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ABBREVIATIONS

BA	Business Angel
BF	Business Finland
BFVC	Business Finland Venture Capital
EC	European Commission
EIB	European Investment Bank
EIF	European Investment Fund
EU	European Union
EIAH	European Investment Advisory Hub
ESIF	European Structural Investment Funds
FVCA	Finnish Venture Capital Association
IP	Intellectual Property
IT	Information Technology
PoC	Proof of Concept
R&D	Research and Development
R2B	Research to Business
RDI	Research, Development and Innovation
RRF	Recovery and Resilience Fund
SME	Small and Medium Enterprises
SP	Service Provider
TESI	Finnish Industry Investment Ltd
TT	Technology Transfer
TTO	Technology Transfer Office
UAS	University of Applied Sciences
VC	Venture Capital

1 INTRODUCTION

The 'Business Finland Technology Transfer Initiative' assignment involved a detailed analysis of both the Finnish technology transfer (TT) market and international examples, in addition to developing an investment strategy coupled with data management suggestions.

Within this analysis, the focus was on:

- Analyses of the target market for TT funding in Finland, the demand and supply side, the current status of data gathering methodology and procedures, plus international practices; and
- Recommendations for financing models and most suitable financial products, implementation modalities including governance structure, framework development for TT data gathering and optimising data gathering methodologies and processes.

This report is structured as six main parts and an Annex. The first part describes the objectives and methodological approach. The second includes an analysis of selected international examples from Europe and Israel. The third part includes an analysis of the Finnish TT market and its needs. The fourth part presents the investment strategy, while the fifth part introduces a proposal for data management. The sixth part provides conclusion and next steps. The Annex includes the List of Interviewed Stakeholders.

The report's main conclusions identified a number of gaps in the Finnish TT ecosystem, related to the need for professional business expertise and additional financing, particularly in the pre-seed and seed phases. It further recommends development of an overall TT investment approach under the umbrella structure of a TT Catalyser that could be governed by an established entity e.g. BF, BFVC or TESI in cooperation with private operators. The TT Catalyser's three main activities of i) TT equity fund, ii) technical assistance and iii) data management coordination are discussed. The report suggests improving data publicity and knowledge flows within the Finnish TT ecosystem by establishing a 'TT Ecosystem Database' (building on existing platforms).

2 OBJECTIVES & METHODOLOGICAL APPROACH

This chapter outlines the objectives and expected results of this study and schematically describes the methodological approach applied.

2.1 Objectives & expected results of the study

The general objective of the assignment is to boost technology, knowledge transfer and commercialisation in Finnish universities and research institutions.

The expected results and the project activities that have been implemented are illustrated in the table below.

Table 1 Expected results and activities of the study

Expected results	Activities
International examples analyses	<ul style="list-style-type: none"> • Identification of the TT international examples from EU, UK and Israel • Analyses of the governance and operational model • Recommendations for key success factors
Identification of available sources for pre-seed financing	<ul style="list-style-type: none"> • Overall mapping of the target 'market' for TT funding in Finland • Mapping of the current TT funding landscape in Finland, with the identification of different sources of funding available for TT investments in Finland for the 2021-2027 programming period, both at national and EU level • Identification of public, private, international, national and local investors and any other organisations involved or potentially interested in the delivery of TT investments in Finland
Investment strategy development	<ul style="list-style-type: none"> • Analysis of best practices in the area of TT • Analysis of the financing models and identification of best suited financial products in the area of the TT, including combinations of grants and financial instruments • Identification of potential sources for capitalisation (including for technical assistance) as well as identification of private co-investors/financiers and analysis of the conditions for their involvement • Developing recommendation for implementation modalities, including governance structure and timeline
Methodology and procedures development for TT data gathering	<ul style="list-style-type: none"> • Analysis of the current status of the data gathering methodology and procedures • Framework development for the TT data gathering

-
- Recommendations for optimising data gathering methodologies and processes
-

2.2 Methodological Approach

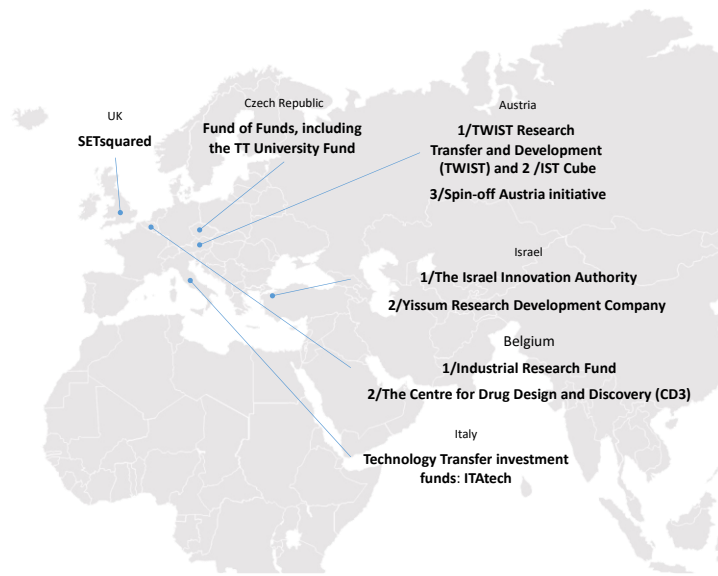
As part of the project implementation, various research methods were applied, including:

- Desk research – focused on policy and governance, Technology Transfer Office (TTO) services, funding instruments, existing studies and evaluations;
- Semi-structured interviews (in total 27) – with policy officers (four), research institutes and university TTOs (nine), incubators and accelerators (three), funders, Business Angels (BAs) and Venture Capital (VC) fund managers (11);
- Statistics and data analyses – provided by Stat.fi Vipunen, Business Finland R2B, TESI, FVCA;
- International practices analyses (in total 10) – selected examples covered six countries – Austria, Belgium, the Czech Republic, Italy, Israel and the United Kingdom;
- Feedback and validations (more than 39) – provided during the Oulu TTO workshop (22) and through various follow-up discussions (17);
- Steering Committee meetings (four in total) – discussions focusing on the preliminary findings and suggestions.

3 INTERNATIONAL EXAMPLES ANALYSES

As part of the international examples analyses, a review of the best practice relevant for TT in Finland was carried out. Based on this review, the ten most relevant examples from six countries were identified. An overview of the international examples analysed is depicted in the map below.

Figure 1 Map of international examples analysed



The main takeaways from the analysis of the international examples are as follows:

- In general, pre-seed and seed equity investments are widely used by the public authorities to support the TT ecosystem.
- A TT-dedicated vehicle is required with a focus and understanding of the universities' and researchers' needs.
- Most of the analysed countries provide equity investments either through dedicated university funds / accelerators or umbrella structure vehicles depending on the financing stage.
- All the interviewees agreed that the most important success factors are that:
 - funds are channelled in the form of smart money, i.e. together with the dedicated advisory services; and
 - institutional arrangement needs to provide an experienced team ideally combining business, VC and science backgrounds.
- Close cooperation, early-stage discussion and project screening with universities and researchers enables not only an increased number of projects coming into the TT funnel but also improved project quality.

- Sectoral focus depends on market readiness in individual sectors and policy strategic directions.
- Funding needs to be supported by the overall ecosystem e.g. in the form of capacity building events, sectoral conferences and networking opportunities.

A description of the individual international examples analysed, including their governance model and identified success factors, is presented in the table below.

Table 2 International examples

ITAttech I and II ¹	
Country	Italy
Governance model	A joint initiative by Cassa Depositi e Prestiti (CDP) and the EIF, managed by EIF under the full delegation model. The successor programme has been set up using a new collaboration model in which CDP will act alongside EIF as Limited Partner (LP) in each fund investment.
Description	<p>In 2016, EIF and CDP committed up to EUR 200 million to finance ITAttech, which was managed by EIF. Under ITAttech, EIF built a portfolio of TT investment funds to catalyse and accelerate the commercialisation of intellectual property (IP) rights with a technological content and the translation of research and innovation into new businesses. In total five dedicated TT funds were selected with ITAttech as the cornerstone investor and open to other investors.</p> <p>ITAttech was fully committed well in advance of its four-year investment period. Each fund has its own investment strategy:</p> <ul style="list-style-type: none"> • Vertis: TT fund with a focus on robotics, and a special partnership with four major Italian universities; • Sofinnova Telethon Fund: pharma/biotech TT fund with a specific focus on rare and genetic diseases; the dealflow will come mainly from Telethon, a major charity and research organisation with labs all over Italy; • Poli360: TT fund dedicated to Milan’s Politecnico, one of the most important Italian technical universities;

¹ [ITAttech: New EIF and CDP initiative to finance technological innovation in Italy](#)
[€260 million in investments from CDP Venture Capital and EIF to support technology transfer](#)

	<ul style="list-style-type: none"> • Progress Tech Transfer: TT fund focusing on sustainability projects, working with most Italian universities (building on the manager’s existing relationships developed over ten years of activities as TT/IP consultants); • Eureka! Ventures: first time team, fund focusing on advanced materials, having a preferential relationship with Turin’s Politecnico and Italian Institute of Technology. <p>In 2021, further to the full deployment of ITAtech EIF and CDP launched a joint successor programme of up to EUR 260 million to continue supporting the high-tech innovation market access in Italy. This renewed partnership will be directed to supporting funds targeting applied agriculture and food technology, environmental sustainability, robotics, life sciences, and aerospace.</p>
Success factors examples	Sectorial / multisectoral focus, Close cooperation with targeted UNIs / research organisations
SETsquared²	
Country	United Kingdom
Governance model	Since 2002, SETsquared is a unique enterprise partnership and a dynamic collaboration between the six leading research-led UK universities of Bath, Bristol, Cardiff, Exeter, Southampton and Surrey. It has been financed mainly by the Higher Education Funding Council for England and the Higher Education Innovation Fund, as well as from membership fees for businesses.
Description	Ranked as the No.1 Global Business Incubator (by UBI Global) ³ , they provide a wide range of highly acclaimed support programmes to help turn ideas into thriving businesses. The partnership has three main missions: to incubate new businesses, promotes university-to-business TT, and to give students better entrepreneurship experience. SETsquared has 12 main programmes dedicated to the specific lifecycles of the RDI process or sectors. For example, the Innovation to Commercialisation of University Research (ICURe) Discovery is an online programme for researchers and academics to begin exploring commercial options for their research. ICURe Explore trains, funds, and supports teams led by university early-career researchers (ECRs) to determine whether there is a market for products or services that utilise their research, science, or technology. Up to EUR 40 000 of funding is available to ‘get out of the lab’ and validate these

² <https://www.setsquared.co.uk>

³ <https://www.setsquared.co.uk/programme/global-no-1-homepage/>

	commercially promising ideas in the marketplace. The SETsquared Executives into Business programme is recruiting talented business executives to lead strong and innovative companies spinning out from the partner universities. SETsquared also provides the Investment platform.
Success factors examples	“Where you get multiple universities [and] a critical mass of talent...that’s why it took off.” Simon Bond, the Innovation Director of SETsquared

TWIST Research Transfer and Development (TWIST) ⁴ and IST Cube ⁵	
Country	Austria
Governance model	TWIST founded by The Institute of Science and Technology Austria (ISTA) IST Cube – a joint initiative of TWIST and EIF since 2017
Description	The TWIST acts as a one-stop shop, its mission is to raise awareness about business in academia, and consequently, to provide consulting and protection concerning IP, licensing of technologies developed at the Institute, nurturing and financing for spin-off projects, inspiring and educating future founders, and liaising with other research organisations and industry. TWIST invests into companies in exchange for a small share in the company. IST Cube is a seed fund enabling the growth of deep-tech and science-based start-ups and spin-offs. IST Cube taps the experience of ISTA’s tech transfer team and is located at IST Park, providing its investees with a state-of-the-art lab and office environment. The fund looks for deep tech start-ups in an early investment stage and provides follow-on investments as well.
Success factors examples	Experienced team, early potential screening and cooperation, proximity, close cooperation with head-hunter

Spin-off Austria Initiative ⁶	
Country	Austria
Governance model	The Spin-off Austria Initiative was initiated by Hermann Hauser and Herbert Gartner – two renowned Austrian investors – and their respective companies Hermann Hauser Investment GmbH, I.E.C.T. – Hermann Hauser and eQventure GmbH.

⁴ <https://twist.co.at>

⁵ <https://ist-cube.com>

⁶ <https://www.spin-off-austria.at>

Description	<p>The long-term goal of the initiative is to raise the awareness that entrepreneurship must be a third mission of Austrian universities, universities of applied sciences and research institutions next to research and teaching. The direction of the Spin-off Austria Initiative is set by its committee which is composed of internationally successful entrepreneurs as well as university leaders and experts. This triple helix model enables the collaboration of all relevant entities and thus speeds up the process of RDI ecosystem development.</p> <p>Three main activities: 1. The Spin-off Austria Conference, 2. The Spin-off Austria Dashboard, 3. A combination of training, networking and lobbying activities</p>
Success factors examples	Triple helix model, Private sector drive

Centre for Drug Design and Discovery (CD3)⁷

Country	Belgium
Governance model	CD3 was set up in 2006 by KU Leuven Research & Development (LRD) and the EIF
Description	CD3 is a drug discovery centre and investment fund created to drive the translation of innovative basic research to the clinic. As an investment fund, CD3 can invest in drug discovery projects as well as in spin-off companies and bio-techs, while as a drug discovery centre, it complements investments with an experienced drug discovery team and state-of-the-art infrastructure.
Success factors examples	Hand-in-hand collaborations with academic research groups and biotech or pharma partners

Industrial Research Fund (IOF)⁸

Country	Belgium
Governance model	IOF is a programme for five universities that is implemented annually with a grant from the Flemish government. It was established in 2004 by the Flemish government.
Description	The distribution of this fund among the different associations occurs according to an annually calculated distribution key, whose components (parameters) are oriented primarily towards valorisation (industrial revenues, patents, spin-off companies).

⁷ <https://www.cd3.be>

⁸ <https://www.ecoom.be/en/services/industrial-research-fund>

	IOF supported projects and related grants are allocated on the advice of the Innovation Board, which is composed of the university, the University Colleges of the Antwerp University Association, as well as a number of business representatives.
Success factors examples	Innovation Board, budget allocation based on the results

The Israel Innovation Authority⁹

Country	Israel
Governance model	Independent publicly funded agency. The Office of the Chief Scientist was established in 1965. It was renamed the Israel Innovation Authority in 2016.
Description	Created to provide a variety of practical tools (advisory services, events, data management) and funding programmes aimed at early-stage entrepreneurs, mature companies developing new products or manufacturing processes, academic groups seeking to transfer their ideas to the market, global corporations interested in collaborating with Israeli technology, Israeli companies seeking new markets abroad and traditional factories and plants seeking to incorporate innovative and advanced manufacturing into their businesses.
Success factors examples	Current CEO Dror Bin served previously as President and CEO of RAD Data Communications, venture partner at Carmel Ventures, etc., collaboration and ecosystem development, long-term tradition.

Yissum Research Development Company¹⁰

Country	Israel
Governance model	Yissum Research Development is a TT company of the Hebrew University of Jerusalem founded in 1964.
Description	Yissum collaborates with industry providing quick and efficient access to researchers' expertise and cutting-edge technology through licensing, sponsored research, enterprise directed research, spinoffs and funds. Yissum's diverse portfolio includes over 200 companies in every sector. Yissum Research Development has established two VC funds: 1. Integra Holdings which is a healthcare investment fund; and 2. Racah Nano Fund with exclusive rights to be first to examine the innovations from the Hebrew University of Jerusalem. The funds employ multidisciplinary teams of experts who work alongside inventors and take a hands-on approach to achieving commercial success.

⁹ <https://innovationisrael.org.il/en/>

¹⁰ <https://www.yissum.co.il>

	The funds also provide know-how and support their portfolio companies from inception to commercialisation, while also leveraging an extensive industry network.
Success factors examples	Long-term tradition, VC funds established directly by the Yissum
FoF, including the AI TT University Fund	
Country	Czech Republic
Governance model	A joint initiative of the Ministry of Economy and EIF
Description	Three fund commitments are foreseen, with fund managers to be selected via dedicated Calls for Expression of Interest: 1. a pre-seed co-investment fund, 2. VC fund focused on strategic technologies and 3. a university TT fund focused on Artificial Intelligence (AI) and related technologies.
Success factors examples	Personnel, RRF funding, Collaborative approach

4 MARKET ANALYSES

This section explains the key characteristics of the Finnish TT market, by providing an overview of the key policy changes and systemic reforms, as well as the key stakeholder groups in TT, followed by descriptions of key TT providers and their supply (volume and performance) as well as of the types and volumes of available TT funding in Finland.

The key characteristics of the Finnish TT market can be summarised as follows:

- The Finnish innovation system and particularly the public research organisations and universities have seen major changes over the past decade. This has significantly impacted their role and capacity to support TT.
- There are many stakeholders in the Finnish TT landscape, but the landscape is also scattered, particularly at the pre-seed stages & business incubation.
- Universities provide TT support and practically all have their own incubators, but only three have a dedicated TT fund¹¹. The study calls for greater TT collaboration across research organisations.
- There is a growing interest towards more commercialisation projects (including promising Deep Tech¹² start-ups) and a need for stronger thematic investment strategies, e.g. sustainability, cleantech, energy, space. These require more professional support, time and funding, but are also able to generate relatively more growth.
- The analysis has identified six main gaps in the Finnish TT system. These are related to the system's limited accessibility for professional business expertise and the restricted availability of appropriate financing (e.g. plain vanilla debt products are not suitable for supporting TT). By addressing the gaps, it is possible to significantly increase the volume and quality of research-based start-ups.
- Investment needs have been estimated for each of the identified gaps, and totals EUR 98 – EUR 200 million over a five-year period¹³.
- With increased collaborative efforts and smart investments, the Finnish TT ecosystem could work more efficiently and deliver significantly more start-ups.

4.1 Systemic reforms

Traditionally, large companies have created a significant proportion of Finland's research and development inputs and outputs, they have led the development of RDI networks with SMEs,

¹¹ University of Helsinki: HYR; University of Lappeenranta: Green Campus Innovations; University of Jyväskylä: Unifund.

¹² It has to be noticed that different instances, also those involved in this study, use different definitions of Deep Tech.

¹³ Taking into consideration the needs assessment, government strategies and international practice analyses.

universities and research organisations, and have been the main commercialisation unit of innovations. Finland has also excelled in industry-research collaboration.

The turn of the millennia saw major changes in the Finnish R&D landscape. The university and research institute sectors have undergone a complete restructuring. At the same time, since the early 2010s both private and public investments to R&D have dropped significantly, and have only recently returned to growth. Today, luckily, Finland remains one of the top performers in R&D intensity among the European countries.

The drop in the overall R&D funding coincided with the reforms of the Finnish University System, the Universities of Applied Sciences and the Government Research Institutions, which jointly caused various challenges to collaboration in research and innovation. In 2018, Tekes and Finpro were merged into Business Finland (BF), which largely carried out their prior funding instruments and activities, while more significant changes were made to the focus and operative modalities. The venture capital funding of BF (BFVC) largely unchanged by this reform.

In 2019, the current Government (PM Sanna Marin) agreed upon an ambitious RDI intensity target of 4% by 2030 and a national roadmap for reaching this. A parliamentary working group was set up to agree on the steps to reaching this goal. The group's suggestions were introduced in the government budget framework in spring 2022 and led to the approval of a new RDI law to increase public R&D expenditure with 40% by 2030.

The Finnish Government has also been updating its IPR strategy. According to the analytical background report there are areas, particularly within the university system, that would benefit from clarification. Some of these date back to the revision of the Finnish University Act, through which the legal bases and responsibilities for the utilisation/commercialisation of university inventions were changed.

Research and innovation performance, as well as the focus of related funding, is highly concentrated around the few largest cities in Finland. The capital region of Uusimaa alone represents 50% of the overall volume and the three leading regions nearly 72% of the total RDI volume in Finland. The same applies to pre-seed, VC and other growth funding. These regions are largely not eligible for Structural funds and instruments provided under its premises. In summary, the key changes in the Finnish innovation system, which are still reflected in the current TT performance & practices, have been:

- The meltdown of the Finnish ICT sector, which was a dominant R&D performer, in the early 2000s, followed with the 2008 financial crisis had a significant negative impact on the private sector R&D, and in their ability to contract and collaboration in research with universities.
- Adoption of the Universities Act (2009), giving universities more autonomy and responsibility (and IPR) i.a. to organise TT and commercialisation activities. This was followed with changes in university legal entities, structures, mergers, new funding models, etc.
- The Reform of Government Research Institutes (2013-) also resulted in significant institutional mergers and was followed up with even more significant changes to their funding.

- 2015 Tekes (Business Finland) funding was cut significantly, with the consequence that it pulled some of its funding from research organisations and focused more on businesses.
- 2018 Tekes and Finpro were merged into Business Finland, resulting changes to their focus and operative modalities. The venture capital funding of BF (BFVC) remained largely aside of this reform.
- 2020/2021 Climate Fund starts operation.
- 2023 R&D law which secures significant increases to public R&D expenditure until 2030.

4.2 Stakeholders

Today, Finnish technology transfer and start-up landscape is highly developed. It comprises, for example, of research base which includes over 35,000 researchers at universities and public research organisations, over 650 BAs and ca 80 active VC fund managers. However, the community is highly centralised as most of the key players and activities are located to the capital area. The various stakeholders of the Finnish TT ecosystem are illustrated in Figure 2.

Figure 2 Stakeholders in the Finnish TT and start-up ecosystem

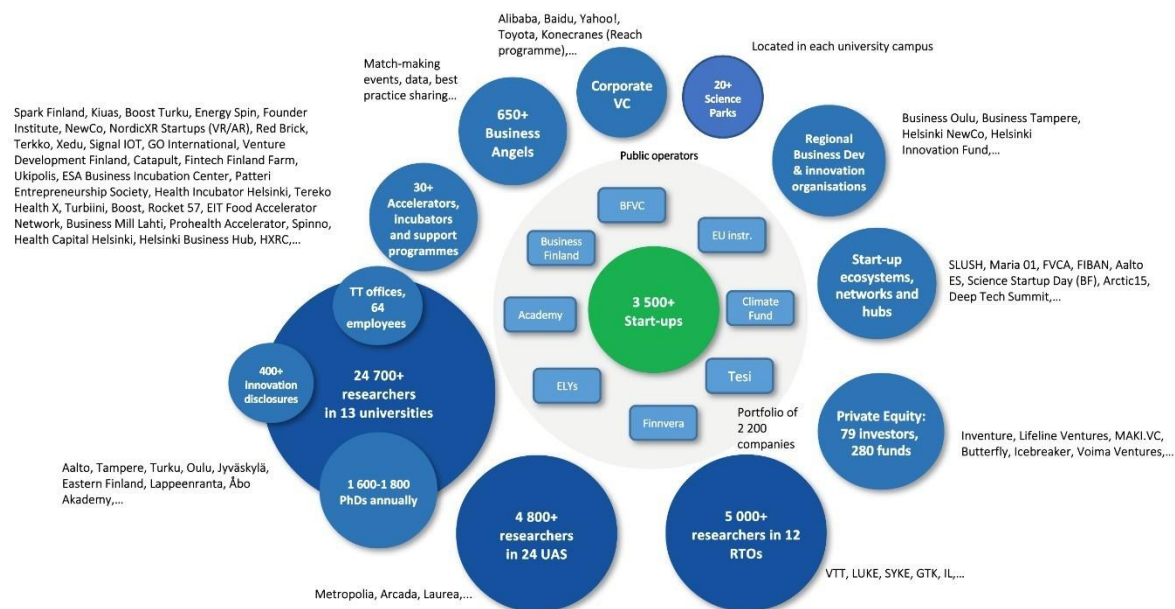


Figure 2 Stakeholders in the Finnish TT and start-up ecosystem Stakeholders in the Finnish TT and start-up ecosystem. The recent developments among the stakeholders include the establishment of the Climate Fund¹⁴ and strengthening of corporate VC. Established in 2020, the Climate Fund is a Finnish state-owned special-assignment company and its operations focus on combating climate change, boosting low-carbon industry and promoting digitalisation. During the same time

¹⁴ https://valtioneuvosto.fi/-/1410877/ilmastorahaston-toiminta-on-kaynnistynyt?language=en_US

some big Finnish industrial companies (e.g. Stora Enso, Konecranes) established their own corporate VC funds.

4.3 Demand

Approximately 300 new start-ups¹⁵ are established annually, of which around 20 are considered Deep Tech start-ups. Around 1/3 of deep tech start-ups come through Business Finland's Research to Business (R2B) funding¹⁶.

¹⁵ The annual number of new start-ups varies depending on the definition and year. In 2021 approximately 40 000 new companies were established. According to studies by ETLA (2016), around 4 000 – 5000 of all new companies fulfil the broad definition of start-ups, while only 6% - 7% of start-ups have true growth potential, resulting in an estimate of 300 true start-ups annually.

¹⁶ Deep Tech –study Finland 2022, Tesi

Figure 3 Number of patents and innovation disclosures by type of publication in Finnish universities 2010-2021. Source: MEC; Vipunen.

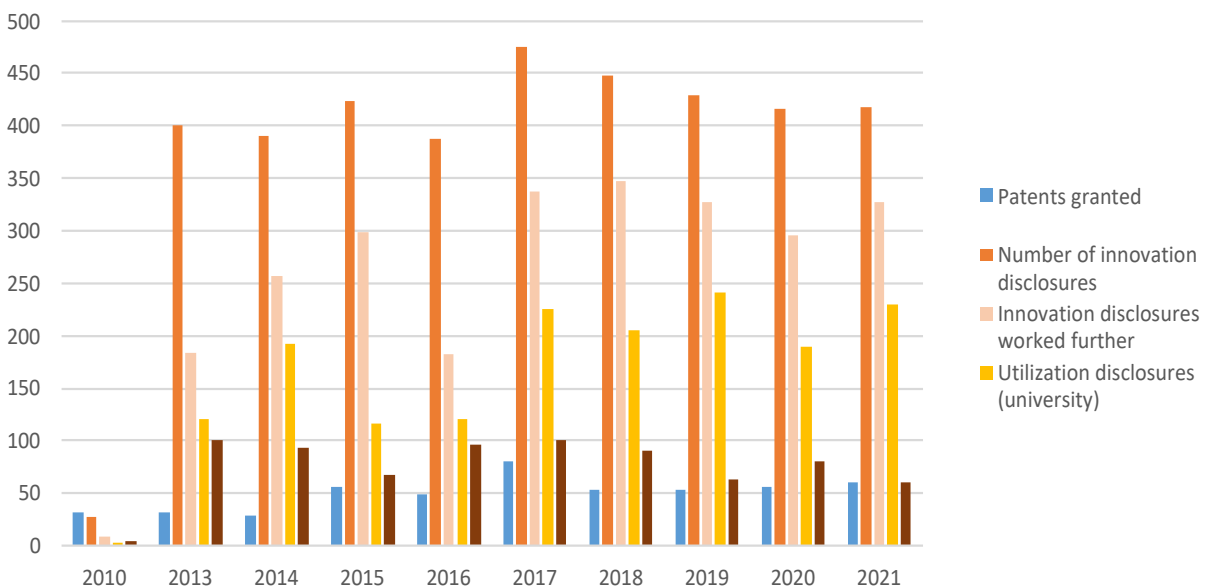
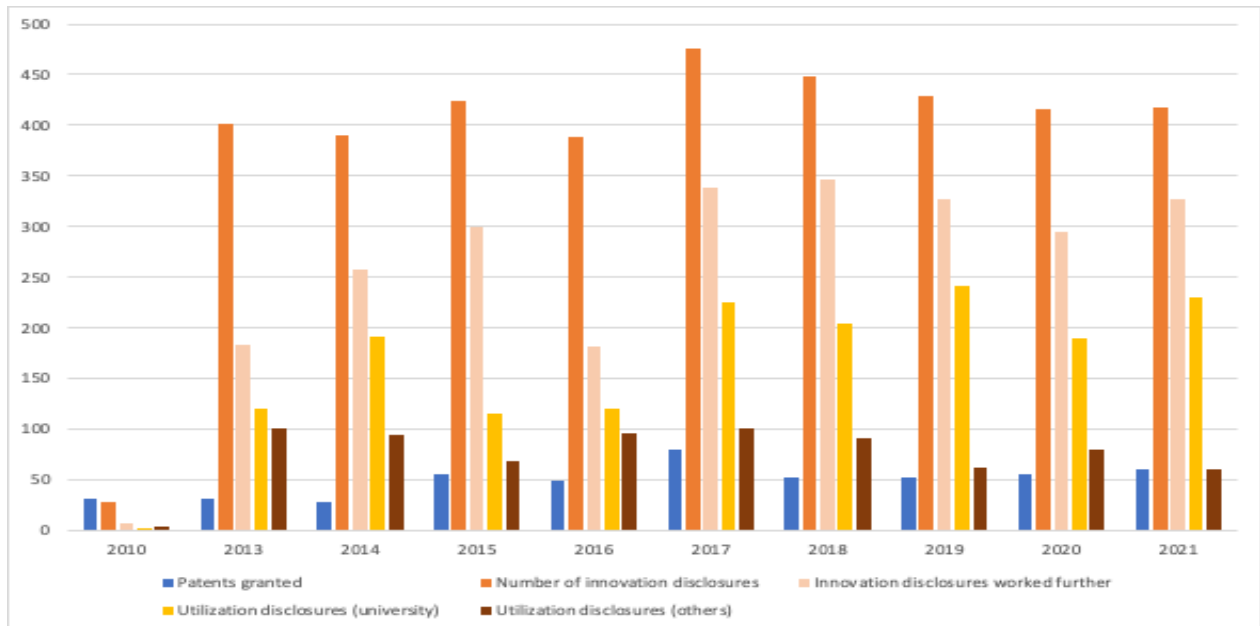
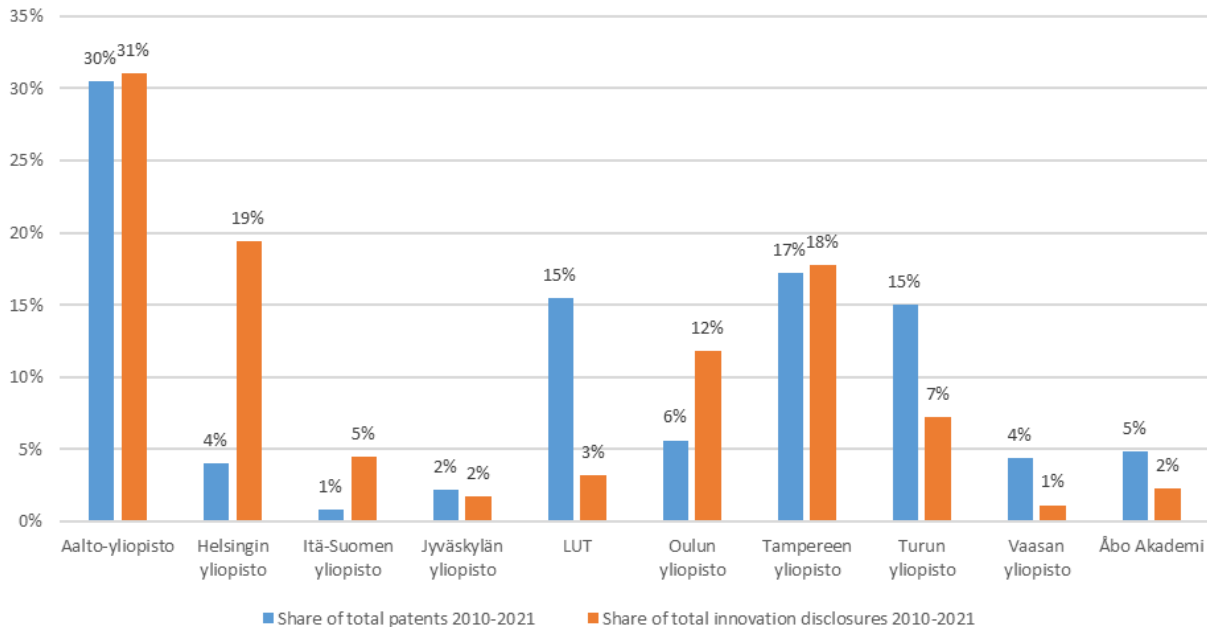


Figure 3 shows clearly that the legal changes made in 2010 have had a positive impact on the number of innovation disclosures and patents in Finnish universities.¹⁷ When comparing innovation disclosures and patents across universities (see Figure 4 below), it shows that Aalto University, based in the capital, accounts for one third of all the innovation disclosures and patents. However, it has to be taken into account that the patenting policies differ between universities, with some offering patenting actively while others have strict policies and rules

¹⁷ In particular the new Universities Act, which completely changed the IPR ownership of universities, as well as their responsibility to support TT (as part of the new “Third Task” of universities). See chapter 4.3 Systemic reforms.

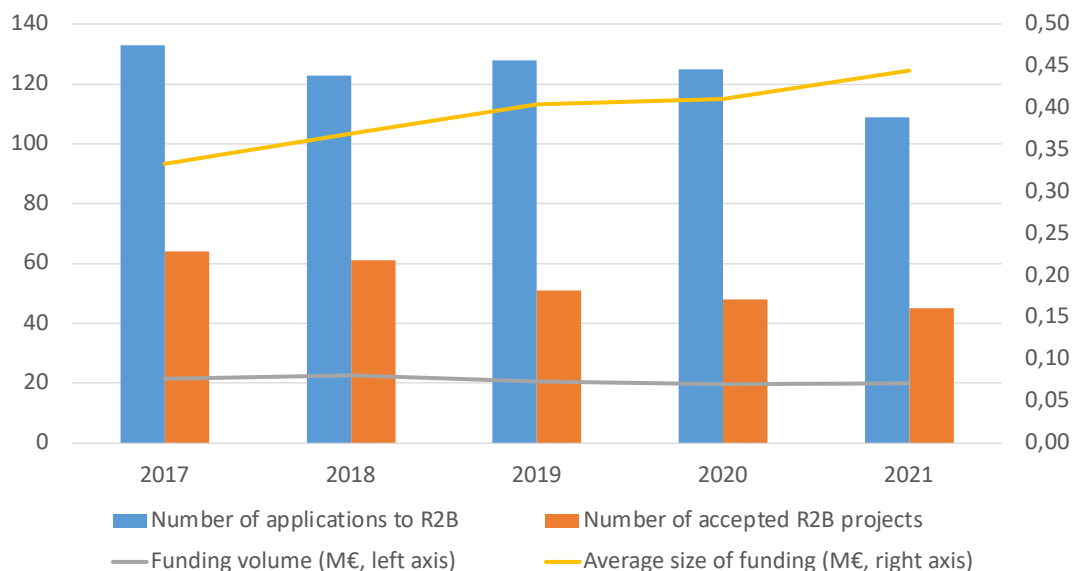
concerning patenting. This partially explains the differences in the percentages of innovation disclosures and patents for some universities.

Figure 4 Universities share of total university patents and innovation disclosures 2010-2021



The main path to establish a start-up at the universities is with the support of R2B funding (see Figure 5 below). During recent years the funding volume has been slightly decreasing, but on the other hand the average size of the funding has increased.

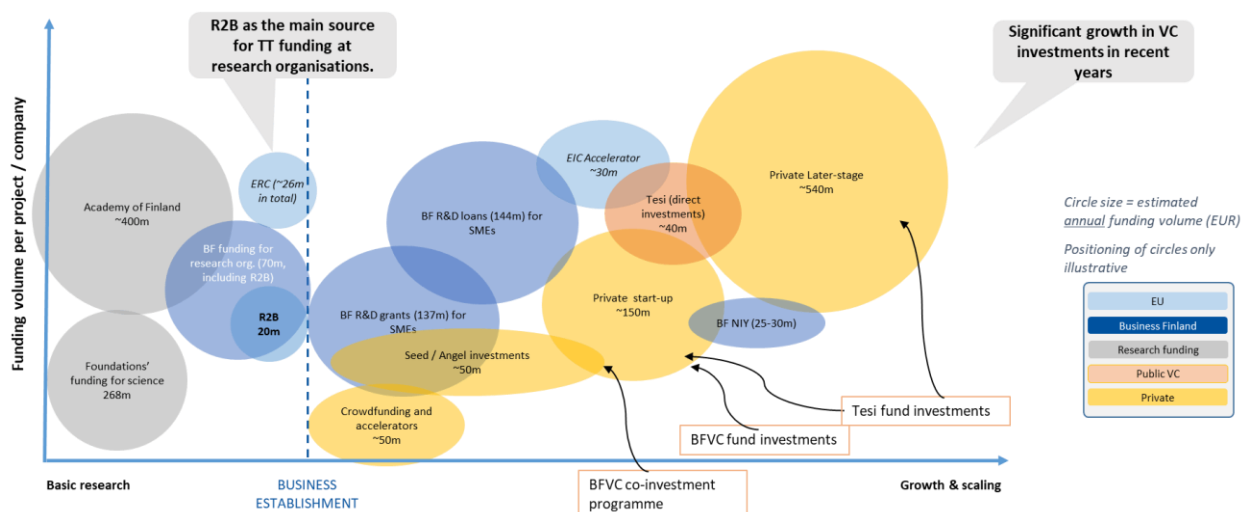
Figure 5 R2B applications, funded projects, funding volume and average size of funding 2017-2021.



4.4 Supply – illustration of relevant funding sources

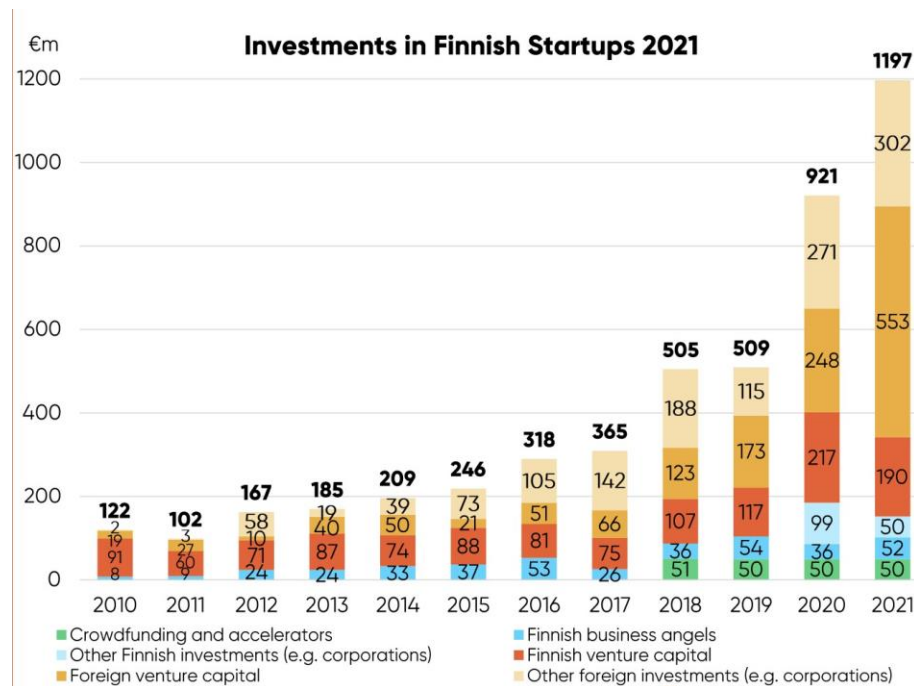
Figure 6 illustrates the various funding sources relevant for TT and spin-offs. The main source of national (external, competitive) public funding for research organisations’ TT activities is R2B funding. It is aimed for public research organizations, who want to build new business based on their research and commercializing their idea. The main sources for R2B follow-up funding, in turn, are Business Finland’s R&D funding, VC funding and BA funding. Business Finland Venture Capital (BFVC) and Tesi have an important role in developing the VC sector in Finland. BFVC invests in early-stage VC funds, while Tesi concentrates on later stage funds.

Figure 6 Illustration of funding sources. Source: Business Finland websites and annual reports; FVCA reports; (in EUR)



Overall, there has been a significant growth in VC investments in recent years, as illustrated in Figure 7 below. The increase in foreign venture capital investments has been particularly impressive in recent years.

Figure 7 Funding sources for Finnish startup companies. Source: Finnish Venture Capital Association:

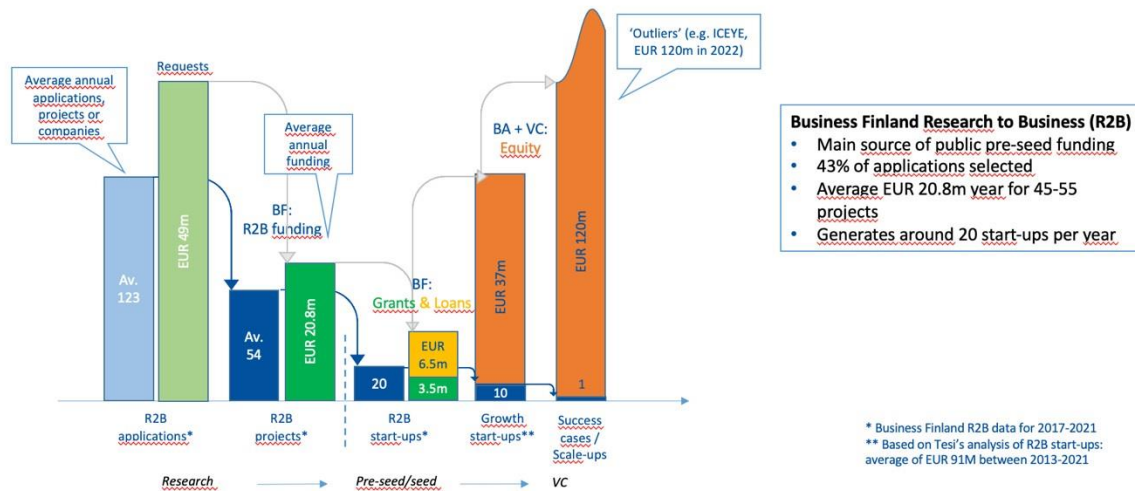


4.5 Annual volumes of R2B funnel

More in-depth analysis of the R2B projects reveals that annually there are on average 123 R2B applications of which 44% receive funding (on average). Out of these R2B projects, 20 start-ups are established annually. Over the period of 2014-21, altogether 165 R2B start-ups were established, of which 122 (74%) had received additional financing from Business Finland after their R2B funding of which 117 (97%) grants and 56 (46%) loans. 41% of those companies received EUR 457 million VC funding, of which 30% from BAs, 46% VC and 24% both. 67% of these companies were Deep Tech companies¹⁸. From the companies that received VC funding, 89% also received funding from Business Finland.

¹⁸ Tesi database.

Figure 8 Illustration of R2B project funnel and annual funding. Source: Business Finland; Tesi



4.6 Gaps and market failures

The analysis, based on the findings from interviews and documents, identified the following gaps within the Finnish TT ecosystem:

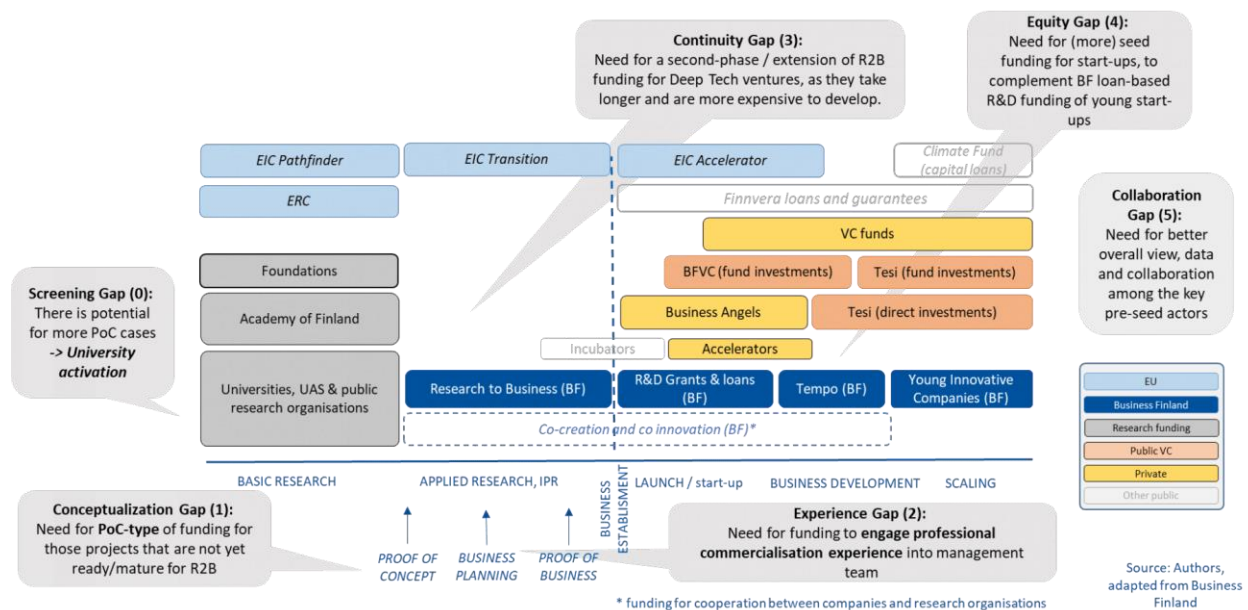
- Screening Gap (0)** There is potential for more TT / Proof-of-Concept (PoC) cases within research organisations.
- Conceptualisation Gap (1)** Many of the business cases coming out of R2B are not mature enough to qualify for follow up funding. There is a demand for **better planning / scrutiny of the concept, prior to entering R2B.**
- Experience Gap (2)** Start-up team composition is critical and recruiting **experienced management team members** (outside research) with R2B funding is difficult.
- Continuity Gap (3)** The main 'gap' appears to be between (the end of) university R2B (pre-seed) funding and before receiving appropriate seed funding for the start-up. There is on average a **6+ months non-funded period**, before getting additional funding decision from Business Finland (which triggers other decisions). During this time, the research team may leave to other projects. This is particular the case for Deep Tech ventures, which need more time and money.
- Equity Gap (4)** New start-ups often have **little equity** and introducing heavy R&D loans **diminishes the valuation from the founders perspective** towards potential seed / VC funders. Hence, more grant-based (for early PoC phases) and/or equity funding is needed to complement

Business Finland’s R&D loans. Business Finland’s Growth Engine funding (equity loan) used to respond to this; now available only through the Climate Fund.

Collaboration Gap (5) Overall, the **TT ecosystem is scattered**, with each organisation having their own processes. Increasing the common agenda, mutual collaboration, information exchange, collectively available data, to name but a few, would benefit all.

These gaps have been illustrated in the Figure 9 below.

Figure 9 Illustration of funding sources and identified gaps.



4.7 Estimated investment needs

The estimates for investment needs for each gap is described in Table 3.

Table 3 Estimated investment needs and reasoning for each gap.

	Screening Gap (0)	Conceptualization Gap (1)	Commercialisation Experience Gap (2)	Continuity Gap (3)	Equity Gap (4)	Collaboration Gap (5)
Focus area	There is potential for more TT / PoC cases within research organisations	Need for PoC-type of funding for those projects that are not yet ready / mature for R2B	Need for funding to engage professional commercialisation experience into team	Need for a second-phase / extension of R2B funding for Deep Tech ventures	Need for seed funding for start-ups, to complement BF loan-based R&D funding of young start-ups	Need for a better overall view, data and collaboration among the key pre-seed actors

	Screening Gap (0)	Conceptualization Gap (1)	Commercialisation Experience Gap (2)	Continuity Gap (3)	Equity Gap (4)	Collaboration Gap (5)
Current volume	Av. 123 applications for R2B per year	Average 54 selected R2B projects	No dedicated funding identified	Ca. 20 new R2B-based companies + other Deep Tech start-ups annually	Ca. 20 new R2B-based companies + other start-ups annually	13 universities, 22 UAS, 11 RTOs
Potential increase	2-3.5X (gradual) increase (400+ in tot.)	30-50 x EUR 20k for PoC studies	Engagement of 30-50 professionals in TT startups, covering fees up to EUR 100k / company	1.5-2x number of R2B based companies; Partially addressed by BF Deep Tech Accelerator	1.5x-2x number of R2B based companies in 3-5 years; +20-30 x EUR 500-750k investments	Data collection & dissemination platform
Estimated need for additional annual funding	EUR 1.0-1.2m for activation in research organisations*	EUR 600k - 1m dedicated PoC funding	EUR 3-5m (grants)	EUR 5-10m grants & loans (gradual increase)	EUR 10-22.5m seed equity (gradual increase)	EUR 150-300k annually

* Early/conservative estimations, e.g. activation costs within research organisations will vary and depend on final arrangements.

Overall, it is estimated that the total investment needs to address the identified gaps is between EUR 98 and 200 million over five years (EUR 19-40 million annually).

Table 4 Estimated investment needs and reasoning for each gap – annual and total in 5 years.

	Gap 0	Gap 1	Gap 2	Gap 3	Gap 4	Gap 5	Total
Annual (EUR)	1.0-1.2m	0.6-1m	3-5m	5-10m	10-22.5m	0.15-0.3k	19-39.4m
Total in 5 years (EUR)	5-6m	3-5m	15-25m	25-50m	50-112.5m	0.75-1.5m	98-200m

4.8 Lessons learnt

- The importance of finding the right balance between public and private funding at different stages of the TT lifecycle.
- Business development competence (sectoral) is probably the most critical issue in terms of ensuring quality and commitment.
- Ensuring critical mass and systematic support by combining various operators/activities.
- There is more commercialisation potential in universities than that which currently ends up in the TT process.
- Based on the past TT experience, identification and development of TT projects has proven difficult and suggests the need for technical assistance (TA) support targeting research teams as well as VC funds.
- Currently available financing terms for research-based start-ups (i.e. Business Finland's grants and loans) would benefit from complementary funding (blending) to address longer maturity times and high risks. This is particularly important for riskier spin-offs and start-ups (e.g. Deep Tech).

5 PROPOSED RECOMMENDATIONS FOR THE INVESTMENT STRATEGY

This chapter contains recommendations for investment strategy proposed on the basis of the market analysis and international examples analysed.

5.1 TT Catalyser

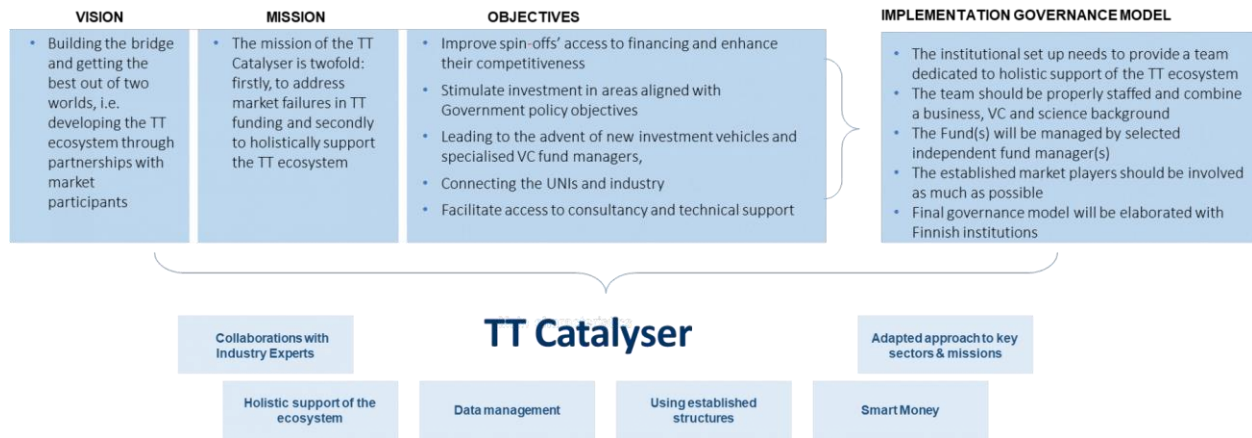
The centrepiece of the proposed recommendations for the investment strategy is the TT Catalyser, a one-stop-shop platform/programme supporting the stakeholders' engagement and TT ecosystem collaboration through pre-seed and seed capital, dedicated TA and the data management platform.

TT Catalyser will provide/secure:

- Collaboration with Industry Experts – due to the TT Catalyser there will be continual and intensive contacts and interactions between representatives of universities, industry and business;
- Holistic support of the ecosystem will be ensured – thanks to the TT Catalyser, with the comprehensive support of the TT ecosystem contributing to better funding, capacity building, networking, etc.;
- Data management – TT Catalyser will be a suitable platform for collecting, managing and sharing data among domestic stakeholders and also with potential foreign investors;
- Using established structures – TT Catalyser will not represent a duplicate platform threatening and competing with existing structures, on the contrary, it will build on existing structures, develop and supplement them;
- Smart Money – TT Catalyser will not only serve as a source of additional funding, but as a comprehensive programme will also provide various forms of TA;
- Adapted approach to key sectors & missions – TT Catalyser will not be based on the "one size fits all" principle. On the contrary, the specifics of selected sectors will be reflected and an adapted approach to key sectors and missions will be implemented.

Vision, mission, objectives, and potential governance model of the TT Catalyser are illustrated in the Figure 10 below.

Figure 10 TT Catalyser

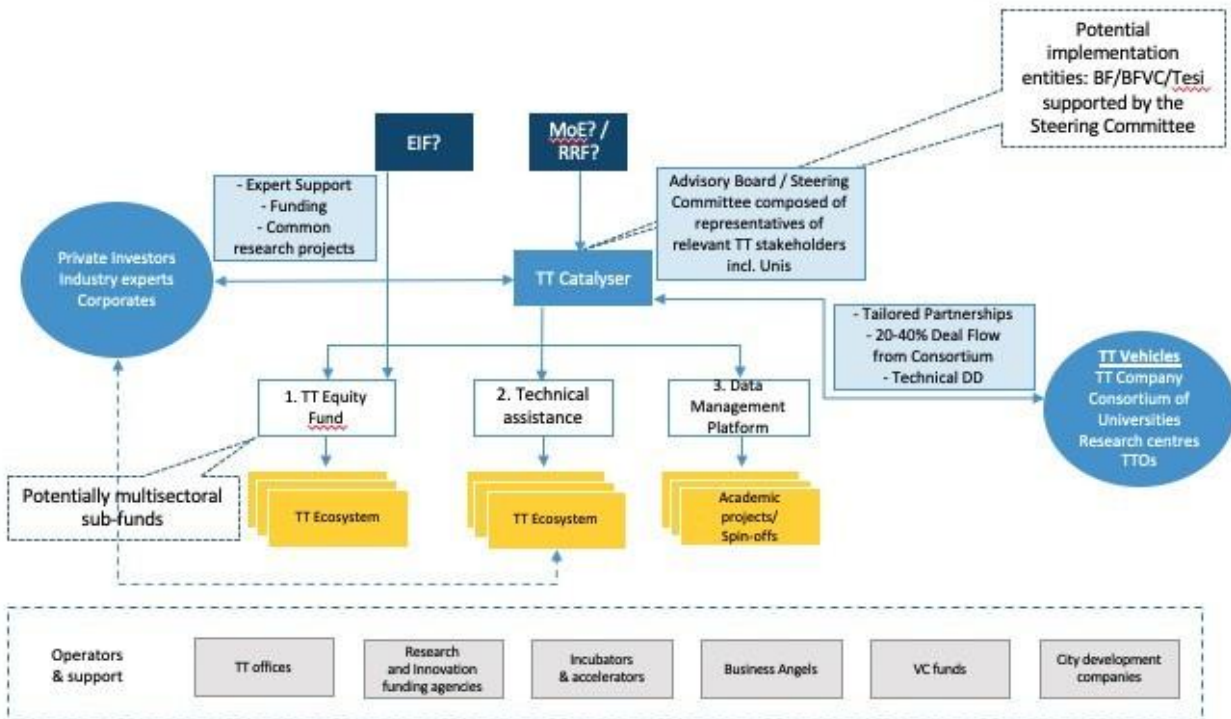


5.2 TT Catalyser: Implementation model

The proposed TT Catalyser consists of three key components: 1) TT Equity Fund, 2) Technical assistance, 3) Data Management platform.

The potential implementation model is illustrated in Figure 11 below.

Figure 11 Implementation model of the TT Catalyser



The implementation model of the TT Catalyser is based on the following guiding principles:

- The TT Catalyser will act as a one-stop-shop platform providing: early-stage equity funding, a variety of practical tools (advisory services, events, training) and data management.
- The TT Catalyser facilitates the implementation of positive changes in academic institutions and clusters and accelerates the translation of research into products and services.
- The TT Catalyser should tailor its approach to better reflect the needs and RDI processes of universities and researchers.
- The TT Catalyser could be implemented by established public entities, such as BF, BFVC or Tesi also using established market players.
- A Steering Committee / Advisory Board could be created to support the TT Catalyser’s activities, comprising representatives of relevant TT stakeholders, including universities, private players, etc.

- Early proactive project screening of the universities' potential conducted by relevant experts.
- Structured and mediated discussions for researchers and private players.
- Smart money – providing the funding together with the advisory services.
- “Skin in the game”, i.e. own funds of the fund manager need to be invested.

5.3 Proposal for TT Equity Fund

As stated above the first key component of the TT Catalyst is the TT Equity Fund reflecting the fact that some VCs do not consider seed investments in science-based companies because, among other factors, they think the VC fund term is not long enough to grow the companies sufficiently to make exits. The objective of the TT Equity Fund is to select one or more (depending on the proposed investment strategies of potential fund managers) fund manager(s) in order to support the commercialisation of research in Finland and to support the emergence and professionalisation of TT fund managers in Finland.

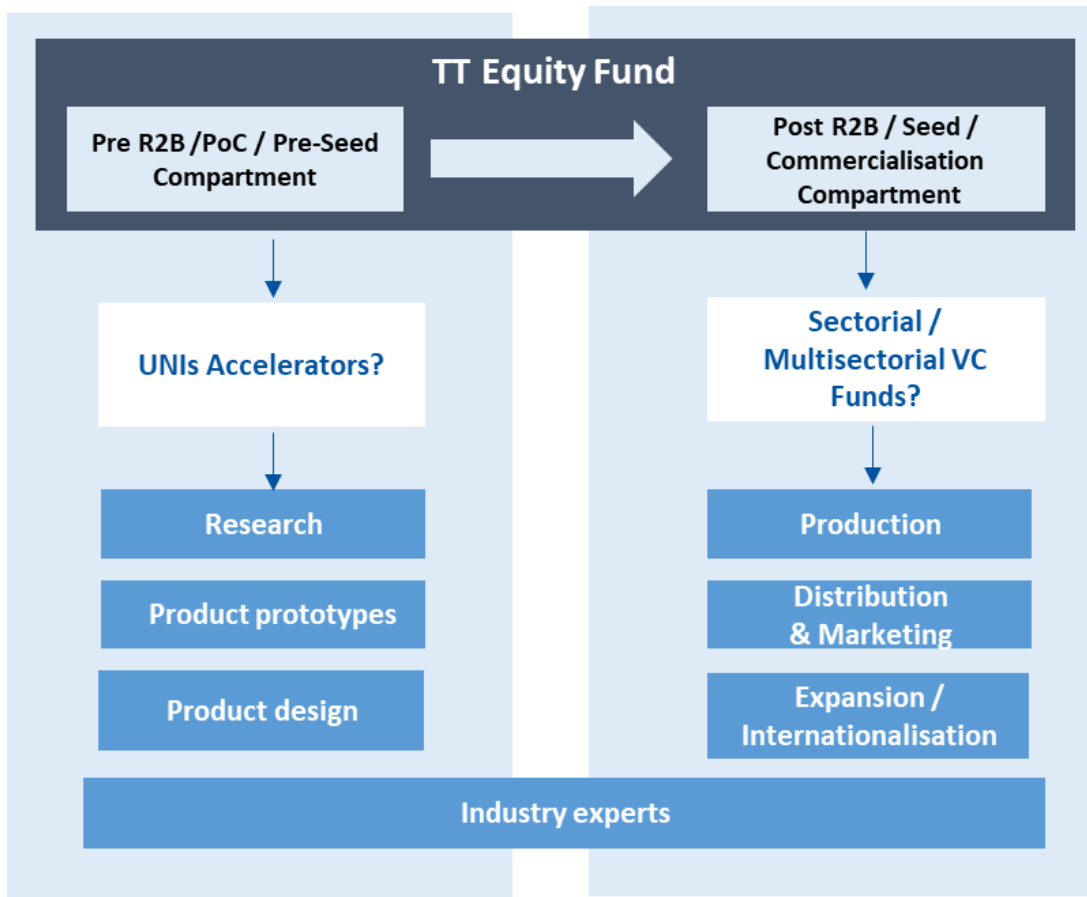
The key characteristics of the TT Equity Fund are as follows:

- The budget of the financial instrument could be divided into two compartments or separate funds (two possible implementation scenarios), thus targeting two distinct segments of potential investees, namely:
 - support the projects of companies from PoC until the production phase (accelerator), i.e. early stage scientific discussions, hands on support and guidance, market identification; and
 - finance investees in the implementation of eligible projects in the development of production, distribution, expansion and internationalisation.
- The separate compartments of the TT Equity fund structure enables targeted investment strategies, individualised advisory support and dedicated personal capacities with the relevant skillsets reflecting the differences between the compartments.
- Design of the fund, managed by the selected fund manager, would follow the generic structure entailing a closed-end vehicle. The fund's lifetime may not exceed 20 years.
- The capital structure should require “skin in the game” from the fund manager in the form of a minimum commitment at fund level and additional private resources mobilised either as capital commitment at fund level or as a co-investment in the capital of the final beneficiary.

- The deal flow will come from Universities, TTOs and Research Centres, but investments to other projects will be possible, in order to limit the fund manager and secure the sufficient dealflow.
- The selected fund manager(s) shall be independent (in terms of both ownership and decision-making) and fully committed teams with strong understanding of the TT and necessary experience relevant to the given fund investment strategy (e.g. in the case of the multi-sectoral funds).

The potential structure of the TT Equity Fund is depicted in the Figure 12 below.

Figure 12 TT Equity Fund



The indicative key parameters of the TT Equity Fund are listed in Table 5 below and should be adjusted based on the mandator’s requirements.

Table 5 Key parameters of funding platform

Fund size (both compartments)	Up to EUR 100m.
Expected investment range	Initial investments, at the final beneficiary's level, typically up to EUR 0.5m – 0.75m.
Type of financing	Equity, quasi-equity and/or other instruments having equity-like characteristics.
Fund duration	Up to 20 years.
Capital recycling	Allowed, up to 100% of total commitments at any point in time.
Fund Manager commitment	On the fund level: Typically 1-2% or more, to ensure appropriate alignment of interest.
State aid intensity / Private investment ratio	In line with the Risk Finance Guidelines and Market Economy Operator test, the fund shall obtain at least 15% ¹⁹ of its total commitments coming from third-party private investors. Alternatively, the fund shall follow the General Block Exemption Regulation. The minimum commitment coming from third-party private investors could be further reduced under InvestEU.
Team	TT experienced team / In case of sectorial or multi-sectoral focus, the team's experience should reflect the selected sectors.
Sectorial / Geographical Investment focus	Technology transfer, including Deep Tech / Not limited only to the Finnish market / Pre-defined % of resources to be invested in priority sectors and/or in Finnish start-ups.
Final beneficiaries / Eligible transactions	The fund shall invest in SMEs, Small Midcaps, Midcaps and/or Proof-of-Concept projects. Supporting spin-offs and start-ups arising from the academic research eco-system, including those accelerated by the TT Vehicles and those falling under the vertical specialisations of the TT Vehicles / IP licensing.

5.4 Proposal for Technical Assistance (TA)

The purpose of the TA would be to boost the capacity of the national and regional TT ecosystem as well as to provide a coordination platform across the entire ecosystem through cooperation with the industry experts, VCs and other market players.

¹⁹ *70/30 ratio is already applied to the Climate Fund

The TT Catalyser would need to be able to promptly mobilise its network of experts, practitioners and stakeholders to support the TA activities. Furthermore, the individual parts of the TA can be outsourced to existing market operators, such as Spark Finland.

The TA could potentially be managed by either the respective fund managers or by BF / BFVC / TESI directly.

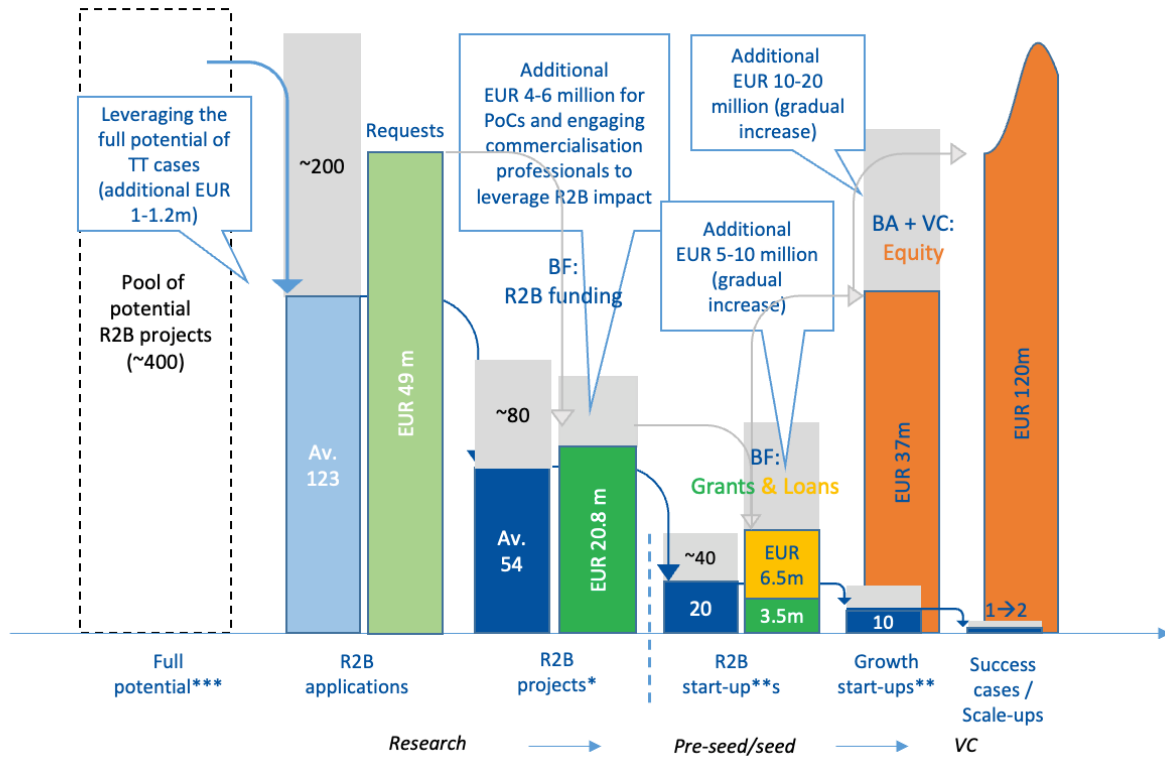
Figure 13 Potential benefit of additional funding



Potential types of advisory services and examples of activities under the TA are listed in Figure 14 below.

Based on the available data and analysis conducted, the estimated overall investment need for doubling the number of TT start-ups is EUR 98 – EUR 200 million over 5 years. The individual components of this investment need are illustrated in Figure 14 below.

Figure 14 Potential benefit of additional funding



* Business Finland R2B data for 2017-2021
 ** Based on Tesi's analysis of R2B start-ups: av. of EUR 91m over 2013-2021
 *** Estimate based on amount of researches, PhDs and innovation disclosures

Source: Business Finland, Tesi

6 DATA MANAGEMENT

6.1 The need for better data

Based on the findings from interviews and document analysis, the availability of open, up-to-date data on TT & commercialisation projects would give a better overview of the commercialisation potential in research organisations, help develop related support services and ease access to finance.

Currently, this information is scattered and not easily or sufficiently available. For example, each university as well as Business Finland, Tesi, the Ministry for Employment and the Economy as well as the Finnish Venture Capital Association (FVCA) collects their own data on different topics around TT. However, there is limited cross-exchange of data. In addition, better automatisation and synchronisation of data would be very useful to 'fuel' the Finnish TT ecosystem. Specifically, indexed good quality data would be needed. For example, improving the availability of the R2B application/project data (see below) would be a good opportunity to improve the data.

Data and information on research projects/ventures should be on a common platform and available broadly to all stakeholders within the ecosystem, including private investors. Currently there already exists platforms such as the Research.fi portal (provided by the Ministry of Education and Culture), which includes extensive information on funded research projects, researchers, publications, funding calls, etc. Another relevant platform is the Dealflow.fi, which includes information of investors, funding rounds and start-ups. The platform is based on Dealroom.co data and it is provided by Business Finland.

6.2 University data availability

A more in-depth analysis of the universities' commercialisation and start-up data highlights that:

- Half of the universities have information concerning commercialisation projects publicly available.
- The data usually covers the name of the project and whether it is ongoing or finished.
- Two universities are partially utilising a data platform.
- Five universities have updated start-up data shared.

A summary of universities' databases for commercialisation projects and start-ups is presented in the following Table 6.

Table 6 Summary of universities' commercialisation and startup databases

University	Commercialisation project database	Startup database
Aalto	https://innovation.aalto.fi/ongoing-projects	https://innovation.aalto.fi/startups
University of Helsinki	https://helsinki.portals.in-part.com	https://www.helsinki.fi/fi/helsingin-innovaatiopalvelut/yrityksille-ja-sijoittajille/spinout-yhtiot
University of Arts	No	No
University of Turku	https://www.utu.fi/en/business-collaboration/innovations-and-entrepreneurship/TUTLI-projects	https://www.utu.fi/en/business-collaboration/innovations-and-entrepreneurship/startups-and-spinoffs
University of Tampere	https://tampere.portals.in-part.com	https://www.tuni.fi/fi/tutkimus/tutkimus-yliopistossa/tutkimuksesta-liiketoimintaa/ennen-vuotta-2021-paattyneet-kaupallistamishankkeet
University of Lappeenranta	https://www.lut.fi/en/companies/innovation-services/projects	https://www.lut.fi/en/companies/innovation-services/projects
University of Eastern Finland	No	No
University of Jyväskylä	https://www.jyu.fi/fi/tutkimus/tutkimuspalvelut/innovaatio/tutli/hankkeet	No
University of Vaasa	No	No
University of Oulu	https://www.oulu.fi/fi/oulun-yliopiston-research-business-r2b-projektit	https://oulu.dealroom.co/intro
University of Lapland	No	No
Åbo Akademi	No	No
Hanken School of Economics	No	No

6.3 R2B data availability

The lack of availability of R2B data was highlighted as one important bottleneck in interviews and therefore a further analysis of the R2B data publicity was conducted. Based on the findings, information on Business Finland funding decisions is publicly available on the Business Finland website²⁰. However, the level of information published varies between funding instruments.

For **companies' R&D funding** the following terms are applied regarding the publicity of funding data: "The following information will be public: the beneficiary's name, business ID, size, sector, region, form of financing, granting date, the amount of funding granted and the amount paid."²¹

For **public research funding** the following terms are applied: "The Funder has the right to disclose the name of the beneficiary of the funding decision, a public summary of the research project, and the sum of granted and paid funding."²²

For **R2B funding**, terms and conditions for public research funding are applied. However, unlike other public research funding projects, information on R2B projects (e.g. project titles/summaries, contact details) is currently not available on the Business Finland website.

Disclosing project information for R2B projects would help to increase transparency and facilitate knowledge flows within the Finnish TT ecosystem.

6.4 Proposal for a data management platform

Based on the analysis of study findings, the following actions are proposed for developing the platform for data management within the Finnish technology transfer ecosystem:

- **Improving the publicity and availability of R2B data.** This should be considered as the 'minimum' level scenario, which would not require any major investments, but would already help to improve the level of data availability to some extent. The information could be published at Business Finland open database and/or at the Research.fi portal. Currently the terms and conditions would already allow the publication of basic information regarding funded R2B projects. For application data, a revision of terms and conditions would be needed.
- **Setting up a TT database building on existing platforms (Research.fi and Dealflow.fi).** This would include the above-mentioned R2B data but also additional data on spin-offs, start-ups, investors, accelerators, etc. Also, universities IP strategies, guidelines and templates for commercialisation could be included. Ideally, there should also be an identifier (e.g. project ID) to link the R2B spin-offs with the preceding projects. Setting up the database should be considered as the second-level scenario, which would require

²⁰ <https://www.businessfinland.fi/en/for-finnish-customers/about-us/funding-information>

²¹ https://www.businessfinland.fi/4b0b8c/globalassets/finnish-customers/01-funding/08-guidelines--terms/funding-terms/funding_for_r_n_d_activities.pdf

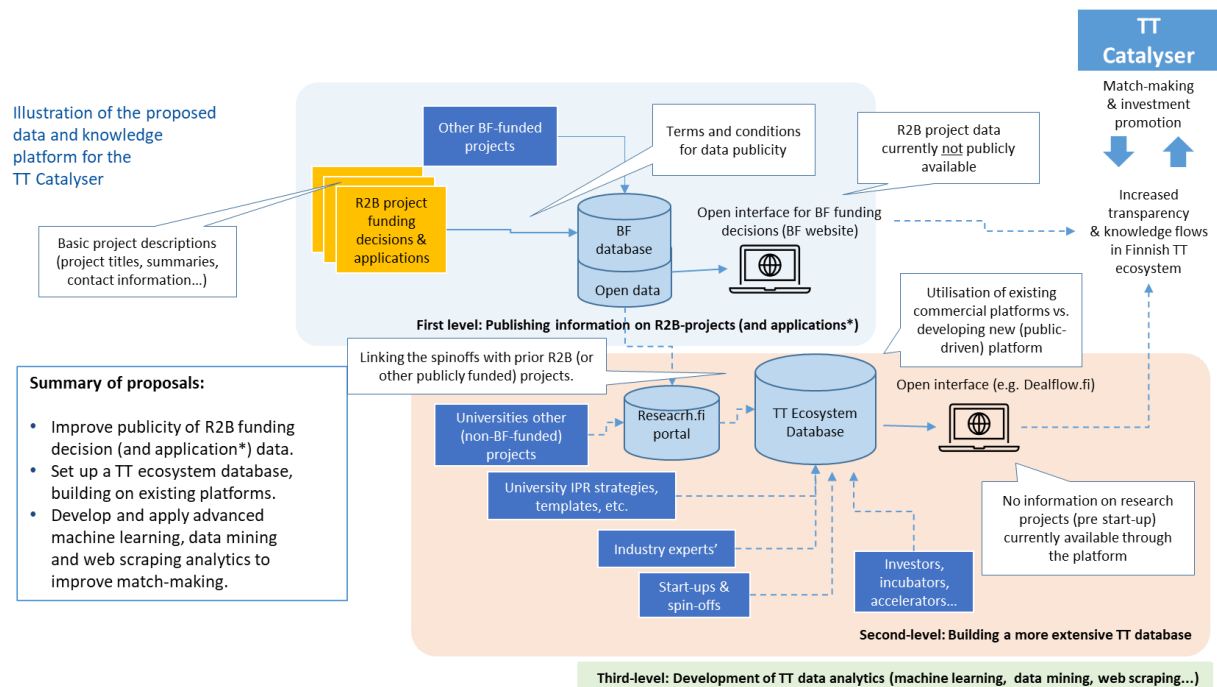
²² https://www.businessfinland.fi/490b7e/globalassets/finnish-customers/01-funding/08-guidelines--terms/funding-terms/public_research_funding.pdf

additional investments and development of data management. The existing platforms already provide good (but not sufficient) foundations for the data management.

- **Developing and applying advanced analytics (AI, machine learning, data mining, web scraping, etc.) to further enrich the data.** This should be considered as the third-level scenario, which would require further investments and competences.

The proposals are illustrated in Figure 15

Figure 15 Illustration of proposals for data management.



*Current regulation does not allow the publication of application data (only funding decisions).

7 CONCLUSION

Over the past few years, the Finnish TT system – on the supply side as well as the demand side - has developed very positively. Particularly the start-up community is dynamic and internationally attractive. Furthermore, there is a good variety of funding instruments available. At the same time, the study has identified several specific areas, which deserve further attention and could therefore be improved, to unlock the full potential of the Finnish TT system. The study also proposes an investment strategy with specific solutions to address these systemic gaps.

The implementation of the proposed strategy would serve to boost the current support mechanisms and provide a more integrated model with enhanced sharing of data and information. As a result, a substantial increase in the volume and growth of new research-based start-ups in Finland can be expected.

Effective implementation of recommendations will require a common and cohesive approach across all relevant TT stakeholders. The proposed actions and measures are recommended to follow an indicative timeline outlined below:

- Step 1: Government decision on the implementation model – fourth quarter 2023;
- Step 2: Call for service operators / fund managers – second quarter of 2024;
- Step 3: Fund-raising from co-investors & negotiations with stakeholders (e.g. universities) – third / fourth quarter of 2024;
- Step 4: Service roll-out from first quarter of 2025 onwards.

ANNEX: INTERVIEWS AND DISCUSSIONS

- **Government**
 - Ministry of Education & Culture (2)
 - Ministry of Economic Affairs and Employment (2)
- **Research organisations**
 - Lappeenranta University of Technology
 - Technical Research Centre of Finland VTT Oy (2)
 - University of Turku
 - Aalto University (2)
 - Hanken School of Economics
 - University of Helsinki
 - University of Tampere
- **Start-ups**
 - Stemsight Oy
 - Kuvaspace Oy
- **Public funding**
 - Business Finland Oy (2)
 - Business Finland Venture Capital Oy
 - Finnish Industry Investment Oy Tesi (2)
 - Helsinki Innovation Fund
 - Academy of Finland (2)
 - Climate Fund (2)
- **Private funding**
 - Finnish Venture Capital Association ry
 - Finnish Business Angel Network ry
 - Innovestor Oy
 - Butterfly Ventures Oy
- **Follow-up discussions**
 - Aalto University (2)
 - Lappeenranta University
 - University of Oulu (2)
 - University of Turku
 - Business Finland (6)
 - Business Finland Venture Capital
 - Ministry of Economic Affairs and Employment (2)
 - Finnvera Oy
 - Spark Finland