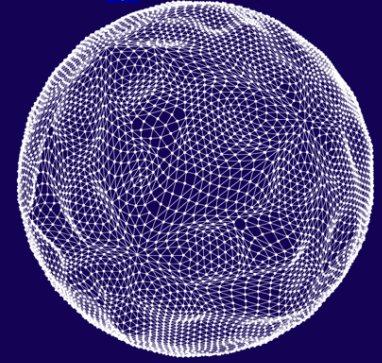




Developing breakthrough technologies for science and society

 Ref. Area 2022/005/074 - 04/10/2022



D5.1 - Report on objectives and scope of individual studies

Name of the project:

ATTRACT

Grant Agreement contract number:

GA- 101004462

Date:

04/10/2022



Executive Summary

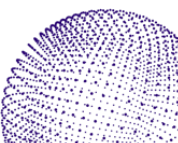
ATTRACT is a pioneering initiative bringing together Europe's fundamental research and industrial communities to lead the next generation of detection and imaging technologies. The ATTRACT Consortium, consisting of leading European scientific research infrastructures (ERIs), has formed an ERI Innovation Ecosystem (ERI-IE) to harvest novel applications of their sophisticated detection, imaging, and computational technologies.

In 2018, the European Commission (EC)'s Horizon 2020 Programme funded ATTRACT phase 1, which aimed to identify breakthrough technologies from fundamental research. Phase 1 supported 170 breakthrough technology concepts in the domain of detection and imaging technologies across Europe. Now, ATTRACT phase 2 will take forward the most promising opportunities generated in phase 1.

The ATTRACT phase 2 Socio-Economic Impact studies (i.e., the focus of this report) seek to enrich the traditional impact metrics and build upon them, generating new insights on how to better measure and realise the full socio-economic potential of ERI-IEs such as ATTRACT.

Towards this objective, eight projects received funding of 125KEUR to conduct novel studies over 28 months. The total amount of funding awarded under this call is 1M EUR. Table 1 shows the overall structure of the ATTRACT Socio-Economic Impact studies. These studies seek novel perspectives and methods to evaluate the current processes and outcomes of ATTRACT or other ERI-IEs across its ecosystem, spinoffs, and research teams, within and across fields such as innovation management, academic entrepreneurship, information systems, research policy, science, and technology studies.

The Socio-Economic arm of ATTRACT phase 2 is comprised of eight different studies that each assess ATTRACT across different perspectives. This report will cover (1) each of the project descriptions, (2) the overall structure of the Socio-Economic program, and (3) the expected outcomes for the benefit of ERI-IE stakeholders including policymakers, scientists, and entrepreneurs.





Projects Overview

The goal of the ATTRACT Socio-Economic Impact studies is to seek novel perspectives and methods to evaluate the current process and outcomes of the ATTRACT Project, as well as to inform future initiatives deriving from the ATTRACT philosophy and framework. To this end, the projects under the Socio-Economic Call are pushing the frontiers in at least one of the following:

- Developing novel concepts and theories to understand the value of ERI-IEs.
- Creating new conceptualizations of financial, political, and social costs and benefits.
- Conducting new empirical studies that offer contemporary modalities for the operationalization and appropriation of socio-economic value, including new metrics to assess efficacy and societal impact.

To ensure a holistic evaluation of ATTRACT, the funded projects represent diverse research traditions and empirical foci, such as innovation management, academic entrepreneurship, research policy, science and technology studies, sociology, political science, and economics. Methodologically, they employ traditional methods (i.e., economic multipliers and spill-overs) and are also augmented by more recent developments (i.e., social networking methods and experiments).

The projects are summarised below (Table 1).

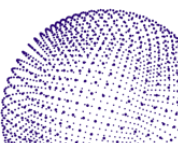
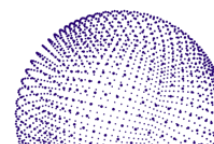




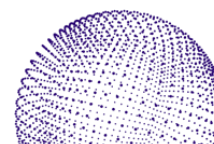
Table 1. Description of the eight ATTRACT phase 2 Socio-Economic Impact projects.

N	Title	Coordinator	Research Question	Research area	Method	Level of Analysis	Empirical Context
1	Capability development for Open and Responsible innovation Ecosystems (CORE)	Aalto University	How innovation ecosystems contribute to building micro-level social capabilities and practices for effective networked innovation collaboration .	Innovation ecosystem Micro-level capabilities Innovation networks	Qualitative Quantitative	Individual Team	ATTRACT projects
2	Behavioral training of ERI scientists for open innovation (ABC4E)	University of Bologna	Can psychological flexibility -based training improve scientists' open innovation attitude and knowledge exchange behaviors?	Open innovation Behavioral psychology	Experiment	Individual Project	ATTRACT academy projects
3	Entrepreneurial Mindset, Diversity of Research Teams and Open Innovation practices in ATTRACT IEs (ATTRACT-EMDOI)	Bern University of Applied Sciences	How do entrepreneurial mindsets, diversity in research teams, and open innovation processes contribute to the commercialisation success of breakthrough technologies?	Entrepreneurship Open innovation	Qualitative Quantitative	Individual Project	ATTRACT projects
4	Comparative Analysis of Socio-Economic Impact in ATTRACT phase 1 (CASEIA)	Facility for Antiproton and Ion Res. (FAIR)	How has the ATTRACT phase-1 paradigm/support mechanism achieved broad-spectrum socio-economic impact at the project level , in comparison to similar projects without ATTRACT support?	Entrepreneurship Technology Transfer	Qualitative	Project	SCINTIGLASS and PANDA calorimeter
5	The impact of data/computational technologies produced by ERI-IE in industry: The	ESADE	How do industrial partners realise benefits from the public datasets and computational technologies produced by European Research	Information Systems Entrepreneurship	Qualitative	Company Industry	EMBL data infrastructure





	case of life science (COMPUTE IMPACT)		Infrastructure-Innovation Ecosystems?				
6	Enable State Administration to be Active Contributors in risk absorption and risk reduction through intellectual property rights (IPR) and state aid (ExSACT)	Jozef Stefan Institute	How to simplify and optimise public investments into (i) research and technology infrastructures, and (ii) background and foreground IPR; while considering state-aid regulations.	Research policy IPR	Qualitative	Policy	ERI-IE ecosystem policy
7	Using novel experimental approaches to boost science commercialisation success: A Pilot Study (NEXT)	Nesta	How can experimental approaches be used to increase the success of science commercialisation initiatives such as ATTRACT?	Experimentation Technology transfer University-industry collaborations	Experiment	Individual Team Project	ATTRACT projects
8	Educating the next generation of tech entrepreneurs: Science-based Entrepreneurship Education as a means for university-industry technology transfer (NEXTGEN-TECH-ED)	Vrije Universiteit Amsterdam	How can Science-based Entrepreneurship Education contribute to knowledge circulation in innovation ecosystems , such that both students, researchers, and practitioners benefit in terms of learning and creating value?	Entrepreneurship Education	Qualitative Quantitative	Individual	Education programs





Individual Project Descriptions

Herewith, further elaboration of each of the projects:

1. Capability development for Open and Responsible innovation Ecosystems (CORE)

Aalto University and TU Delft (coordinator: Tia Björklund)

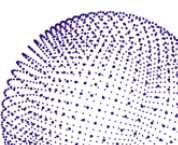
In order to promote effective investments into ERI-IEs, a clear understanding is needed of the social capabilities and networks that such ecosystems rely upon, as well as the effect of participation in joint activities on the development of these capabilities. Understanding such spill-over effects of capability development is important for both the organization of innovation ecosystem initiatives and the long-term sustainability of such networks. To this end, this project explores how innovation ecosystems contribute to building micro-level social capabilities and practices for effective innovation collaboration in an open and responsible manner.

The research project is organised around three novel inquiries into the micro-foundations of ERI-IEs. First, they examine how ecosystem actors identify and leverage social and societal connections in pursuing innovation opportunities, and how these capabilities are affected by participation in the ATTRACT student programs. Second, they examine how knowledge flows and creative interaction is structured in the social networks of ATTRACT actors in these programs, broadening understanding of how dispersed, democratic networked innovation can take shape over time. Finally, they will co-design an intervention study to enhance capability development in selected networks, extending understanding of leveraging co-design in joint capability development in leveraging European Research Infrastructures.

2. Behavioral training of ERI scientists for open innovation (ABC4E)

University of Bologna and Kore University of Enna (coordinator: Matteo Vignoli)

This experimental study wants to improve open innovation in ERI science-driven projects. To achieve this goal, they will design and test behavioural training techniques that develop scientists' psychological flexibility, a key entrepreneurial skill, and empower knowledge exchange in open innovation processes. In an open innovation context, scientists display different degrees of openness,





with different open innovation attitudes. Scientists' disposition to evaluate external knowledge and to share internal knowledge will affect the extent to which their research results are open or closed, impacting on programs' performance such as ATTRACT. To adopt knowledge from the outside and share knowledge from the inside, knowledge boundaries need to be dismantled.

In this study, experimentation at the individual level will be conducted in an attempt to modify scientists' behaviours using psychological training, while integrating two different disciplines. They will test (i) whether it is possible to train scientists by developing their entrepreneurial skills through targeting their psychological flexibility, and (ii) whether such training improves scientists' open innovation performances. To do this, they will adapt acceptance commitment therapy (ACT) to ERI contexts for open innovation in science. ACT is already used not only in clinical environments but also in high performance contexts, such as distress management, as well as in work and sport contexts.

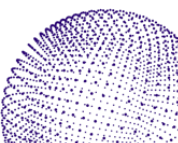
The results of the study will consist of a definition of training to be used for scientists that want to improve their open innovation competences and their capabilities to transfer results of basic research to society. The training will be a helpful tool for ERI managers as well, since they will be able to assess the scientists in their organization who need support to develop open innovation competences. Finally, policy makers will benefit from the study since they will be able to use the training tool as an additional tool or proxy to maximise the success of funded projects.

3. Entrepreneurial Mindset, Diversity of research teams and Open Innovation practices in ATTRACT innovation ecosystems (ATTRACT-EMDOI)

Bern University of Applied Sciences and TU Delft (coordinator: Christian Hopp)

This study will investigate individual- and team-level factors that increase the chances for the commercialisation of breakthrough technologies over “the valley of death”. More specifically, they will address the following key aspects: entrepreneurial mindsets, diversity of research teams, and open innovation practices.

Crucially, entrepreneurial mindsets are of particular importance since many ATTRACT phase 1 projects had university and/or research institution partners which might not have been experienced, trained, or even interested in commercialising technologies beyond scientific discovery. Moreover, enhancing diversity in research outcomes through diversity in research teams is one of the key priorities of the Horizon 2020 program. The project will analyze whether ATTRACT phase 2 groups that are more diverse regarding gender, geography, and work-background are also more innovative,





and whether they succeed more often in commercialising their technologies. Finally, the ATTRACT project calls require implementing concepts of innovation ecosystems, linking organizations of various kinds. The degree of openness represents one of the key elements of ecosystems that rely on scientific co-creation processes and may even comprise other external stakeholders, the public, or ATTRACT project groups. This study will thus analyze how effectively these innovation ecosystems are structured and whether they enable the commercialisation of breakthrough technologies.

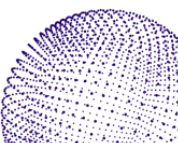
To analyze the three components of commercialising breakthrough technologies, they will follow a mixed-methods approach. First, they will review the compositions of all approved ATTRACT phase 2 R&D&I projects and conduct interviews with several liaisons to identify the archetypical compositions of project groups. They can then select one showcase project for the archetypical ecosystem and generate three case studies. Based on the outcomes from the qualitative research, they will design a questionnaire addressing the entrepreneurial mindset, diversity, and open innovation practices. In addition, they will also assess whether ATTRACT phase 2 projects managed to overcome “the valley of death”.

4. Comparative Analysis of Socio-Economic Impact in ATTRACT phase 1 (CASEIA)

Facility for Antiproton and Ion Res. (FAIR), Human Sciences Research Council South Africa, Steinbeis and Fraunhofer-Gesellschaft (coordinator: Sonia Utermann)

This research will undertake a comparative analysis to better understand how the support offered through ATTRACT phase 1 has led to impacts such as strengthened innovation ecosystems, commercial applications of innovation, skills development, and broader social goods. Two case studies were chosen as well-defined engineering projects that support critical aspects of large-scale basic physics. The first of these, namely SCINTIGLASS, is an ATTRACT phase-1 supported project that aims to develop radiation-hard and cost-effective inorganic scintillators for calorimetric detectors based on binary glass compositions doped with cerium, ultimately to be used for application in particle physics and photodetectors. In contrast, the comparator case study, which has not received ATTRACT phase-1 support, is situated within the PANDA (antiproton ANihilation at Darmstadt) Experiment at the Facility for Antiproton and Ion Research (FAIR). A critical part of this experiment is the development of an innovative calorimeter for antiproton research.

Their conceptual and theoretical framework will take as a point of departure the work of Henry Chesbrough, which explores the means by which open innovation has the potential to leverage greater economic and social benefit from science, including that from large-scale infrastructure. Building on this, the study will also draw on the growing literature addressing the economic and





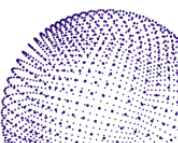
social dynamics of large-scale science infrastructure. Their analytical framework will draw on the expressed aims and objectives of the ATTRACT programme. Methodologically, the study will draw on secondary data related to the projects, as well as in-depth semi-structured interviews with all the major project stakeholders. Using an innovation ecosystems approach, they will model the actors and relationships underpinning each case study, and assess the enablers and constraints that come to bear on the achievement of innovation and socio-economic impact goals. Using a novel social learning approach, they will trace not only who has knowledge at a given time, but what form this knowledge takes and how it can be exploited.

The final analysis will assess the differences between ATTRACT's open innovation approach, and the 'business as usual' approach of the comparator case. Specific questions asked are: (i) Through what new pathways did ATTRACT support lead to the streamlining of innovation? (ii) What were the effects of using a co-innovation approach? (iii) Were new processes, products or services created, and what were their effects on jobs and growth? Through this in-depth comparative analysis, new insights will be gained into the efficacy of the ATTRACT paradigm and support mechanisms at the project level, which in turn will provide valuable new knowledge with respect to science policy related to scientific research infrastructure innovation ecosystems.

5. The impact of data/ computational technologies produced by ERI-IE in industry: The case of life science (COMPUTE IMPACT)

ESADE, IESE Business School, European Molecular Biology Laboratory and Warwick Business School (coordinator: Jonathan Wareham)

The ERI-IE has a rich tradition of producing novel computational tools and generating large datasets that generate tremendous value to industry and society. Despite the transformational effects of these technologies, their impacts have not been appropriately conceptualised and measured in traditional socioeconomic studies. Where economic assessments have been conducted, the emphasis has been on approximating the value to academic and scientific communities, with less granular approximations of industrial relevance. An exemplary case of this is seen in the life sciences field, where a lack of understanding of the specific value provided by computational infrastructures to the industry's innovation processes is evident. Given the growing societal importance of bioinformatics and emergent multi-omics profiles in both traditional pharma and biotech, as well as emergent forms of therapeutic development and clinical medicine, this proposal aims to develop a focused study on how industrial partners benefit from bioinformatics research infrastructures. This proposal focuses on two flagship initiatives under the European Molecular Biology Laboratory-European Bioinformatics Institute (EMBL-EBI), namely AlphaFold and Open Targets. Through these two case





studies, this proposal seeks to contribute to a better understanding of how Research Infrastructures (RIs; i.e., such as those under ATTRACT) generate impacts on their industrial counterparts, beyond those currently measured in traditional economic metrics. Insights from this study would benefit ATTRACT's stakeholders, funders, and scientific policymakers.

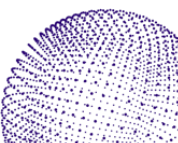
6. Enable State Administration to be Active Contributors in risk absorption and risk reduction through IPR and state aid (ExSACT)

Jozef Stefan Institute and Faculty of Information Studies in Novo Mesto (coordinator: Spela Stres)

This project will explore the effect of the state administration on financing research, RI/TI infrastructures and IPR transfer procedures through state-aid rules abiding (RI/TI and IPR) management. State administration tries to encourage industry-academia (co)operation with financial incentives. Still, it encounters rules and legislation to protect competition in the free market, imposed within state-aid rules. The regulations, however, do allow the granting of aid within substantive exceptions (e.g., particular importance for development), or special conditions (e.g., advance notification of state aid to the EC and its consent), or in a simplified form up to a certain amount (e.g., de-minimis rule).

Due to limited recognition of state-aid rules, the allocation of funding and IPR lacks management given the state-aid restrictions. Ambiguities result in state investments into industry-academia collaboration or research/technology infrastructure (RI/TI infrastructure), with usage being limited and complicated. The provision of state aid and understanding or lack of knowledge thereof may thus support or slow down, respectively, such investments and the smooth transition of technology through technology readiness levels with the involvement of ERI-IE.

Improving the understanding of state-aid rules in financing research, RI/TI's use and IPR transfer procedures within ERIs collaborative projects with industry would improve incentives efficiency for research to the economy transition. A seamlessly integrated ERI, supporting research and economy from knowledge creation through defining IP to commercialisation with proper funding, in view of state-aid limitations, would enhance investments, lower risk and enable involved actors (research, economy) to bring more science to everyday use. A better understanding of RI/TI use and IPR contractual issues concerning state-aid rules will be easier to implement by the state administrations of the ERI-IEs. In addition, it will clarify the concept and rules of state aid to the beneficiaries of funded projects.





7. Using novel experimental approaches to boost science commercialisation success: A Pilot Study (NEXT)

Nesta, Barcelona Graduate School of Economics, ESADE and IESE Business School (coordinator: Albert Bravo-Biosca)

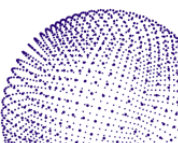
To ensure that public investments in funding initiatives like ATTRACT are put to best use, this study proposes to use experimental methods to evaluate commercialisation initiatives and test methodologies to improve their impact. Experimental approaches have been underutilised in the domain of innovation policy; as such, this project aims to contribute to filling this gap by showcasing how experimental approaches can be used to increase the success of science commercialisation initiatives. To do so, they will collaborate with ATTRACT partners to identify testable interventions with the potential to accelerate science commercialisation, focusing on the following three areas: (a) engaging researchers and businesses in tech transfer activities, (b) ideation to identify potential uses for new technologies, and (c) product development/customer validation activities to commercialise the solutions.

The findings of our study will have important implications for innovators, policymakers, and technology transfer actors. Specifically, they will provide actionable insights on how ATTRACT partners, other research infrastructures, and policymakers can improve the impact of their commercialisation activities, contributing to maximizing the societal returns from public investments in scientific research. In addition, this study will also increase awareness and understanding of how experimental approaches can be used to accelerate the commercialisation of science. Becoming more experimental in the design and implementation of tech transfer interventions could unlock new applications and help accelerate the commercialisation of scientific research. By demonstrating the feasibility and value of experimentation in this field, this project will contribute to increased experimentation in technology transfer activities, resulting in better evidence, more effective interventions, and faster science commercialisation.

8. Educating the next generation of tech entrepreneurs: Science-based Entrepreneurship Education as a means for university-industry technology transfer (NEXTGEN-TECH-ED)

Vrije Universiteit Amsterdam and University of Twente (coordinator: Marlous Blankesteyn)

This project aims to understand how Science-based Entrepreneurship Education (SBEE), as a crucial component of ERIs, can contribute to establishing dynamics of knowledge circulation in innovation





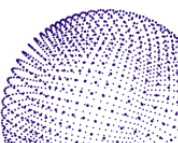
ecosystems. The project would like to ensure that students, researchers, and practitioners benefit in terms of learning and creating value as they engage in these ecosystems. Furthermore, the project aims to answer two related sub-questions: (1) Which didactical design principles can be deduced from current initiatives in science-based entrepreneurship education in ERIs? (2) How can the output of these programs, in terms of technology transfer from university to the innovation ecosystem, be optimised?

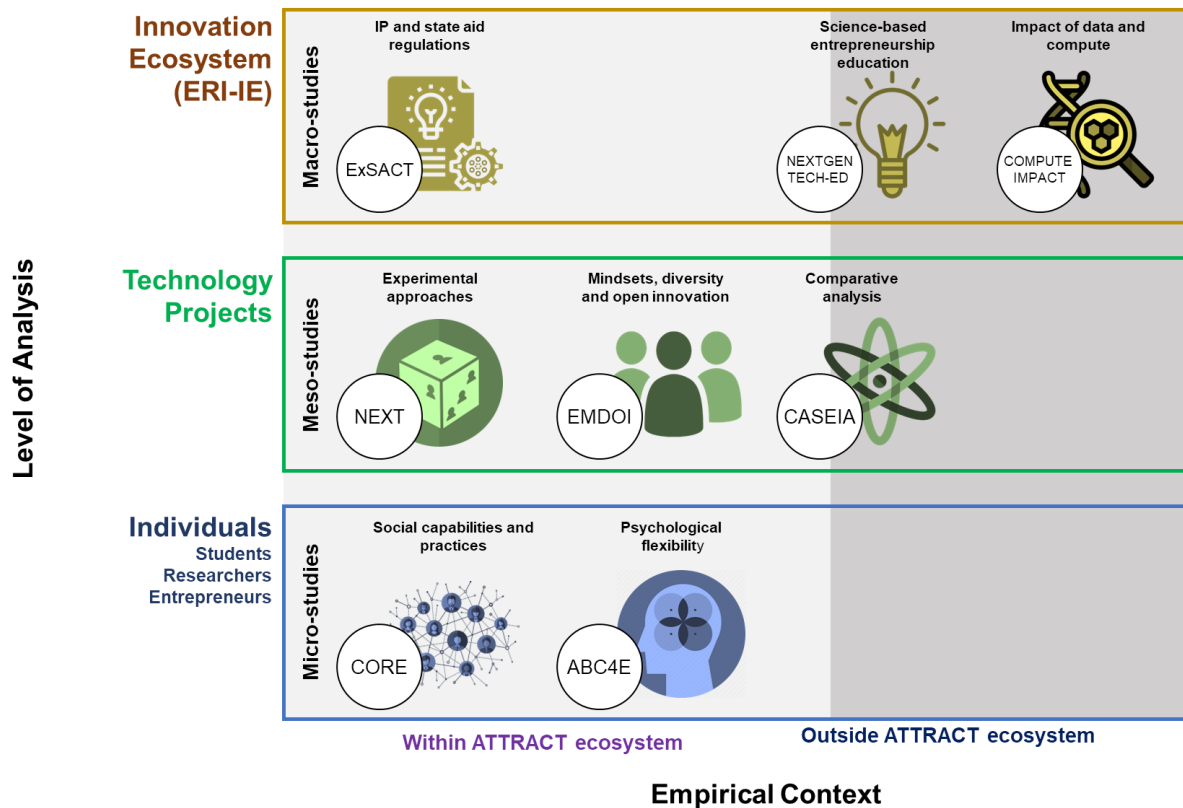
The overall objective of the study is to develop a method that is theoretically novel and directly relevant to educators and policymakers, and aims to evaluate the socio-economic impact of pure science, as well as their economic spill-overs, via education. The study also aims to research how ERIs can position themselves as entrepreneurial actors and learning hubs in an innovation ecosystem that comprises start-ups, established companies, incubators, and other innovation hubs, and governmental organizations; in doing so, this will optimise their potential to contribute to solving societal problems. This project delves into the didactics of teaching and preparing students to play a role in this context through facilitating processes of knowledge circulation via projects, internships, and so on. This project also researches the effects of such programs on establishing processes of knowledge circulation.

Overall Structure

To assess how the different Socio-Economic Impact studies create a coherent portfolio in the evaluation of ATTRACT, the projects can be mapped according to their empirical context and analytical level (Figure 1). As shown in Figure 1, the project portfolio clearly occupies a diverse analytical level and empirical context.

Figure 1. ATTRACT Socio-Economic thematic fields



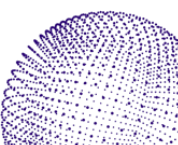


More specifically, three analytical levels are observed; these are projects working at (i) the innovation-ecosystem level (macro-studies), (ii) those that focus on the technology itself (meso-studies), and (iii) those at the individual level (micro-studies).

Three projects explore the impact of ATTRACT from the ecosystem point of view. First, ExSACT assesses the role of state-aid regulation in innovation. Second, NEXTGEN-TECH-ED assesses the role of entrepreneurship education in training future innovators. Third, COMPUTE IMPACT assesses the impact of data and computational technologies produced by the science infrastructures across Europe via an assessment of two case studies under EMBL.

Three projects focus on the technology projects themselves in an attempt to understand the challenges and opportunities brought by science commercialisation. First, NEXT aims to pilot randomised controlled trials to understand low-cost interventions toward commercialisation success. Second, EMDOI aims to assess the composition and practices of the technology teams to identify factors for success. Third, CASEIA aims to compare project outcomes based on the support received.

Finally, at the individual level, two studies will explore how scientists and students can be more innovative. First, CORE aims to assess individual capabilities and practices towards effective





collaborations for innovation. Second, ABC4E aims to stimulate researchers to improve engagement in open innovation and knowledge exchange.

Diversity is also observed in terms of the projects' level of engagement with ATTRACT, with certain projects being highly focused on ATTRACT, while others take a wider view of the ERI-IE. Finally, two projects work at the juncture of these two empirical contexts (Figure 1); more specifically, CASEIA will compare a project within and outside of ATTRACT to identify the important mechanisms that should be integrated into ATTRACT to help its participants. Secondly, NEXTGEN-TECH-ED will survey the education space to identify how science infrastructures and universities within and beyond ATTRACT can be more effective in enabling their researchers to be entrepreneurial.

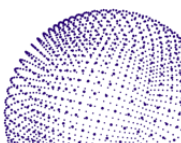
Overall, the Socio-Economic Impact Projects are enhancing knowledge related to ATTRACT and the larger ERI-IE context with respect to how they can be more successful in knowledge transfer, technology valorization, and commercialisation. Despite the diverse portfolio, we recognise that it is still not possible to cover all the possible perspectives. For instance, a traditional cost-benefit economic evaluation of ATTRACT is missing. Realizing the importance of filling such gaps, the ATTRACT socioeconomic coordination team is putting various measures in place for the different projects to interact and collaborate, allowing for new potential research that would alleviate some of these limitations.

Coordination to ensure coherence and impact

Measures are in place to ensure coherence across the different socioeconomic studies and to deliver important knowledge for the benefit of the ERI-IE. Coordination is headed by the ATTRACT Socio-Economic Facilitator who oversees the activities and is the touch point for all the Socio-Economic Coordinators. The project partners, including the PCB, will periodically monitor the progress of the studies. Such monitoring may include face-to-face meetings and site visits.

Activities to stimulate coordination include the following:

- An initial kick-off workshop.
- Periodic zoom calls to exchange knowledge and update different partners.
- An interim workshop.
- A final workshop following the end of the Studies to present the Studies' conclusions.





Expected Impacts

The ATTRACT socioeconomic studies are expected to impact different stakeholders within ATTRACT and the broader ERI-IE by generating new knowledge and providing recommendations on topics related to the valorization of scientific discovery.

Herewith a summary of each stakeholder and their expected benefits:

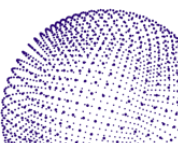
The primary beneficiary of the socioeconomic studies is **ATTRACT** itself. The different studies would measure the current effectiveness of ATTRACT's programme design across its different stages including grant call, selection, funding, incubation, evaluation, and communication. These insights would then be important for crafting recommendations to improve future iterations of the project.

Insights from ATTRACT would also inform **similar proof-of-concept initiatives** related to the commercialisation and valorization of early-stage technologies across Europe and globally. A systematic study of ATTRACT's support mechanisms would be useful to inform other similar projects on which interventions are the most effective in development success. Various experimentation strategies have been incorporated in certain studies to identify the critical factors in program design.

Through the study of the ATTRACT ecosystem, the socioeconomic studies will inform **policymakers** on how they can better harness the scientific infrastructures as engaged contributors in the innovation economy. With the greater recognition by policymakers that these research centres generate tremendous value beyond publishing basic research, various studies under the socioeconomic call will help conceptualise and trace these impacts. Moreover, studies will explore how policy instruments can be more effective in enabling such an innovation ecosystem.

Beyond technology commercialisation, the ATTRACT socioeconomic studies would benefit **research infrastructures** mainly in Europe but also beyond. Our studies would provide a more holistic conceptualization of their impacts on society. Beyond quantitative measures such as citations or patents, the different studies within ATTRACT complement these established measures through different qualitative case studies.

Within these research infrastructures are **technology transfer offices and professionals** that have long-established traditions and practices in supporting the transfer of knowledge to industry. Studies within ATTRACT are also going to inform them on the best ways to stimulate their researchers to be





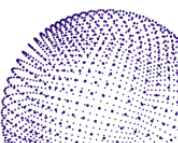
more active in engaging with their industry counterparts. Moreover, the studies will also show the emerging challenges in technology valorization that they must be prepared to address.

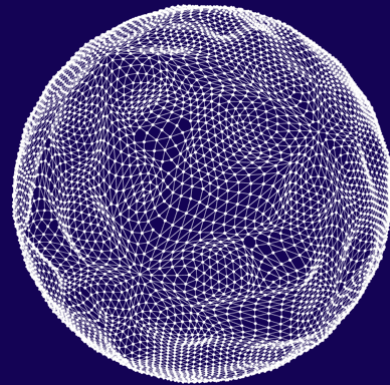
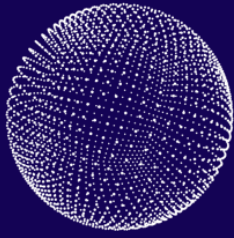
For the **researchers** in these infrastructures and associated academic centres, the ATTRACT socioeconomic studies would explore how their discoveries can have wider impacts, beyond scientific research. Many socioeconomic projects within ATTRACT are studying how to overcome the psychological and sociological barriers that impede these researchers from engaging with outside stakeholders.

Apart from research, another thrust of scientific infrastructure is in the education and training of **students** who will be important in generating future innovations. Recognizing this, ATTRACT has setup the ATTRACT academy to foster interactions between the projects and students in the hope of creating a more entrepreneurial labor force. To evaluate the impact of these engagements, the socioeconomic arm has projects that will look closer at how to be more effective in training students through these experiential learning opportunities.

In addition to the impacts of the ATTRACT socioeconomic projects in academia and policy, there will also be impacts on business and industry. First, ATTRACT will study in-depth technology commercialisation to help potential **entrepreneurs** overcome the various challenges in developing products based on early-stage, uncertain technologies. On the other side, existing **technology ventures and corporations** can also benefit from the studies by exploring how they can engage with novel technologies coming from these infrastructures and adopt them in their product development pipelines.

Finally, the socioeconomic studies hope to impact wider **society**. Although the general public has appreciated the value of science in certain instances (e.g., the COVID vaccine), there is still less understanding of the role of scientific infrastructures in solving grand societal challenges. The ATTRACT socioeconomic studies are aiming to paint a more holistic picture of the value provided by the ERI-IE.





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