields and function as a seedbed for the development of fundamental insights, tools and technologies that hold benefit for a wide range of companies and industry sectors. Greater involvement of industry in RIs can help to orient pre-competitive research towards the development of solutions that can benefit business and society.

To explore the potential of OIS in the context of RIs, Aarhus University's Center for Open Innovation in Science has commissioned this report to investigate opportunities and barriers associated with the OIS model as a tool to enhance research infrastructures' engagement with industry and, ultimately, their impact. This impact could manifest through better integration of actors managing technological infrastructures, increased internal coherence within research and technology infrastructures, or by amplifying the impact of existing efforts that strengthen the research and educational use of European RIs. The exploratory study described in this report has taken first steps to explore the potential for integration of OIS components in selected European RIs – for instance as pilots in Horizon Europe and potentially in a more structural manner in FP10 – and/or as an element in the forthcoming European Strategy on Research and Technology Infrastructures.

Defining features of the Danish OIS model

- **Community:** OIS programmes facilitate a community or network for relevant academic and industrial partners. This aims to strengthen ties between industry and academia and to provide opportunities for new collaborations to evolve. Furthermore, the community is a place of knowledge sharing where synergies between projects can materialize.
- **Co-creation**: The OIS platform provides funding for selected projects that are co-created by industrial and academic partners. This aims to ensure that projects are user-driven and address the needs and challenges faced by the industry. Co-creation may be supported in several ways, for instance through digital platforms, networking and ideation events.
- **Open principles:** Partners in OIS-based projects must sign a non-negotiable legal framework that states that all data and research results generated within the project must be made openly accessible to the public without restrictions on its further use (i.e. no IP-rights can be claimed). This means that OIS-based collaborations address fundamental research questions and are situated in a precompetitive space, at early TRLs.

Source: ODIN (https://projects.au.dk/open-odin) and Plant2Food (https://projects.au.dk/plant2food)

Aims and approach

The aim of this exploratory project is to assess whether the Danish OIS model (as demonstrated in ODIN and Plant2Food) or a variant thereof could serve as a value-adding component for selected European research infrastructures. More specifically, the project explores the potential relevance of an OIS model to enhance public-private research collaboration involving research infrastructures.

The report draws on a survey of relevant academic and 'grey' literature as well as 13 interviews with selected stakeholders with insights into RI-industry collaboration, particularly within the domains of Materials Science and Life Sciences, and actors with experiences of precompetitive and open public-private partnerships. For a list of informants, please refer to Appendix I.

The exploratory study was undertaken by a team of researchers at the Danish Centre for Studies in Research and Research Policy (CFA) at the Department of Political Science, Aarhus University. The study was commissioned by the Open Innovation in Science Centre at Aarhus University through a grant from the Novo Nordisk Foundation.

The report is structured as follows. First, the extent and character of RI-industry collaborations is described based on relevant literature. This also includes descriptions of the current extent of openness in such collaborations and how openness is characterized. Second, the potential of OIS as an enhancer of RI-industry collaboration is discussed in relation to the insights provided by interview informants. Finally, the conclusion summarizes key points for consideration and presents possible directions for the further exploration of the OIS model in the context of RI-industry collaboration.

Collaboration between RIs and industry

While collaboration between RIs and private companies is common, the academic literature on this form of engagement remains sparse compared to the extensive studies on university-industry collaboration in general (Li-Ying, Sofka & Tuertscher, 2022; Scarrà & Piccaluga, 2022). A few studies and reports, however, provide insights into the extent and characteristics of RI-industry collaboration today. The following section synthesizes this literature, along with insights provided by interview informants.

Types of engagement

A survey including 35 ESFRI landmarks found that 49% of these RIs collaborate with industry partners on a regular basis, thus suggesting that relationships between RI and private companies are somewhat well established (Bučar, Gerdina & Brečko, 2023). The survey also found that 92% of the RI respondents wanted to strengthen collaboration with industry and made active plans to achieve this (Bučar, Gerdina & Brečko, 2023). Indeed, several of the bigger RIs have established dedicated offices to promote industrial collaboration.

The ESFRI report *Innovation-oriented cooperation of Research Infrastructures* from 2018 identifies two main relationship models characterizing engagement between RI and industry. In the *upstream business model*, industry functions as a supplier, meaning that the company "acts mainly as a provider of state of the art technologies, new designs, components, software, under standard procurement conditions or in closer collaborative conditions" (p. 12). This type of interaction is often prevalent in the construction or upgrading phases of RIs, where private partners are brought in for developing "co-solutions" to shared problems (p. 12). As such, collaboration in this context has a strong element of co-creation and reciprocal knowledge exchange even though industry occupies the role of supplier. In the *downstream business model*, industry functions as a user. This relationship is more common in the RIs' operating phase, where companies buy access to RIs' facilities, data and services to support their own R&D efforts. These projects may be characterized by basic research as well as applied research, innovation and product development (ESFRI, 2018). Furthermore, this type of interaction between RI and industry may also involve co-creation of joint R&I projects and proprietary research that is commissioned by companies (ESFRI, 2018). As such, companies may engage with RIs in various ways, acting as both suppliers, users and collaborators, depending on the objectives of the RI and the specific context for interaction.

In connection with this, a survey study targeting both SMEs and larger companies found that the most common types of collaboration between industry and RIs are: 1) "Use of equipment / data / collections" (78%), 2) "Research cooperation funded through an EU-funded project" (70%), 3) "Research cooperation funded through national sources" (64%) (Angelis, 2023). This was also confirmed in interviews stressing that purchase of services for testing, standardization and validation is the primary type of interaction.

The extent of industry usage of RI facilities varies across different types of usage. The ESFRI report finds that private companies' direct access to RIs for own proprietary research is fairly low – only "5% of the total available user time" (ESFRI, 2018, p. 46). These are the cases in which industrial users pay for access and other operational costs. However, industry involvement is more prevalent when we look at public-private partnerships, in which private companies team up with public academic users – these account for 20% of the total available user time (ESFRI, 2018). If such projects are fundamental in character and thus aim at publication, companies will have charge-free access to the facilities in the same way as researchers (ESFRI, 2018).

Openness in RI-industry collaboration

Overall, European RIs have a high commitment to the EU's open science agenda and promote transparency and accessibility in the research conducted at their facilities. This is also evident from the revised Charter for Access to Research Infrastructures which champions the open science and FAIR principles (European Commission, 2024). Consequently, many RIs have adopted Open Science policies seeking to make as many research outputs as possible available to the scientific community.

While many RIs align with the open science agenda, interviews suggest that RI-industry collaborations frequently involve NDAs and IP negotiations. Even though open access is often a possibility (and is required in EU-funded projects), most other collaborations use closed modes by default. A survey study on ESFRI landmarks' cooperation with industry found that private companies perceived legal issues (incl. IPR) as one of the main barriers in RI-industry collaboration (Angelis, 2023). This is echoed by Bučar, Gerdina & Brečko (2023) who state that "stakeholders have indicated that cooperation is hampered due to different goals and expectations between industrial users and Research Infrastructures on one hand,

but also due to the administrative, legal, and fiscal burdens connected to working with Research Infrastructures" (p. 4). There are examples of programmes that focus on open collaboration around RIs, though in different ways. These examples also suggest different understandings of "openness", which can range from openness for others to use the results (though potentially with IP protection) to providing open and universal access to results.

One example is the EU-funded ATTRACT programme that fosters collaboration between top European RIs and industry to bridge the gap between fundamental research and market-ready innovation. It supports early-stage projects in detection and imaging with seed funding (Phase 1), then scales the most promising ones toward commercialization (Phase 2) (Pennings et al., 2018; ATTRACT website).

Another example of an Open Science-based programme is Open Targets that seeks to foster collaborative projects, where RIs and pharmaceutical companies join forces in pre-competitive drug discovery that addresses general purpose problems. While Open Targets require open sharing of early-stage project results, project agreements also make room for balancing '"the principle of openness with the organization's needs for opacity and closure following competitive and market logic" (Kozlowski, 2019, p. 95).

The nanoelectronics R&D hub imec also engages in open innovation, offering industry access to their advanced facilities in joint precompetitive projects. In this case, openness is in the form of shared IP,, in the sense that the RI receives the rights to project results and shares these via licensing to interested project partners. This thus involves costs to interested companies in order to access the technology, though licensing income is part of imec's business model in order to finance the operation of their facilities. As such, examples of open collaboration around RIs demonstrate the diverse implementations of open innovation.

The OIS model as a potential amplifier of RI-industry collaboration

Based on inputs from interviewed stakeholders, there seems to be potential to further expand on open and pre-competitive public-private partnerships. This is also highlighted by ENRIITC[1] who recommended increasing "the number of collaborative initiatives" (2019, p. 20). The question is whether the OIS model could be a productive way of bolstering such collaborations. This is discussed in the following sections.

Addressing the barriers to RI-industry collaboration

While RI-industry collaboration is well-established in some RI-contexts, there still appears to be significant untapped potential. This was echoed by several interview informants, who attributed this unrealized potential to severalbarriers to RI-industry collaboration. First, some informants stressed that collaboration agreements (including agreements over the distribution of IP rights to outcomes form collaboration) often involve difficult and lengthy (sometimes year-long) negotiations, which delay innovation processes.

Second, informants noted that the high level of bureaucracy in EU programmes is seen as a barrier to industry in terms of joining public-private partnerships. This is especially the case for SMEs, who tend to be more resource-constrained than larger industry actors. Such heavy bureaucratic processes are, according to informants, slowing down the R&D life cycle.

Finally, informants pointed to the cultural differences between the academic and industry sectors, especially in terms of objectives and time horizons. Industry actors focus on commercialization and profit maximization, which means they want quick and reliable outputs and minimum project risks. Scientists, on the other hand, work primarily towards academic outputs and in much slower work cycles. These differences also manifest in different languages and understandings of R&D, which means that some form of mediation or translation between the sectors is often necessary. Here, informants particularly stressed the RIs' challenge in communicating their relevance and potential to industry. This point is also articulated by ESFRI, who state that "a change in culture is needed in both RIs and industry. All stakeholders should be better informed on, and more aware of, the existing potential for cooperation. Industry should become more RI-oriented and RIs more business-oriented." (2018, p. 98).

Potentially these barriers could be addressed by open collaboration models such as the OIS model presented above. The core of this model is the IP-free processes where knowledge, ideas, data and materials can be shared between academic and industry to generate new insights and translate them into innovative solutions and technology. Launching an IP-free model, involving a non-negotiable legal framework, could help to resolve some of the tensions related to resource-intensive IP negotiations. Indeed, some informants also stated that IP claims and NDAs are not always necessary in the early phases of R&D work. Moreover, evaluations of the Danish OIS programmes, Plant2Food and ODIN, find that the IP-free legal framework is perceived as less bureaucratic by industry partners, making it easier for them to enter collaborations.

[1] European Network of Research Infrastructures & Industry for Collaboration (initiative funded by Horizon 2020 from 2020-2022)

Importantly, the OIS model has also shown potential in bridging academia and industry by providing a space for co-creation of precompetitive projects, where ideation and matchmaking between actors is facilitated through hand-held processes. Indeed, experience from Plant2Food and ODIN highlight that the model has proven effective in establishing a space where industry is able to communicate their challenges and needs to potential academic partners, thus providing the foundation for co-creation of joint research projects that are oriented to business needs.

Perspectives on the OIS model as an enhancer of RI-industry collaboration

Informants generally agreed that collaboration could and should be enhanced and that some form of openness is valuable, especially in terms of accelerating innovation processes. As phrased by one respondent, "We need fast pathways to innovation to find solutions to the big societal challenges". The informants' perceptions of the OIS model as a potential amplifier of innovation varied, however. One respondent was mainly skeptical about the idea of yet another EU funding instrument, while others maintained the importance of IP – both in terms of getting industry actors to join and sometimes in terms of the RI's business model which sometimes depends on licensing. However, other informants saw potential in expanding opportunities to work in a precompetitive and IP-free space. Interviews revealed limited but positively received open collaborations already in place, and one informant noted that companies are often not as reluctant to participate in open collaboration as might be expected.

In this regard, informants mentioned some **attention points** that should be considered in the further exploration of the potential of the OIS model in RI-industry collaboration:

- Firstly, it is essential that the **thematic area** of the collaborative projects is compatible with the OIS principles. This means that projects must focus on topics that are not business-critical. As such, projects must be situated at low TRLs and address fundamental research questions that are relevant for a broad range of companies. Notably, methods and standardization were mentioned as "low hanging fruits", where companies might be more open to engaging in IP-free collaborations.
- Furthermore, the **national context** must be taken into account. One respondent noted that an OIS model requires high degrees of trust in the innovation ecosystem, which varies across EU member states. As a consequence, some national contexts might be more prone to accepting IP-free collaboration than others.
- Also, some **scientific areas** and **industrial sectors** might be more compatible with the OIS principles than others. It was highlighted that industrial sectors with a "fast innovation rate" and sectors that "apply a deep scientific base for their products" might be more fit for open and IP-free collaborations. For industries with a fast innovation cycle, OIS can be attractive as it avoids lengthy IP negotiations, while for industries involving extensive basic research (such as pharma), OIS allows for greater collaboration and sharing costs of early-stage precompetitive research. More specifically, informants mentioned the following areas as examples that could be further explored: chemicals, batteries, energy, synthetic protein, aerospace, and pharma.
- **Sufficient funding** was seen as essential to the success of a potential OIS instrument. Both in terms of rewarding extensive application efforts with a reasonable success rate and also because funding is usually shared between several partners. No-fee access to the RI is also a strong incentive to enter into IP-free precompetitive collaborations.

- The type of **industry actors** and their motivations should also be considered. It was pointed out that large companies might be more willing to engage in open and precompetitive projects, because they have extensive R&D resources and because they are driven by setting the standard in their sector. At the same time, the smaller financial means of R&D-based startups and SMEs could also be an incentive to engage in such collaborations. Smaller companies who often do not have the resources to purchase services from RIs might see a potential in obtaining access to state-of-the-art facilities and results through IP-free collaboration.
- The **degree of openness** in open innovation initiatives varies, and some informants were more positive towards open innovation models with *shared* IP than completely IP-*free* models. As stated by one informant, companies are very protective of their intellectual assets and may find it hard to join in if their ability to develop own IP is too restricted. Thus, some informants advocated for flexibility in terms of the degrees of openness.
  The **framing** of a potential OIS instrument was also seen as important to the success of the initiative, and in particular to industry's interest and engagement in projects. One informant saw two potential approaches here: 1) an RI-centric framing, focusing on maximizing the use of the capacity of the RI through industry collaboration, and 2) a problem-centric framing, aiming to address novel questions and problems through collaborative projects. It was suggested that the latter would be more impactful, given that it would involve a higher degree of novelty in the aims and questions explored through collaborations, whereas the former relies mostly on increased use of existing knowledge and infrastructure.

Conclusion

This exploratory study finds that Open Innovation in Science (OIS) models may offer a promising pathway to deepen and diversify collaboration between European Research Infrastructures (RIs) and industry. While RI–industry collaboration is already underway in many contexts, our interviews and literature review reveal persistent barriers—such as protracted IP negotiations, bureaucratic processes, and cultural differences—that hinder the speed and quality of joint innovation efforts. The Danish OIS model, as tested in the ODIN and Plant2Food programmes, demonstrates how pre-competitive, IP-free collaboration frameworks can lower these barriers, accelerate ideation, and foster trust-based co-creation between academic and industrial partners.

Importantly, OIS aligns well with the open science values embedded in many European RIs. It offers a structured mechanism to support industry engagement without compromising openness, and it may be especially relevant in areas where methods, standards, and early-stage technologies are being developed. However, OIS is not a one-size-fits-all solution. Its applicability depends on sectoral dynamics, the maturity of the local innovation ecosystem, and the type of industrial actors involved. A staged or flexible approach to openness—such as allowing for shared IP—may also be necessary in some settings.

We recommend further exploration of the OIS model as a complementary tool for strengthening RI–industry collaboration, including:

- Piloting OIS-inspired initiatives in selected RIs under Horizon Europe or as part of the forthcoming EU strategy for RIs.
- Focusing such pilots on low-TRL, problem-oriented themes that cut across sectors and hold broad relevance.
- Ensuring sufficient and accessible funding to encourage participation from both large firms and SMEs, including no-fee RI access.
- Monitoring and evaluating pilot outcomes to identify enabling conditions and best practices for scaling.

With targeted adaptation and thoughtful framing, OIS has the potential to enhance the translational impact of European RIs while fostering a more open, inclusive, and agile innovation ecosystem. These results also suggest that OIS can potentially be seen as one of multiple tools that promote openness in the sharing and development of new technologies.

It is also important to distinguish between different aspects of openness, including e.g. open sharing of results vs unrestricted access to the further use of disseminated results. Combining an OIS model with some degree of protective IP and specific conditions for use could be a way forward, to increase parties' incentives to engage in open collaboration while maintaining open access to key outputs from a collaboration.

References

Ali-Khan, S. E., Jean, A., MacDonald, E., & Gold, E. R. (2018a). Defining success in open science [Version 2; Peer review: 2 approved]. *MNI Open Research, 2*(2). https://doi.org/10.12688/mniopenres.12780.1

Ali-Khan, S. E., Jean, A., & Gold, E. R. (2018b). Identifying the challenges in implementing open science [Version 1; Peer review: 2 approved]. *MNI Open Research, 2*(5). https://doi.org/10.12688/mniopenres.12805.1

Angelis, J. (2023). 2023 report on cooperation of ESFRI research infrastructures (Landmarks) with industry. Zenodo. https://doi.org/10.5281/zenodo.8383568

Bučar, M., Gerdina, O., & Brečko, B. (2023). Cooperation of ESFRI research infrastructures (Landmarks) with industry. Zenodo. https://doi.org/10.5281/zenodo.8205249

EFIS Centre. (2023, October 25). *Research and technology infrastructures: Moving the R&I frontier forward*. https://www.efiscentre.eu/research-and-technology-infrastructures/

ENRIITC. (2019). *Deliverable Report: D3.2 Strategy for innovation and industry-RI cooperation*. https://cordis.europa.eu/project/id/871112/results

ESFRI. (2011). *ESFRI strategy report on research infrastructures: Roadmap 2010*. Publications Office of the European Union. https://www.esfri.eu/sites/default/files/esfri-strategy_report_and_roadmap_2010.pdf

ESFRI. (2025). Funding of European infrastructures. *ESFRI*. https://www.esfri.eu/latest-esfri-news/new-esfri-report-research-infrastructure-funding-published

ESFRI. (2018). Innovation-oriented cooperation of research infrastructures. Università degli studi, Dipartimento di Fisica. https://www.esfri.eu/sites/default/files/u4/ESFRI_SCRIPTA_VOL3_INNO_double_page.pdf

European Commission. (2024). European charter for access to research infrastructures: Principles and guidelines for access and related services. *Publications Office of the European Union*. https://op.europa.eu/en/publication-detail/-/publication/ec4692ae-ac6f-11ef-acb1-01aa75ed71a1/language-en

Gold, E. R. (2021). The fall of the innovation empire and its possible rise through open science. *Research Policy, 50*(5), 104226. https://doi.org/10.1016/j.respol.2021.104226

Gold, E., Ali-Khan, S., Allen, L., Ballell, L., Barral-Netto, M., Carr, D., Chalaud, D., et al. (2019). An open toolkit for tracking open science partnership implementation and impact. *Gates Open Research, 3*(December), 1442. https://doi.org/10.12688/gatesopenres.12958.2

Kozlowski, J. (2019). *The growing importance of research infrastructures*. CORE. Retrieved March 31, 2025, from https://core.ac.uk/download/pdf/328832164.pdf

Li-Ying, J., Sofka, W., & Tuertscher, P. (2022). Managing innovation ecosystems around big science organizations. *Technovation, 116*, 102523.

Norn, M. T., Priego, L. P., Ramos-Vielba, I., et al. (2024). Archetypes of open science partnerships: Connecting aims and means in open biomedical research collaborations. *Humanities & Social Sciences Communications, 11*, 1184. https://doi.org/10.1057/s41599-024-03682-2

Norn, M. T., & Ramos-Vielba, I. (2025). Open for business: Can open science partnerships mitigate barriers to academia–industry collaboration and science-based innovation? *Industry and Innovation, 1–23*. https://doi.org/10.1080/13662716.2025.2499531

Scarrà, D. & Piccaluga, A. (2022). The impact of technology transfer and knowledge spillover from Big Science: a literature review. *Technovation*, *116*(C).

Pennings, R., Tello, P., & Nordberg, M. (2018). The ATTRACT: a strategic proposal for boosting breakthrough co-Innovation on detection and imaging technologies in Europe – preparing the scene in phase 2. ATTRACT. ATTRACT-Strategic-Programme-Summary.pdf

Appendix I

Table I.1 Overview of informants

Name	Title	Affiliation
Jonathan Wareham	Professor and member of Project Consortium Board in ATTRACT	Catedrático ESADE Business & Law School Ramon Llull University (ES)
Sune Kaur-Pedersen	Team leader	Centre for Knowledge-based Innovation, Ministry of Higher Education and Science (DK)
Pablo Garcia Tello	Section Head of the Development of EU Projects & Initiatives	CERN
Antonio Bonucci	Head of Industrial Liaison Office	European XFEL
Ondřej Hradil	Research Infrastructure Manager	Masaryk University
Angela Zennaro	Industrial Liaison & Technology Transfer Senior Officer	CERIC-ERIC, Central European Research Infrastructure Consortium
Nikolaj Zangenberg	Centre Director and Innovation Manager	Big Science Center, Danish Technological Institute
Søren Vrønning Hoffmann	Senior researcher and Head of Beamline Group	ASTRID2/ISA, Aarhus University
Sabine Brock	Industry Relations Manager and Deputy Chief Technology Officer	DESY
David Hulcoop	Head of Industry Relations and Executive Director of Open Targets	EMBL-EBI
Stephan Bouman	Head of Project Portfolio Management	Medicon Valley Alliance
Teng-Leong Chew	Director	Advanced Imaging Center (AIC), Janelia Research Campus
Vincent Ryckaert	IP Manager	Imec