Collaboration for Success: International benchmark of innovation partnership models

17.6.2022

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Tiivistelmä

Innovaatiokumppanuusmallit, joissa yhdistyvät yksityisen ja julkisen sektorin toimet, ovat tärkeä keino luoda houkuttelevia ympäristöjä ja kannustimia pitkän aikavälin yhteistyölle tutkimusyhteisön, liike-elämän ja muiden tutkimus-, kehittämis- ja innovaatiotoimijoiden (TKI) välillä. Suomeen laadittiin kansallinen TKI-tiekartta vuosina 2020–2021. Yksi tiekartan strategisista tavoitteista on kehittää uusi julkisen ja yksityisen sektorin innovaatiokumppanuusmalli, jolla nopeutetaan TKI-yhteistyötä korkeakoulujen, tutkimuslaitosten ja yritysten välillä Suomessa. Suomi pyrkii kansallisena tavoitteena lisäämään TKI-investointeja neljään prosenttiin suhteessa BKT:hen.

Tämän selvityksen tarkoituksena oli tukea TKI-tiekartan tavoitteiden mukaisen innovaatiokumppanuusmallin kehittämistä. Selvitys on tehty kolmelle suomalaiselle teollisuusjärjestölle: Metsäteollisuus ry, Kemianteollisuus ja Teknologiateollisuus ry. Tutkimuksen toteuttivat Gaia Consulting Oy ja VTT keväällä 2022.

Kumppanuusmallien analysoinnin lähtökohtana käytettiin Meissnerin (2019) luomaa viitekehystä, jossa kuvataan eri TKI-kumppanuusmallien keskeiset toimintaperiaatteet. Viitekehystä kehitettiin edelleen selvityksessä toteutetun systemaattisen kirjallisuuskatsauksen pohjalta tavoitteena ottaa huomioon erilaisten kumppanuusmallien kriittiset menestystekijät. Mallin avulla tunnistetaan myös ne mekanismit, joilla erilaiset kumppanuusmallit luovat arvoa ja vaikuttavuutta.

Viitekehyksen ulottuvuuksiin peilaten kumppanuusmallit analysoitiin seuraavista näkökulmista: toimintamalli ja rahoitus, jaettu visio, yhteistyö ja partnerit sekä lisäarvo ja vaikuttavuus. Kumppanuusmalleja tarkasteltiin verrokkimaissa Alankomaat, Itävalta, Ruotsi ja Tanska.

Tulosten analyysissä laadittiin neljä väitettä menestyksekkäistä kumppanuuksista.

1. Toimiva kumppanuus edellyttää, että yritysten ja laajemmin toimialojen uudistumisen tarpeet sovitetaan yhteen kunnianhimoisen tutkimusperustan kanssa ja nämä tarpeet luovat kumppanuuden jaetun vision. Kumppanuuteen sitoutuneiden toimijoiden (yritykset, tutkimuslaitokset, rahoittajat) on oltava valmiita ottamaan rahoitusinvestointeihin liittyvät riskit.
2. Erilaisilla rahoitusvälineillä olisi luotava selkeä jatkumo, mikä luo pitkän aikavälin rahoitusmahdollisuuksia dynaamisen ei-lineaarisen innovaatioprosessin eri vaiheissa. Rahoitusta olisi myönnettävä sekä TKI-toimiin että yhteistyön tekemiseen.
3. Kestävä kumppanuus edellyttää koordinointia yhteisen vision toteuttamiseksi. Koordinaattorin tehtävänä kumppanuudessa voi olla sekä yhteisten etenemissuunnitelmien laatiminen kumppaneille, että palvelujen, infrastruktuurin ja asiantuntemuksen tarjoaminen.
4. Kumppanuuden vaikuttavuuden lisäämiseksi kaikkien kumppanuuden toimijoiden on hyödyttävä kumppanuudesta ja tuotettava sille lisäarvoa. On tärkeää tehdä näkyväksi erilaiset arvo-odotukset. Käytännössä se edellyttää konkreettisia ja kattavia mittareita, jotka ohjaavat kumppanuutta strategisella tasolla.

Innovaatiosysteemi on yhä monimutkaisempi heijastellen haasteita, joihin sen avulla etsitään ratkaisuja. Siten innovaatiokumppanuusmallin onnistumiseen tarvitaan dynaaminen ja modulaarinen malli, joka koostuu erilaisista osasista ja kumppanuuksista, joilla kullakin on omat arvonsa ja säännöt kumppanuuden toiminnasta. Modulaarisuus antaa myös mahdollisuuden mukauttaa kutakin yksittäistä kumppanuutta toimijoidensa erityistarpeiden mukaisesti ja siten lisää mahdollisuuksia luoda kasvua ja uutta liiketoimintaa.

Tärkeintä on, että kaikki kumppanuusmallit tai niiden osiot toimivat yhdessä luodakseen johdonmukaisen innovaatiojärjestelmän, jossa toimijat voivat siirtyä jäsennellysti vaiheesta toiseen, ei lineaarisesti vaan dynaamisesti kehitystarpeiden mukaisesti. Monet osaset ovat myös jo olemassa, esimerkiksi Business Finland Veturi-rahoitus ja Suomen Akatemian Lippulaiva-rahoitus ovat hyvin toimivia Suomen innovaatiosysteemissä olemassa olevia osia.

Selvityksen suositukset ovat yleisohjeita siitä, mitkä ovat kansainvälisten vertailun päätelmien mukaan tärkeimmät näkökohdat, jotka vahvistaisivat Suomen innovaatiosysteemiä ja lisäisivät sen toimijoiden kilpailuetua. Seuraava askel tulisi olla luoda yhdessä eri innovaatiosysteemin toimijoiden kanssa yksityiskohtaisempi strategia ja etenemissuunnitelma, jonka avulla voidaan hahmotella erityistoimia ja sitä, kenen olisi otettava vastuu toimista.

Johtopäätökset ja suositukset

1. Innovaatiosysteemin näkyvyys ja saavutettavuus kansallisella tasolla sekä selkeät yhteydet kansainvälisellä tasolla

- Määritetään selkeä omistaja kansalliselle innovaatiosysteemille siten, että rahoituksen kokonaiskuvaa voidaan suunnitella ja järjestelmää kehittää ja että järjestelmän näkyvyys on selkeä kaikille innovaatiokumppanuuksien eri toimijoille.
- Poistetaan esteet eri rahoitusvälineiden ja ekosysteemien väliltä ja siten varmistetaan, että tieto siirtyy eri toimijoiden välillä, ja että toimijat ja hankkeet pääsevät siirtymään kehitysvaiheessa eteenpäin, kun haluttu kypsyys on saavutettu edellisessä vaiheessa.
- Keskitetään kehittämistoimet heikoimpiin kohtiin, kuten rahoitusinstrumenttien väliin jäävien innovaatiotoiminnan epäjatkuvuuskohtien ylittämiseen sekä sen varmistamiseen, että rahoituksen kokonaismäärä kasvaa riittävästi mahdollistaen yritysten uusien innovaatioiden kehittämisen ja kaupallistamisen tavoitteet.
- Luodaan ja muodostetaan koordinoidusti selkeä näkyvyys ja yhteydet erilaisiin kansainvälisiin rahoituslähteisiin, erityisesti EU:n rahoitukseen, mutta myös muihin rahoituslähteisiin. Ollaan aktiivisesti ja ennakoivasti vaikuttamassa eurooppalaisen tutkimusagendan muodostumiseen.

2. Kehitetään sellaisia innovaatiokumppanuuden malleja, jotka perustuvat yhteiseen näkemykseen, ammattimaiseen koordinointiin ja menestyksen mittaamiseen

- Tuetaan sellaisia erilaisiin tarpeisiin sopivien innovaatiokumppanuuden mallien luomista, joissa lähtökohtana on kumppanuuden liimana toimivan yhteisen vision kehittäminen ja yhteisten toimenpiteiden suuntaviivojen laatiminen.

- Vahvistetaan kumppanuuksia ammattimaisen koordinaation avulla 1) tavoittelemaan sellaista yhteistä visiota, joka on riittävän kunnianhimoinen uusien innovaatioiden luomiseksi uusilla kasvualoilla ja 2) mittaamaan niiden synnyttämää arvoa ja johtamaan systemaattisesti onnistumista ja vaikuttavuutta
- Tuetaan vaikuttavuuden seurannan menetelmien kehittämistä, kuten indikaattoreita tai muita tapoja, joilla voidaan seurata a) miten kumppanuus tuottaa arvoa sen eri osapuolille, b) miten kumppanuus onnistuu saavuttamaan yhteisesti määrittelemänsä vision ja c) kumppanuuden taloudellisia ja yhteiskunnallisia vaikutuksia kansallisella tasolla. Kehitetään kumppanuusmallien joustavuutta, jotta muutosten tekeminen ja kestävä kasvu ja uudistuminen on mahdollista indikaattorien ohjaamana.

3. Sitoutumisen edistäminen ja avoin suhtautuminen kumppanuuksien erilaisiin arvo-odotuksiin

- Kehitetään kumppanuusmalleja siltä pohjalta, että tunnustetaan, että arvon luonti kumppanuudessa edellyttää luottamuksen rakentamista kaikkien osapuolten välille sekä kaikkien osapuolten riittävää osallistumista kumppanuuteen.
- Tehdään kumppanuutta koskevien eri organisaatioiden odotukset ja hyväksyttävyys näkyväksi ja avoimeksi.
- Yhdistetään ja tarvittaessa virtaviivaistetaan erillisten rahoitusinstrumenttien ja organisaatioiden kannustus- ja palkitsemisjärjestelmien mittareita kumppanuuden tavoitteiden ja menestysindikaattorien kanssa. Huomioidaan arvioinnissa innovaatiotoiminnan vaikuttavuuden erilaiset aikajänteet.

Summary

Partnership models that combine the efforts of private and public sector are important means of creating attractive environments and incentives for long-term cooperation between academia, business, and other research, development and innovation (RDI) actors. One of the strategic priorities of the Finnish National Roadmap for Research, Development, and Innovation, launched in 2020, is the development of a new public-private partnership (PPP) model to accelerate RDI cooperation between higher education institutions, research institutes and business. Finland aims as a national target to increase the investments of RDI-activities to 4% of GDP.

This study aimed to support the development of this partnership model. The study was commissioned by three Finnish export federations: The Forrest Industry, The Chemical Industry and the Technology Industry. The study was conducted by Gaia Consulting Oy and VTT Technical Research Centre of Finland in the spring 2022.

The Meissner's (2019) framework for RDI partnership models was taken as a starting point and a reference for the analysis in this study. The framework describes the key operating principles of various RDI partnership models. The Meissner's framework was further developed during this study to reflect the dynamics and success factors of the identified partnership models and ecosystems. In addition, the impact and value of the different models was analysed through a multi-criteria approach.

As a results, partnership models were benchmarked from the perspectives of their operational model and funding, shared vision, collaboration model and complementary partners, and value co-creation and impact. Partnership models were benchmarked in the study countries Austria, Denmark, the Netherlands, and Sweden.

Four claims for successful partnerships were developed:

1. A successful partnership requires bridging together companies' industrial needs and a sufficiently ambitious research agenda to a shared vision. Actors committed to partnerships (companies, research institutes, funders) must be prepared to take the risks involved in the financial investment.
2. Different funding instruments should create a clear pipeline that creates long-term funding opportunities in different phases of a dynamic non-linear innovation process. Funding should be provided to both RDI activities and collaboration.
3. Sustainable partnerships need coordination in order to fulfil their vision. The role of the coordinator in the partnership can be both to create common roadmaps for partners and projects and to provide services, infrastructure, and expertise.
4. To accelerate partnership impacts, all actors in the partnership need to benefit from and add value to the partnership. It is important to make visible the different value expectations. In practice, concrete and comprehensive impact indicators integrated in the strategic management of partnerships are a necessity.

In order to succeed, a dynamic and modular model is needed consisting of different elements or partnerships that each have their own value expectations and rules on how the partnership

works. Many of the elements are already there, for example, the Business Finland “Veturi” funding and the Academy of Finland Flagship funding are well-functioning existing pieces of the Finnish innovation system. The modularity also gives the possibility to adjust each individual partnership according to the specific needs of its actors and as such increase the potential to succeed in creating growth and new business.

Most important is, that all the partnerships or elements work together to create a consistent innovation funnel where actors can move in a structured way from one phase to the other, not in linear way but according to the development needs dynamically. At the same time, the innovation system is increasingly complex.

The recommendations give an overall guidance on what, according to conclusions from the international benchmarks, are the most important aspects that would make the Finnish innovation system stronger and increase the competitive advantage of its actors. The next step would be to co-create together with the different innovation system actors a more detailed strategy and roadmap to concretize on specific actions and on who should take responsibility of the actions.

1. **Making the innovation system visible and accessible on the national level and clear connections to the international level**

- Defining a clear owner for designing the national innovation funnel funding, so that the system can be developed and made visible in an approachable way to all the different actors in innovation partnerships.
- Remove the barriers between the different funding instruments and ecosystems, ensuring knowledge transfer between different actors, and the movement of actors and projects to the next base to continue the work after it reaches maturity in the previous stage.
- Focus development measures on the weakest points of the funnel, such as existing funding gaps that may have occurred in the system due to structural changes of funding organisations and instruments during the past few years, as well as to ensure adequate funding volumes overall to reach the growth and new business creation goals.
- Well-coordinated help to give clear visibility and to connect with various international funding sources, in particular EU-funding but also other sources.

2. **Developing innovation partnership models built on a shared vision, professional coordination and measuring success**

- Supporting the creation of innovation partnership models that suit different needs, where the development of a joint vision that acts as a glue for the partnership and sets guidelines for the activities and projects is in focus.
- Emphasising and guiding partnerships towards an understanding of the added value of professional (external or internal) coordination for 1) creating a shared vision that is ambitious enough to create new innovation in new growth areas and 2) measuring the success of it.
- Support the development of impact measures, such as indicators or other ways of following up a) the value of the partnership for the partners, b) the success of the partnership

in achieving its shared vision, and c) the economical and societal impacts of the partnership at national level.

3. **Fostering commitment and an openminded attitude towards different value expectations within the partnerships**

- Developing partnership models that build on the recognition that getting value requires creation of mutual trust and contribution from each party.
- Making transparently visible and acceptable the different organisations' value expectations towards the partnership.
- Interlinking and partially streamlining the partnership targets and success indicators to the individual organisations' incentives and rewarding systems.

The study also presents some more detailed development suggestions for enhancing the visibility and accessibility of the Finnish innovation system to all parties, developing innovation partnership models built on a shared vision, professional coordination and measuring success, and fostering commitment and an openminded attitude towards different value expectations within the partnerships.

1 Introduction

1.1 Project background and aims

Partnership models that combine the efforts of private and public sector are important means of creating attractive environments and incentives for long-term cooperation between academia, business and other RDI actors. The Finnish National Roadmap for Research, Development, and Innovation was launched by the Government in 2020. The Ministry of Education and Culture and the Ministry of Economic Affairs and Employment prepared the roadmap in consultation with Finnish RDI stakeholders and other ministries. The roadmap aims to improve the global attractiveness of the Finnish RDI environment and encourage companies to invest more in RDI. One of the strategic priorities of the roadmap is the development of a new public-private partnership (PPP) model to accelerate RDI cooperation between higher education institutions, research institutes and businesses in Finland.

This study supports the development of new innovation partnership models in Finland by:

- providing an analysis based on international comparisons of well-functioning and competitive partnership models,
- assessing the operating models, solutions and best practices applied in PPPs implemented in the reference countries,
- identifying general success factors and weaknesses of partnerships, and
- formulating policy and operational recommendations for creation of a Finnish partnership model that can improve the international competitiveness of the innovation system

The study was commissioned by three Finnish export federations: The Forest Industry, The Chemical Industry and the Technology Industry. The study was conducted by Gaia Consulting Oy and VTT Technical Research Centre of Finland in the spring 2022.

1.2 Methodology

In this study, the public-private innovation partnerships are defined by a combination of private-sector research and development with public interest of social impact. The partnerships consider all phases of research, development, and innovation (RDI). The expectation is that the engagement of multiple private companies is a key condition for public financial participation. Industry is expected to contribute by proposing specific research areas, identifying technological opportunities, and by bringing products resulting from the innovation development work to the markets. Public actors are expected to play a decisive role in the development of new programmes or focus areas, e.g., to meet emerging societal needs as well as to address risks and uncertainty.

The study is based on a comparison of innovation partnership models found in the following selected reference countries: Austria, Denmark, the Netherlands and Sweden. Partnership examples that support and accelerate broad-based cooperation between different size companies, universities, research institutions and other parties in the development and commercialisation of innovations were prioritised in the selection process.

A special focus was given to ecosystem-based models as they are more likely to ensure a genuine and long-term partnership. The study also covers other types of partnerships, such as bilateral partnerships. Some of the selected examples are presented as in-depth case studies as a part of this report.

The analysis of the partnership models follows a descriptive and qualitative approach to create a comprehensive understanding of the mechanisms and functions of the partnership models at a practical level. The analyses are supplemented by illustrative examples of the practices.

The Meissner's (2019)[1] framework for RDI partnership models was a starting point and a reference for the analysis in this study. The framework describes the key operating principles of various RDI partnership models, including the target model, time span, goals, and generated impact and value.

The dimensions of the Meissner's framework lay the foundation for the analysis of partnership models. The Meissner's framework was further developed during this study to reflect the dynamics and success factors of the identified partnership models and ecosystems. In addition, the impact and value of the different models was analysed through a multi-criteria approach.

The key research questions of the study included:

- What are or could be Finland's competitive advantages in international comparisons?
- Where are we weaker than the reference countries and why?
- What lessons could Finland learn from the benchmark countries?
- What would be the justification for introducing new models in Finland?
- What basic conditions must first be guaranteed in the wider innovation ecosystem?
- How can the partnerships create global networks and utilise national expertise?

The work included a general **literature review** of innovation partnership models with a special focus on the selected benchmark countries. The review included relevant scientific literature, and more practical policy reports. Based on the review, the Meissner's analytical framework was revised. The work resulted in a comparison based on a systematic reference framework from partnership models in the reference countries.

[1] Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Co-operation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3

The literature review was followed by an international **benchmark study of selected partnership models** in the reference countries through desk study and interviews. A total of 19 interviews were conducted. The interviewees represented innovation partnerships and partnership members from Austria, the Netherlands, Sweden, Denmark and Finland. The benchmark aimed at deepening the understanding of the functions of the chosen partnership models. The interviews were conducted with partnership coordinators and the companies who had participated in the partnership activities[2]. The benchmarking provides an in-depth perspective of how the partnerships operate in practice and how different actors perceive the partnership.

Finally, synthesising analysis, conclusions and recommendations were drafted with the aim to formulate policy and operational recommendations to support the implementation of the Finnish innovation partnership model and to improve the international competitiveness of the innovation system.

The work included a stakeholder analysis forum and a final seminar to increase stakeholder participation and outreach[3], supported by internal analysis meetings of the project team.

[2] See Annex 1 for the interview questions.
[3] See Annex 2 for the agendas.

2 Literature review

The objective of the literature review was to carry out an extensive overview of innovation partnership models and to provide a science-based understanding of public-private partnership models including their critical success factors and weaknesses. The review of academic literature was complemented with an overview of recent policy documents on Finnish and European levels. The aim of the practice-based review was to enrich the science-driven data with concrete examples of functioning practices in public-private partnerships.

The ultimate aim of the literature review was to build an analytical framework to generate an understanding of the critical success factors of innovation partnership models. The starting point for the framework building was the taxonomy, developed by Meissner[4], which is targeted to assess the concepts, success factors and weaknesses of RDI partnership models. The taxonomy was complemented and further developed based on the know-how provided by the literature review.

In this section, a short overview of the theoretical foundations of innovation partnerships will be presented. Then the analytical framework, which will guide the analysis of innovation partnerships throughout the report, is presented. Finally, success factors of innovation partnerships are described by describing the findings founded both in academic literature and practical policy reports.

2.1 Academic discussion on success factors of innovation partnerships is scattered

The aim of the review was to consider the critical success factors of public-private innovation partnerships. The assessment is based on a systematic literature review with the following keywords:

"Public-private partnership, ecosystem, innovation ecosystem, innovation cluster, regional cluster, public-private partnership in services, living-labs, test beds, innovation collaboration, industry-academy collaboration, collaborative innovation, co-innovation, triple and quadruple helix".

The literature review was based on a robust empirical bibliometric analysis followed by a qualitative analysis of the most cited key documents. Using well-established bibliometric methods, bibliographic coupling (BC) and co-citation (CoC) analysis, the aim was to identify thematic differences within innovation partnership literature and make visible the theoretical groundings of departure from the extant literature. Applying both analysis in parallel enables

[4] Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Cooperation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3

us structuring the theoretical background of partnerships and identifying current challenges and gaps in of research field.[5]

The systematic literature review resulted in 3243 articles (2224 journal articles, 4 book chapters, 1211 conference proceedings) published during the years 1989–2022. From the collected data, the articles describing the theoretical basis and the current forefront of science were searched by reference analysis. The reference analysis allows grouping into different topics and evaluating the numerical effectiveness of individual articles and their thematic grouping. Clustering, network analysis and visualisation of publications are performed with VOSviewer software.

Figure 1 presents the longitudinal theoretical forefront of the science through bibliographical coupling and Figure 2 visualises the theoretical bases of the co-citations. The key clusters identified in Figure 1 are innovation ecosystems, triple/quadruple helix (including industry-academy partnerships), collaborative innovation, different innovation models (including open innovation and co-innovation) and living labs. Figure 2 provides a view on the main perspectives of theoretical roots (and the most relevant journals) such as research policy, administrative science, management studies and innovation (systems).

[5] Suominen, A., Seppänen, M., Dedehayir, O. (2019). European Journal of Innovation Management, Vol. 22 No. 2, pp. 335-360. DOI 10.1108/EJIM-12-2017-0188

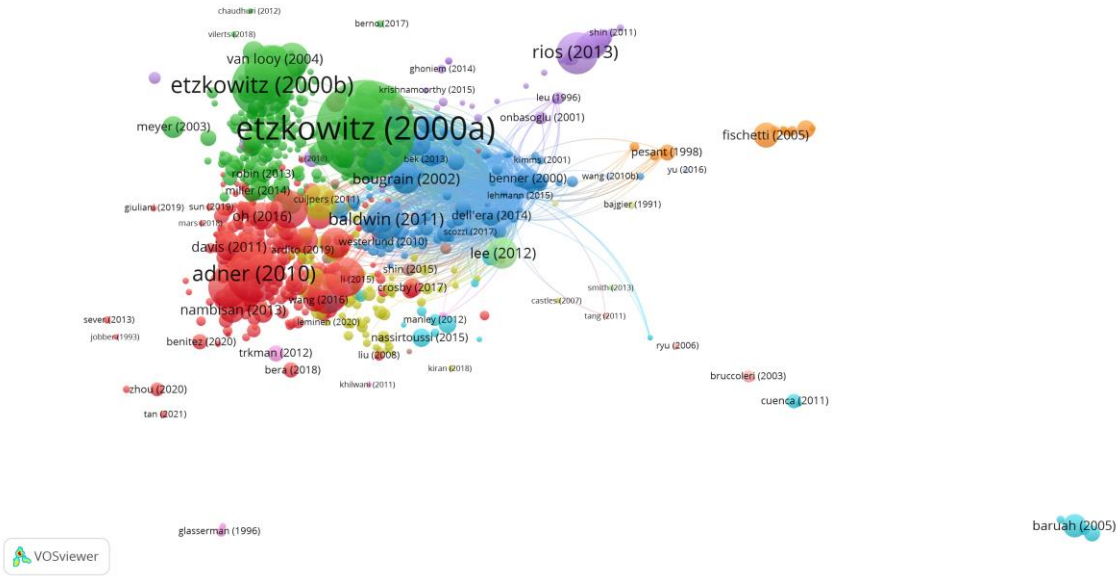

Figure 1. The longitudinal theoretical forefront of bibliographic coupling (BC)

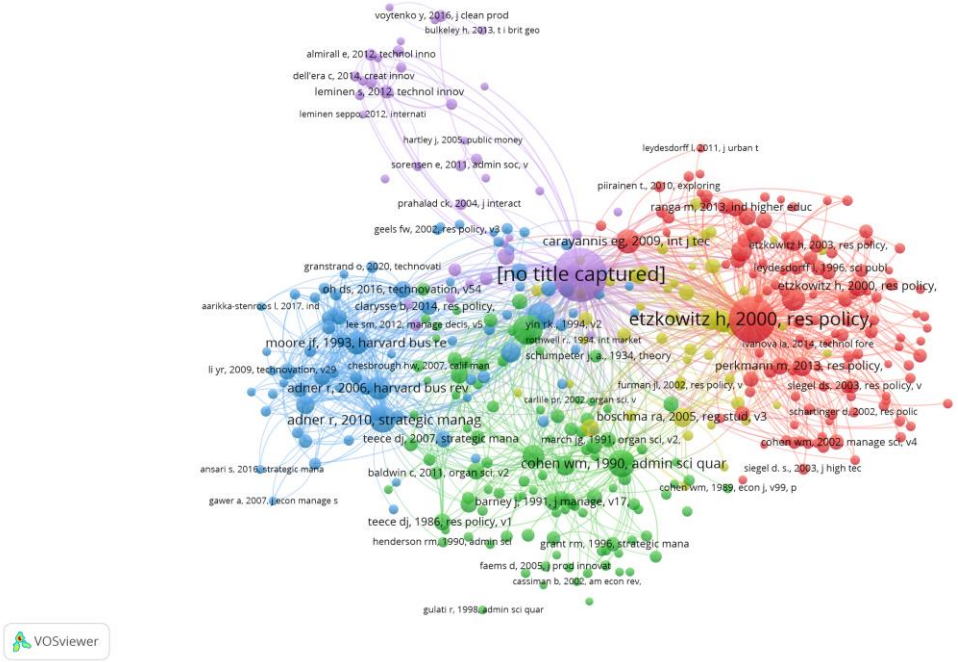

Figure 2. The theoretical bases through co-citation (CoC) analysis

The next section(s) provide a short summary of the key clusters and the most current discussions. On a general note, it can be summarised that most of the literature focused on partnerships with geographically proximate parties within one region or country and they viewed the partnership from the perspective of one of the involved actors. In addition, dyadic partnerships were the most typical collaboration form considered, i.e., multi-actor collaboration within innovation (eco)systems was not broadly covered. Furthermore, the topic of "public-private partnerships" was not considered in the academic articles. In addition, the articles had limited view on practical success factors or operation models of partnerships (only 31 articles mentioned "success factors" in their title or the abstract). When success factors were discussed the article(s) typically focused on one factor that was tested through quantitative data, or on a qualitative approach towards collecting views (as a snapshot) from one partnership.

When considering the theoretical forefront of the science on *innovation ecosystem clusters* the most cited articles (especially Adner 2006[6], 2010[7]) focused on a longitudinal analysis of technology transition and on macro-level relationships between companies. Thus, during the course of time the focus on innovation ecosystem clusters has changed, and the current papers (2020 onwards) include also (longitudinal) case studies on collaboration practices between companies, although the role of universities remains limited. Furthermore, the recent discussion around innovation ecosystems also emphasizes the role of public actors (especially cities) as enablers of the systemic innovation. In addition, the literature on *living labs clusters* has a strong connection to the city agenda and living labs are discussed as platforms for innovation and citizen engagement (Leminen et al[8]). Accordingly, the living labs discussion is strongly emphasising regional perspectives, even though the most recent ones discuss how digitalisation (and even covid-19) has changed the means of collaboration towards virtual participation and online tools. On the other hand, the *triple and quadruple helix* literature explored the mechanism for (regional) innovation performance and provided some case examples. Here the theoretical forefront of the science (for instance Etzkowitz et al.[9], Carayannis et al.[10]) emphasizes different modes of knowledge creation and transition between the triple helix actors. Over the years, the scope of discussion has broadened as the

[6] Adner, R. (2006) 'Match Your Innovation Strategy to Your Innovation Ecosystem Match Your Innovation Strategy to Your Innovation Ecosystem', *Harvard business review*, 84(4), pp. 98–107. doi: 10.1007/978-1-4614-3858-8_100487

[7] Adner, R. and Kapoor, R. (2010) 'Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations', *Strategic Management Journal*, 31, pp. 306–333. doi: 10.1002/smj.821

[8] Leminen, S, Nystrom, AG and Westerlund, M (2020). Change processes in open innovation networks - Exploring living lab. Industrial Marketing Management 91 , pp.701-718

[9] Etzkowitz, H. & Leydesdorff, L. (2000) The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. Research Policy 29 (2) , pp.109-123

[10] Carayannis, E. G. *et al.* (2018) 'The ecosystem as helix: an exploratory theory-building study of regional competitive entrepreneurial ecosystems as Quadruple/Quintuple Helix Innovation Models', *R and D Management*, 48(1), pp. 148–162. doi: 10.1111/radm.12300

view to involved actors has started to take account of new actors and roles, for instance Pique et al (2018[11]) emphasise the meaning of accelerator programmes as a new ecosystem mechanism and increasing commitment of universities through capital funds.

From the above-mentioned selection of 3243 articles, only 31 articles explicitly discussed "success factors" of different innovation partnerships. The articles provide scattered views on success factors and most typically they focus on one aspect such as the collaboration model, the actors and their roles, or entrepreneurship. Practical examples that have clear relevance to our analytical framework were identified from this selection and are summarised in the next chapter. [12]

The academic literature focusing on benchmarking countries highlights certain regional characteristics of the academic debate.

The Nordic academic discussion highlights academy and industry collaboration, focusing specifically on the academia's interest in collaboration. The literature review of **Swedish innovation partnerships** focused on the triple or quadruple helix -models emphasising the importance of a shared vision. Also, living labs as development platforms and the implementation of regional innovation policies were addressed in the discussion.

The academic literature on **Danish innovation partnerships** focused on public-private partnerships and the triple helix model. The main interest in the discussion was on the coordination and the different partners' roles in challenge-oriented collaboration. In addition, cooperation from the view of cultural differences between public and private partners was addressed.

The academic literature on **Austrian innovation partnerships** addressed perspectives of living labs and development platforms at the core of value creation and how the triple helix model affects the cooperation of the different actors.

Finally, the academic literature on **the Netherlands' innovation partnerships** related to public-private collaboration, living labs' strategies and innovation ecosystems' orchestration.

2.2 Success factors of innovation partnerships viewed through the lens of an analytical framework

The analytical framework presented in this chapter is built on the taxonomy developed by

[11] Pique, J.M, Berbegal-Mirabent, J., Etzkowitz, H. (2018). Triple Helix and the evolution of ecosystems of innovation: the case of Silicon Valley. Triple helix 5 (1)

[12] The literature review of Swedish cases resulted 40 articles from year 2009 to 2019, Danish case resulted 11 from 2009 to 2107) South Korean resulted 19 articles from 2010 to 2021, Austrian case resulted 10 articles of two being relevant (2015, 2021) and the Netherland review resulted 34 of which 5 were relevant for the focus of the report.

Meissner[13] to assess the concepts, success factors and weaknesses of RDI partnership models. The taxonomy of Meissner has been further developed, drawing on the scientific literature presented in the previous section.

Based on the scientific analysis, innovation partnerships can be divided into three types of partnerships. These types are:

1) bilateral relationships, which typically imply long-term commitment based on formal contracts or informal trust,

2) project-based collaboration with a short- or mid-term commitment formed as a consortium or project network, or

3) clusters & ecosystems with a limited number of participants forming either a legal entity with a long-term joint vision or a more open and dynamic ecosystem, where partners and their roles may change during the co-evolution

Figure 1 illustrates the continuum of the partnership types and their key characteristics.

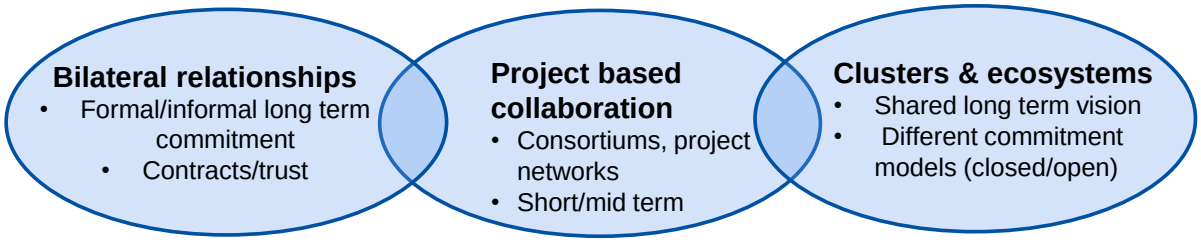

Figure 3. The continuum of partnership models (modified from Valkokari et al 2009)[14]

The following framework summarises the types of partnership models. In addition, it introduces four analytical dimensions that characterise the critical factors of functioning partnership models. Critical factors in analysing functioning partnership types are:

- **Operational model and funding** including perspectives to governance and management models as well as contractual and financial aspects of the partnership

[13] Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Cooperation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3

[14] Valkokari, K. Hyötyläinen, R. Kulmala, H. I., Malinen, P. Möller, K. Vesalainen, J (2009). Verkostot liiketoiminnan kehittämisessä. WSOY Pro, Helsinki

- **Shared vision** putting emphasis on the way in which the strategy is built (e.g. interaction between top-down and bottom-up perspectives) as well as the time horizon for reaching the common goals
- **Collaboration model and complementary partners** including the ways in which the partnership is coordinated, actors' engagement in the partnership and the use of platforms (including physical, digital or social platforms) to enable the collaboration
- **Value co-creation and impact** of the partnership highlights the importance of value co-creation as well as comprehensive and broad-based measures to the generation of impacts of the partnership

Table 1. Analytical framework of the type and critical factors of partnership models.

Type of partnership	Operational model and funding	Shared vision	Collaboration model and complementary partners	Value co-creation and impact
Bilateral relationship	Formed between two actors. Typically project-based collaboration. Resources based on self-funding. Potential use of external funding sources. IPR access may be the driving force. The informal nature of the collaboration may cause challenges.	Result oriented, iterative and constantly evolving. Mid- or long-term horizon, aligned with the collaboration. No clearly defined or communicated vision.	Project based collaboration model between two partners. Strong commitment based on personal relationships. Informal nature.	Clear expectation on value and impact for collaborative partners. Results are directly exploitable after project implementation. Ad hoc and short-term impact on innovation system.

Type of partnership	Operational model and funding	Shared vision	Collaboration model and complementary partners	Value co-creation and impact
Project-based	Contract-based collaboration and resourcing, typically projects with a variety of funding conditions. Collaboration is built on existing infrastructure or testing and development environments. IPR clearly defined, typically in the funding conditions of the project.	Renewal of technology, intensification of innovation process. Short- or mid-term time horizon, aligned with the project duration.	Collaboration is built on the commitment of various actors. Commitment aligned with project duration.	New knowledge and experiments. higher uncertainty and risk. Impact is limited due to the non-legal status of the model.
Clusters and ecosystems	Clusters with a limited number of partners (possible legal entity) or open and dynamically evolving ecosystem. Equal rights and shared resources. Joint IP; difficult to agree on due to the iterative nature of	Individual targets are aligned with a shared long-term vision, roadmap visualising the joint actions needed, as well as agreement on partners' roles and responsibilities. Enhancing the RDI capacity; new innovative	Many partners representing different capabilities; open / dynamic collaboration model. Strong commitment to common vision; contribution required. Dynamic.	Impact and added value for all parties. Potentially high impact on innovation system, economy and society. Resource intensive in a short-term. Value generated at different times and different horizons

	collaboration targets.	breakthrough; socio-techno-logical renewal. Long-term time horizon for col-laboration.		for different partners (de-pending on roles).

On the operational model and funding, previous scientific work highlights the importance of open innovation strategies and dynamic capabilities, i.e. participating organisations' capability to co-evolve and adapt to the changing environment[15] , and absorptive capacity, i.e. organisations' ability to identify, assimilate, transform, and use external knowledge[16]. In addition, the contracts which consist of a combination of means to protect knowledge and the return of investments made on innovation are emphasised. From the managerial perspective, interdisciplinary management committees consisting of both academic and industrial representatives and with responsibility to align partners' interests have been emphasised. [17]

The need for a common vision is rarely discussed in the academic literature. However, in recent scientific discussion, the need for a grounded vision[18], carefully developed strategies[19] and generation of a shared understanding of how to design processes to ensure project success[20] have been identified as crucial elements. Strategic alignment[21], win-win-situations,

[15] Moore, J. (1996). The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems, HarperCollins Publishers, available at: http://blogs.harvard.edu/jim/files/2010/04/ Predators-and-Prey.pdf; Teece, D. (2007). "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", Strategic Management Journal, Vol. 28 No. 13, pp. 1319-1350, available at: http://onlinelibrary.wiley.com/doi/10.1002/smj.640/abstract; http://dx.doi.org/10.1002/smj.640

[16] Yun, J., Park, K., Im, C, Shin, C, Zhao, X (2017). Dynamics of Social Enterprises—Shift from Social Innovation to Open Innovation. Science, Technology and Society. https://doi.org/10.1177/0971721817723375; Ritala and Hurmerinta (2013). Incremental and Radical Innovation in Coopetition—The Role of Absorptive Capacity and Appropriability. Journal of Product Innovation Management. https://doi.org/10.1111/j.1540-5885.2012.00956.x

[17] Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Cooperation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3.

[18] Andreani, S., Kalchschmidt, M, Pinto, R, and Sayegh, A. (2019). Reframing technologically enhanced urban scenarios: A design research model towards human centered smart cities. Technological Forecasting and Social Change. Vol. 142, pp. 15-25.

[19] Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Cooperation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3

[20] Groote, J. & Backmann, J. (2020). Initiating open innovation collaborations between incumbents and startups: how can David and Goliath get along? International Journal of Innovation Management Vol. 24, No. 02, 2050011. DOI 10.1142/S1363919620500115

[21] Wagner, Bican & Behm, (2021). Critical success factors in the front end of innovation: results from an empirical study. International Journal of Innovation Management Vol. 25, No. 4.; Adner, R. (2006), "Match your innovation

and a strong problem orientation have been identified as key success factors within university-industry-government cooperation. The academic literature on collaboration and partnerships highlights the importance of social capital and trust[22]. The public-private partnerships' vision should be a result of a joint sense-making process, shared among the members of the partnership and balancing the different interests.

Interlocking platforms are key in bringing collaborating actors together and fostering communication[23]. Contradictory views have been presented on how the policy intervention benefits the partnership formation and value creation. While some studies find the direct government policy in cluster formation futile[24], other studies emphasise that in some cluster contexts inadequate policy coordination creates barriers to technology diffusion[25]. A study[26] using data from seven EU regions suggest that the role of public policy is systems conforming rather than systems creating. However, innovation support programmes can assist SMEs in traditional manufacturing industries to consolidate and/or extend their innovation ecosystems beyond familiar business partners by promoting cooperation with both private and public sector knowledge providers. Laitinen et al[27] found that creativity, sharing information, and acting and learning together are the critical success factors for complex regional city development networks (case Chicago).

The literature argues that partnerships create value that no single actor could reach alone. The impact of co-creation comes from the complementary nature of actors. The process of value-creation requires co-evolution where actors enhance and upgrade everyone's abilities. A shared understanding of the value[28] and concrete indicators to make it visible for all actors is a key[29]. A systems approach should be acknowledged in the management and policy processes (including indicators) as the partnerships typically aim at solving broader system level challenges[30]. Strategically oriented approach and comprehensive indicators are required to

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strategy to your innovation ecosystem", Harvard Business Review, Vol. 84 No. 4, pp. 98-107; [11] Moore, J. (1996), The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems. HarperCollins.

[22] Theodoraki, C., Messeghem, K. & Rice, M.P. A social capital approach to the development of sustainable entrepreneurial ecosystems: an explorative study. Small Bus Econ 51, 153–170 (2018). https://doi.org/10.1007/s11187-017-9924-0

[23] Li, Y.-R. (2009), "The technological roadmap of Cisco's business ecosystem", Technovation, Vol. 29 No. 5, pp. 379-386. Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Cooperation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3

[24] Casper, S. (2007), "How do technology clusters emerge and become sustainable? Social network formation and inter-firm mobility within the San Diego biotechnology cluster", Research Policy, Vol. 36 No. 4, pp. 438-455.

[25] Silvestre, B. & Neto, R. (2014) Are cleaner production innovations the solution for small mining operations in poor regions? The case of Padua in Brazil, Journal of Cleaner Production, Volume 84, Pages 809-817,

[26] Radicic, D., Pugh, G. & Douglas, D. (2018). Promoting cooperation in innovation ecosystems: evidence from European traditional manufacturing SMEs. Small Business Economics volume 54, pages 257–283.

[27] Laitinen, I., Osborne, M., & Stenvall, J. (2016) Complex regional innovation networks and HEI engagement - the case of Chicago. International Journal of Knowledge-Based Development, Vol. 7, No. 2, pp. 184-201.

[28] Iansiti, M. and Levien, R. (2004b), The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability, Harvard Business School Press, Boston, MA; Jacobides, M.G. and Tae, C.J. (2015), "Kingpins, bottlenecks, and value dynamics along a sector", Organization Science, Vol. 26 No. 3, pp.

[29] Meissner, D. (2019). Public-Private Partnership Modes for Science, Technology and Innovation Cooperation. Journal of the Knowledge Economy 10: pp. 1341-1361. DOI 10.1007/s13132-015-0310-3

[30] Suominen, A., Seppänen, M., Dedehayir, O. (2019). European Journal of Innovation Management, Vol. 22 No. 2, pp. 335-360. DOI 10.1108/EJIM-12-2017-0188

capture the multi-dimensional value generated in partnerships[31]. This requires stronger integration of value data to the development and strategic planning of partnerships, and development of diversified data-driven management in companies and organisations.[32]

2.3 A practical perspective on the critical success factors

This review provides a practical perspective on the critical success factors of innovation partnerships. It is based on the recent policy reports of the Ministry of Education and Culture of Finland, the Ministry of Economic Affairs and Employment of Finland, and the European Union[33]. The review provides a picture of widely identified practices seen as requirements for effective and competitive partnership models.

Operational model and funding. While partnerships promote joint innovation and wide-ranging participation, the activities must have clear ownership. Typically some of the organisations take a lead in building cooperation across organisational boundaries. Achieving international success requires visionary leadership and long-term investment from leading organisations.[34] The cooperation should be clearly facilitated and coordinated. Typically, in ecosystems, leadership is shared between actors. However, in the building and transformation phases of a partnership, some of the partners need to take a leading role.[35] To support the reconciliation of interests, the board should consist of representatives of different actors. In addition to responsibilities, the contract should include a clearly defined model of value-sharing and mechanisms for settling possible disputes[36].

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[31] Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds.) (2013). Public-private innovation networks in services. Edward Elgar, Cheltenham and Northampton.; Djellal, F. and Gallouj, F. (2013). The Productivity in services: measurement and strategic perspectives. The Service Industries Journal, Vol. 33, No. 3-4, 282-299.; Hyytinen, K., Ruutu, S., Nieminen, M., Gallouj, F. & Toivonen, M. (2014), A System dynamic and multi-criteria evaluation of innovations in environmental services. Economics and Policy of Energy and the Environment, no. 3/2014, pp. 29-52.

[32] Smits, R. and Kuhlmann, S. (2004). The rose of systemic instruments in innovation policy. Foresight and Innovation Policy, Vol. 172.; Smits, R., Kuhlmann, S. and Shapira, P. (Eds.) (2010), The Theory and Practice of Innovation Policy: An International Research Handbook. Edward Elgar, Cheltenham. ; Kuhlman, S. (2003), Evaluation as a source of 'strategic intelligence'. In Shapira, S. and Kuhlman, S. (Eds.) Learning from Science and Technology Policy Evaluation. Experiences from the United States and Europe. Edward Elgar, Cheltenham, pp. 352-379.

[33] Perjo., Liisa., Fresricsson., Christian., & Oliveira e Costa., Sandra. (2016). Working Paper: Public-Private-People Partnerships in urban planning | UBC Sustainable Cities Commission. https://www.ubc-sustainable.net/library/publication/working-paper-public-private-people-partnerships-urban-planning

[34] Hyytinen, K., et al. (2022). Kansainvälisesti merkittävät kehitys- ja kokeiluympäristöt : Menestystekijät ja vaikuttavuuden kriteerit. Publications of the Ministry of Economic A-ffairs and Employment 2022:31.

[35] Laasonen, V., Ruokonen, H., Talvitie, J., Lähteenmäki-Smith, K., Kolehmainen, J., Ranta, T., Järvelin, A-M. & Piirainen, K. (2019). Selvitys innovaatioympäristöjen ja -ekosysteemien menestystekijöistä sekä julkisen sektorin rooleista kehityksessä. Publications of the Ministry of Education and Culture 2019:32.

[36] Valkokari, K., Hyytinen, K., Kutinlahti, P. & Hjelt, M. (2021). *Collaborating for a sustainable future - ecosystem guide*. VTT Technical Research Centre of Finland. https://doi.org/10.32040/2020.Ecosystemguid

National RDI funding and organisations' own core funding are prerequisites for a continuous partnership. The participators' preconditions for engaging in long-term activities should be ensured when granting national RDI funding.

There is a need for long-term funding instead of project funding, but different funding mechanisms are needed at different stages of a successful partnership. In the initial phase, public funding is often used to build high-quality knowledge and investment-intensive infrastructure and a collaborative platform. The focus of the funding should shift gradually towards enterprise financing. At the beginning of the development cycle, it is important to build a business model aiming at a growing revenue stream from enterprises.

National RDI funding should be grouped together in larger packages[37]. It is also important to link to international funding and partnerships, including EU research and programme funding[38]. In addition, contracts must secure IPR and ensure that the contracts are legally respected.

Shared vision. Setting an ambitious vision and clear objectives requires dialogue and stresses the actors' own responsibility[39]. Without a jointly designed long-term vision, there is a risk of a collapse of the partnership. The partnership vision should be accompanied by strategic themes linked to broad societal challenges, so that cooperation will address different actors' practical challenges.[40] In a well-functioning and sustainable partnership model, actors need to be committed to radical renewal. Simultaneously, public financial instruments are used to develop ecosystems and new approaches to testing, piloting and scaling innovation. Individual actors need to link their own development needs to the joint vision. Without a commonly agreed long-term vision with interrelation to the organisations' own targets there is no motivation for ecosystem activities, nor do partners contribute their know-how or resources to co-development. The collision between such top-down and bottom-up intervention logics requires collaborative platforms or environments, as well as boundary resources linking different intervention logics. Collaborative platforms can be of a social nature (events, seminars, workshops), physical (common spaces, development platforms such as educational institutions) or virtual (digital collaborative platforms).[41]

Collaboration model and complementary partners. A well-functioning sustainable partnership is broad-based, dynamic (= sufficient number of newly joining and outgoing actors) and revolving. Its actors (private, public and third sector) complement each other and work together in an open and transparent manner. Different roles are important for a vibrant

[37] Työ- ja elinkeinoministeriö. (2021). Kestävä talouskasvu ja hyvinvointimme tulevaisuus. Publications of the Ministry of Economic Affairs and Employment 2021:12.
[38] Laasonen, V., Ruokonen, H., Talvitie, J., Lähteenmäki-Smith, K., Kolehmainen, J., Ranta, T., Järvelin, A-M. & Piirainen, K. (2019). Selvitys innovaatioympäristöjen ja -ekosysteemien menestystekijöistä sekä julkisen sektorin rooleista kehityksessä. Publications of the Ministry of Education and Culture 2019:32.
[39] Valkokari, K., Hyytinen, K., Kutinlahti, P. & Hjelt, M. (2021). *Collaborating for a sustainable future - ecosystem guide*. VTT Technical Research Centre of Finland. https://doi.org/10.32040/2020.Ecosystemguid
[40] Pekkala, H. Ed. (2020). Digitaalinen työnvälitys ja ekosysteemit. Selvitys Työmarkkinatorin ympärille rakentuvan ekosysteemin hallintamallista. Publications of the Ministry of Economic Aff-airs and Employment 2020:22.
[41] Pekkala, H. Ed. (2020). Digitaalinen työnvälitys ja ekosysteemit. Selvitys Työmarkkinatorin ympärille rakentuvan ekosysteemin hallintamallista. Publications of the Ministry of Economic Aff-airs and Employment 2020:22.

partnership. The involvement of competitors is a typical bottleneck that can be overcome by understanding the complementary roles of actors and the limits of their activities. The rules for joining and leaving the partnership should be visible as well. A diverse set of actors will enable cross-sectoral knowledge and use of existing research infrastructures and development environments, or even jointly create new platforms. The critical mass of actors is also a prerequisite for the launch of the partnership. There must be enough common practical activities among the participants to bind them together and increase value[42].

High-quality and up-to-date research infrastructures and test environments are key to the emergence of internationally competitive research and innovation ecosystems[43]. Creating interaction that enable ecosystem co-creation may require public intervention, as activities that foster interaction often involve a "market failure", i.e. action that none of the individual players has an interest in taking responsibility for. Typically, the role of the public sector is most important in the first phases of ecosystems' lifecycle. As ecosystem co-creation progresses and solutions to operational challenges emerge, costs of ecosystem orchestration can be allocated in other ways." [44]

Co-creation requires resourcing and funding for orchestration. Typically, permanent resources are needed in a partnership to maintain partnership dynamic, interactive and well-functioning collaboration. In practice, this means human resources that contribute to the coordination, orchestration and facilitation of ecosystem cooperation. [45] In addition, the interaction between actors must be continuous and transparent. The partnership develops through an interaction between the actors and the environment. Transparency and trust between actors in the development work lay the foundation for renewal and effectiveness at local, regional, national and international levels.

Value co-creation and impact. It is important that all actors benefit from and add value to the partnership, although the form and time horizon can vary. Actors in the partnership need to be involved based on their own interests. It is important to make the different value expectations transparent in accordance with their individual expectations.

From the point of impact, it is important that the partnership does not remain at the national or provincial level. Partnerships need to set high ambitious impact targets and to network across borders to test their real competitiveness and to ensure broad-based economic societal impact.[46]

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[42] Karjaluoto, A., Parts, Ü., Lehtinen, R. & Frantti, T. (2019). Kasvua digitaalisesta turvallisuudesta Tiekartta 2019–2030. Publications of the Ministry of Economic Aff-airs and Employment 2019:17.

[43] Koski, O., Husso, K., Kutinlahti, P., Huuskonen, M. & Nissinen, S. (2019). Innovaatiopolitiikan lähtökohdat. Publications of the Ministry of Economic A-ffairs and Employment 2019:18.

[44] Pekkala, H. Ed. (2020). Digitaalinen työnvälitys ja ekosysteemit. Selvitys Työmarkkinatorin ympärille rakentuvan ekosysteemin hallintamallista. Publications of the Ministry of Economic Aff-airs and Employment 2020:22.

[45] Pekkala, H. Ed. (2020). Digitaalinen työnvälitys ja ekosysteemit. Selvitys Työmarkkinatorin ympärille rakentuvan ekosysteemin hallintamallista. Publications of the Ministry of Economic Aff-airs and Employment 2020:22.

[46] Koski, O., Husso, K., Kutinlahti, P., Huuskonen, M. & Nissinen, S. (2019). Innovaatiopolitiikan lähtökohdat. Publications of the Ministry of Economic A-ffairs and Employment 2019:18.

Added value and impact should also be measured with clear indicators. A common vision and action plan will help to set concrete measures and to monitor progress. Metrics need to be developed to make visible the benefits from the viewpoint of different actors. In addition to organisation-type related impact measures common partnership-specific metrics are required. An understanding of success and the direction of change help guide partnerships and their joint decision-making in the right direction.[47]

[47] Hyytinen, K. et al. (2022). Kansainvälisesti merkittävät kehitys- ja kokeiluympäristöt : Menestystekijät ja vaikuttavuuden kriteerit. Publications of the Ministry of Economic A-ffairs and Employment 2022:31.

3 Benchmark cases

This chapter provides a snapshot of the innovation policies of the chosen study countries, Austria, Denmark, the Netherlands, and Sweden. Each country description is followed by a practical case example of a partnership model. The given examples are to their characteristics project-based partnerships, clusters and ecosystems. To complement the analysis, one example of a bilateral partnership is given at the end of the chapter.

The case examples are structured according to the Meissner framework and describing the operating model, vision and objectives, actors and collaboration platforms, impact and values, and success factors.

3.1 Austria: Competence Centres bridge the gap between research and markets

Austria's science and innovation system is highly sophisticated and its investment to RDI is among the highest in the EU. Investment into RDI has been steadily increasing since 1990s, meeting the EU target of 3% of GDP in 2014. The RDI intensity reached its all-time high in 2020 with 3,23% of GDP.[48]

Austrian research and innovation policy is coordinated through three federal ministries: the Ministry of Education, Science, and Research (BMBFW), the Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), and the Ministry of Digital and Economic Affairs (BMDW). The Austrian Science Fund (FWF), the Austrian Research Promotion Agency (FFG) and the "Austria Wirtschaftsservice" (AWS) are the main funding agencies for research and innovation. [49]

FFG is the primary funding agency for industrial research and development. FFG runs a national programme for Competence Centers for Excellent Technologies (COMET) that has been recognised as one of the most successful innovation policy initiatives in Austria and is internationally considered a best-practice for supporting application-oriented cutting-edge research.[50]

The programme was launched in 2006 and it brings together state-of-the-art scientific competence and technological know-how. Business and research partners work closely together in COMET centres bridging the gap between research and market-ready products and services. The centres significantly improve the innovation capacity in business and help to

[48] Statistics Austria. (2021). Research, Development and Innovation. Available at: http://www.statistik.at/web_en/statistics/EnergyEnvironmentInnovationMobility/research_and_development_r_d_innovation/125847.html

[49] Austria.org. (2022). Science and Research. Available at: https://www.austria.org/science-and-research

[50] FFG. (2022). Objectives and Mission. Available at: https://www.ffg.at/en/FFG/objectives-and-mission

develop solutions for grand challenges of the future, like climate change, digitalisation and health.

Within the COMET programme there are three programme lines: projects, centres, and modules. COMET projects support the entry in the COMET programme to work on new research-industry RD ideas. The centres perform state-of-the-art research and build capacity and competences. COMET modules concentrate on high-risk research. From project to centre to modules, the degree of novelty in science and the strategic orientation increases.

COMETs are funded by the Federal Ministry for Digital and Economic Affairs, the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, the participating provinces, company partners and research organisations. The research programmes are co-designed by academia and business, considering both long-term scientific and medium-term economic objectives.[51]

3.1.1 The Austrian Blockchain Center – A one-stop shop for blockchain solutions

Basic operations and partners	Vision and justification for the model	Lessons learned for Finland
• The largest centre of expertise in block chain technologies in the world • Established in 2019 • Aims to promote the deployment of applications such as IoT and industry 4.0 • A company owned by an association promoting blockchain technologies • Funded by both the public COMET programme and the member companies • Provides concepts development, workshops, management of innovation projects and assistance in research funding applications • Involves 21 scientific institutions, 54 companies and 17 other actors, including 16 international institutions/companies	• The objective is to promote the application-oriented RDI of the blockchain in the financial and energy sector, logistics, retail, administration and industrial applications • Promotes the development of technical, legal and administrative infrastructures required for blockchain applications • Activities provide companies with information based on the latest research and research funding for research organisations , for example in the form of doctoral research projects	• Bringing different actors together across sectors creates new innovations and business activities • ABC's brand as “one -stop shop service” increases its attractiveness • 50-50 funding from the public and private sectors secures the necessary resources to carry out interesting research • Making the innovation pipeline visible through instruments focusing on different phases

The Austrian Blockchain Center (ABC) is the world's largest blockchain competence centre, founded in 2019. ABC is an interdisciplinary application-oriented research institute that brings together competencies in the field of the fundamentals and application of blockchain technologies in one place. The core functions of the centre are applied research and

[51] FFG. (2022). COMET Programme. Available at: https://www.ffg.at/en/comet/programme

development of use-cases, prototypes, and proof of concepts. ABC's RDI topics include economic, technological, application-related, political and legal issues. The objective of the ABC is to advance scientifically sound development of applications, like Industry 4.0 and IoT (Internet of Things) based on blockchain technologies. [52]

Operating model

ABC centre's legal status is a limited company. The main owner of the company is the association for the advancement of blockchain technology. The governance of ABC is divided into two parts, administration and scientific management, with separate boards of directors. Participating companies are not directly involved in the governance of the centre.

The centre provides concept development, workshops, innovation project management, and help with research funding applications. Companies can define how much they want to be involved in the ABC activities and choose the membership model accordingly. In principle, the more the company needs the services of the centre, the more they contribute as membership fees.

The annual budget of the centre is approximately 5 million euros, and it employs 20 people. The centre runs both non-funded innovation projects and partly publicly funded projects through the COMET (Competence Centers for Excellent Technologies) framework. COMET-funded projects require 50% contribution from the participating companies. The centre also leverages international funding sources, such as Horizon Europe funding for its projects. The IP rights remain with the participating company in the ABC participation model, but the centre can use the technology for research purposes.

Vision and objectives

Blockchain technology has the potential to break silos between industries and to support totally new business models. The centre delivers on the adoption of Blockchain Austria action plan, drafted by the Austrian Federal Ministry of Digital and Economic Affairs, calling for the establishment of interdisciplinary research institutes and platforms to accelerate knowledge exchange between business and academia[53]. Originally started as a university-led initiative, the ABC's has evolved to be the one-stop-shop for blockchain-related technologies. The centre's goal is to advance application-oriented RDI of blockchain in the financial and energy sector, in logistics and retailing, in government and in industrial applications like industry 4.0 and IoT. ABC also contributes to the development of technological, legal and organisational infrastructures that the decentralised applications will require.

Actors and collaboration platforms

ABC involves 21 scientific institutions, 54 companies and 17 associated participants, including 16 international institutions/companies. Partners include Austrian Institute of Technology, University of Vienna, Vienna University of Technology, Accenture, Coca-Cola Hellenic Bottling Company, and Raiffeisen Bank International. ABC is open to international partners (both

[52] ABC Research. (2022). About ABC Research. Available at: https://www.abc-research.at/
[53] FFG. (2022). FFG Projektdatenbank – ABC. Available at: https://projekte.ffg.at/projekt/3089750

companies and universities) with the same terms and conditions as for Austrian partners. The centre builds its international networks through international conferences and blockchain initiatives. ABC works closely with other agencies such as the other COMET centres CDP and SBA Research.

Impact and values

ABC measures its success based on the amount of generated knowledge, number of employed researchers, scientific publications, published open-source projects, gender balance in the projects, and success in EU funding. Since the launch, the centre has produced interesting prototypes and user-cases.

ABC is a resource-effective way of unlocking the potential of blockchain technology. Companies gain state-of-art expertise on blockchain technologies, and research partners get real-life problems to apply the latest research. New innovations resulting from collaborations between ABC partners will be the key for the creation of new jobs and securing Austria's position among the top innovative countries in Europe.

For the academia, ABC provides additional resources such as funding for PhD projects. Universities also gain new knowledge about applied research within industry. Participating companies get access to the latest blockchain research and test-infrastructure (software).

Success factors for similar partnerships

Success factors of this cluster-type partnership have been:

- Bringing together actors from across industries and sectors to engage in cross-cutting development of blockchain-based decentralised technologies, thereby raising the potential for disruptive innovation. The collaboration has already led to an intensification of blockchain-based applications and business models.
- Successfully facilitating this cooperation and thereby securing the position of the coordinating ABC centre as a well-known competence centre for blockchain technology, giving both credibility to the partnership and helping to attract participants.
- Securing adequate resources to do interesting and timely research by 50-50 matched funding from business partners and governmental funding.
- Unlocking the potential of interdisciplinary projects where objectives of different participants are well-balanced.
- Enhancing the visibility of the innovation funnel through the three programme lines, from project to centre to modules, where the degree of novelty in science and the strategic orientation have different emphasis.

3.2 Denmark: Regional partnerships join forces in national superclusters

Danish research and innovation policy is coordinated through three federal ministries: the Ministry of Education, Science, and Research (BMBFW), the Ministry for Climate Action, Environment, Energy, Mobility

The European Innovation Scoreboard (EIS) ranks Denmark as an Innovation Leader and the country is among the few countries that has reached the Europe's 2020 target for RDI intensity of 3% of GDP[54].

In Denmark, innovation policy is divided between two ministries. The Ministry of Higher Education and Science is responsible for research and research-driven innovation policy. The Danish Agency for Higher Education and Science is the administrative body under the ministry. The Ministry of Business and Growth is responsible for business and innovation policies with the administration through the Danish Business Authority.

Strategic research, technology and innovation is channelled mainly through the Innovation Fund Denmark (Innovationsfonden) under the Ministry of Higher Education and Science, while the Danish Growth Fund (Vaekstfonden) under the Ministry of Business and Growth funds solution-driven innovations for business growth. Export is supported by Denmark's Export Credit Agency (EKF Danmarks Eksportkredit), the Danish Green Investment Fund as well as the Investment Fund for Developing Countries (IFU, under the Ministry of Foreign Affairs). In 2021, the funding scene was complemented by the new Green Future Fund, a joint initiative of the Government and the major funds, with the specific aim of promoting export of Danish climate technologies and global decarbonisation.

For decades, Denmark's innovation policy has had a strong focus on clusters based on the regional strengths of Danish industry. The clusters catalyse innovation, development and growth in Danish key industrial areas by bringing together the whole ecosystem and coordinating the actions of companies, knowledge institutions, industry associations, public bodies and financial institutions. The cluster work is based on the needs of the companies.

Denmark took a step towards more mission-driven innovation policy in 2020, when the number of innovation networks and clusters was reduced from 40 to 14 and focused on national priority areas such as environmental technologies, energy technologies, digital technologies, construction and food and bio-resources.

Currently, the 13[55] national clusters are facilitated by the national organisation Cluster Excellence Denmark that is funded by the Danish Agency for Higher Education and Science along with the Danish Business Authority. Individual cluster can receive funding from the cluster programme "Innovation power Danish clusters for knowledge and business 2021-

[54] OECD. (2022). Main Science and Technology Indicators. Available at: https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB#

[55] The 14th cluster went bankrupt in 2022 after two years of operation.

24”[56]. Between 2021 and 2024 the new superclusters will receive total public funding of approximately DKK 640 million from the Ministry of Higher Education and Science and the Danish Executive Board for Business Development and Growth. On top of public funding, cluster can have other sources of income, such as membership fees, consultancy fees and private project investments from the partners.

3.2.1 The Danish Food and Bio Cluster – Providing a single entry to the entire Danish food industry

Basic operations and partners	Vision and justification for the model	Lessons learned for Finland
• Established in 2020 • Ten local offices, three incubators and about 40 employees all over Denmark • Has a board that consists of partners and a cluster coordinator that is responsible for practical management • Funded through the Government Cluster Programme , membership fees, public and private project funding • Sells services to both its members and other actors • The 350 members of the cluster account for 70 –80% of the total food industry in Denmark • Members vary from start -ups and SMEs to multinational companies, universities municipalities and other public organisations	• Vision is to be globally competitive and recognised as a world leader in innovation and sustainable development of the entire value chain • Exists to strengthen knowledge - based innovation and collaboration between companies and knowledge institutions across the value chain both in Denmark and internationally • The biggest impact and value are related to the size of the cluster • The cluster organisation is able to support and help as a neutral mediator between different conflicting interests and parties	• The mutual trust of the cluster is strong and has a mission that is supported by both the state and the members • The funding and revenue from multiple sources • The cluster brings added value to society as a whole • Long-term research • Local offices guarantee small and local actors to access to national activities

The Danish Food and Bio Cluster was founded in 2020 as a result of the Danish reform of national clusters. The cluster is based on previous long-term cooperation within the food industry and is a platform for innovation and growth for both Danish and international companies and knowledge institutions.

Operating model

The cluster works nationwide with a decentralised organisation that reflects its history of combining four regional clusters. At the time of this study, it comprises 10 offices, 3 incubators, and around 40 employees. The local presence is perceived important, as it fosters the

[56] Cluster Excellence Denmark. (2022). The cluster organization. Available at: https://clusterexcellencedenmark.dk/the-danish-clusters/clusterorganization/?lang=en

dialogue between the cluster organisation and the municipalities and enables the cluster to provide efficient and easily accessible services to local enterprises.

The cluster is governed by a board consisting of representatives of industry and research members. The operational leadership is provided by a cluster manager. Other key management positions include a chief operating officer and a European Cluster Collaboration Platform responsible.[57]

The cluster is funded through the government's cluster programme (runs for at least until 2025), membership fees, project funding from Danish national funding agencies, EU, and private foundations, as well as consultancy assignments for members and non-members (incl. e.g. funding application writing support). The regional offices and some of the cost of employees in those offices are funded by the municipalities.

Membership fees range from 1 000 DKK to 50 000 DKK (about 100-7000 €) per year. The cluster is dependent on the diversified funding base and most of the revenue comes from project funding. The cluster has a wide membership base, but most of the members are SME's and start-ups, who pay moderate membership fees.

The Food and bio cluster is a membership organisation and most of their activities are 'members only' - activities. Services include:

- Inspiration and events (non-members can often pay to take part in events)
- Networking: Access to subject-based networking
- Cooperation: Access to scientific knowledge, help from experts and funding
- Online knowledge sharing: Food Innovation Talks and Masterclasses
- 1-to-1 sparring (with additional cost, that is provided for non-members too with a higher price than members)
- Matchmaking with other companies and knowledge creators
- Access to international projects and fundings
- International Innovation Bootcamps
- Matchmaking with international project partners
- Help with EU-funded projects
- Incubator services: For start-ups the cluster has three incubators that provide incubation, business development, access and exposure within industry specific networks, access to innovation projects, and funding

[57] European Cluster Collaboration Platform. (2022). Food & Bio Cluster Denmark. Available at: https://clustercollaboration.eu/content/food-bio-cluster-denmark

Vision and objectives

The vision of the cluster is to be globally competitive and recognised as a world leader in innovation and sustainable development of the entire value chain[58]. The current vision stems both from the previous clusters and from government-supported participatory processes of defining strategic agendas for Danish key sectors. It exists to strengthen knowledge-based innovation and collaboration between companies and knowledge institutions across the food and bioresources value chain both in Denmark and internationally. The objectives are based on "five paths to grow" that outline how the cluster will support the industry to achieve renewal and growth in a changing operating environment. The objectives include 1) fostering increased innovation and cooperation between larger and smaller companies and knowledge institutions, 2) supporting competitive growth by increasing e.g. sales skills and market awareness, 3) increasing entrepreneurship by support to spin-outs, start-ups, providing business advice and connections, 4) providing mediating services to support the access to talents and 5) forward-looking work defining challenges and trends for the industry, such as the transition to digitalised agrifood production.[59]

Actors and collaboration platforms

The cluster's members make up 70-80 per cent of the entire Danish food industry, and the number of members is growing, from 260 member organisations in 2020 to 350 at the time of this study (2022). Members range from start-ups and SME's to multinational companies like Arla Foods, all universities in Denmark and other knowledge institutions, municipalities and other public organisations.

Collaboration platforms include e.g. the online knowledge sharing, and incubator services described under the operating model of the cluster. One interesting feature is the local presence of the cluster in all major regions of Denmark that provide local contact points into the national network. The cluster also runs various projects and networks on relevant themes, e.g. Green Protein Network and Danish Vertical Farming Network. The national cluster cooperates with sister clusters internationally and allows companies from different countries to become members, thus providing also international collaboration platforms for its Danish members.

Impact and value

Impact and value are measured for example by member surveys, which have shown mainly positive commitment to the cluster. Another indicator of success is that none of the member companies decided to leave after the first year when the membership fees were to be renewed. KPI's that are followed are mainly linked to the governmental funding, such as direct activity and output indicators (how many people are involved in activities).

[58] Food & Bio Cluster Denmark. (2022). Brochure. Available at: https://foodbiocluster.dk/Files/Files/Food-Bio-Cluster-Denmark-profilbrochure.pdf
[59] Food & Bio Cluster Denmark. (2022). About Food & Bio Cluster Denmark. Available at: https://foodbiocluster.com/about

In addition, Danish clusters in the national programme are required to have or obtain a Gold Label in the European Cluster Excellence Initiative (ECEI).[60] Having a Gold label means that the cluster organisation demonstrates excellent cluster management. This is required because the Government recognises that excellent coordination and management as a prerequisite for clusters' creating expected impact and value for businesses and society.

The impression so far is that the different organisations have gained different value from the cluster. For businesses the cluster has provided access to knowledge, research, and networks both on national and local level. It has also provided access to international networks that benefit both academic and business partners. The cluster has also helped the members to attract international funding. In the short term, especially SMEs and startups have benefitted from the cluster's matchmaking services and incubators. For research partners, the value is expected to grow in the longer term.

The biggest impact and value are related to the size of the cluster. Most of the actors of food and bio industry in Denmark are members in the cluster and the cluster organisation is able to support and help as a neutral mediator between different conflicting interests and parties.

Success factors for similar partnerships

As described above, this cluster-based partnership has transformed from a regional cluster towards a cross-cutting ecosystem, spanning across national and international boundaries. The partnership has succeeded in creating value for its partners through the following success factors:

- Building consolidation and trust, by focusing national support and policy setting to a national cluster, attracting big international companies, promoting cooperation, and working against unnecessary overlaps (although some overlaps still exist between the national clusters).
- Sharing of knowledge with most of the country's actors in the sector, as well as all knowledge institutions engaged in food industry related education and research, so everyone is informed about the ongoing projects in the sector.
- Developing a financially sustainable model with income coming from various streams (national, regional, project funds, private funding, membership fees, service fees) secures continuity for the partnership.
- Creating value for society by fostering both industry needs and a research-driven culture, promoting a joint understanding of challenges, and exploring possible solutions. A clear understanding of the roles of the different parties in the partnership supports the value creation.
- Recognising and planning for future challenges, including further work on the cluster's own sustainable business model, considerations on an appropriate balance between

[60] Cluster Excellence Denmark. (2022). The Cluster Organisation. Available at: https://clusterexcellencedenmark.dk/the-danish-clusters/clusterorganization/?lang=en

member services and inclusion of non-members, and how to balance interests and needs of industry and academia to enhance the added value for all partners.

3.3 The Netherlands: Mission-driven innovation policies guide industry-led Top Sectors towards common goals

The Netherlands is one of the world's most open and innovative economies. The country is ranked 4th in the 2019 Global Competitiveness Index and 5th in the 2020 Global Innovation Index. The Netherlands' RD intensity was 2,29 % in 2020[61].

The Ministry of Economic Affairs and Climate Policy and its Enterprise and Innovation Department is responsible for innovation policy in the Netherlands. The Netherlands Enterprise Agency RVO, which operates as the Ministry's agency, is the main innovation and business financier. The innovation PPP models can receive funding from other sources as well, such as the Dutch Research Council NWO and the Academy of Sciences KNAW.[62][63]

Since 2011, the innovation policy has focused on the Top Sectors, where companies, the scientific community and central government work together to support innovation. The Top Sector public-private-research cooperation has been recognised as a global best-practice in streamlining activities and solving societal challenges. The nine sectors[64] were chosen based on the Netherlands' global strengths. The government has supported the activities of the Top Sectors with public funding to mobilise private funding.[65][66]

In 2019, the Dutch Government adopted a mission-driven innovation policy, agreeing on 25 missions organised under four main themes (energy transformation and sustainability, agriculture, water and food, health and well-being, safety) to tackle societal challenges and develop the economy. The missions also guide and help combining the activities of the Top Sectors.[67]

[61] OECD. (2022). Main Science and Technology Indicators. Available at: https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB#

[62] The NWO is the national research council of the Netherlands funding science that has both scientific and societal impacts.

[63] Government of the Netherlands. (2022). Enterprise and innovation. Available at: https://www.government.nl/topics/enterprise-and-innovation

[64] Agri-food, Information technology, Chemicals, High-tech systems and materials, Life sciences and health, Creative industries, Energy, Aerospace, and Logistics

[65] Roschier, S. et al. (2020). Uuden kumppanuusmallin valmistelu - selvitys verrokkimaiden malleista. Gaia Consulting Oy (background report ordered by the Finnish Ministry of Science and Education).

[66] Topsectoren. (2022). Available at: https://www.topsectoren.nl/

[67] Topsectoren. (2022). Innovatie. Available at: https://www.topsectoren.nl/innovatie

Each of the four themes has its own research and innovation agenda (KIA, Knowledge and Innovation Agenda). The financial resources are specified in the Knowledge & Innovation Covenant (KIC) which is a meeting between companies, research organisations and representatives of the administration. This allows both public and private partners to communicate their needs and expectations for each theme. [68]

For example, through the KIC 2020-23, the NOW invests €118M euros a year to fundamental and practical research in demand-driven public-private partnerships. Several partnerships are developed to answer to specific knowledge or development issues of the partners (public or private). Partnership budgets vary between 3 and 10 million euros, where the public funding is matched in cash by the partners and at least 30% of the total partnership funding is contributed by private parties.[69]

3.3.1 Breed4Food partnership – From competition to cooperation: shared interests inspire new partnerships

Basic operations and partners

- Consortium between 4 Dutch breeding companies and the University of Wageningen
- Cooperation was formalized when Top Sector –policy started
- Operates in strategic five -year periods, each of which will have its own partnership agreement
- All four companies are equal partners and provide equal amounts of resources
- The university doesn't invest funds but is a full partner
- The Dutch TKI and NOW finance activities and research
- Coordinator and freelance communicator were hired by the consortium to carry out day to day actions

Vision and justification for the model

- The aim of the consortium is to expand the position of partner companies on the world market and strengthen the scientific position of the research on the field
- In addition, it aims to create scientific breakthroughs that enable the sustainability of both business and society
- In the consortium, four competing companies have joined forces, leading to scientific and commercial results even tough two of the companies are competitors in the same field

Lessons learned for Finland

- Clear objectives and rules were defined at the beginning of the partnership
- The common goal is the development of information
- Companies have similar needs, enabling applications in all sectors
- None of the companies could use this much resources for the RDI alone
- Large investments, long -term commitment
- Hiring a Coordinator has improved communications internall y and externally

[68] Janssen, Matthjis. (2020). Post-commencement analysis of the Dutch 'Mission-oriented Topsector and Innovation Policy' strategy. Utrecht University.
[69] NOW. (2022). Partnerships (KIC 2020-2023). Available at: https://www.nwo.nl/en/researchprogrammes/knowledge-and-innovation-covenant/partnerships-kic-2020-2023

The Breed4Food consortium was formed in 2013 by the Wageningen University & Research (WAR) together with four Dutch animal breeding companies: CRV (cattle), Hendrix Genetics (turkeys, layers, pigs, aquaculture and traditional poultry), Topigs Norsvin (pigs), and Cobb Europe (broilers).[70] The cooperation between the companies has existed for a long time, but when the Top Sector policy was introduced, the actors decided to formalise the partnership. The consortium receives funding from the Dutch Top Sector Agri&Food and from the NOW.

Operating model

The partnership works in strategic periods. The consortium has a partnership agreement that is renewed every 5 years when the strategic period changes. The third strategic period of 2022-25 is currently ongoing.

All the companies in the consortium bring the same amount of cash and in-kind contribution to the consortium. Respectively, they have the same decision-making power. The WAR has full partnership rights even though they do not contribute with cash.

The consortium has a board which makes the ultimate financial decisions. The board has a representative from each of the five partners. The consortium working group makes an annual plan for each year that follows the strategic period's focus, and each industry partner leads a work package team.

Breed4Food has an acting manager who is responsible for the operational leadership of the consortium. The manager's role is to make sure that the internal communications, the working principles and vision, and the overall cooperation works in practice. The role includes management of possible tensions between the partners. The current manager is an external actor and brings a wide network and an "outsider" perspective to the partnership. The manager is paid by the consortium for the work hours of coordination, and in addition the consortium employs a freelance communication manager who is in charge of internal and external communications.

The Breed4Food programme focuses on the development of innovative research projects in five research areas. Partners of Breed4Food participate in national and international research projects together with other industrial partners, universities, and research institutes. The average duration of the granted projects is 4 years. [71]

The Dutch TKI (Top consortium for Knowledge and Innovation) has a model contract for all the PPPs on the intellectual property rights. In Breed4Food, the university always owns the IP rights of the invention. The licensing conditions include that every invention is discussed with all the partners and the partners can access the license for free.

The TKI and NWO are the main funders and have separate agreements with the consortium, with separate aims and scope. Half of the total funding has to come from the partners, and

[70] The Fish Site. (2013). Breeding Consortium Appoints De Geus as Director. Available at: https://thefishsite.com/articles/breeding-consortium-appoints-de-geus-as-director
[71] Breed4Food. (2021). Our affiliate projects. Available at: https://www.breed4food.com/affiliate-projects

from this 50 per cent contribution, half is cash and half is in kind[72]. On top of this funding, the companies in the consortium pay for the coordination and communications separately.

To exemplify this, the current agreement with NOW started in 2014 and cooperation is expected to continue until 2030. The four companies combined and the NWO have invested €1.5M each in the work, which aims to find more effective use of genetic information to make better predictions of animal characteristics. [73]

Vision and objectives

Breed4Food's goal is to enable scientific breakthroughs to solve societal challenges ensuring both sustainability and profitability. Furthermore, the consortium aims to expand the partner companies' position in the world market and strengthen the scientific position of the research centre. This is done by accelerating the innovation and impact of the companies' breeding programmes to enable more efficient production with fewer antibiotics and a better life for the animals. Environmental factors have also been a research topic, for example the environmental impact of different species in relation to their contribution to greenhouse gases, nitrate, and phosphate. [74,75]

The goal of the current strategic period, PPP Breed4Food III 'Accelerating genomic prediction' is to enable collaboration and strengthen the companies' position worldwide. [76]

The partnership's aims are reached by delivering new applied knowledge, methods, software, and tools.[77] In general, the consortium aims to develop the whole sector. According to the consortium, the partnership aims to increase the efficiency in the food chain, reduce the ecological footprint, minimise the use of antibiotics and contribute to food safety, better health and welfare of livestock.[78]

Actors and collaboration platforms

The partnership is a closed consortium formed by Wageningen University & Research and the four companies. However, the consortium funds projects of external researchers, who are invited to present their research proposals for funding. At least two research institutions must collaborate in each research project to bring new contacts to the companies.[79] By 2020,

[72] This is the procedure in all the PPPs.
[73] NWO. (2022). Breed4Food. Available at: https://www.nwo.nl/en/researchprogrammes/partnership/partnership-programmas/programme-breed4food
[74] NWO. (2022). Breed4Food. Available at: https://www.nwo.nl/en/researchprogrammes/partnership/partnership-programmas/programme-breed4food
[75] Hendrix Genetics. (2019). Breed4Food shares research on the environmental impact of animal breeding. Available at: https://www.hendrix-genetics.com/en/news/breed4food-shares-research-environmental-impact-animal-breeding/
[76] Breed4Food. (2022). Breed4Food PPP III. Youtube video. Published on 8 April 2022. Available at: https://www.youtube.com/watch?v=qZJJVJeIlKI
[77] Hendrix Genetics. (2019). Breed4Food shares research on the environmental impact of animal breeding. Available at: https://www.hendrix-genetics.com/en/news/breed4food-shares-research-environmental-impact-animal-breeding/
[78] Breed4Food. (2022). About Breed4Food. Linkedin. Available at: https://www.linkedin.com/company/breed4food/
[79] NWO. (2022). Breed4Food. Available at: https://www.nwo.nl/en/researchprogrammes/partnership/partnership-programmas/programme-breed4food

in the NWO-funded work, 27 researchers have worked for the consortium to develop tools and insights.[80]

Impact and values

The work of the consortium is periodically evaluated, both internally and externally. The recommendations of the external evaluation are used to plan the work for the next strategic period.[81]

The partnership's uniqueness comes from the fact that four competing companies have joined forces in the partnership. The co-operation has value for both the scientific progress in genetic research and the implementation of new technologies by the breeding companies. Alongside research results, the cooperation has resulted in better accessibility of skilled workers, as some of the researchers have transferred to the companies. [82] [83]

The partnership has already delivered a number of successful outcomes, both commercial and scientific. Breed4Food enables the key breeding companies in the Netherlands to engage in joint development of pre-competitive knowledge.[84]

Success factors for similar partnerships between competitors

The actors share a vision and a long-term strategic agenda, and they have agreed on an operation model. Compared to ecosystems and clusters, the partnership includes a limited number of actors. Success factors of this partnership have been:

- Defining a clear starting point and goals at the beginning of the partnership. This has helped in releasing tensions when conflicting interests occur.
- Forming the partnership between companies with similar needs. The new knowledge and technology produced can be applied in all industrial areas involved.
- Unlocking opportunities that the companies could not gain individually. The companies are major players in the industry but still not big enough on their own to use the latest technologies.
- Agreeing on clear rules, as the companies are competing in some respect, although they are mostly complementary to each other.
- Setting the aim to develop knowledge together instead of guarding own rights, which is helped by the sector's relatively open culture in the Netherlands.

[80] NWO. (2022). Breed4Food. Available at: https://www.nwo.nl/en/researchprogrammes/partnership/partnership-programmas/programme-breed4food
[81] Breed4Food. (2021). External review Breed4Food II. Available at: https://www.breed4food.com/news-breed4food/item/33-external-review-breed4food-ii
[82] NWO. (2020). Breed4Food Programme day: A review of Partnership https://www.nwo.nl/en/news/breed4food-programme-day-review-partnership-animal-breeding
[83] Wageningen Livestock Research. (2020). Bread4Food STW Partnership Day. Youtube video. Published on 25 June 2020. Available at: https://www.youtube.com/watch?v=Ac2u6wQ7sbU
[84] Wageningen University & Research. (2022). Breed4Food. Available at: https://www.wur.nl/en/project/Breed4Food-5.htm

- Recognising that generating new knowledge requires high investments and long-term commitment in RDI.
- Treating the cooperation as a community – with social events and other ways of bringing people together.
- Acknowledging the manager's crucial role – it is quite unique that a limited consortium of this kind hires an external manager.

3.4 Sweden: Strategic Innovation Programmes develop solutions to global challenges

Sweden tops the 2021 European Innovation Scoreboard and the Stockholm region is recognised as the most innovative region within the EU. Sweden's RD intensity was 3,53 % in 2020.[85]

In Sweden, the Ministry of Enterprise and Innovation leads the innovation policy. The main research and innovation funding agencies are Swedish Research Council (basic research), the research council for sustainable development Formas, the Swedish Research Council for Health, Working Life and Welfare (Forte) and the innovation agency Vinnova. In addition, the Swedish Energy Agency funds energy-related RDI.

The strategic innovation programmes (SIP) aim to improve Sweden's ability to develop solutions to global societal challenges by increasing international competitiveness and fostering closer cooperation between the various actors in the thematic areas of strategic importance for Sweden. The programmes are based on strategic research and innovation agendas that were developed through a participatory stakeholder approach in 2012-16. A total of 17 SIPs have been established since 2013. Vinnova, The Swedish Energy Agency and Formas jointly fund the SIPs so that one of the agencies is the responsible principal funder of each of the programmes.[86]

Under each SIP, companies, research institutes and other organisations jointly develop products and services for the future. Any organisation involved in development of the theme can apply for funding. Most participating companies in the programmes are SMEs. The programmes can receive funding up to 12 years. One half of the funding comes from the government and one half from companies and participants.

In addition to funding, the SIP services include monitoring thematic areas, training, career support, and disseminating information and the results of the programme's research projects to enterprises through workshops and events.

[85] OECD. (2022). Main Science and Technology Indicators. Available at: https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB#
[86] Vinnova. (2021). Strategic innovation programs: cooperation for sustainable innovation. Available at: https://www.vinnova.se/en/m/strategic-innovation-programmes/

Each SIP is led by a programme office and part of the funding will go to the coordination of the programme. The programme has an external programme manager and a board that consists of representatives from participating companies and research institutes, a representative of the responsible funding agency, and, where appropriate, other stakeholders.

The programmes organise open calls, and also fund strategic projects that are decided by the Board of the SIP. The scope of the calls is developed by the SIP and funding to projects is applied from the principal responsible funding agency of the programme.

The programme term is six years at a time, with possibility for a second term extension. The programmes are evaluated every three years.

3.4.1 RE:Source – Guiding Swedish business and society towards circular transition

Basic operations and partners	Vision and justification for the model	Lessons learned for Finland
• Consortium between 4 Dutch breeding companies and the University of Wageningen • Cooperation was formalized when Top Sector –policy started • Operates in strategic five -year periods, each of which will have its own partnership agreement • All four companies are equal partners and provide equal amounts of resources • The university doesn't invest funds but is a full partner • The Dutch TKI and NOW finance activities and research • Coordinator and freelance communicator were hired by the consortium to carry out day to day actions	• The aim of the consortium is to expand the position of partner companies on the world market and strengthen the scientific position of the research on the field • In addition, it aims to create scientific breakthroughs that enable the sustainability of both business and society • In the consortium, four competing companies have joined forces, leading to scientific and commercial results even tough two of the companies are competitors in the same field	• Clear objectives and rules were defined at the beginning of the partnership • The common goal is the development of information • Companies have similar needs, enabling applications in all sectors • None of the companies could use this much resources for the RDI alone • Large investments, long -term commitment • Hiring a Coordinator has improved communications internall y and externally

RE:Source is one of the Sweden's 17 Strategic Innovation Programmes (SIP). The programme runs from 2016 to 2022, with a possibility for extension for another six years. RE:Source is led by RISE Research Institutes of Sweden in collaboration with Chalmers Industritekinik.[87]

Operating model

[87] RE:Source (2022). About RE:source. Available at: https://resource-sip.se/om-resource/

RE:Source is an open ecosystem-based partnership with a membership model, where joining as a member is free of charge and most activities are open also to non-members. RE:Source's activities can be divided into four categories: business development, education, internationalisation and disseminating results.

At the time of this study (2022) the partnership has more than 100 members from big industry, SME's and research organisations. They form a membership forum which meets annually to decide the goals of the partnership and to accept new members. It also selects the board of RE:Source. The board consists of representatives of members from industry, research and municipalities, with emphasis on industry.

The board governs the activities and takes decisions on strategic focus and activities of the partnership. The board appoints a strategic council of experts that support the strategic development of RE:Source. The daily operations are managed by a programme office with the key staff of two programme leaders (one from RISE and one from Chalmers Industriteknik) and two communicators[88] .

The programme is primarily funded by the government through the Swedish Energy Agency. Funding covers both the coordination of the programme, and project activities.

RE:Source finances two types of projects:

- Strategic projects that find research-based solutions to RE:Source's strategic questions. Strategic projects are decided by RE:Source's board. These projects must have several partners and benefit the entire industry, not only an individual company.
- Open calls for proposal that go through the Energy Agency. Most of the funding is distributed through open calls. RE:Source is responsible for launching the funding calls, deciding the funding criteria as well as the budget. The Energy Agency reviews the submitted applications and makes the funding decisions in line with its general conditions for publicly funded projects. Project funding is divided 50/50 between public and private contributions. Companies can also contribute in kind with e.g. project time.

Projects are usually funded for three years divided into one-year intervals. Most projects are run by research organisations with industrial partners. RE:Source sets up a support programme for successful projects including communication, matchmaking, business coaching and international networking. RE:Source provides also smaller grants for short-term projects (maximum of 6 months) outside the main project calls for laboratory and technical tests.[89]

By 2022, around 200 projects have been funded under the programme. In total, the Swedish Government has allocated around €5M per year to various projects through RE:Source[90].

[88] RE:Source. (2019). A brochure. Available at: https://resource-sip.se/content/uploads/2019/08/broschyr-etappberattelse-till-webb.pdf
[89] RE:Source. (2019). A brochure. Available at: https://resource-sip.se/content/uploads/2019/08/broschyr-etappberattelse-till-webb.pdf
[90] RE:Source (2022). About RE:source. Available at: https://resource-sip.se/om-resource/

Vision and objectives

RE:Source started as a waste management initiative, which characterised both activities and members of the partnership at the beginning. Members were mostly private and public waste companies.

As with the other SIP's the vision was based on a strategic research and innovation agenda that was developed through a participatory stakeholder process. As the operating environment and understanding of circular economy, as well as national and European policies, rapidly developed, the vision was upgraded and broadened to grasp the sustainable use of resources from a circular economy perspective. The current vision is to make Sweden a frontrunner for material use within planetary boundaries by 2030[91]. The new vision has also widened the membership base to cover more diverse actors from academia, business, and public sector. Public waste management companies are still at the heart of the partnership.

Actors and collaboration platforms

RE:Source is an open ecosystem in the sense that any organisation can take part in projects and other activities. It defines itself as a 'national innovation arena' that works on five platforms: innovation, demonstration, knowledge, internationalisation, and competence development. The main collaboration platforms are facilitated by the programme office, in close collaboration with the leaders of the strategic projects that play a significant role in advancing the cooperation.

Impact and value

The progress of RE:Source is monitored by indicators linked mostly to the governmental funding. In addition, membership surveys have been done.

RE:Source projects have evolved through the years from academia-led projects into more practical in nature. Research organisations are the biggest beneficiaries of the funding, but companies unlock useful services like business development, incubator services and international networks.

The progress of RE:Source is evaluated externally every third year on behalf of the funding agencies. After the first six years of operation, a more extensive evaluation was done in 2000, which sums up that RE:Source has succeeded in engaging key actors in the activities and had value for the participants. Due to the broadness and complexity of its domain, it still has some work to do to have a significant impact the national innovation system.[92]

Success factors for similar partnerships

Based on its open collaboration with joint vision the RE:Source could be identified as an ecosystem partnership. Furthermore, the change of vision from waste management to

[91] RE:Source (2022). About RE:source. Available at: https://resource-sip.se/om-resource/
[92] Tobias Fridholm, Jonas Niki Hugosson, Katarina Ekeroot – Sweco, Tomas Åström, Josefine Olsson, Sebastian Eriksson Berggren, Jonatan Ryd, Vera Stafström – Faugert & Co Utvärdering/Technopolis Sweden och Erik Arnold – Technopolis Ltd. (2021). Six-year evaluation of the strategic innovation programme RE:Source. Vinnova Rapport VR 2021:14.

circular economy showcases the dynamic nature of the collaboration. Success factors of this partnership have been:

- Keeping the vision relevant to the participants, funders, and the broader society by successful upgrading and broadening the scope into circular transition in pace with changes in the operating environment.
- Ensuring a close and good cooperation with the funding organisations when it comes to focus and scope of funded activities.
- Establishing a strong programme office that can offer the partners various services, e.g. assistance with funding application processes and different administrative tasks, which helps especially SME's to participate.
- Managing a sufficient variety of funding, ranging from open calls to strategic projects, and also flexibility for small scale testing and development, ensuring industry relevance of projects by 50% own funding requirement

3.5 Bilateral industry-academia-partnerships

Basic operations and partners	Vision and justification for the model	Lessons learned for Finland

• Finnish university and the large international specialty chemicals company
• started in 2015 and is ongoing
• Patent exploitation forms the foundation for the partnership
• The roles in the partnership are clearly defined
  • The company leads the partnership and is responsible of the testing, piloting and scale up activities in its own facilities
  • The university researchers do applied and sometimes even basic level research towards the joint direction and suggest new research areas
• The company markets the innovation, but the university looks for Finnish company collaborators as end users
• The partners work in a tight interaction with bi -weekly meetings on the progress of the work
	• A joint goal of commercialising the research results into profitable business forms the foundation for the partnership
	• The company was looking for new business and RDI platforms. The university had new patents and was was looking for an industry partner to commercialize them
	• The partnership was innated by the university and it was established after a successful proof -of-concept testing on the patented research results
	• Two new products commercialized, and some more in innovation pipeline
	• Company benefits from the researchers' vast industry network in Finland and University has gained international networks
		• Proof of concept as early as possible
		• Market needs as the start to the partnership answered by the research
		• A phase-by-phase approach gives freedom to research ad decreases the risks for the industry partner
		• Mutually understanding the scale of the project and what kind of investments are needed for commercialisation and scaleup
		• Being able to justify why the research results present true innovation potential instead of just being something new

This case complements the previous chapters by describing the kind of bilateral partnerships that exist between Finnish universities and international industrial partners. In the Meissner framework, this is a bilateral partnership, driven by the interests of the two partners.

The collaboration between the Finnish university and the large international specialty chemicals company (that does not have a formal presence in Finland) started in 2015 and is

ongoing. Besides research activities, university research infrastructure is also actively used as part of the collaboration. The partnership discussions started when the company heard about the research results from the university presented in a conference. Patent exploitation forms the foundation for the partnership.

Operating model

The roles in the partnership are clearly defined. The company leads the partnership with the aim of commercialising the results and is responsible of the testing, piloting and scale up activities in its own facilities. The university researchers do applied and sometimes even basic level research towards the joint direction that is in line with the company needs, and also suggest new research areas. The company is the primary partner to market the innovation, however, also the researchers are actively participating in this work and for example finding possible Finnish company collaborators as end users to the product to be commercialised from their own networks. The partners work in a tight interaction with bi-weekly meetings on the progress of the work. The research results from both academia and business feed into each other's work in an iterative process. This ongoing process is also crucial in meeting the value expectations of both partners.

Patents and IPR lay the foundation to the partnership. From the university perspective, when initiating the partnership search process for research results, an invention disclosure or a pending patenting process gives adequate support when discussing the terms for the partnership. For the company the invention disclosure or a (pending) patent gives proper idea of the innovation and makes the initial business opportunity evaluation easier. In terms of research contracting, even if for the research activities done between the company and the university, the patent incentivises and motivates the researchers to work towards the joint direction determined by the company business needs.

The partnership is entirely funded by the company partner. The joint contract is renewed every year, but the underlying patent is the glue to motivate for long term partnership. The active role of the company in leading the partnership guarantees that the research stays on track from the funder's perspective, a basis for continued renewal decision of the contract. The weekly meetings ensure effective decision making and give the possibility to change plans and priorities swiftly.

Vision and objectives

A joint goal of commercialising the research results into profitable business conducted by the company forms the foundation for the partnership. When initialising the partnership, the company was looking for new business from new product platforms and RDI platforms. The university, after having patented some of its research results, was looking for an industry partner to commercialise its research results but also to use the partnership to fund and conduct interesting and motivating mission-oriented basic and applied research. The initial idea and proposition to start the partnership came from the university. The partnership was established after a successful proof-of-concept testing on the patented research results. The joint goals are verified at least annually when renewing the contract, however, due to tight and frequent interaction between the two parties, changes to activities can be done also outside of the contract renewal process.

The partnership is strongly guided by the needs of the company, which reflect the market needs. Commercial needs form the decision-making basis for continued joint activities. At the same time, from the researchers' perspective the research activities are also bottom-up. Mutual trust created by joint activities and continuous cooperation has enabled a situation where the company allows the researchers to conduct the research according to their vision, and to suggest new research lines. This has over time become something that the company is even expecting. This positive partnership dynamic forms the basis for a long-term commitment even if formally the results are evaluated and contract continued on a yearly basis.

Actors and collaboration platforms

The company and the university are sole actors in this partnership, and it is not attached to any other platform or ecosystem. As such, it conforms to the linear commercialisation model from university research to new business of one large company, where the company is carrying all the risks associated with the research collaboration and commercialisation activities. The initial patent is the basis of the commitment in the partnership for both parties although the collaboration activities have become more versatile during the collaboration.

Formally, the partnership is based on two separate contracts. The actual work is done under a contract between the company and the university stating the terms for funding the work and using the university research facilities. This contract forms the basis for the university to sell the use of its research infrastructure and to create mission-oriented research work for the staff. For the company this first contract unlocks the opportunity to use the research infrastructure and expertise. Another contract covers the initial patent and is signed between the company and the individual researchers involved in this patent. This second contract motivates the company to commit to the research to gain access to the right knowledge basis to support the new business creation. From the researchers' perspective, the second contract incentivises them to commit to the joint research and commercialisation goals with the company partner.

Overall, the work is guided through the joint frequent working meetings between the parties more than through the formal contracts.

Impact and value

The partnership has been successful for both parties according to their impact and value expectations. The company has already commercialised two new products, and some more are in their joint innovation pipeline. The company has been able to benefit from the researchers' vast industry network in Finland when further searching for end users to the commercialised products. For the university and its researchers, the long-term partnership with a company that allows for risk taking as part of the joint research activities and shows adequate patience needed in deep tech research before moving to the next phase, is both beneficial and motivating. The benefits to the university cover, for example, direct research funding, international recognition, and attraction to the international science community. These factors lead to new opportunities in research and partnerships. For third parties, such as Finnish potential end user companies, the partnership has helped to find new business collaboration and opportunities.

The key to creating impact and value in the partnership lies in two core know-hows. The first is listening to each other in such a way to properly learn to understand the needs of the other party. The second is to be able to communicate the results of the work in a way that the business benefits are clear for the decision makers in the company and of the needs such that they are clear and motivating to the researchers. These two core know-hows are mutually complementary.

Success factors for similar partnerships

Success factors of this bilateral partnership have been:

- Ensuring proof of concept as early as possible to lay a proper foundation for the partnership in communicating the potential business benefits to the decision makers at the company.
- Taking market needs as the start to the partnership but giving appropriate room for research in defining the ways to answer to the need. A phase-by-phase approach gives freedom to research and at the same time decreases the risks for the industry partner.
- Mutually understanding the scale of the project and what kind of investments are needed for commercialisation and scaleup – things look different in a test tube than in a final product.
- Being able to justify why the research results present true innovation potential instead of just being something new.
- Believing in innovation, also from the researchers' side – if the inventors of an innovation do not believe in it and do not want to invest time and resources in it, against the possibility for receiving benefits when successfully commercialised, the foundation remains weak for long term partnership.

3.6 Summary of key practices enabling success in partnerships

Operating model

- A good practice is to set up local offices for the partnership (e.g., in Denmark the cluster has 10 local offices) jointly with municipality funding. This can lower the threshold for smaller companies to take part in the cluster's work.
- Hiring both an outside coordinator and a communications person to manage the consortium's day to day work and relations outside the consortium (e.g., Breed4Food) helps to make the consortium more visible to the society at large.

- Legal status as a limited company is proven to be a good practice in some cases (e.g., the ABC Centre in Austria for whom the main owner of the company is the association for the advancement of blockchain technology).
- In case of international participation and forming international connections, examples of good practices are to allow international companies to join into the partnership, or to have sister clusters in other countries.
- Public funding is in mostly only available for companies operating in the country in question. This does not seem to be a hinder for interest to join since companies see for example possibilities to create networks with the science community and SME's as valuable offering from the partnership.
- Good practice is to have strong links to EU level activities for example in the format of joining actively EU projects or linking the management structure of the partnership to an EU cluster programme.

Vision

- National level decision making on themes for partnerships are seen to foster solution development for grand challenges and growth and competitiveness of the country. For example, Austria, Denmark, the Netherlands, and Sweden all have made decisions on 10-20 themes underneath which to support in a structured way ecosystems and clusters.
- Parallel to national level theme selection, inside the programmes the concrete vision to steer the implementation is jointly defined and agreed upon by the members (with clear membership in the partnership).
- Strategic goals can be tackled by steering funding for strategic projects that benefit the entire ecosystem and by allowing parallel a different funding stream for projects developing solutions more specifically to one or few industry partners (e.g., in Sweden).

IPR

- Best practices for IPR handling vary according to partnership needs. For example:
    - The entire partnership can be founded on new IPR sold to a company for commercialization. The researchers can gain income linked to the commercialisation of the IPRs.
    - The university can own the IP rights of the invention (e.g., Breed4Food) and for example determine that the licensing conditions are jointly agreed upon among partners. Sometimes the access for license can also be free for all partners.
    - The IP rights can remain with the participating company (e.g., ABC participation model in Austria), but the centre/coordinating body can use the technology for research purposes.

Funding

- The funding of the partnerships consists of a mix of private and public funding. Membership fees for companies allow for participation in the partnership (e.g. In Denmark the companies pay a membership fee based on the size of the company (about 100-7000 € per year), in Austria companies define active level of participation and pay accordingly with the principle the more use of services the higher membership fee, in the Netherlands equal fees for all companies).
- Services provided by the coordinator entity (sometimes also to non-members) include for example EU project proposal work, incubator and lab services. These services can be included in the membership fee or can form an additional income stream for the partnership entity.

4 Analysis

4.1 Strengths and weaknesses of partnership models

Following the main objective of the report, the strengths and weaknesses of three partnership models, as according to the, in this study used, analysis framework are analysed from the perspectives of industrial renewal and growth. In a rapidly changing competitive business environment, acting alone or relying on slowly changing and long-standing networks can no longer guarantee success in global markets. Besides, solving extensive systemic challenges requires problem-solving by a wide range of actors, which has moved the public-private-partnership models towards multi-actor involvement.

Table 2. Strengths and weaknesses of the partnership models.

Type of partnership	Strengths	Weaknesses
Bilateral relationship	Long-term relationships between a university and an industry actor enables competence building and education of future employees (at the regional level). Results are directly exploitable by individual actors, for instance IPR access may be a driving force.	The informal nature of the collaboration may cause challenges such as discontinuity; targets are not aligned at organisational level. Targets are actor-specific and the impact on the innovation system level remains ad hoc and short term.
Project based	Short- or mid-term time horizon, requires only commitment to the project (required investment of resources remains limited). IPR (both input and output) is clearly defined; typically according to project funding rules.	Collaboration is built on existing competences and roles; disruptive/system level innovation remains limited Due to the limited duration, co-development between the parties (various actors with different intentions) remains scattered, there is no time to build a shared vision (or even a shared understanding/language).

Type of partnership	Strengths	Weaknesses
Clusters and ecosystems	The collaboration is guided by a shared vision and longer-term commitment of parties. Equal rights to outcomes and/or shared resources (contractual relationship). The collaboration enhances the RDI capacities and builds future competitive edges aligned with a national strategy à potentially high impact on the innovation system, economy and society.	Complex relationships and conflicts, due to many partners representing different capabilities and different interests; closed models (clusters with a legal entity) are not dynamically evolving, whereas more open ecosystems may end up being too loosely coupled. Difficulties to agree on IPR due to the iterative nature of collaboration targets and the variety of utilised funding instruments. Impacts and value are typically generated in the long term and poorly aligned with shorter-term agendas of industrial actors; especially SMEs have challenges to commit as collaboration is resource intensive in the short term.

Bilateral relationships are most typically based on personal relationships and thereby informal in their nature. Moreover, bilateral relationships usually co-exist within other partnership types, as well, as stronger nodes that bring the network together. An example of a more formal bilateral RDI partnership is presented in chapter 3 in the case study between a Finnish university and their industry partner. The motivation for bilateral partnerships between universities and industrial actors is usually that it enables relevant competence building for the university and training of future employees for the industrial actor. In such cases, the value of the partnership is delivered mostly at a local or regional level and the bilateral partnerships have only limited impact at the national innovation system level. In addition to academia-industry partnerships, the literature on innovation relationships broadly explores partnerships between established companies and start-ups (or entrepreneurs) as well as customer – supplier co-operation.

Compared to bilateral relationships, project-based collaboration involves a broader variety of actors. Participation in such collaboration is often rather ad hoc. The results of project-based collaboration remain scattered and therefore their impact on the national innovation system is often quite limited. Furthermore, collaboration that is built on existing competences and roles has a limited impact on disruptive, system level innovation. The time horizon for

individual collaboration remains short-term, but national programmes and funding instruments may influence the selection of topics in a medium-term perspective. The benefits of project-based collaboration are usually that individual partners have the freedom to decide about their participation. An example of a collaboration of this type is given in chapter 3, in the case study of the Breed4Food consortium in the Netherlands, which is a rather project-based model, although the core partnership members share a medium-term research agenda.

Digitalisation and servitisation have already changed and will continue to shape our operating environment and the ways in which cooperation occurs. Accordingly, the third partnership model, clusters and ecosystems, have gained more interests within both academia and industry. Clusters and ecosystems are differentiated by their level of openness. Clusters are usually more closed-type collaborations that may form a legal entity owned by the partners. Ecosystems are by nature more dynamic and open, which implies more complex coordination. One challenge of ecosystems' collaboration lies in the significant variation in the timespans of involved actors' decision-making and thus in the attainment of set objectives. Due to their contractual relationships, clusters are more easily controlled and on the other hand their development paths are not as dynamically changed. The case studies of chapter 3 provide several examples of clusters and ecosystems. The Swedish RE:Source can be classified as an ecosystem where the structure is open to everybody and the biggest glue between different organisations is the shared vision that the participants themselves have a big role in creating, whereas the Danish Food and Bio Custer, while it is open for a vast number of members, provides some of its services to members only. From the coordination perspective both models have similar challenges over their lifecycle, i.e. balancing between private and public funding and between a research-oriented and an industry-driven focus. The case-example of the Danish Food and Bio Cluster presents an important challenge that is shared by many clusters. The development of a sustainable business model, including an appropriate balance between member services and open services, and balance between the interests and needs of industry and academia, is a common challenge in similar clusters.

As discussed above, all three explored partnership models have strengths and weaknesses. There are key factors that influence success in all models.

First, every partnership requires a vision, a reason to stay together and continue the development. In bilateral partnerships, the vision might be shared informally at the personal level, and in project-based collaboration the vision is usually only loosely coupling the actors. Multi-actor partnerships like clusters and ecosystems require a vision that can be transparently shared among actors.

Second, to ensure sufficient continuity of collaboration, resource investments are required from all parties. Here again decisions on resource investment in bilateral partnerships remain with the individual partners, whereas the other partnership models typically call for public funding. In project-based collaboration public funding is applied from different sources and there is limited (if any) funding for activities between projects. Clusters and ecosystems that have longer-term shared agendas can face challenges in balancing public and private investments over the lifecycle.

Third, all partnerships need coordination to fulfil their vision. There are different possibilities for organising the coordination and the role of the coordinator can focus on a whole scale of activities, from project administration to vision building. The importance of coordination is highlighted within the multi-actor partnership models, where knowledge needs to flow in a many-to-many relationship without overloading parties with unnecessary information.

Finally, a clear measurement of impact is as important as the shared vision to ensure that value is created to all involved actors. Like other success factors, the evaluation of impact is more complex in multi-actor settings. In bilateral relationships that are based on informal, personal connections, impact evaluation is rarely done together, although it could support the development or renewal of the partnership.

4.2 Four claims for successful innovation partnerships

The following four claims act as analysis summary from the benchmarks that were looked at in this study. They aim to highlight the main aspects and lessons learned from the benchmark countries and as such form the basic conditions that should be guaranteed to enable a strong and competitive innovation system for Finland. They also aim at summarizing justification for further development of the existing Finnish innovation system.

The four claims for successful innovation partnerships are:

1. A successful partnership requires bridging together industrial needs and a sufficiently ambitious research agenda to a shared vision. Actors committed to partnerships (companies, research institutes, funders) must be prepared to take the risks involved in the financial investment.
2. Different funding instruments should create a clear pipeline that creates long-term funding opportunities in different phases of a dynamic non-linear innovation process. Funding should be provided to both RDI activities and collaboration.
3. Sustainable partnerships need coordination to fulfil their vision. The role of the coordinator in the partnership can be both to create common roadmaps for partners and projects and to provide services, infrastructure, and expertise.
4. To accelerate partnership impacts, all actors in the partnership need to benefit from and add value to the partnership. It is important to make visible the different value expectations. In practice, concrete and comprehensive impact indicators integrated in the strategic management of partnerships are a necessity.

4.2.1 The Vision Claim: a need for ambition & risk tolerance

A successful partnership requires bridging together industrial needs and a sufficiently ambitious research agenda to a shared vision. Actors committed to partnerships (companies, research institutes, funders) must be prepared to take the risks involved in the financial investment.

A shared vision describes the reason for partnership to exists and therefore it is crucial for successful collaboration**.** It also puts emphasis on the way in which the strategy is built (e.g. interaction between top down and bottom up perspectives) as well as the time horizon for reaching the common goals. In all innovation partnership models, there is a need to make visible how and by whom the shared vision is configured. In other words, the engagement of all parties in vision building and aligning the strategic intentions is a baseline. The public-private partnerships face special challenges in forming visions that bridge together industrial needs and a sufficiently ambitious research agenda. A shared vision helps the parties in going in the right direction, together. It is important to note that the vision may change during the existence of the partnership, when the business environment or the needs of the society transform.

RE:Source's vision has expanded during the timespan of the ecosystem, helping it to remain timely and attracting new partners and funding sources. Upgrading the vision together with the partners as the society changed to view circular economy more as a systemic transformation than as pure waste management was key to the continuing success.

In order to align the strategic intentions, it is important to identify different expectations. Building a shared vision requires making visible the different objectives of different organisations. Based on a shared vision and roadmap, the parties of the partnership can agree on roles and responsibilities. One of the key motivations for partnerships is the risk sharing, but that requires transparency of roles and responsibilities of the involved parties. As a starting point, it is important that IPR rules are pre-defined, as companies are not willing to take risks if the ownership of the potential IPR is not clear. Therefore, the ownership and use of the outputs must be agreed in advance (this is also in accordance with most public funding conditions).

Breed4Food companies can, to a certain extent, share research results, which helps to build a shared vision on which research topics to advance.

Longer-term national innovation partnerships (such as clusters and ecosystems) also have lobbying power, and through future-oriented agendas shared with a network of actors the partnerships have better opportunities to influence European research agendas and e.g. regulatory development.

The third crucial dimension of vision building of public-private partnership is the needs of the Finnish society. This is particularly important in the era of grand challenges such as

digitalization and the green transition. Thus, the partnerships should enhance interaction between top-down and bottom-up perspectives to build strategic agendas and future competitive edge. In general, the society represented by public governmental bodies can be expected to provide the general mission driven aims and needs for the partnerships. The research parties can best assume the role of guiding the partnerships towards ambitious new possibilities. Industry has the knowledge of the market and its needs.

In summary, a shared vision that brings together a general mission, an ambitious research agenda and future business opportunities is the glue for successful partnerships. This requires a collective understanding of risks. Furthermore, the rules of partnerships should be clearly stated and ensure flexibility, i.e. possibility to iterate between different paths and finding new ways forward.

4.2.2 The Funding Claim: a need for a clear pipeline

Different funding instruments should create a clear pipeline that creates long-term funding opportunities in different phases of a dynamic non-linear innovation process. Funding should be provided to both RDI activities and collaboration.

There is a need for a visible and understandable funding pipeline that covers the entire dynamic innovation process and supports the long-term vision of the partnership**.** Long term funding with adequate funding volumes is a prerequisite for ensuring that companies, research organisations and other relevant parties commit to the entire pipeline, taking the innovation from research to commercialisation and in the end, to the creation of business value. This pipeline can sometimes, especially in the case of deep tech innovations that are especially important to the green transition, be a rather long journey, and thus visibility on the continuation is a key factor to enhance commitment.

Long-term funding is not necessarily dependable on the duration of a particular funding instrument, nor does it imply continuous public funding without control points. The key question is how to ensure that adequate funding is available both for actual RDI activities and activities that enable and enhance broad innovation collaboration and partnerships.

To ensure this, the different financial instruments should be streamlined to form a visible and continuous funding pipeline, where the different funding sources and instruments complement each other and are dynamically available for the specific needs along the flow in the innovation funnel. The different instruments cover both private and public sources on national, regional and international levels.

> Getting funding from local governments has helped with keeping the actions of Food and Bio Cluster relevant in the communities. Having regional level funder can help connecting actors that do not have a national presence to take part in national clusters.

A clear understanding of the funding flow both on the receiving and the distributing side is needed. For example, public funding might be the most adequate alternative at the early research dominated stages where the risks and uncertainty is high. When climbing up the TRL ladder, a more versified funding landscape will function better, with an increasing

importance to ensure coverage also for scale up activities both from public and private (and even joint) sources. It would be beneficial already from the beginning of an innovation partnership to build a strategy for the gradual increase of private funding when proceeding into the realm of development activities. It needs to be recognised that there are also very well-functioning and relevant value creating innovation partnerships that are fully financed by private companies. A relevant question might be, whether public funding is funneled to the most relevant innovation activities, or what should be done differently to ensure optimal impact of public funding?

The main question with EU funding is how it could be leveraged better in innovation partnerships and how to increase its attractiveness as a funding source alongside national public funding. At its best the EU and national funding would complement each other in accelerating innovations in the pipeline and steering the activities to shared strategic directions. Innovation partnerships could have a role in increasing the quality of applications and success rate, especially as EU funding is not only about the funding, but also provides valuable networking, possibilities for scale up, and pathways to having an influence on EU development.

4.2.3 The Ways of Working Claim: a need for coordination

Sustainable partnerships need coordination in order to fulfil their vision. The role of the coordinator in the partnership can be both to create common roadmaps for partners and projects and to provide services, infrastructure, and expertise.

While it is true that all functioning partnerships need someone to handle the administrative coordination, not all partnerships need a designated, let alone external, coordinator. Especially partnerships with just a few partners can usually decide on the division of labour amongst themselves without any outside input. In either way, the coordination needs allocated resources. Coordination by the partners can mean that one of the partners, either a research institution or a bigger company, like in the Business Finland -funded Veturi-partnerships, takes the lead in coordination. In all these cases the key to success is trust. The partners need to trust each other enough to let one partner who has stakes in the partnership take command of the administrative and coordination tasks.

> "When the cluster organisation provides a good project manager, our actual work can be focused on the project. This has helped us to run smooth delivery of projects."
>
> - Industry participant in a cluster

As a rule of thumb, the bigger and more complex the partnership, the greater the need for an external coordinator. An efficient coordinator ensures smooth progression towards a shared vision and ensures that participants reach the individual objectives for the partnership. A good coordinator acts as an interpreter between industry and academic partners to fulfil the needs of both sides. In more sustainable and structured ecosystems and clusters, the coordinator can provide different services like project management, business development, internationalising and incubator services to partners that have different needs outside individual projects. Designating the burden of administrative tasks and project management tasks to an external coordinator can leave more room for the other partners to focus on actual

innovation activities. In best case scenario, the coordinator can serve as an expert both on innovation partnerships and on the management. An external coordinator can help different partners with their varying value expectations to find common ground. At the end of the day, all partners, the coordinator included, have to share the common vision and mission and goals for the partnership.

When the role of each partner in a closed and limited partnership is well defined and there is adequate trust between the partners, there is no need for a separate or external coordinator, like in the case between the Finnish university and their industry partner.

In Finland, one commonly recognised problem is the ambition to create 'one size fits all' -models and structures. This typically creates a situation where the innovation partnership model fits only certain types of partnerships. To avoid this pitfall, there cannot be any one way of perceiving the role of the coordinator. Each partnership will need to figure out their needs separately. This does not make redundant an undertaking to increase the capabilities of current coordinators in the field so that they can provide their services to even larger and more diverse needs of the Finnish innovation community. A common pitfall is to fixate on certain structures where coordination becomes a purpose of itself, as this can create unhealthy incentives for coordinators to create more work for themselves. Coordinating partnerships should be seen as a skill that requires certain capabilities. It is possible to both increase the capacity of organisations that aim at coordinating partnerships and increase the capacity of partnerships where the partners take care of the coordination themselves. On some occasions, it is necessary that the coordinator has extensive understanding of a specific industry to be able to help the partnership in creating and executing a shared vision. This means that in some cases the coordinator has to come from the industry and cannot be an external facilitator.

4.2.4 The Impact and Added Value Claim: concrete and comprehensive indicators are needed to make different value expectations visible

To accelerate partnership impacts, all actors in the partnership need to benefit from and add value to the partnership. It is important to make visible the different value expectations. In practice, concrete and comprehensive impact indicators integrated in the strategic management of partnerships are a necessity.

In a partner network it is natural that different types of organisations have contradictory expectations on the value created. The value of the partnership stems from the complementary nature of the actors involved: different parties have joined forces to create something that no single actor in the system would be able to create. However, it is important that all actors benefit from and add value to the partnership. To ensure the value to all parties, actors need to be involved in a partnership based on their own interests and to transparently communicate their organization specific value to the other partners.

For businesses, the cluster can provide access to both knowledge and research, and networks to both national and local businesses due to its decentralised structure. It can also provide access to international networks that provide benefits for both academic and business partners. The national cluster cooperates with sister clusters internationally and allows companies from different countries to become members; it also helps members to attract international funding. SMEs and start-ups benefit from clusters matchmaking services and incubators.

Because value expectations are based on the rationale and core tasks of each organisation, impacts cannot be made visible using one-size-fits-all indicators. Instead, it is important to align the success indicators in accordance with the value expectations of each party. In practice this necessitates concrete and tailor-made indicators to make visible the value to companies, the research community (including universities and research and technology organisations RTO) and the broader society (incl. economy). The benefits to the companies come for example from developing new products and services, generating new value networks, finding new business opportunities and gaining growth in business and in export. Besides new research findings and high-level scientific publications, benefits to the research community come for example from increases in direct research funding, gaining international recognition and attracting international talents to Finland, which again open for new opportunities in research and partnerships globally. From the perspective of the economy and the society in general, indicators are needed to make visible the changes and impacts brought by the partnership on a system level. Indicators that describe change on a system level are for example: renewal of markets and industries, new jobs created, attracting new global actors and investments to Finland, as well as productivity and global competitiveness.

Besides organisation-specific benefits, partnerships also generate impacts on the level of partnership collaboration. To make shared values visible, there is a need to define common indicators to demonstrate the success of a partnership. Indicators that describe shared value can for example be: committed and engaged partners acting in the network, diversity of organisations taking part in the partnership, RDI investments by companies and public sector, growth in EU funding and in international RDI investments.

"One benefit we get from partnerships is increasing our own capabilities as a company both by learning from the researchers but also by recruiting new talents from partner organisations"

- Industry partner in a project-based partnership

Besides comprehensive indicators, data about benefits should be collected from a variety of sources so that the resulting picture is as comprehensive as possible. Data on organisation-specific impacts need to be provided by the companies and organisations themselves. To generate broad-based understanding of societal and economic renewal, supplementary data

from national sources (for example Statistics Finland data) as well as from surveys and qualitative data sources need to be collected.

A typical challenge of current indicators is that they do not measure impact. Instead, the focus is typically on input indicators defined as resources (e.g. funding, personnel, facilities, time, material). To some extent, direct outputs are measured by number of articles, patents, and invention disclosures. However, when the objective of a partnership is to solve broad societal challenges, generate sustainable growth and accelerate industrial renewal, new and better indicators that are aligned with the impact targets are required. Therefore, it is important to develop indicators that can capture the impacts both for individual organisations and for the broader economy and society.

5 Conclusion and recommendations: vision for the future

5.1 Conclusions

Finland aims as a national target to increase the investments of RDI-activities to 4% of GDP. At the same time, the innovation system is increasingly complex. The knowledge foundation lies both in high quality research as well as in the dialogue that the different parties, whether industry or other private and research or other public, conduct with each other. There is an increasing need to cross borders between the traditional industry sectors as well as for multidisciplinary research. Also, it is not enough to just commercialize the innovations for new business but also ensure for the subsequent need for skilled workforce that is the prerequisite for success of the new business. Thus, to reach the national RDI-investment target, besides increase in public national and regional RDI funding, such partnerships are needed that also incentivize an increase of private sector investments to RDI as well as international partnerships to leverage international RDI funding, such as EU-funding.

In order to succeed, a dynamic and modular model is needed consisting of different elements or partnerships that each have their own value expectations and rules on how the partnership works. Many of the elements are already there, for example, the Business Finland "Veturi" funding and the Academy of Finland Flagship funding are well-functioning existing pieces of the Finnish innovation system. The modularity also gives the possibility to adjust each individual partnership according to the specific needs of its actors and as such increase the potential to succeed in creating growth and new business. In addition, the modularity allows for both disruptive and incremental RDI work according to the specific needs of the partnership and thus also lowers the threshold of SME participation.

Most important is, that all the partnerships or elements work together to create a consistent and dynamic innovation system where actors can move in a structured way from one development phase to the other, not in linear way but instead by combining different competences and instruments dynamically. Value and knowledge should flow freely in the system instead of staying contained within one part of the innovation pathway. An example of such dynamic innovation system is illustrated in Figure 3 below. Figure illustrates the way in which innovations and value are *co-created* in a wider innovation ecosystem encompassing diversity of actors and complementary competences[93].

[93] VTT Visiopaperi -Lupaavimmat Teknologiat. Näkökulma Suomen kestävään kasvuun ja vaikuttavaan innovaatiopolitiikkaan (2022) https://www.vttresearch.com/fi/vttn-visiopaperi-lupaavimmat-teknologiat

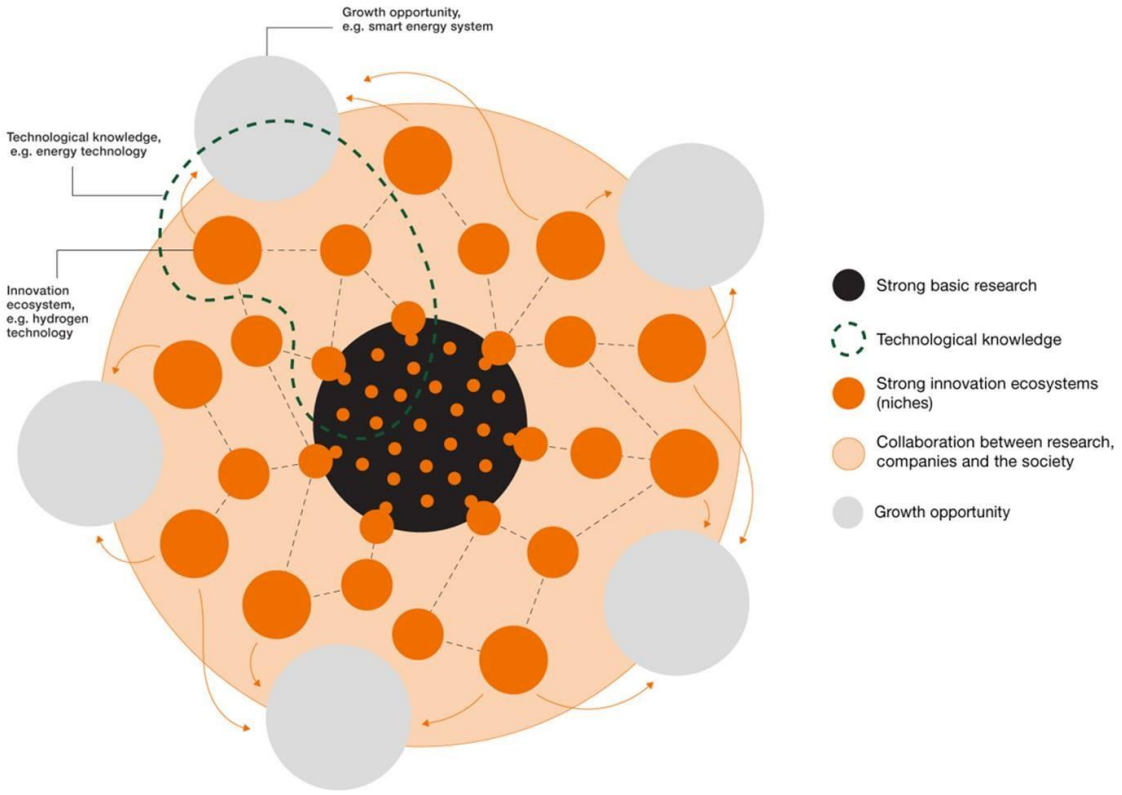

Figure 4. A dynamic innovation system in which innovations and value are co-created in the dynamic collaboration between research, companies, and the society (Source VTT[94])

One single model cannot suit all the needs

No single model in the studied countries was identified as a perfect model to be copied to the Finnish context. Finland and the late SHOK model have in some cases been used as a benchmark for other countries' model development. Each of the benchmarked models contain well-functioning and interesting components worth looking further into. In each of the models, there are also aspects that the stakeholders recognized as challenging or limiting. Overall, it seems that the benchmark countries have been able to master some elements, such as the coordination of future-oriented agendas and balancing research and industry-driven interests. A summary on the lessons learned from the benchmarks from which Finland could take learnings from and use as basis for justification of new or further developed models or as basic conditions in the wider innovation ecosystem, is provided for each presented case in Figure 3.

Ecosystems and clusters should always aim at ambitiously creating continuous and concurrent renewal of business of several parties instead of meeting the business needs of one

[94] VTT Visiopaperi -Lupaavimmat Teknologiat. Näkökulma Suomen kestävään kasvuun ja vaikuttavaan innovaatiopolitiikkaan (2022) https://www.vttresearch.com/fi/vttn-visiopaperi-lupaavimmat-teknologiat

company. Partnerships that are completely market-oriented, rise from the needs of one company and do not receive public funding, can be mutually beneficial for the partners involved if the roles and value expectations are clear.

Currently, the public funding instruments in the Finnish context cover different pieces of the innovation funnel needed in partnership development. Important instruments are e.g. the Flagship programme of Academy of Finland, which emphasises research-driven approaches, and Business Finland's ecosystem-building instruments that are based more on industry needs. What currently seems to be missing, is a clear bridge between these valuable instruments that allows for dynamic movement and flow in the innovation funnel, not linearly but according to different needs when striving for new business creation. At the time of writing, it seems that the Finnish innovation system is again shifting from an explicit ecosystem-orientation towards more cluster-based models with focus on ensuring continued collaboration over the different phases of the innovation funnel. Thus, it might soon become relevant to consider how to avoid too closed cluster models and enable such dynamic multi-actor involvement that is required for creating impact through collaborative innovation for a variety of parties.

The needs of the Finnish society to be integrated in the visions of innovation partnerships on mission level

When considering visions of public-private innovation partnerships, a crucial dimension in creating future competitive edge is the needs of the "third actor", the Finnish society. This means considering both generic needs, such as ensuring the availability of skilled workforce, and substance needs, such as speeding up the green transition and digitalization. In general, the society represented by public governmental bodies can be expected to provide the general mission driven aims and needs for the partnerships. The research parties can best assume the role of guiding the partnerships towards ambitious new possibilities. Industry has the knowledge of the market and its needs. A shared vision brings together a general mission, an ambitious research agenda and future business opportunities and is the glue for successful partnerships.

The engagement of all relevant stakeholders is important, as the vision and agenda of a partnership needs to be built in collaboration. In other words, the national RDI roadmaps need to be connected to the industrial and research agendas. This kind of integrative future-oriented agendas serve also as tools for European level discussions and enable proactive influencing of European research agendas.

As a general rule, the more the partnership receives public money, the more the needs of the society and research community should be taken into consideration. The more an industry partner wants to partake and influence the framing of the vision itself, the more this company needs to invest funds into the partnership.

The visibility and transparency of the entire innovation system towards all different stakeholders is crucial

Visibility and transparency of the entire innovation system towards all different stakeholders can be fostered through an open mindset, with good communication and dialogue, and with an ecosystem approach where the input of different parties is considered important and valuable regardless of differing outcome and impact expectations.

One particular challenge is to make the existing funding instruments and their opportunities more visible, also outside the primary target group of the instrument. It might be beneficial to look for joint system level objectives for example in the Academy of Finland's Flagship programmes and Business Finland – funded Veturi companies' agendas and publicly communicate these to the broader stakeholder networks.

Another challenge is the variety of instruments available in the rapidly changing operational environment. A significant amount of resources is required to follow the development, take part in it and benefit from the possibilities. There is a need for joint strategic decision-making across the Ministries and funding agencies. There is no need to create new joint structures from the scratch, but rather to review the operations of existing funding models together and make the opportunities visible to all parties. However, when analysing and connecting currently existing funding instruments, they should be critically reviewed with a view to bravely eliminating dysfunctional or overlapping structures, if such are identified.

Visibility across funding instruments means also view across international funding opportunities and how to capture them most effectively. Information and aid are available for example on different EU-funding opportunities. The main question that needs to be focused on, is how to create together and coordinated with different actors, especially aid providers, a clear view to all parties, on the different international funding opportunities and what would always fit at a particular moment in the dynamic innovation funnel flow to that particular need or development phase.

Solving the described challenges requires taking a customer or actor perspective to the dynamic innovation funnel approach. The starting point could be for example to identify relevant actors and their needs, and then identify the gaps between the current funding instruments according to the needs. Furthermore, sufficient sustainability and funding volumes in programmes and funding models needs to be emphasised. A sufficiently long-term approach will foster involvement of a variety of actors (research, SMEs) that are needed in building a well-functioning and impact-creating partnership. In addition, the more complex the partnership, the more it will benefit from having a dedicated (external or internal) coordinator.

The different value expectations of the actors to be respected as equally valuable starting points

To increase partnership impacts to their full potential, all actors in a partnership need to benefit from and add value to the partnership. In order to have clear understanding of the shared benefits and value expectations of each individual organisation, it is important to make the different value expectations visible. In practice, this necessitates concrete and comprehensive impact indicators which are integrated in the strategic management of the

partnership. Sometimes such indicators might seem challenging especially if striving towards true growth and business impact which involves aspects at the borderline of confidentiality. However, prerequisite for impactful partnership is always mutual trust and it is crucial that enough time is spent when building the partnership to create the needed trust.

Concrete measurable indicators are required to clarify the objectives and demonstrate the value and benefits generated by the innovation partnership. Indicators must be comprehensive so that they make visible the broad-based impacts generated by a partnership. Focus needs to be put on the direct benefits to companies and the science community as well as on the broader economic and societal benefits generated. Two types of indicators are required to demonstrate the impact of a partnership. First, there is a need for indicators that are adjusted to each organisation's own objectives, and secondly, there is need for common indicators that make visible the shared value.

To enable impact leadership, indicators should be incorporated into operational day-to-day management and governance of a partnership. Success and progress should be systematically monitored based on identified indicators. Systematic follow up based on the selected indicators provides transparent data to support joint decision-making among partners. This helps to drive the partnership in the right direction in line with the shared vision and to make corrective actions, if needed. For effective steering, funding of the partners (and partnership) should also be linked to generated impacts verified with the commonly agreed indicators. Moreover, to streamline the targets of the partnership and the individual organisations, it is important to interlink the targets to individual organisations' incentives. Having streamlined targets is crucial for motivating actors from a diversity of organisations to contribute to the shared vision.

If possible, within the boundaries of partnership wide confidentiality, it would also be beneficial for the society and national economy as a whole to make the indicators and accordingly the successful partnerships public. This would give good examples to various actors, and especially SMEs to adhere to when considering development activities. And overall, this would enhance a positive spiral in the Finnish innovation system.

5.2 Recommendations

These following recommendations give an overall guidance on what, according to the conclusions from the international benchmarks, are the most important aspects that would make the Finnish innovation system stronger and increase the competitive advantage of its actors. The next step would be to co-create together with the different innovation system actors a more detailed strategy and roadmap to concretize on specific actions and on who should take responsibility of the actions.

In order to create a transparent and complete dynamic innovation funnel, the Finnish innovation system needs:

1. **Making the innovation system visible and accessible on the national level and clear connections to the international level**

- Defining a clear owner for designing the national innovation funnel funding, so that the system can be developed and made visible in an approachable way to all the different actors in innovation partnerships.
- Remove the barriers between the different funding instruments and ecosystems, ensuring knowledge transfer between different actors, and the movement of actors and projects to the next base to continue the work after it reaches maturity in the previous stage.
- Focus development measures on the weakest points of the funnel, such as existing funding gaps that may have occurred in the system due to structural changes of funding organisations and instruments during the past few years, as well as to ensure adequate funding volumes overall to reach the growth and new business creation goals.
- Well-coordinated help to give clear visibility and to connect with various international funding sources, in particular EU-funding but also other sources.

2. **Developing innovation partnership models built on a shared vision, professional coordination and measuring success**

- Supporting the creation of innovation partnership models that suit different needs, where the development of a joint vision that acts as a glue for the partnership and sets guidelines for the activities and projects is in focus.
- Emphasising and guiding partnerships towards an understanding of the added value of professional (external or internal) coordination for 1) creating a shared vision that is ambitious enough to create new innovation in new growth areas and 2) measuring the success of it.
- Support the development of impact measures, such as indicators or other ways of following up a) the value of the partnership for the partners, b) the success of the partnership in achieving its shared vision, and c) the economical and societal impacts of the partnership at national level.

3. **Fostering commitment and an openminded attitude towards different value expectations within the partnerships**

- Developing partnership models that build on the recognition that getting value requires creation of mutual trust and contribution from each party.
- Making transparently visible and acceptable the different organisations' value expectations towards the partnership.
- Interlinking and partially streamlining the partnership targets and success indicators to the individual organisations' incentives and rewarding systems.

Annex 1. Case interview questions

For the case studies, different national actors were interviewed through the following questions.

Questions for the partnership coordinator/funding organisation representative

1. Tell about yourself and your organisation
2. What is the aim/goal of this partnership?
    - What is the value of the partnership for all partners involved
    - How did it emerge?
    - What is the expected/pursued (broader socio-economic) impact of partnership?
3. How does the partnership work?
    - What are the roles and responsibilities of different actors in the partnership?
    - Is it a one-time project or an ongoing partnership with many projects?
4. Who funds the partnership?
    - Who are the responsible and committed actors for funding of innovation and business development?
    - Who can receive funds? What are the funding criteria?
    - What are the key funding sources in the different phases of the innovation and development process?
    - What other tangible or intangible resources are used/available to the partnership?
    - What is the ideal funding model to build sustainable partnerships
5. How is the success of the partnership followed up and measured?
6. What makes this partnership successful?
    - What have been the critical elements in building the partnership (shared vision, management model, funding model, committed actors/capabilities, something else)
    - What kind of obstacles does the partnership face?
    - How has the partnership developed over time and what drivers have impacted most on the development?
7. Is there an international aspect in the partnership? What kind?
8. Does your organisation have other partnership programmes? Are they different from this? How?

Questions for the member organisations

1. Tell briefly about yourself and your company
2. Why did you join the partnership?
    - How did the partnership emerge
    - What is the aim/goal of this partnership?
    - What is the value of the partnership for the company and for all partners involved
    - Who are the end-customers of the partnership and what is the value proposition to them?
3. What is the process of the partnership?
    - What are the roles and responsibilities of different actors in the partnership?
    - Is it a one-time project or an ongoing partnership with many projects?
    - Are you involved in one or several projects within the partnership?
4. Who funds the project/partnership?
    - Does your company fund or contribute otherwise to the project/partnership? How?
    - Who are responsible and committed actors for funding of innovation and business development?
    - Who can receive funds?
5. How is the success of the partnership followed up and measured?
    - What kind of results has the partnership achieved?
6. What makes this partnership successful?
    - What has been the critical elements in building the partnership (shared vision, management model, funding model, committed actors/capabilities, something else)
    - What kind of obstacles does the partnership face?
    - How has the partnership developed over time and what drivers have impacted most on the development?
    - What kind of role does data sharing play in the partnership if any?
7. Is there an international aspect in the partnership? What kind?
8. Are you involved in other partnerships (what kind; reflect on the main similarities and differences)?

Annex 2. Stakeholder analysis forum and final seminar agendas

Stakeholder analysis forum was held on 11 May 2022. The agenda was the following.

1 Welcome and goals for the day
2 Presentation of the desk study and interview findings
3 Key takeaways: 4 claims on successful partnerships
4 World Café discussion on the claims
5 Common discussion

A final seminar will be held on 7 June 2022. The preliminary agenda is the following.

1 Welcoming words
2 Keynote speech on innovation partnerships: Petter Hartman, CEO, Medicon Village
3 Presentation of the results of the project
4 Panel discussion on the results of the project
5 Commentary speech: Matias Mäkynen, Member of Parliament, Chair of the Parliamentary RDI Committee
6 Final remarks

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