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Assessment of completed BRIDGE Discovery projects

Synthesis at programme level

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About the study

This study was conducted on behalf of
Swiss National Science Foundation (SNSF) and Innosuisse - Swiss Agency for Innovation Promotion

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Executive Summary

The aim of this short evaluation was to systematically collect information from the completed projects of the BRIDGE Discovery programme as of June 2023. This will be used for strategic optimisation and decision making for the funding period 2025-2028.

BRIDGE Discovery is an open-topic funding programme at the interface between basic and applied research, which is jointly funded and implemented by the Swiss National Science Foundation (SNSF) and Innosuisse - Swiss Agency for Innovation Promotion.

The study used a mixed-methods approach to gather information about the programme context and the funded projects: analyses of programme documents; interviews with programme managers, members of the steering committee, the evaluation panel, etc.; analyses of project data and reports; interviews with principal investigators and implementation partners; and an online survey.

The conclusions of the study on the outputs and outcomes of the projects and the mitigating factors for project success can be summarised as follows:

- All completed projects successfully developed innovative milestones towards potential applications. The vast majority of projects are continuing with further research and implementation steps. Due to the complexity of the challenging research projects, the first economic impact can be expected at the earliest 2-5 years after project completion, most of the impacts will only be realised in the next 5 to 10 years, and possibly even longer.
- Three possible implementation paths emerged, each leading to different implementation and exploitation options: (1) implementation via a spin-off company, (2) implementation via an existing industrial partner, and (3) out-licensing of a technology. Each of the three options requires a different approach to financing and transfer, which should be considered at the research stage.
- It is important for management and team members to be aware of the different expectations of academic and industrial partners. In addition to inter- (or even trans-) disciplinary project management skills, cultural values and entrepreneurial attitudes and skills will help to facilitate knowledge transfer within the project.

Suggestions for the further improvement of the programme include the following:

- Minor changes to improve and clarify the communication of the programme's objectives, including a more precise definition of the programme's objectives and the promotion of the support measures.
- Providing coaching, training courses or networking activities to strengthen the entrepreneurial spirit and skills of the project team.
- Different measures should be used to determine the success of a project, depending on its individual objectives. Different implementation routes mean that different outputs and outcomes can be expected depending on the project. Programme monitoring should therefore take this into account.

The results of the study indicate a rather large gap between the portfolios of the SNSF and Innosuisse, resulting in a high demand for BRIDGE Discovery. Given the current budget constraints, options for a more comprehensive picture of portfolio integration are outlined.

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Contents

1 | Research objectives and programme design

Launched in 2017, the BRIDGE funding programme is jointly sponsored and implemented by the Swiss National Science Foundation (SNSF) and Innosuisse - Swiss Agency for Innovation Promotion. The 2021-2024 funding budget for BRIDGE amounts to CHF 105 Mio, to which SNSF and Innosuisse contribute equally. The BRIDGE programme has two main funding lines: BRIDGE Proof of Concept (PoC) and BRIDGE Discovery. The first (Proof of Concept) is aimed at young researchers who want to develop an application or service based on their research results, often leading to start-ups, and the latter is aimed at experienced researchers who want to explore and implement the innovation potential of research results starting at the somewhat lower Technology Readiness Levels (TRL). A comprehensive evaluation conducted by Buser et al. in 2022 underlined that Discovery significantly strengthens "application-oriented research" and "research networks". It was unclear whether the objectives had been met in terms of bridging the gap for implementation, as most of the projects were not completed during the evaluation period. Additionally, there remained uncertainties regarding the conceptual boundaries and overlaps between the assessed projects and Innosuisse's innovation projects without implementation partners.

The aim of this short evaluation was to systematically gather information from the completed BRIDGE Discovery projects (by June 2023) and to lay the foundation for strategic optimisations and decisions for the funding period 2025-2028. The four detailed research objectives were as follows.

1 | Conduct nuanced assessments of the completed projects in terms of achieved results and goal attainment, considering the respective connections to research and (planned) implementation.

2 | Produce short case studies of completed projects to assess the status quo at the end of the project, identify best practices in working with companies, highlight success stories in research and preparatory implementation, and provide a qualitative assessment of potentials.

3 | Identify what effects have occurred and how they can be captured for the forthcoming BRIDGE impact monitoring to be carried out on a regular basis.

4 | Position BRIDGE Discovery within the funding portfolios of SNSF and Innosuisse.

These research objectives were pursued by applying the methodology described in chapter 6.1. In addition, case profiles of the completed projects with more detailed project-related information were prepared and submitted separately to the BRIDGE office and Innosuisse.

1.1 | The design of the BRIDGE Discovery programme

BRIDGE Discovery is an open-topic funding programme[1] that awards grants to projects at the interface between basic and applied research to advance the innovation potential of scientific results. The programme targets researchers at Swiss higher education institutions such as universities, federal institutes of technology, universities of applied sciences, teacher education colleges or other research institutions as defined in the Federal Act on the Promotion of Research and Innovation (RIPA).

According to the BRIDGE terms of reference, the overall goals of the BRIDGE programme are:

1 | To facilitate research-based innovation by accelerating the uptake of research findings that may be transformed into products, services and further commercial or non-commercial solutions for the benefit of the Swiss society and economy.

[1] Clinical trials are not eligible for funding. Between 2017-2020 only projects with technological innovations were eligible for funding under BRIDGE Discovery.

2 | The BRIDGE programme should also trigger promising research ideas by speeding up the feedback loop between academia and the scope of implementation.

3 | BRIDGE shall as well strengthen the structural cooperation between SNSF and Innosuisse in view of creating a truly consistent set of funding instruments for research and research-based innovation projects.

Within these goals, BRIDGE Discovery does not have specific sub-goals, except that Discovery aims at experienced researchers / university professors working mainly with post-docs and possibly pre-docs on projects with the clear goal of developing an application, a service, a method or a process.[2]

In coordination with Innosuisse's start-up and next generation innovators division, BRIDGE Discovery fellows can participate in training courses, which serves as an entry point for obtaining coaching services. However, these services are not yet systematically offered to BRIDGE Discovery fellows. Access to patent search is supported by the Federal Institute of Intellectual Property (IPI). The BRIDGE office organises annual BRIDGE events (Proof of Concept) and events in conjunction with the mid-term reviews in Discovery, but implementation partners or investors have not been involved in those events yet.

In addition to the boards and executive committees of the SNSF and Innosuisse, the governing bodies for the implementation of the programme are the BRIDGE steering committee, a specific Discovery evaluation panel, the PoC evaluation panel and the BRIDGE office.[3] The BRIDGE steering committee is responsible for the overall implementation and guidance of the programme. The evaluation panel reviews the submitted project proposals and monitors their implementation. The BRIDGE office manages all funding and networking activities of the programme.[4]

Calls for proposals in Discovery are published periodically, once a year. Proposals may be submitted by a single applicant or by a consortium of up to three applicants. Implementing partners may be involved at the proposal stage but are not eligible for funding under BRIDGE Discovery. The proposal must initially be announced in the form of a letter of intent submitted via an electronic platform provided by the BRIDGE office. The Letter of Intent outlines the proposed Discovery project and is not evaluated but serves as a notification to the programme management. Full proposals must follow a structure defined in the programme regulations, be written in English and be submitted via the platform. In case of rejection, it is possible to resubmit a proposal once if it is a substantially revised version of the rejected proposal.

Applications undergo a two-stage selection process. During the initial stage, the evaluation panel assesses applications based on the following criteria: (a) project quality (innovative potential, scientific content, feasibility, implementation), (b) applicant qualifications, and (c) additional criteria, if two or more projects receive equal ratings (sustainable economic, social, or environmental impact of the project, and various forms of diversity in the projects). External experts are consulted during this stage. Subsequently, the best project proposals are selected to advance to the next stage.

At the second stage, applicants are invited to present their project in English during an interview. The project proposals are then ranked, after which the evaluation panel will provide their recommendations to the steering committee, which makes the final decisions. According to the Discovery regulations, it is intended to complete the evaluation and decision-making process within 7 months.[5]

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[2] BRIDGE Discovery also allows funding of other scientific staff of institutes, similar to other Innosuisse programmes and more open than typical SNSF funding.

[3] See https://www.bridge.ch/en/about-bridge/

[4] See the 'regulations on BRIDGE Discovery grants' for more details: https://www.bridge.ch/en/funding/discovery/

[5] The earliest possible starting date of BRIDGE Discovery grants is 1 January of the year following the funding decision. Therefore, the average start of the completed BRIDGE projects was 370 days or approximately one year after submission.

Funding is granted for a period of up to four years, with eligible costs capped at CHF 850,000 for the entire duration (max. four years) of the project per applicant (as of March 2023). In exceptional cases, a cost-neutral extension is possible, such as in situations pertaining to parental or adoption leave, caring responsibilities, illness or accident. Beneficiaries must submit activity reports, inclusive of annual financial reports, progress reports, output data, and a final report. A mid-term evaluation is conducted based on the submitted progress report. The evaluation panel has the authority to recommend the continuation, termination, or reorientation of the project and may set specific conditions if the project continues or is reoriented. The steering committee will again make the final decision.

1.2 | Assessment

The interviews conducted with programme stakeholders and project participants revealed a relatively clear understanding of the objectives and the design of the BRIDGE Discovery programme. As the projects are often still exploratory in nature, most stakeholders feel that projects do not necessarily need to involve implementation partners from the outset. However, stakeholders' expectations regarding the level of maturity that Discovery projects should reach by the end of the project and the appropriate timing for involving implementation partners remain unclear. Some of the stakeholders interviewed believe that an ideal project implementation would involve initiating discussions with companies towards the end of the project to explore the possibility of transferring or implementing further steps towards a follow-on project or implementation. Other stakeholders believe that an implementation partner should be engaged at the latest in the second phase of the project after the mid-term review.

Which approach is best suited to the overall success of the project depends on the project and its objectives. In cases where the research is slightly more radical and not yet advanced enough, securing intellectual property may be prioritised to prevent the knowledge from leaking outside, which in some cases could be detrimental to implementation. In other cases, the search for implementation partners may already be more important.

Under either scenario, a Discovery project may result in subsequent collaborations with implementation partners, out-licensing of project results or the establishment of a spin-off company by the research team. **All three routes require a unique strategy to facilitate the transfer of project results into practice during (or sometimes after) the project implementation phase. This facet seems not yet been addressed explicitly in the design of the Discovery programme.**

Governance and implementation design

According to the BRIDGE terms of reference, the BRIDGE steering committee, consisting of seven members selected by the SNSF and Innosuisse, is responsible for the successful implementation of the programme. The steering committee is also responsible for selecting the members of the evaluation panel. **Steering committee representatives expressed a desire to have clear objectives from both agencies to better understand what success means for the Discovery programme, coupled with greater decision-making authority. This, in turn, would enable the committee to act more strategically and quickly.**

The review process of project proposals can take up to 12 months, indicating a somewhat slow approach as a consequence of the external review process.

The Discovery evaluation panel comprises approximately 25 members from a range of disciplinary backgrounds, with roughly three-quarters affiliated with research organizations and one-quarter from the business sector. Membership has recently grown due to expanded coverage of social sciences and humanities. All topics are discussed and decided by the panel based on a majority principle, whereby external expertise can be called upon if required. Views among stakeholders on the decision-making process for social science and humanities topics vary somewhat. **The primary challenge is finding a justified balance between projects oriented towards technology and those focused on themes of the social**

sciences and humanities in the review process. It was also mentioned that the panel could benefit from increased representation from the business sector.

The BRIDGE office is located at the SNSF, using the funding tool of the SNSF, the fund's entry tool for submitting projects and its review system. The principal investigators' (PIs) view on the office is very positive, responsive and flexible in its approach.

The actual use of additional services such as Innosuisse entrepreneurship courses and coaching services, the IP advisory network or access to patent searches through the IPI is reported in half of the completed projects (7). Some of the PIs and implementing partners interviewed expressed a desire for more information on the full range of support available, of which the entrepreneurship strands were less well known and could be particularly beneficial to the remaining research team, given that a relatively high proportion of projects go on to create spin-offs.

Target group reach

High levels of applications indicate a substantial demand for BRIDGE Discovery. While the funding rate was initially critically low, it appears to have risen recently. In a competitive call system featuring such projects, it is advisable to target a funding rate of roughly 30% to balance excellence and overall efficiency of the system.

Table 1 | Submitted, funded and resubmitted BRIDGE Discovery projects

Year	Submitted	Funded total	Funding rate	Resub-mitted	Resub-mission-rate	Funded Resub-mitted	Funding rate resub-mitted
2017	190	8	4%	-	-	-	-
2018	87	12	14%	26	14%	7	27%
2019	79	10	13%	18	24%	2	11%
2020	79	9	11%	22	32%	2	9%
2021	94	16	17%	16	23%	3	19%
2022	69	16	23%	12	15%	5	42%
Total	**598**	**71**		**104**		**19**	

Source: BRIDGE Office; calculations by Austrian Institute for SME Research

The evaluation by Buser et al. (2023) highlights the varied nature of the content of discovery projects up to 2022. Researchers from 11 disciplines are carrying out projects that cover 25 areas of innovation.

In terms of subject areas, there are numerous project proposals in engineering and biotechnology, but relatively few proposals in IT and environmental technology, the latter somewhat harder to assess for the panel because there is less existing industry there for implementation. In addition, due to its novelty since 2021, there are few proposals covering topics of the social sciences and humanities (10-15%). Nevertheless, some stakeholders do not see an immediate need for action, as this could change over time without intervention. So far, some experts in social sciences and humanities have been co-opted to the evaluation panel to respond to the specific expertise needed. Some interviewees question whether social innovation projects are treated fairly in an open competition with technological projects, given that technical and social innovation projects are fundamentally different in nature and require different types of evaluation criteria and different competencies for review.

One interviewee argued that universities of applied sciences and colleges lack a proficient support infrastructure for grant proposals, rendering them more reliant on ETHs and universities to join their

consortium. Though, their project proposals have increased recently. The BRIDGE evaluation by Buser et al. (2023) shows that, overall, 259 out of 910 (28%) applications in BRIDGE Discovery were submitted by universities of applied sciences (UAS)[6] and that the funding rate (7%) is slightly lower than for ETHs and universities (10%). In the SNSF evaluation (SWR, 2022), the authors note that experts from universities of applied sciences are underrepresented in the BRIDGE Discovery evaluation panel, which should be rectified.

Although there are no cooperation requirements (with a maximum of three participants), about 62% of the completed (first generation) Discovery projects were consortia. **Some stakeholder interviewees argued in favour of more inter-, or even transdisciplinary projects.** Thirteen projects can already be categorised as at least multidisciplinary from the point of view of principal investigators. Nine PIs view their projects as interdisciplinary, but none as transdisciplinary, indicating room for future improvement in this regard.

Table 2 shows that, on average, review procedures could not be completed within the seven-month decision period (ToR) and/or that projects could start soon after. The similar indicator, 'time to project start', can be used to approximate this. **The duration between proposal and project start was also a concern for some interviewees** in the case studies, which presents challenges in engaging industry partners. Although this was presented by one interviewee as "the general case" in publicly funded RDI projects, programme management should be aware that BRIDGE Discovery puts at a disadvantage innovation projects that have a certain time horizon before the innovation may become obsolete or be taken up by competitors.

Based on the evaluation conducted by Buser et al. (2023, p. 113), it was found that 11 out of 32 survey respondents reported working with implementation partners, which accounts for roughly a third of the funded Discovery projects. This finding contradicts the sample of first-generation projects that we analysed in our study when considering it retrospectively. **During the project lifetime, 79% (11/14) collaborated with implementation partners**, indicating that projects rather successfully include implementation partners and/or take steps to start spin-offs during or towards the end of the project.

Embedding in the Swiss funding portfolio

Innosuisse innovation projects without implementation partner

Innosuisse particularly supports here high-risk projects with strong innovation potential and with high market potential, 'but have not yet found a partner for the implementation on the market'. Thus, applications can be submitted for projects such as feasibility studies, prototypes and testing facilities without an implementation partner initially.

In comparison to BRIDGE Discovery, innovation projects without implementation partners aim for a TRL level that is slightly higher. Projects are implemented within a shorter time span of up to 18 months, with the goal of providing the project team with the final push for a start-up or to collaborate with an implementation partner. Finally, project proposals are typically decided upon within 8 weeks.

Innovation projects without implementation partners are not considered by the interviewees to be a viable alternative to BRIDGE Discovery. This is because **BRIDGE Discovery projects are not yet mature enough to meet the requirements of this (and any other) Innosuisse programme.**

Start-up Innovation Projects (SIPS), starting in 2023, is a follow-on funding programme for already established start-ups with growth potential just before market entry. This programme would therefore be suitable as follow-up funding for spin-offs after a BRIDGE project, if they are already close to market entry. In fact, some of the spin-offs created (especially in the biotech sector) do not meet this

[6] ETHs: 301 applications, universities: 271 applications, other organisations: 81 applications (Buser et al, 2023).

requirement. These spin-offs are created on the assumption that further funding can be found to support the remaining research or product testing (e.g. clinical trials) needs.

SNSF

In 2022, the SNSF evaluation (SWR) indicated that its two main priorities are project funding for curiosity-driven research of all types and sizes, and career development support for young researchers through project funding and dedicated career development programmes. While the SNSF's portfolio should encompass fundamental and applied research, Innosuisse is responsible for managing innovation based on scientific findings (ibid). Regarding BRIDGE, the report states that the programme is "significantly underfunded" compared to actual demand, a finding that is supported by the views of the respondents in this study. The report suggests two ways of dealing with this situation: either increase funding for the programme, or by evaluating how to position BRIDGE Discovery within the funding portfolios (ibid). There are indications in this report that the gap between the portfolios of the SNSF and Innosuisse is indeed wider than one would expect because of the areas covered (i.e. research and innovation promotion) by each organisation. For example, the primary objective of the SNSF, the promotion of research, includes both basic and applied research, as defined in the Swiss Research and Innovation Promotion Act (RIPA). The promotion of science-based innovation, on the other hand, should be addressed by the activities of Innosuisse. However, the SNSF has taken on the task of funding and supporting mainly basic research, while Innosuisse supports industry-oriented research (ibid.). However, this **leaves a relatively large gap between the portfolios of the two agencies**, which cannot be filled by a programme with a relatively small budget such as BRIDGE or, in particular, BRIDGE Discovery on its own.

A new funding instrument currently being tested by the SNSF is the implementation network, which targets existing and former research projects funded under the r4d programme or a National Research Programme (NRP) that are seeking some form of implementation or valorisation through links with other stakeholders.

Private foundations

Private foundations are occasionally an option for alternative funding, depending on the specific topic and a foundation's specific calls, and are often associated with lower funding. Overall, this is a very narrow window of opportunity for very specific topics.

2 | Overview of projects

This short evaluation consists of information gathered from 13 BRIDGE Discovery funded projects concluded between 2021 and 2023. The projects span a duration ranging from 2 years at the shortest to 4.5 years at the longest, with an average of 3.7 years. A distinctive feature of these projects is the interval between their proposal submission and launch, averaging a year but ranging from around 234 days to 572 days. The funding of the projects ranges from CHF 417,540 up to CHF 2 million, with the average funding standing around CHF 1 million.

Table 2 | Basic data on the finalised 13 BRIDGE Discovery projects

	Average	Min	Max
Time to project start (days)	386	324	602
Project Duration* (months)	40	24	54
Average Budget	CHF 1.015.293	CHF 417.540	CHF 2.000.000
Number of project partners	1	0	2
Number of project staff	9	1	19
Number of implementation partners	1	0	2
Disciplines	Material Sciences (2), Microelectronics/Optoelectronics (2), Other disciplines of Physics (2), Biochemistry, Mechanical Engineering, Experimental Microbiology, Pharmacology/Pharmacy, Genetics, Theatre and Cinema, Veterinary Medicine		

*The average project duration was prolonged because of the COVID-19 pandemic.
Source: BRIDGE office, calculations by Austrian Institute for SME Research.

The projects in the analysis are based in a variety of academic institutions, but the majority are led by PIs from universities: University of Geneva (1 project), University of Zurich (3 projects), EPF Lausanne (EPFL) (3 projects), ETH Zurich (ETHZ) (2 projects).

Other institutions, which contribute with a project each, include: Swiss Center for Electronics and Microtech (CSEM), Swiss Federal Laboratories for Materials Science and Technology (EMPA), Paul-Scherrer-Institute (PSI), University of Applied Sciences Northwestern Switzerland (FHNW)[7].

Almost a third of PIs are female, and there are PIs from various nationalities.

The scientific spectrum the projects explore is broad, spanning Microelectronics, Material Sciences, Other disciplines of Physics (2 projects in each) as well as Biochemistry, Mechanical Engineering, Microbiology, Pharmaceuticals, Genetics, Veterinary Medicine and Theatre and Film Studies (1 project each). The application fields of the projects focus on Engineering (4 projects) and Life Sciences (5 projects), while two projects aimed for applications in Energy and one in ICT.

This is in line with the results of the evaluation by Buser et al. (2023, p. 88) covering all projects starting up to 2022. 35% of the funded Discovery researchers are based at the ETHs, 30% at universities, 20% at universities of applied sciences and 15% at other research institutions, covering eleven disciplines[8], and are implemented in a wide variety of innovation fields (see ibid).

The number of involved researchers varies depending on the project size and lengths. The six largest project teams ranged from 10 to 19 researchers, while smaller projects were conducted by less than five researchers. Smaller and shorter projects, especially projects with a duration of 24 months were less likely to involve PhD students.

In 12 cases, there were other collaborations in addition to the project partners. In 9 of 13 cases an implementation partner was specified in the project application. Letters of Intent (LoI) from a company as an implementation partner were presented in five projects at the proposal stage. However, also four projects without LoIs were able to collaborate with an implementing partner throughout the project.

[7] Both EMPA and PSI are part of the ETH domain.

[8] Based on the database P3 of the SNSF, see Buser et al. (2023).

3 | Case study and survey results of completed projects

This section summarises the qualitative results of the 13 completed Discovery projects by detailing the project objectives, the implementation process and the immediate results achieved. We also assess the potential long-term outcomes of the projects and identify critical contributing factors and areas for future improvement.

Project origin and goals

BRIDGE Discovery projects were based on or built upon previous research. **The motivation for setting up a BRIDGE Discovery project was very clearly in all cases to strengthen applied research and development**. There is no clear rule as to who initiated the project: the idea could come from a research organisation, from an implementing partner, or from both. Approximately one third of the projects received SNSF project funding prior to their submission to BRIDGE Discovery. The partners involved in the project knew each other and had worked together in most cases, but some Discovery consortia also included new partners. **Thus, there was a relatively high level of trust and knowledge, which facilitated the exchange between partners over the course of the project**. The different project members generally knew what to expect from each other and were aware of each other's objectives. In several interviews, PIs were cautious about who they would collaborate with as their work was highly innovative and they often expressed an interest in transferring their research into applications, products and services on their own. For example, one interviewee had experienced problems with intellectual property rights (IPR) in a previous project where the IPR owner (a company) decided not to develop a certain innovation for strategic reasons. **The preferred constellation in most projects is therefore either to create a spin-off company or to work with a company that was created before the BRIDGE Discovery project and was either also a direct spin-off or had close links to the research institute** (e.g. by being located on the campus). Only two projects did not have an implementing partner at all. In the majority of cases (8 out of 13), the primary implementation partner was a spin-off (such as a start-up or SME) originating from the Principal investigator's institute or university.

The interviewed PI and implementation partners positioned the programme clearly between the funding portfolios of the SNSF and Innosuisse. They also emphasised that there are almost no other funding opportunities or alternatives in this regard in Switzerland. Two PIs mentioned that they would probably have looked for alternatives at EU level (e.g. Horizon 2020). However, this would have taken place before the end of the bilateral agreement between the European Commission and Switzerland. Since then, Switzerland has lost its associated country status and is no longer associated to Horizon Europe, which now further limits alternative funding opportunities, at least for coordinators of EU-projects. Except in one case, no other PI considered an Innosuisse programme (e.g. innovation projects without an implementation partner) as an alternative to BRIDGE. This was due to the amount of basic research still required in some cases or the early stage of the innovation project in general. One project idea was submitted to Innosuisse before BRIDGE Discovery but was rejected.

All PIs were familiar with the technology readiness scale (TRL) and all of them were able to approximate the project progress on the TRL scale. As mentioned above, there were differences in the TRL reported at the beginning and at the end of the project among the completed Discovery projects. It should be noted that the reported TRL level is based on the subjective assessment of the PIs. **All projects reported that they had made progress and in the majority of cases the project objectives had been fully achieved (8)**. In projects where the objectives were not fully achieved, this was either due to the need for further testing, as was the case for two projects in the biotechnology sector, low market demand for the innovation, technical challenges or the need for more time and resources. Three projects instead required adjustments to their project goals in response to unanticipated challenges in research and development. The PIs of these projects highlighted, that they highly appreciated the flexibility and understanding of the BRIDGE Evaluation panel and Steering committee when changes in the research

goals have become necessary. There was one case in the sample, where the project was terminated prematurely after the mid-term review. The PI subsequently declined to be interviewed on the grounds that the project had been discontinued, but that proposed changes to the project design could have resulted in a solution that better met market needs.

Project implementation

Cooperation between the project partners generally worked well, albeit to varying degrees. In eleven projects, good cooperation within the project team or between the project partners was explicitly emphasised. Several aspects that are conducive to good cooperation in the projects can be identified based on the interviews.

In some cases (5), **good harmonisation and successful balancing of the different interests of those involved in the project was mentioned as an important factor for good cooperation**. In particular, the expectations of scientific and economic partners regarding the project objectives and output should be clarified and the different underlying expectations, which are also due to the different logics in the scientific and economic systems, should be considered.

Two PIs found it relatively easy to find partners for implementation, as there was a relatively high level of interest in their research topics in industry. Two other PIs, on the other hand, experienced difficulties to find partners in their field. Access to networks and a project idea that appeals to industrial partners are key. In terms of **collaboration intensity** with implementation partners, only two PIs reported that their collaboration was solely based on information exchange. One PI classified the collaboration as loose, but eight PIs reported an intense collaboration with the implementation partner/start-up. Eleven out of twelve PI rated their collaboration with the implementation partner as successful or highly successful.

The **skills of the team and the complementarity of the project partners are also important**. Still high-risk projects in this environment require specific skills to successfully lead the project team, in addition to balancing market expectations. An entrepreneurial spirit in the team is helpful here.

Another point that favoured collaboration was proximity to the implementation partner, both geographically and in terms of the researchers' discipline. In two projects, the **physical proximity between PIs and implementation partners was emphasised as having simplified communication. Another PI mentioned that the establishment of a spin-off had already created a basis of trust**, as the scientific and commercial partners already knew each other well. Three PIs emphasised the great importance of trust between project partners, which is particularly necessary due to the innovative content of the projects.

The importance of prior experience of collaboration between partners from academia and industry was also emphasised in some interviews, in particular experience in the project team with spin-offs (4) from universities. In some (3) cases, the founding of a spin-off was favoured over the involvement of external implementation partners, as this gave the scientists the opportunity to keep control of the direction in which the project develops. In the worst-case scenario, the project could otherwise be discontinued by the corporate partner for strategic reasons. One interviewee emphasised that this also depends on the innovation in question, i.e. the more disruptive it is, the more likely it is to wait with the involvement of external parties, for example until legal protection of intellectual property has been obtained. One PI even saw the creation of a spin-off as a particular success factor for a project, which it could not have envisaged with an existing implementing partner.

Flexibility in implementation, both on the part of the BRIDGE Office and the project partners, is a further aspect. **Due to the research component with an uncertain outcome in most projects, flexibility in the direction of project development is particularly emphasised.**

Several challenges arose during the implementation of the projects. These include ambiguities in the project objectives, expectations, roles and tasks of the different project members and, of course, personnel changes. Interdisciplinarity, i.e. the difficulty of communicating between disciplines and their

different 'languages', is a classic case in point. **The ability to mediate between different disciplines and partners was therefore also mentioned as an important success factor**. In one project, the scientific work was perceived as particularly challenging, while in another it was the economic implementation (commercialisation) that posed the greatest difficulties. In another project, the PI did not see any real collaboration between the project partners, but instead each partner limited themselves to their own part of the project. In one project, the project team faced ethical challenges due to different legal situations regarding animal testing and animal husbandry in another country. Unexpectedly long negotiations on intellectual property protection (2) were mentioned as external factors that could have a negative impact on project implementation. Three projects explicitly mentioned the COVID-19 pandemic as slowing down project implementation.

The ability to **access support services** was highlighted as a particular added value of public funding. Raising additional finance (e.g. venture capital) and the associated access to investor networks were seen as important external factors influencing the realisation, and particularly the further development of projects. Support services, such as those provided by Innosuisse and others, were also considered important. Intellectual property advice and business/start-up coaching were mentioned. However, PIs and other project team members primarily used the support services of their universities (5) for IP services, with a high level of satisfaction. In retrospect, business/start-up coaching could have been used more by team members, as formulated by individual interviewees. Two PIs mentioned that no further external support was needed as the project team already had extensive experience.

In the context of BRIDGE Discovery itself, two PIs also found the information provided by the evaluation panel during the project review to be particularly helpful.

Project results and potential impacts

As intended by BRIDGE Discovery, the projects show a preference for both academic as well as commercial and entrepreneurial aspirations. Based on the survey responses, 13 of the 14 PIs agree or strongly agree that their BRIDGE projects have focused on strengthening application-oriented research and development and transferring research themes to the market and into practice. Other themes such as raising third-party funds to finance research, strengthening cooperation with implementation partner(s), preparing a follow-up project with an implementation partner, securing intellectual property / filing patent application were also highly relevant in most projects.

There are still relatively high development risks, as certain aspects of basic research are still relevant in these projects. Only one PI categorises the innovation pursued in the BRIDGE project as (rather) incremental. Twelve PIs categorise the innovation pursued as (rather) radical, three of them as very radical.

Most of the BRIDGE projects (9/14) commenced at a lower end of the TRL scale (<4). The targeted TRL at the end of the project was most often five or six (9/12). Out of twelve projects aiming to reach at least a TRL level of five, ten were able to achieve this. In certain projects, the development of the innovation exceeded expectations: Out of five projects, all reached or surpassed a Technology Readiness Level (TRL) of seven, although initially, only three of these projects had set their sights on achieving this.

In the short term, the impact of these projects can be seen through measurable outputs such as peer-reviewed publications, patents, and the development of prototypes. **Immediate outputs vary between projects due to differences in project objectives, project duration and thematic areas.** For example, one project has produced two prototypes, but no peer-reviewed publications to date. On the other hand, projects that required more basic research tended to have more peer-reviewed publications than those that had a higher TLR at the start of the project. These metrics are indicative of immediate progress and are crucial for maintaining project momentum, but they are also highly individual to project objectives. The short-term success of the programme is also reflected in the formation of industrial partnerships and stakeholder engagement, which are essential to bridge the gap between laboratory research and market

or societal translation. In six out of 13 projects, this meant strengthening existing partnerships and networks, while four projects established entirely new partnerships.

The **scientific output** of the projects in terms of articles and theses is shown in the table below. The projects supported both scientific training (theses) and scientific research (peer-reviewed papers).

Table 3 | Outputs of the completed BRIDGE Discovery projects

Project results	Achieved	Ongoing / planned	Achieved per project
Master theses (n=13)	27	0	2.1
Dissertations (n=13)	11	6	0.85
Peer-reviewed publications (n=13)	74	9	5.7
Other scientific publications (n=13)	17	2	1.3
Co-publications with implementation partners (n=12)	17	3	1.4

Source: BRIDGE Discovery reports, project database, and survey by Innosuisse. Calculations by the Austrian Institute for SME Research.

In terms of outcomes and based on the survey responses, most projects still plan to secure (additional) intellectual property rights, most often patents (11/14), in some cases (4/14) (also) other rights such as trademarks or design rights. Five projects plan to out-license intellectual property. Only two projects filed no patents and five projects filed more than one patent at the end of the project. This gives an average of 1.4 patents per completed project. The academic contribution shows an average of 8.5 publications per project. While there are some smaller projects without peer-reviewed publications, there are five projects with more than 13 publications. The number of dissemination engagements, such as conference presentations, is similarly distributed, with an average of 12 engagements per project, but ranging from one to 62 engagements. Scientific output, in particular publications, may be affected by activities such as securing intellectual property rights. Therefore, the publication of project results may be delayed until, for example, a patent application has been filed.

Other important outcomes were the **development of career opportunities** (both academic and non-academic), collaboration with other research organisations and implementation partners, and the generation of new research or innovation ideas. While the interviews provided anecdotal reports of project members going to work for a newly created start-up or to work for other companies (and thus pursuing a non-academic career), the survey results indicate that the BRIDGE Discovery projects had developed academic career opportunities for project staff (13/14 agreement) and (or) led to the concretisation of a non-academic career (13/14 agreement). While this supports the finding of Buser et al. (2023) that BRIDGE Discovery has opened up new career paths, it should be noted that this only applies to project team members at the postdoc and predoc level. These are moving from academia to industry with specific skills, which is highlighted by some as a positive outcome. Others stressed that a move to industry can also mean that excellent ideas from young researchers are not pursued. There is no evidence that the involvement of PhD students in projects has a negative impact on the success of project implementation. Although this observation is based on 13 cases, the positive synergies seem to outweigh any possible negative effects. PhD students play an important role in providing the basic research needed to develop project ideas for implementation. They also get to know the needs of companies in relation to innovation projects, although they are mainly involved in more basic research tasks, which is an important qualification aspect in itself.

Short-term impacts also include the establishment of **follow-on projects**. All PIs are planning or already running follow-up projects, which are either a direct continuation of the BRIDGE project or related to the technology developed in the BRIDGE project. There are several projects where the implementing partner is continuing the implementation on its own or where the focus is now only on the development of the start-up. Only two projects did not report any follow-up projects, while three projects each resulted in

three follow-up projects. It is interesting to note, however, that while all PIs are planning to continue the project in some form, most are doing so either with funding not from Innosuisse or SNSF (7) or even without public funding at all (2). Only four projects plan to continue or are already continuing the project with additional funding from Innosuisse: three in an innovation project with implementation partners and one in an innovation project without implementation partners. However, another interviewee stated that the BRIDGE project (also) led to related Innosuisse projects, which are not considered to be follow-up projects in the strict sense. Two PIs plan to submit an Innosuisse project soon. One PI stated that after the BRIDGE Discovery project, R&D activities are still needed before the project can be submitted to Innosuisse. It is worth noting that in ten projects, cooperation with an implementation partner led to further collaboration with them.

Medium-term impacts emerge as projects mature and their results are more fully integrated into the wider scientific community and industry. These impacts are characterised by the progressive adoption of research products in the marketplace and the incremental influence on policy and practice. For example, a project aimed at improving energy efficiency in industrial processes may, in the medium term, lead to wider adoption of these processes across the sector, resulting in significant reductions in energy consumption and operating costs. Similarly, research results from projects are expected to influence curricula and teaching methods, thereby shaping the skills and knowledge base of future researchers and professionals. In some projects (4/13), the medium-term impact would be the application of the developed innovation in a niche market (e.g. spectroscopy, microscopy), while in other projects (5/13) a product, service or solution would have a wider impact on technologies (e.g. photonics) or people and the society as a whole (e.g. medical technology, drug development, ...).

Long-term impacts are considered in terms of lasting contributions to scientific disciplines and lasting societal benefits through implementation. The fundamental research enabled by the projects with a lower TLR, and therefore a significant proportion of fundamental research, is likely to influence subsequent research in the field. When fully implemented, most PIs and implementing partners (8 out of 13 projects) highlighted potentially significant societal impacts. For example, health-related research projects aimed at refining diagnostic tools, treatments and vaccines, which promise to significantly improve health outcomes and quality of life for all populations. Environmental research initiatives contribute to the development of sustainable practices and policies, help mitigate the effects of climate change and promote the conservation of ecosystems. Five respondents indicated that their project contributes to environmentally sustainable solutions, while six respondents indicated that the project has a (rather) weaker impact on sustainability. However, in these high-impact cases, both the PIs and the implementing partners emphasised that most of the impacts will only be realised in the next 5 to 10 years, and possibly even longer. When asked about the likelihood of the research results being translated into a market and/or societal innovation, ten PIs replied that this was likely or very likely, while only one replied that it was unlikely.

Particularly noteworthy are the economic and societal impacts resulting from the start-ups and spin-offs generated by the funded projects. These new companies frequently serve as innovation incubators, facilitating the transformation of research breakthroughs into marketable products and services. The physical and cultural proximity of these entities to their parent universities fosters an entrepreneurial ecosystem, promoting technological entrepreneurship and generating employment opportunities. Both the PIs and the implementation partners interviewed expressed a strong interest in translating research results into practice. While this motivation was the basis of all projects, it has not yet been realised, and in few cases the original idea was abandoned (by the implementation partner) due to insufficient market potential. The interviews also showed that the research results usually form the basis for follow-up research activities. The projects can therefore lead not only to potential economic or social impacts, but also to impacts across research fields and disciplines. From the perspective of programme management, it is important to take into account the different institutional logics of the organisations involved, as well as the different impact pathways different kinds of implementation can take.

Half of the projects would not have been carried out without the funding, a further five would have been carried out to a much lesser extent, and only one would have been carried out to about the same extent. **These results indicate that the programme's additionality is rather high**. As mentioned above, in Switzerland there are only alternatives to BRIDGE Discovery for very specific topics.

4 | Conclusions and discussion points

1. Status quo at the end of the project

Considering the initial objectives in the project applications, we can conclude that about 60% of the projects were able to achieve all their objectives, albeit sometimes in a different way, and can therefore be considered a success. At the other end of the scale, there is no project that did not achieve any of its objectives at all. The vast majority have achieved interesting results in the sense that they are pursuing their objectives in follow-up projects or in their own spin-offs. It should also be noted that it would be unreasonable to expect ready-made solutions at the end of a BRIDGE project. In almost all cases, there is still a considerable amount of R&D to be done before a product, a service or a process is ready for implementation. For some projects it is even too far to start a project within the Innosuisse portfolio, for others it is possible to implement innovation projects with or without implementation partners or receive start-up support. First economic results are expected in the medium term, 2-5 years after project completion. If clinical trials, additional testing and regulatory approval are required before market introduction, the process will take longer. However, there are also immediate and visible results that can be listed here:

- There is evidence that the projects led to the application of scientific knowledge, most clearly in the creation of spin-off companies in six projects. This adds to the regional knowledge clusters at these research institutions, because spin-offs tend to stay close to their Alma mater to benefit from future knowledge transfer.
- None of the interviewees described their projects as complete failures, and all resulted in follow-up research activities. Follow-up activities are mostly pursued in publicly funded projects outside the Innosuisse and SNSF portfolio (e.g. at EU level). Some of these projects further develop the Discovery project, others are related in the sense that they build on the project results and findings, but do not further develop the original project idea.
- Apart from the usual Masters' theses, PhDs and scientific publications as scientific outputs, Discovery projects tend to strengthen both academic and non-academic career paths. A transition from academia to industry in terms of people is manifested at the level of post-docs and PhDs, which is also true for spin-offs (professors stay at the research organisation, and sometimes have some kind of involvement in the spin-offs).
- The assessment of the economic success of the projects will depend on the indicators that are used in each individual case. There are discovery projects that will not lead to an economic realisation in the near future, but these are clearly a minority and, given the early stage of discovery projects, it is to be expected that not all projects will lead to the commercialisation of an innovation, due to the still high risk involved in the R&D process. For the technology-oriented projects in this study, three possible implementation paths emerged, each leading to different implementation and exploitation options.

2. Success factors in research and preparatory implementation

Most projects involved a potential implementation partner at some stage during the project implementation. In some cases, a spin-off was created to act as an implementation partner, in other cases the implementation partner was chosen at the beginning of the project, and in some cases the implementation partner was an existing company but was chosen at some point after the start of the project. However, direct commercialisation is not always the preferred route. Another option would be to out-license secured IPRs to an existing company. In such cases, there is less need for project members at research institutes to be involved in the commercialisation process. Thus, there is great heterogeneity in the preferred routes for exploiting an innovation and a certain flexibility in terms of defining success criteria for Discovery projects is necessary. Under these circumstances, we identify the following success factors:

- From research organisations, often located nearby, have proven to be highly effective collaborators as they alleviate the main problems associated with university-business partnerships.
- A good balance between the different partners involved and their individual project objectives. Project management and team members should be aware of the different expectations of academic and industrial partners. Competence in inter- and transdisciplinary project management facilitates knowledge transfer within the project.
- Flexibility in deciding when and how to involve an implementation partner. It was clear that all Principal investigators were interested in translating research results into practice, which at some point requires the involvement of an implementation partner. However, due to the different foci of the projects, there are different opinions on when and to what extent an external partner is useful to best implement the project results.
- Due to the open R&D process and high-risk profile of the projects, it is important that the programme management provide opportunities to allow for the adoption of the project during its implementation. In the majority of projects where adjustments were necessary, these were approved by the evaluation panel and could also be implemented.
- Handling the IP rights is an important, but challenging process, which seems to be supported in a rather high-quality manner by the host institutions.
- Entrepreneurial skills within the team can help to focus project activities on implementation and support the translation of the project into applications. In projects where the PI does not have such competences, these could be brought into the project through external consultants or coaches. Start-up training courses for project members have also proved helpful, especially for post-docs or PhD students who have chosen to work in a spin-off company.

3. Design of BRIDGE Discovery

The BRIDGE Discovery programme is rated very positively by the interviewees, who do not see a need for major changes in the overall design of the programme. The programme objectives of (1) stimulating promising research ideas and (2) facilitating research-based innovation through acceleration are well addressed by Discovery. The overall governance and implementation design is appropriate and enables the programme management to work towards the achievement of the programme's objectives. Based on the information gathered from the completed projects, the additionality of the programme is high, i.e. about half of the projects would not have been carried out at all without the funding and almost the other half would have been carried out to a (much) lesser extent.

- Some of the research ideas promise high impact and societal relevance. In terms of acceleration, however, some aspects of the design and implementation can be improved (see chapter 5).
- The interviews identified three routes for implementation: implementation through existing partners, creation of a spin-off or out-licensing. These three routes do not seem to have been explicitly addressed in the design of the Discovery programme so far. The different implementation routes can be considered in the project evaluation process and could be supported in the project through measures such as the inclusion of an Innosuisse coach to help align the project goals with different implementation routes rather early in the project delivery.
- One of the challenges of the proposal evaluation process is to strike a balance in the selection of projects focused on technological innovation and those focused on topics related to social sciences and humanities. Although this short evaluation was not tasked with investigating the inclusion of social innovation in detail, the topic was included in the stakeholder interviews based on the presence of the topic. It was argued by several that technical and social innovation projects are fundamentally different in nature, requiring different types of evaluation criteria and different competencies. It is therefore an open question whether a joint evaluation panel and/or a joint call without a dedicated budget line is the right choice for fair treatment. Given their fundamental differences, we tend to argue in favour of separating social innovation from technological innovation, either through budget lines, separate calls and separate evaluation criteria and a separate (smaller) panel.

4. BRIDGE Discovery in context with the funding portfolios of SNSF and Innosuisse

Buser et al. (2023) found in their evaluation that BRIDGE is clearly positioned along the research and innovation chain and fills a gap between the funding portfolios of SNSF and Innosuisse. Combined with the rather low funding rate, which reflects the high demand, this would mean that BRIDGE would also meet the third programme objective of contributing to a coherent set of funding instruments, in this case between the (other) SNSF and Innosuisse programmes.

- The data acquired from this study suggests that the programme successfully accomplishes its objective, although it may not be able to address the gap between basic research and innovation activities in its entire range.
- The most frequently cited reasons for applying to BRIDGE Discovery instead of another programme (e.g. Innosuisse Innovation projects without an implementing partner) in the programme evaluation (Buser et al., 2023), are similar to those given in the interviews: Discovery was perceived as the most suitable programme for the project (link between basic and applied research), or the project was not mature enough for implementation in an Innosuisse programme.
- There are indications from the case studies that the well-known 'valley of death' is a potential problem for the spin-offs that have been created. On the one hand, in some cases the completed projects themselves require further R&D activities that are not covered by the Innosuisse funding programmes. On the other hand, some completed projects have continued their innovation efforts in an Innosuisse programme. In either case, acquiring venture capital is currently a major challenge for these companies.
- Relatively few projects continue within the Innosuisse funding portfolio, although about half of the projects have founded spin-offs or intend to do so, two projects have follow-up projects with the SNSF, but seven are pursuing their goals with other funding (EU, private foundations, direct

venture capital for a start-up, or even one again with Discovery). Researchers generally complain about the lack of access to European programmes, which significantly hampers their research.

5 | Possible improvements

Although we can conclude from the previous chapter that BRIDGE Discovery is successful in achieving its objectives, there is still room for deliberation about improvements, mainly in terms of smaller adjustments, but also at a conceptual level on how to make the transfer even more permeable in the context of the Swiss research and innovation support portfolio as a whole.

Minor changes can improve and **clarify communication** about the goals and what is expected from the programme and the projects. This includes a few key points:

1. The programme's objectives are currently open to different interpretations and could benefit from a more precise definition with specific targets and associated indicators. Relatedly, the governance of the programme could also benefit from greater decision-making authority for the BRIDGE steering committee, as argued in chapter 1.2.
2. While universities and ETHs offer various support services that are appreciated by the project teams, there is room for improvement in promoting the support of Innosuisse and other organisations such as the IPI, not only to the lead scientists, but to everyone involved in Discovery projects, as all project members are the target group, especially if their development paths point towards a spin-off option.

To increase the likelihood of projects leading to successful implementation, support to **strengthen the entrepreneurial spirit and skills** of project team members could be considered.

1. It is worth noting that some of the PIs in our sample projects already had a high level of entrepreneurial spirit and experience. Therefore, additional support needs to be tailored to the individual research teams, which could be done during a screening meeting with a coach in the first half of the project. This could also help to define implementation pathways for the projects.
2. We could find a relatively high share of projects with (planned) spin-offs. Here, it could be beneficial to involve some coaching/mentoring early in the projects to screen for potentials and people's plans to assess appropriate support that could be provided by the Innosuisse portfolio more actively. Access to venture capital and start-up networks may be beneficial if a spin-off is involved during the project period, or if a spin-off is created based on the project results.
3. Training courses on how to set up and manage project teams composed of researchers from different disciplines (for younger PIs) could also be an option worth considering. This would not only help to increase efficiency during the implementation process but may also enhance knowledge transfer between disciplines.

Some **improvements in the programme's implementation** to better address its goals could be considered:

1. The time between application and project start should not exceed seven months, as foreseen in the BRIDGE ToR, as longer timeframes hamper industrial cooperation and time-critical projects per se.
2. It is also suggested to establish a mechanism to respond more quickly to scientific challenges arising in projects, so that difficulties and potential next steps can be discussed with evaluation panel members directly when issues arise. E.g. making decisions without meetings of all panel members.

3. It can be more challenging to transfer research results to established industrial partners, especially larger, globally active industries with competing internal strategies, which might result in sudden disinterest in the project results. IP rights could be formulated with the perspective of maintaining adaptability, in the event that there are shifts in strategies due to mergers and acquisitions, or alterations in the strategies of global companies. This can be achieved through flexible licensing agreements, joint ownership agreements, milestone-based revisions or exit clauses. BRIDGE might want to provide a sample contract, as this is done in some other programmes.
4. Two noteworthy insights have emerged from the interviews. Firstly, retaining the intellectual property rights with the research organization serves as an attractive career prospect for postdoctoral researchers navigating high job uncertainties. Secondly, transferring project equipment to a start-up after the project's completion facilitates jumpstarting the new company. This could be facilitated by BRIDGE.

Another important question is what makes a Discovery project a success. While a distinction should be made between scientific (e.g. publications) and industrial outcomes (e.g. demonstrators, prototypes), the success of a project could also be measured according to its individual objectives. **Three implementation paths emerge from the case studies: The involvement of an existing industrial partner, the creation of a spin-off company or the out-licensing of a technology.** Depending on the objectives of the project, each of these paths could lead to different measures of success (e.g. product development, investment in a start-up company, licensing income). These results may be influenced by factors such as the disciplinary origin, the pioneering nature of the project idea, the structure of the industry, etc.

1. Different measures should be used to determine the success of a project, depending on its individual objectives. Different implementation routes mean that different outputs and outcomes can be expected depending on the project. Programme monitoring should therefore take this into account (see Annex 6.2).
2. The timing and nature of the involvement of implementation partners should continue to be at the discretion of PIs. The researchers noted that, particularly for high-risk and more radical innovation ideas, there is a high risk of knowledge drain if implementation partners are involved too early, which could ultimately lead to a sub-optimal outcome. Best practice could be identified in relation to the implementation pathways chosen.
3. Specific indicators (KPIs) along the implementation pathways could therefore capture the most relevant aspects to determine successful projects, see Chapter 6.2. for examples.
4. To be able to assess the medium-term effects (outcomes), an impact monitoring three (or even up to ten) years after project completion can be developed by Innosuisse, which could present the results along the three identified pathways.

Given the **fairly large gap between the portfolios of the SNSF and Innosuisse** (see chapter 1.2), resulting in a high demand for BRIDGE Discovery and the currently limited budget, **several options could be considered**.

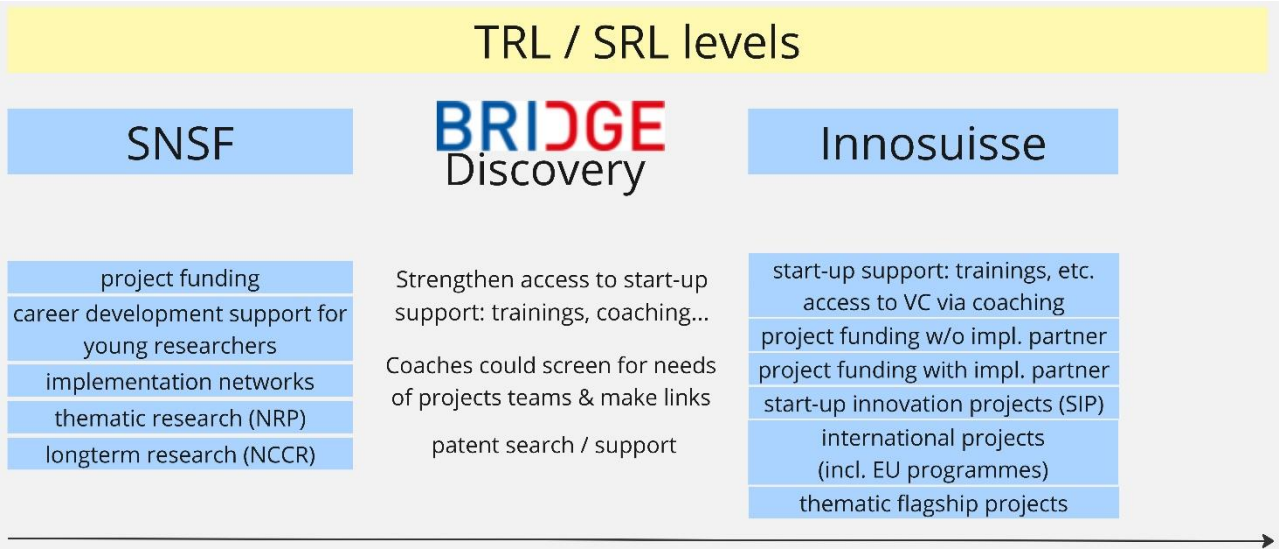
This argument is further supported by the fact that the programme targets a variety of project types, including high-risk technological projects with longer time horizons, where PIs hold sometimes the attitude that the project results are not (quite) ready to be transferred to follow-on programmes at Innosuisse, which might sometimes be true, and sometimes less so.

This could be addressed in several ways:

- Either BRIDGE Discovery is flexible enough to extend the implementation period of such projects if the initial case of high potential is still valid and considered feasible.
- Alternatively, such projects could be encouraged to reapply to BRIDGE Discovery.

In addition, a more comprehensive approach is presented below, showing the existing or potential interaction of BRIDGE Discovery with (mainly) the SNSF and Innosuisse portfolios.

Figure 1 | (Possible) interactions of BRIDGE Discovery with the SNSF and Innosuisse support portfolios



Source: KMU Forschung Austria, SNSF, BRIDGE and Innosuisse

This figure provides examples on how BRIDGE Discovery could benefit from the current SNSF and Innosuisse portfolios.

For running Discovery projects, this concerns primarily coaching, and in case of start-ups as options also trainings and facilitating access to VC.

The figure also shows schematically the funding portfolio of the SNSF and Innosuisse in 2023, which is closest to the pre- and post-stages of Discovery projects: The overall approach could benefit from closely monitoring which next steps are likely for which types of projects, and how the criteria of the existing portfolio / programmes, e.g. innovation projects without or with implementation partners, start-up innovation projects, EU programmes, etc., could be modified to ensure that the three implementation pathways mentioned above can be taken into account.

Given that the results from Discovery projects are nearly always not market-ready, they even flag up some fundamental research questions not yet solved, there is also a rationale for occasional subsequent projects within the SNSF portfolio.

However, there are also reasons for the SNSF to consider how its portfolio (e.g. thematic research, implementation networks) can provide the basis for interesting cases for future BRIDGE Discovery projects even more than they do now.

The aim is to establish a diverse 'bridging ecosystem'. This involves connections to both preceding and succeeding programmes, and sometimes to those at similar stages. The goal is to accommodate various scenarios in terms of how close the project is to application, the scale of the project, and the timeframes involved. This is crucial for advancing more innovative ideas towards practical use, taking into account the specificities of different research areas and industries.

One outcome of this process could be a well-defined overview of the available options for 'bridging projects'. This overview should then be shared with the research community and industry, serving as a transparent guide for evaluating different pathways towards implementation.

6 | Annex

6.1 | Methodology

The methodology of this short analysis is based on context interviews, project database analyses, an online-survey, and case studies of finalised projects.

Context interviews

Christian Brunner, coordinator of BRIDGE at SNSF; Nicoletta Casanova, president of the BRIDGE steering committee and innovation councillor of Innosuisse; Annalise Eggimann, director of Innosuisse; Laetitia Philippe, research development at SNSF / now head of the national research and innovation division at SBFI; Kathrin Kramer, deputy head of project and programme funding at Innosuisse, Jakob Rhyner, chairman of the Discovery evaluation panel; Pierre Willa, head of division at SNSF.

Analysed documents and data

The evaluation team analysed the project data provided by the BRIDGE office in the form of Excel files, project applications and reports, as well as the publicly accessible project database of the SNSF and Innosuisse.

Case studies

The 13 case studies are based on semi-structured interviews with principal investigators and implementation partners, where available, complemented with information from the final project reports.

Online-Survey

The survey was developed in close collaboration between Innosuisse, the SNSF and the evaluation team and implemented online by Ecolysis GmbH Zürich (Peter Koch) and Innosuisse. The response rate is 100% of the principal investigators.

6.2 | Possible indicators for assessing project outcomes

The application and evaluation process of Discovery projects rightly allows for different implementation paths. In some cases, patenting and out-licensing could serve as indicators of project success. In other cases, where a different implementation path is sought, indicators such as follow-up projects with an implementation partner or spin-offs created or even prototypes developed could be used as indicators of project success. As implementation steps are still needed at the end of the project before a possible market launch, it is recommended to evaluate the project outcome after three years as this is foreseen within the Innosuisse impact monitoring plan.

Measurement of project outcomes to assess project success depends on the individual projects. Relevant aspects that could indicate, how successful a project was depending on the implementation path followed could be:

Route 1: Out-licensing

Research partners:

- Patent applications
- Patents granted
- Number of out-licensing agreeements
- Licence reveneue

Implementation partner:

- Use of in-licensed technology: secure freedom-to-operate, access to technology, product development, etc.

Route 2: Implementation via existing partner

Research partners:

- Collaborations (LoIs)
- Patent applications with and without partner
- Out-licensing agreements (+revenue)
- (Co-)Publications with and without partner
- Developed prototypes and demonstrators
- Follow-up projects with partner

Implementation partner:

- Use of acquired technology: product and service development, strategic reasons, etc.
- Follow-up projects based on project results (& volume of projects)
- Number of products/services developed
- Targeted market size
- Revenue with newly developed or adapted products/services
- Potential outcome and impact (incl. effects along the criteria of EU taxonomy / SDGs)

Route 3: Implementation via spin-off

Research partners:

- Spin-offs
- Patent applications with and without spin-off
- Out-licensing agreements
- Follow-up projects with spin-off

Implementation partner:

- Available (and missing) competencies in the spin-off
- Investments in the spin-off (private investments, volume of follow-up projects)

- Patents
- Out-licensing agreements (e.g. in case of outsourcing of product production)
- Targeted market size
- Number of products/services developed
- Revenue with newly developed or adapted products/services
- Potential outcome and impact (incl. effects along the criteria of EU taxonomy / SDGs)

Some of the suggested indicators are already included in the routine project monitoring reporting at project completion, while others could be added in the future Innosuisse and SNF (BRIDGE) plan to conduct a survey to collect information on the project's outcomes and impacts three years after its completion, which could also incorporate some of the suggested indicators.

6.3 | Survey results

Has the project idea been the subject of SNSF funding before project submission?	Number of answers
... No	10
... Yes, SNSF project funding	4
... Yes, SNSF career funding	0
... Yes, another SNSF funding instrument:	0

Source: Survey of completed projects, Innosuisse

Have the following themes been strategically important to you when submitting the project?	Strongly disagree (1)	Disagree (2)	Rather disagree (3)	Rather agree (4)	Agree (5)	Strongly agree (6)	No answer	Total
Developing basic research topics	0	1	3	2	4	3	1	14
Strengthening application-oriented research and development	0	0	0	0	3	10	1	14
Academic qualifications (Master, PhD, Postdoc) and strengthening of academic careers	0	1	2	5	4	1	1	14
Peer reviewed publications	0	0	3	5	1	4	1	14
Raising third-party funds to finance research	0	0	1	0	7	5	1	14
Transferring research to the market and into practice	0	0	0	0	3	10	1	14
Gathering experience from the business world and practice for use in research	0	0	0	7	1	5	1	14
Preparing a spin-off/start-up	0	1	0	5	1	5	2	14
Strenghtening a non-academic career	0	2	3	4	0	4	1	14
Strengthening cooperation with implementation partner(s)	0	2	0	1	4	6	1	14
Preparing a follow-up project with an implementation partner	0	1	0	3	3	6	1	14
Securing intellectual property / filing patent application	0	0	1	3	3	6	1	14

Source: Survey of completed projects, Innosuisse

Please indicate which applies to the innovation you pursued with your BRIDGE Discovery project. The innovation pursued by the BRIDGE Discovery project is...	Number of answers
Strongly incremental (1)	0
Incremental (2)	0
Rather incremental (3)	1
Rather radical (4)	6
Radical (5)	3
Strongly radical (6)	3
No Answer	1
Total	14

Source: Survey of completed projects, Innosuisse

At what stage of maturity (i.e., Technology Readiness Level, TRL or Innovation Readiness Level, IRL) was your research when you submitted your BRIDGE Discovery application ?

	TRL/IRL 1	TRL/IRL 2	TRL/IRL 3	TRL/IRL 4	TRL/IRL 5	TRL/IRL 6	TRL/IRL 7	TRL/IRL 8	TRL/IRL 9	TRL does not apply/ no answer	Total
... at the start	3	2	4	1	1	1	1	0	0	1	14
... TRL / IRL targeted	0	0	1	0	4	5	2	1	0	1	14
... TRL / IRL achieved	0	0	2	1	2	4	1	2	1	1	14

Source: Survey of completed projects, Innosuisse

	Very weakly	Weakly	Rather weakly	Rather strongly	Strongly	Very strongly	Don't know / no answer	Total
Does the BRIDGE Discovery project lead to environmentally sustainable solutions?	3	0	3	1	2	2	3	14
Does the BRIDGE Discovery project lead to socially sustainable solutions?	2	0	4	1	3	0	4	14
In your BRIDGE Discovery project, to what extent did your research focus on the development of digital technologies?	5	0	2	2	1	4	0	14
To what extent did your research focus on developing new digital business models?	5	2	3	1	2	1	0	14

Source: Survey of completed projects, Innosuisse

How do you assess the BRIDGE Discovery project with regard to the integration of different disciplines ?	Number of answers

Multi-disciplinary (1)	4
Inter-disciplinary (2)	9
Trans-disciplinary (3)	0
None of the above categories applies (#NV)	1
Total	14

Source: Survey of completed projects, Innosuisse

What kind of intellectual property rights protection is being planned?	Number of answers
Patent application(s)	11
Trademark(s) / Copyright / Design right(s)	4
In-licensing (rights to use, develop, or commercialize intellectual property assets that are owned by another entity)	4
Out-licensing (granting another entity the rights to use, develop, or commercialize its own intellectual property assets)	5
Total	14

Source: Survey of completed projects, Innosuisse

What assistance have you used or plan on using to protect your intellectual property rights?	Used (1)	Planned (2)	Not planned / N.A.	Total
Transfer office of your research organisation	12	1	1	14
Federal Institute of Intellectual Property	7	1	6	14

Source: Survey of completed projects, Innosuisse

Have the following outcomes been achieved at the end of the BRIDGE Discovery project?	Strongly disagree	Disagree	Rather disagree	Rather agree	Agree	Strongly agree	Don't know / no answer	Total
Establishing a link between basic and application-oriented research	0	0	0	0	3	10	1	14
Strengthening basic research	0	1	1	5	2	4	1	14
Strengthening application-oriented research	0	0	0	0	3	10	1	14
Developing academic career opportunities (e.g., PhD, Postdoc) for project staff	0	0	1	0	4	8	1	14
Using the research and project results in education and training	0	0	0	8	2	3	1	14
Establishing cooperation with another research organisation or exploiting synergies	0	0	1	0	3	9	1	14

Knowledge and technology transferStrengthening the exchange between science and industry	0	0	0	0	4	9	1	14
Strengthening the exchange between science and the public sector	0	2	3	5	2	1	1	14
Strengthening the exchange between science and NGOs / non-profit organisations	1	4	5	1	1	1	1	14
(Steps towards) Foundation of a start-up/spin-off	0	2	1	3	0	6	2	14
Concretisation of a non-academic career / future employment for project staff	0	1	0	2	3	7	1	14
Exchange of ideas with implementation partner	0	0	0	1	3	8	2	14
Collaboration with implementation partner in a project	0	0	0	0	3	9	2	14
Concrete plans to implement the results with an existing implementation partner / enterprise	0	0	0	0	3	9	2	14
Further achievementsEmergence of new research or innovation ideas outside the project.	0	1	0	2	3	7	1	14

Source: Survey of completed projects, Innosuisse

Which of the following research results can be directly linked to the BRIDGE Discovery project?				
	checked (1)	unchecked (0)	Don't know / no answer (#NA)	Total
Master thesis : Ongoing / planned	0	13	1	14
Master thesis : Achieved	10	3	1	14
Master thesis : No results	3	10	1	14
Dissertation(s) PhD : Ongoing / planned	3	10	1	14
Dissertation(s) PhD : Achieved	9	4	1	14
Dissertation(s) PhD : No results	1	12	1	14
Research publications (double peer reviewed) : Ongoing / planned	5	8	1	14
Research publications (double peer reviewed) : Achieved	11	2	1	14
Research publications (double peer reviewed) : No results	0	13	1	14
Other scientific publications : Ongoing / planned	2	11	1	14
Other scientific publications : Achieved	9	4	1	14
Other scientific publications : No results	3	10	1	14

Co-publications with implementation partner : Ongoing / planned	3	9	2	14
Co-publications with implementation partner : Achieved	6	6	2	14
Co-publications with implementation partner : No results	3	9	2	14

Source: Survey of completed projects, Innosuisse

Please enter the concrete numbers for the results ongoing or planned:											
	1	2	3	4	5	6	8	14	15	17	KA*
Master thesis : Ongoing / planned	0	0	0	0	0	0	0	0	0	0	0
Dissertation(s) PhD : Ongoing / planned	1	1	1	0	0	0	0	0	0	0	0
Research publications (double peer reviewed) : Ongoing / planned	3	1	0	1	0	0	0	0	0	0	0
Other scientific publications : Ongoing / planned	0	1	0	0	0	0	0	0	0	0	1
Co-publications with implementation partner : Ongoing / planned	3	0	0	0	0	0	0	0	0	0	0
Master thesis : Achieved	2	3	0	2	1	1	0	0	0	0	1
Dissertation(s) PhD : Achieved	6	1	1	0	0	0	0	0	0	0	1
Research publications (double peer reviewed) : Achieved	0	3	2	2	0	0	1	1	1	1	0
Other scientific publications : Achieved	0	3	2	0	1	0	0	0	0	0	3
Co-publications with implementation partner : Achieved	2	1	0	2	1	0	0	0	0	0	0

*answers of "0" included
Source: Survey of completed projects, Innosuisse

From your perspective, how do you assess the implementation and exploitation opportunities of the research results at the end of the project?	Number of answers
The project results are not advanced enough to consider next steps towards a possible application; we still need to clarify basic research questions (1)	0
The feasibility of the project goals has been tested, and this testing indicates that concrete implementation steps are indeed possible (2)	2
Conclusive results have been attained, making it feasible to proceed with concrete and further implementation steps (3)	11
Don't know / no answer	1
Total	14

Source: Survey of completed projects, Innosuisse

How do you assess the likelihood of implementing the research results in an innovation on the market and/or society in the medium and long term?	Number of answers
Very unlikely (1)	0
Unlikely (2)	1
Rather unlikely (3)	0
Rather likely (4)	2
Likely (5)	3
Very likely (6)	7
Don't know / no answer	1

Source: Survey of completed projects, Innosuisse

Are you planning to (or do you already) continue your project after the BRIDGE Discovery funding has ended?				
	Unchecked (0)	Checked (1)	No answer	Total
No	14	0	0	14
Yes, but without additional funding	12	2	0	14
Yes, with additional funding from Innosuisse	10	4	0	14
Yes, with additional funding from SNSF	12	2	0	14
Yes, with other funding	7	7	0	14

Source: Survey of completed projects, Innosuisse

Please tick all planned or ongoing applications for additional funding from Innosuisse					
	Planned (1)	Ongoing (2)	Not planned (3)	Don't know / no answer	Total
Innovation project with implementation partners	0	3	1	0	4
Innovation project without implementation partners	0	1	3	0	4
International project funding	1	1	2	0	4
Innovation Booster	0	0	4	0	4
Network Event Series	0	0	4	0	4
Flagship projects	0	0	4	0	4
Start-up Training	0	0	4	0	4
Start-up Coaching	0	0	4	0	4
Start-up Innovation project	1	0	3	0	4
BRIDGE Discovery	1	0	3	0	4

Swiss Accelerator	0	0	4	0	4
SNF					0
Project funding	1	1	0	0	2
Career funding	0	0	2	0	2
National Research Programmes (NRPs)	0	0	2	0	2
National Centres of Competence in Research (NCCRs)	0	0	2	0	2

Source: Survey of completed projects, Innosuisse

Did you collaborate or exchange with one or more implementation partners on your BRIDGE Discovery project?	
No (1)	2
Yes, one implementation partner (2)	9
Yes, two or more implementation partners (3)	3
Don't know / no answer	0
Total	14

Source: Survey of completed projects, Innosuisse

Did you collaborate or exchange with one or more implementation partners on your BRIDGE Discovery project?	Number of answers
No (1)	2
Yes, one implementation partner (2)	9
Yes, two or more implementation partners (3)	3
Don't know / no answer	0
Total	14

Source: Survey of completed projects, Innosuisse

Number of partners	Number of answers
One	0
Two	2
Three	1
Total	3

Source: Survey of completed projects, Innosuisse

How would you characterise your main implementation partner?	Number of answers
Start-up/spin-off (< 10 years old) (1)	4

SME (2)	3
Large company (3)	4
Public sector / administration (4)	0
NGOs / non-profit organisations (5)	0
Does not apply / don't know	1
Total	12

Source: Survey of completed projects, Innosuisse

How would you characterise the other implementation partner(s)?

	Checked	Unchecked	Don't know / no answer
Start-up/spin-off (< 10 years old)	0	3	0
SME	2	1	0
Large company	2	1	0
Public sector / administration	0	3	0
NGOs / non-profit organisations	0	3	0
Total	4	11	0

Source: Survey of completed projects, Innosuisse

How would you describe the collaboration between your project and the implementation partner(s)?

	Exchange of information (1)	Loose collaboration (2)	Intense collaboration (3)	Does not apply / don't know	Total
Integration of the implementation partner's expertise in research and development	2	1	8	1	12
Utilisation of the implementation partner's infrastructure	1	4	5	2	12
Collaboration for the development and design of the product, process, or service	3	2	6	1	12
Collaboration for the market introduction phase	4	2	3	3	12

Source: Survey of completed projects, Innosuisse

Did you have other forms of exchange or collaboration with your implementation partner(s)?

One of our project members became co-founder and CTO of the startup. Patents from the Bridge project have been licensed by the startup.l	1
The answers relate to the implemenation partner of an ongoing Innosuisse project. During the BRIDGE project there was no dedicated implemenation partner.	1
Patent rights transfer	1

Source: Survey of completed projects, Innosuisse

How successful was your collaboration with the implementation partner(s) overall? Success of the cooperation with implementation partner	Number of answers
Highly unsuccessful (1)	0
Unsuccessful (2)	0
Rather unsuccessful (3)	1
Rather successful (4)	0
Successful (5)	5
Highly successful (6)	6
Don't know / no answer (#NA)	0
Total	12

Source: Survey of completed projects, Innosuisse

Did the cooperation with your implementation partner(s) during the BRIDGE Discovery project lead to further collaboration with them?	Number of answers
No (1)	1
Yes, such cooperation is planned (e.g. within another project) but has not yet started (2)	0
Yes, cooperation has already started (e.g. within another project) (3)	10
Further cooperation does not apply / Don't know	1
Total	12

Source: Survey of completed projects, Innosuisse

Would you have carried out the research idea of the BRIDGE Discovery project even without project funding of BRIDGE Discovery?	Number of answers
No, we would not have carried out the project (1)	7
Yes, but likely to a much lesser extent (2)	5
Yes, but likely to a slightly lesser extent (3)	1
Yes, most likely to more or less the same extent (4)	1
Don't know / no answer	0
Total	14

Source: Survey of completed projects, Innosuisse

How would your project have developed if the BRIDGE Discovery application had been unsuccessful?

	Checked (1)	Unchecked (0)	No answer	Total
I would have looked for another funding opportunity	5	2	0	7
I would have developed the project further with funds from my university / research institution	1	6	0	7
I would have reduced the project design compared to the application for funding	5	2	0	7
The project would have been realized more slowly	4	3	0	7
Other:	1	6	0	7

Source: Survey of completed projects, Innosuisse

How would you rate the benefits of the BRIDGE Discovery project in terms of the following topics?	Very low (1)	Low (2)	Rather low (3)	Rather high (4)	High (5)	Very high (6)	Don't know / no answer	Total
Solving the remaining basic research elements	1	1	4	3	4	1	0	14
Solving the application orientated research questions	1	0	0	1	3	9	0	14
Collaboration with research partners	1	0	1	0	4	8	0	14
Collaboration with implementation partner(s)	1	0	1	1	1	9	1	14
Strengthening the academic career of the project staff	1	0	3	2	3	5	0	14
Strengthening the non - academic career	1	0	1	2	3	7	0	14

Source: Survey of completed projects, Innosuisse

How successful do you think your BRIDGE Discovery project has been overall?	Number of answers
Highly unsuccessful (1)	1
Unsuccessful (2)	0
Rather unsuccessful (3)	0
Rather successful (4)	1
Successful (5)	4
Highly successful (6)	8
Don't know / no answer	0
Total	14

Source: Survey of completed projects, Innosuisse

Overall, how satisfied are you with the BRIDGE Discovery funding programme?	Number of answers
Very unsatisfied (1)	1
Unsatisfied (2)	0
Rather unsatisfied (3)	0
Rather satisfied (4)	0
Satisfied (5)	4
Very satisfied (6)	9
Don't know / no answer (#NA)	0
Total	14

Source: Survey of completed projects, Innosuisse

Specifically, how satisfied are you with the support you received during the project?	Very unsatisfied (1)	Unsatisfied (2)	Rather unsatisfied (3)	Rather satisfied (4)	Satisfied (5)	Very satisfied (6)	Don't know / no answer	Total
Support from the university/research institution (e.g., Research Office, Technology Transfer Office, etc.)	1	0	0	1	7	5	0	14
Support from the BRIDGE Office	1	0	0	2	6	5	0	14
Support from SNSF and/or Innosuisse	1	0	0	2	5	5	1	14

Source: Survey of completed projects, Innosuisse

Would you like to comment on external support?
We could have benefitted from more support for the transition from a research project to a business application / start-up.
I think Bridge is a perfect program for Switzerland. It puts a healthy amount of funding towards translation. We have a lot of great research in Switzerland, but if it doesn't get out of the lab and towards the benefit of society, what's the point in the end?
It would be helpful to be assigned a "coach" from the Bridge Office to add further expertise to the project and thus to go beyond the mostly "only" administrative interactions with the Bridge Office
Very disappointing with this project. I hope this is not the case for too many investigators of the Bridge with funding cut for no reason

Source: Survey of completed projects, Innosuisse

Where do you see room for improvement for BRIDGE Discovery? What do you think works very well?
More help and training on technology transfer towards the end of the project would be great!

I suggest getting more technically well informed individuals on the panel who appreciate the challenge of translating research. It's about much more than a good business plan; the technology has to make sense. This is difficult to figure out.
Very key vehicle to support innovation, if anything, I would further increase its budget and aim for even greater impact
The BRIDGE project was a very nice opportunity. Excellent ratio of funding and administrative duties.
I think the instrument needs a larger budget
Make it clear and transparent what the success criteria are. At the time of our project submission / evaluation, it was not clear how much focus was on scientific merit (peer-reviewed publications) and how much on technology implementation (spin-off, license agreement, ...)
I think it is a very bad idea to cut funding after one year of project. I have done research for 30 years and never saw this before.

Source: Survey of completed projects, Innosuisse

6.4 | Literature

Buser, B., Moser, C., Capillo, M., Lügestenmann, M., Kaiser, N., Leitner, K.-H. (2023). Evaluation BRIDGE. Schlussbericht (Final Report). Econcept AG in cooperation with AIT Austrian Institute of Technology GmbH. Zurich

SWR (2022). Evaluation des Schweizerischen Nationalfonds. Bericht des Schweizerischen Wissenschaftsrates. (Evaluation of the Swiss National Science Foundation). Bern