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Institutionalising experimentation in innovation policy: challenges and solutions in upscaling

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Abstract

The paper addresses one of the major weaknesses of transformative innovation policy: the lack of solutions for institutionalising experimentation beyond pilots. To address this issue, we explore a) pilots and policy labs as two potential approaches to experimentation, b) the issue of institutionalising experimentation in the regional context through individual agencies or bottom-up, self-organised stakeholder involvement, and c) methodological issues in implementing partnerships for regional innovation (PRI). In our argumentation, we draw on the experiences from the EU regional innovation policy, particularly from the Slovenian research and innovation partnerships (SRIP) and regions in Denmark, the Netherlands and Sweden. Although they are cases from institutionally different contexts, they are all explicitly or implicitly grounded in the 'learning networks' approach. Our analysis suggests that: a) pilots and policy labs as the mainstream institutional solutions to experimentation, at least in the context of the EU regional innovation policy, face serious challenges, b) transformative regional policies require complementary national or regional government-facilitated approaches complemented by bottom-up driven partnerships for regional innovation, and c) organisationally these partnerships can build on the accumulated experience of network-based programs. We provide tentative advice on how policies should be designed to increase the chance of upscaling.

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1 Introduction

This paper critically explores the implementation of the transformative innovation policy (TIP) framework in the context of regional policy. A key feature of the TIP is directionality and intentionality in supporting technological change and innovation. A specific direction of transformation needs to be inclusive and experimental; it should aim at the overall sociotechnical system and go well beyond conventional STI policy (Schot and Steinmueller, 2018). This shift requires a transformational or mission-oriented approach whose objectives should be the subject of broad-based public debate (Linder et al., 2021). To achieve mission goals, participants need the flexibility to propose various solutions and manage projects as portfolios, enabling experimentation, cross learning and discovery of 'what works' (Katell et al., 2018). This is also the approach articulated in the JRC (2022) 'Playbook: Partnerships for Regional Innovation[1].'

However, implementing this requires a governance solution to experimentation that the TIP approach has not yet addressed[2]. This issue is not unique to the proposed PRI. We think that it represents a broader feature of the current state of TIP, where policy conceptualisation seems to be much ahead of policy practice. A systematic review of TIP suggests that the approach still does not give us workable ideas on how to achieve 'broad stakeholder involvement, evaluate transformative outcomes, and build up dynamic policymaker capabilities' (Haddad, 2022). The approach recognizes the need to initiate strategic niches which may emerge based on the portfolio of experiments but is silent on how to upscale or enlarge pilots.

A recent OECD (2022) review of German innovation policy pleads for establishing a public-private laboratory for innovation-policy experimentation. Presumably, successful experiments will then be enlarged and run conventionally. Policy labs are a workable solution that enables testing programs on a smaller scale before upscaling them (see Tonurist et al., 2017, for an overview). However, as argued below, policy labs focus on the front end of the policy and lack the 'capabilities and authority' required to influence the scaling-up and implementation of solutions. The lack of strong ties to stakeholders inhibits policy lab designers from addressing the politics involved in the policy process and thus issues of accountability which is the main challenge of TIP ((Radosevic, 2023), Lewis et al., 2019: 15). This issue has been recognized from the outset. Namely, experimentation in TIP is conducted through strategic niche management (Kemp et al., 1998; Hoogma et al., 2022; Geels, 2011) and grassroots experimentation (Smith et al, 207). However, the key issue which is not addressed is 'how experimentation can generate transformative change, beyond the pilot and/or the niche development which may follow from it' (Schot and Steinmueller , 2018: 1563),(Kivima and Kern, 2016).

We acknowledge that the issue of upscaling may not be relevant in the cases of very local (small grassroots settings) or very big missions (national or EU-wide) where pilots followed by upscaling are not envisaged due to either very small or very large scale. However, in these cases also, the issue of governance and how to maximize the potential of interaction among various stakeholders is central. Very small or very large-scale programs are almost by definition experimental i.e., ultimately, design emerges through feedback in the implementation process.

TIP literature acknowledges that achieving a mission or transformation at scale requires 'a clear and empowered governance (structure) that can be held accountable for achieving the results' (EC, 2018: p13). It is also argued that experimentation requires that the state has an 'organisational culture and dynamic capabilities that welcome the possibility of failure and experimentation (Mazzucato, 2020). Agencies carrying out missions should 'have sufficient autonomy to take risks without questioning their authority'(Mazzucato, 2021). On the other hand, the exact governance mechanisms are not confined to 'autonomous agencies' but may also include steering groups that operate across departments and ministries (Linder et al., 2021). Ultimately, what matters is 'to embed experimentation into the design of the system and to inform that experimentation – and learning from differences – from real participation' (Mazzucato, 2021, p183). Yet, how to go about these governance challenges remains unclear.

JRC's (2022) Playbook proposes Partnerships for Regional Innovation (PRI), which should include all major stakeholders. They are also called Challenge-Oriented Innovation Partnerships (CHOIRs), envisaged as *'multi-department partnerships linked to specific territorial challenges to achieve impacts within established time*

[1] https://s3platform.jrc.ec.europa.eu/pri-playbook

[2] We recognize that design and implementation of transformative innovation policy faces many more challenges than is just the issue of scaling up which we address. Yet, we consider it central to experimental governance and essential for effective institutionalisation of Partnerships for Regional Innovation (PRI).

frames'. JRC's (2022) Playbook envisages a staged approach to CHOIRs. They can begin by focusing on smaller niche CHOIRS, developed around established discovery processes, which can be upscaled by connecting *'many regional and local initiatives, (which then) cut across more policy areas and assume more comprehensive vertical and horizontal co-ordination tasks (p47)'*. However, this does not address the upscaling issue but simply assumes that niche pilots will multiply and upscale automatically. On the other hand, we acknowledge that the Playbook was not meant to be an operational guide but the first step in developing TIP in the EU regional context. In that respect, we hope that our paper can contribute to its further development.

In a nutshell, TIP literature, including JRC (2022) Playbook, does not provide a satisfactory solution to the governance challenge for complex transformative policies where numerous actors are involved and where, given the uncertainties involved, experimentation seems inevitable. The major weakness is the lack of solutions for institutionalising experimentation and their upscaling. The critical challenge of TIP is ensuring that experimentation, local knowledge, and flexibility that characterises network governance are coupled with high-level coordination (Block, 2016).

In responding to this challenge, this paper explores a) the relevance and applicability of pilots and policy labs as two potential approaches to experimentation in the EU regional innovation policy, b) the issue of institutionalising experimentation in the regional context through individual agencies or bottom-up, self-organised stakeholder involvement, and c) methodological issues in implementing partnerships for regional innovation as a mechanism of governance and upscaling of transformative innovation policy initiatives. In our argumentation, we draw on the experiences of Slovenian research and innovation partnerships (SRIP) and learning networks implementation projects in three EU regions.

Our analysis suggests that a) pilots and policy labs as the mainstream institutional solution to experimentation in the context of the EU regional innovation policy would face serious challenges, b) transformative regional policies require national or regional government-facilitated but bottom-up driven partnerships for regional innovation, and c) organisationally these partnerships should build on the accumulated experience of network-based SMEs programs in the EU and Slovenian SRIP, and d) methodologically partnerships for regional innovation (PRI) would benefit from the accumulated knowledge of successful 'learning networks' and application of principles of 'action learning'.

The next section (2) explores the relevance and applicability of pilots and policy labs as two currently in-vogue approaches to experimentation in innovation policy. Section 3 examines the feasibility and trade-offs of top-down and bottom-up (ecosystem-driven) approaches as governance solutions to implementing TIP in the regional context. Sections 4 and 5 outline the key lessons for PRI based on four cases of policy practice in the network or multistakeholder context. Section 6 develops three characteristics of PRI: their strategic features, key strategic activities, and mode of work of PRI. A final section, 7, summarises key issues, including policy and management messages.

2 Challenges of experimental innovation policy and its relevance to the EU regional innovation policies

Transformative innovation policy frames policy action well beyond the confines of R&D funding for projects and extend policy space much more towards the direction of innovation activities, their implementation and diffusion. The policy objectives go beyond individual innovations towards socio-economic transformation of specific techno-economic systems (energy, mobility, urban economy, etc.) where technical uncertainties are coupled with economic, social and environmental uncertainties, which in turn require changes in the governance of innovation policy towards experimental governance.

Pilots and policy labs are two currently in-vogue approaches to experimentation in innovation policy. Conventionally, experimentation in public policy is associated with the notion of Randomized Control Trials (RCT). RCTs are the most rigorous method to evaluate 'what does or does not' work'. Their academic and policy relevance has been recognised through the Nobel Prize in economics (Abhit Banerjee, Esther Duflo and Michael Kremer) for experimental approaches to alleviating poverty. However, they have also been criticised for being similar in rigour to observational studies and for their selection bias of what gets evaluated (Deaton and Cartwright, 2018; Ravallion, 2020).

A review of RTC methods suggests that they may not be used as a general solution but are more appropriate for some questions in innovation policy than others (Bravo-Biosca, 2019). Depending on the type of question to be explored, policy evaluation should employ a specific type of policy experiment and relevant tool. The relevant issue may be 'what is possible or feasible' (*mechanism experiment*), 'what is appropriate' (*exploratory experiments*), 'what can work better' (*optimisation experiments*) or 'what works' (*evaluation experiments*)(ibid). Our reading of the literature suggests that in innovation policy, RTC have advantages in testing small-scale and simple solutions (*optimisation experiments*) and much less in exploratory experiments.

RCT provides an undoubtedly desirable new evaluation method; however, its relevance in the context of EU regional policy may be quite limited due to the difficulty in controlling the policy environment and identifying randomised equivalents. RCTs are retrospective and assume minimal changes across time and contexts. Also, program implementation is regarded as an activity that does not provide new insights or lead to policy changes (Warwick and Nolan, 2015). The standard view of RCT understates the complexity of program implementation, which is the primary source of learning and discovery (Hirschon and Birckmayer, 2006). A strict application of RCT would require random allocation of public subsidy, which may be considered an inefficient use of public investments or justified only in specific cases. RCTs do not consider the government as a facilitator to enable closer coordination among individual economic agents and allow for experimentation in the economy (Warwick, 2013).

These weaknesses or challenges of applying RCT in the context of innovation policy are not to deny their relevance as one of the evaluation methods particularly suitable for a specific range of policy instruments where complexity and context are not the major issues. The most prominent example of RCT practical evaluations in innovation policy are different types of light-touch interventions like innovation vouchers (Cornet et al., 2006)[3], vouchers to stimulate collaboration with external actors (Bakshi et al., 2013) or foster business interactions through enterprise networks (Caie and Sziedl, 2018).

RCT requires the developed theory of change, i.e. contribution analysis, whose application in innovation faces several challenges[4] (Bravo Biosca, 2019). Innovation outcomes can take much longer to become visible than in other fields. Also, innovation outcomes are quite skewed, and thus the average effect may be meaningless (Crawford et al., 2015). Intermediate outcomes or outputs that can be discerned earlier in the process may be an imperfect proxy of final outcomes. In complex programs, RCT may be relevant only after the intervention has been prototyped, which, given the time scales of policy cycles, may be difficult to organise. Also, there is a danger of stopping pilots of complex programs due to unforeseen political pressures. Finally, innovation ecosystems are complex environments where various other factors impact intended intervention, and thus context may entirely dominate the ultimate outcomes.

As OECD (Criscuolo et al., 2022) pointed out, an alternative may be sought by using big data and machine learning, which could enable natural experiments by generating control groups whose characteristics (both

[3] For one of a few cases of application of RCT in the case of industrial policy see (Hasan Bakhshi, 2015 Volume 44, Issue 8,)

[4] Developmental evaluation is also described as real-time evaluation, emergent evaluation, action evaluation or adaptive evaluation (Patton, 2016)

observable and unobservable) match those of the treatment group. However, we think this may still not resolve the key limitations of the experimental approach in the case of complex and context-sensitive programs.

An emerging new alternative to limitations of RCT in the case of complex transformation innovation policy challenges is developmental evaluation. As pointed out by Patton, a godfather of developmental evaluation, 'RCTs conceptualise interventions as occurring in closed systems and study the intervention as a static and mechanical cause aimed at preconceived effects in a simple linear model of cause-effect' (Patton, 2017). The developmental evaluation approach is radically different and geared to ill-defined, often social innovation challenges. Its purpose is not to test 'what works' but 'to facilitate ongoing programme, project, product, staff and/or organisational development. The evaluator's primary function in the team is to facilitate and elucidate team discussions by infusing evaluative questions, data and logic and to support data-based decision-making in the developmental process. Developmental evaluation can be used wherever social innovators are engaged in bringing about systems change under conditions of complexity ' (Patton, 2011:20).

Developmental evaluation is appropriate in situations, among others, where there are no known solutions to issues or where multiple pathways forward are possible. Thus, there is a need for innovation and exploration of situations requiring collaboration among stakeholders from different organisations, and systems (Patton et al., 2016). This approach is suitable for scaling up social innovation, catalysing systems change, and improvising rapid responses in crisis conditions (ibid). In this case, the evaluation is not ex-post as in the case of conventional evaluations or ex-ante activity as in the case of RCT activity but a collaborative, interactive process. Developmental evaluators interpret patterns in the data collaboratively with stakeholders involved so that evaluation becomes an integral part of the innovative process.

Unlike RCT, developmental evaluation does not rely on any particular evaluation method, design, tool, or inquiry framework. '*It includes any kind of data (quantitative, qualitative, mixed), any kind of design (e.g., naturalistic, experimental), and any kind of focus (processes, outcomes, impacts, costs, and cost–benefit, among many possibilities)—depending on the nature and stage of an innovation, and on the priority questions that will support development'*(Patton, 2016:10). The key criterion is that rapid feedback is essential regardless of the methods or data are collected (ibid).

Three issues are essential from the perspective of the EU regional policy and our paper in particular. First, the developmental evaluation has *no clear boundary between pilots and upscaling*. The interactive nature of evaluation is equally applicable in the case of pilots as well as full-scale programs. Scaling up is about developing greater impact by adapting program principles to a new or larger context, not replicating a model or recipe like successful RCT. The point is that '*what has become established in one context is experienced as innovative in a different context'* (Patton, 2016:292) or in our interpretation from pilot to upscaling stage or from one region to another. The aim is '*to clarify and elaborate the ways in which different contexts affect adaptive innovation: the degree, nature, and consequences of adaptive innovation from context to context as ideas and approaches are shared and spread'* (Patton, 2016:292).

Second, developmental evaluation uses principles of 'action research' or 'action learning', which we also propose as one of the key methodological approaches to be used in the work of the PRI. Action research or action learning is used to understand and solve problems. While ongoing monitoring or tracking progress on predetermined indicators matters, the focus is identifying emerging issues. The aim is to make changes to improve immediate outcomes (single-loop learning) but also to prevent the problem or embed the solution in a changed system (double-loop learning) (Patton, 2016).

Third, the organisational solution to pilots is policy labs as platforms for driving policy experimentation and scaling up the most promising approaches[5]. However, the issue is whether policy lab can be the general or the only approach. We consider pilots suitable only for specific and targeted interventions and programs that do not face qualitatively different issues in upscaling stages.

[5] For example, the OECD (2002) review of German innovation policy suggests that policy labs should have 'the mandate to support champions – those who engage in experiments – and promising innovations across the STI system, including public bodies undertaking regulatory experimentation and innovative public procurement, as well as city initiatives and other bottom-up efforts supporting transitions' (OECD, 2022:46).

The advantage of pilots is that they can be modified or cancelled. While pilots can be quite successful and promising, we should bear in mind that scaling up is a non-trivial challenge for several reasons[6].

First, the results of the successful pilot in region X may not predict the effects within the region once the program scales up. As the program scales up to reach more beneficiaries, it may change the behaviour of political stakeholders, administrative bodies and users. This may be due to unforeseen costs or benefits that each stakeholder perceives differently once the program scales up. Second, a once-upscaled program may affect non-beneficiaries or regional actors who were not part of the experimental setup in how they perceive it as positive or negative. These reactions may amplify or undermine the intended benefits of the program. Third, for some regions, the overall impacts of the program may be significant in the medium term and generate structural effects which could not be measured or foreseen directly during the pilot stages. Finally, policy implementation and institutional capacities may be qualitatively different in pilot regions or projects compared to those required in the upscaling stage. There might be threshold effects, with additional barriers emerging when initiatives are being scaled.

In a nutshell, pilots are suitable if the programme has limited scope and outreach. Simple interventions with large upscaling opportunities seem most appropriate for piloting and using RCT or its emerging equivalents. The broader the scope and outreach of the intended program, the more there will be factors that pilots cannot account for, thus lowering their learning value or relevance. Pilots are acceptable where risks and failures are acceptable and technical risks are differentiated from strategic risks. In complex programs use of pilots is of limited significance, and the use of "diagnostic monitoring" (Kuznetsov and Sabel, 2017) or early warning systems, when results do not seem likely, is more appropriate. In TIP programs, differences between pilots and upscaling are qualitatively different. Hence, the idea that transformative regional policy can be developed based only on initiating specific pilots, some of which will upscale and generate momentum for transformative change, seems questionable. This is because transformation requires large-scale experimentation, which, to happen, needs to be set-up and promoted in a system, or rather ecosystems, to gather critical mass.

[6] For an overview of issues involved in scaling up in the case of development aid programs see https://yrise.yale.edu/. Here we draw on insights of Yale Research Initiative on Innovation and Scale (Y-RISE)

3 The institutionalisation of transformative regional innovation policy: trade-offs of different organisational solutions

Section 2 raised the question: what is the governance solution for initiating, designing and implementing transformative or mission-oriented regional innovation policies? Ulmanen et al. (2022) rightly point out that godfathers of mission-oriented and transformative innovation policies differ on 'how to engage stakeholders and what qualities these stakeholders should have to facilitate transformation'. We broadly agree with Ulmanen et al. (2022) that they advocate either a top-down approach (mission-oriented) or promote bottom-up, self-organised stakeholder involvement (transformative policy). JRC's (2022) Playbook follows the latter approach. Yet, whatever direction they advocate, none of them has a governance solution and set of useable guidelines or 'good' practices for engaging in the transformative innovation policy process and coordinating various stakeholders. Elsewhere we demonstrate that this is not the case with only these two approaches but also with several other experimental innovation policy approaches (see Radosevic et al., 2023). Hence, this seems like the S3 example of "policy running ahead of theory" (Foray et al., 2011).

The first solution is when TIP is the responsibility of either individual agencies or agencies collaborating or is *inter-departmental responsibility coordinated by inter-ministerial coordinators ('whole of government').* Given the nature of societal challenges where technological solutions are only part of the story, these organisations aim to involve as many as possible relevant stakeholders from business, the R&D system and civil society. In all cases, the advantage is a high degree of autonomy which enables experimentation and even 'diagnostic monitoring' based on the funding of a portfolio of projects. On the other hand, vertical accountabilities may not always operate smoothly when there is a lack of clear boundaries within the hierarchy. For example, when the ministry sits on the supervisory board of agencies, which should be able to act autonomously. However, the biggest challenges of this solution are that upscaling and implementation are much more uncertain as the price of autonomy is insulation and loss of power once projects need upscaling. However, the initial advantage of government autonomy to experiment may become a disadvantage in the upscaling stages when acceptance by all affected is essential. As demonstrated a long time ago by Hirschman (1967), this insulation may be counterproductive for agencies engaging in conflictual social, regulatory, and economic issues which transformative policies abound with.

The second solution is *bottom-up or ecosystem driven*, aiming to create and structure regional innovation ecosystems (bringing together public and private stakeholders from different research and business communities) around a common challenge. The approach envisaged in the JRC (2002) Playbook seems to be centered around this approach. This approach has much fewer issues regarding legitimacy as all major stakeholders are involved, but the main problem is defining objectives and governance complexity. In all complex matters involving numerous actors, which are mutually interdependent, the goals are usually not established initially but emerge because of negotiation (Klin and Kopenjan, 2014). Hence, the assumption in TIP that the main task is to 'work backwards' from goals toward realisation are quite a significant simplification of how complex projects are designed and implemented. Also, regarding governance, the challenge is how to ensure mutual accountability[7]. Innovation system actors have a significant capacity to orchestrate and accommodate the system without substantially changing behaviour. For example, OECD (2022) reports highlight that '*Germany has developed a number of mission-oriented approaches for STI, but they are not always sufficiently "transformative*" and suffer from a lack of coherence and co-ordination (p46)'. The challenge is that any TIP can be captured by incumbents who can marginalise newcomers. So, instead of addressing the mission and working towards transforming innovation systems, the reality is non-directional 'mutual adjustment' or 'muddling through'. This requires attention to mutual accountability and adjustment criteria, ensuring that the TIP has transformative impacts. Table 1 outlines in summary way trade-offs between these two approaches.

[7] For theoretical exploration of this issue and conceptual solution see Radosevic et al (2023)

Table 1: Trade-offs between two modes of governance of regional Transformative Innovation Policy

	Individual agencies/'Whole of government'/Top-down	**Ecosystem-driven/bottom up**
Objectives	Easier to agree on	Difficult to agree on
Autonomy	High autonomy, which may lead to higher flexibility	Potentially cumbersome network governance
Legitimacy and critical mass	Weaker as it is uncertain if regional stakeholders will 'buy in'	High provided that all stakeholders are involved and engaged
Accountability	Mainly vertical and easier to address in principle, though also possibly with greater 'capture risks' due to information asymmetries.	Challenging mutual accountabilities, but easier implemented in institutionally 'thick' regions
Upscaling and implementation challenges	Challenging in enlarging it beyond the government actors and agencies' mandates (limited policy reach)	Easier to upscale and implement in institutionally 'thick' regions (developed inter-organisational co-operation and institutional capacity)
Appropriateness	For mission-oriented programs	For transformative sociotechnical programs

Source: authors

As Weber and Rohracher (2012) argue, one of the four transformation failures is policy coordination failure. In that respect, each of the two solutions – top-down and bottom-up, summarized in Table 1 - has problems in resolving at least some of the following coordination challenges: multi-level (EU - regions-national), horizontal (inter-ministerial), vertical (ministry-agency-firms and knowledge institutions), intersectoral (public-private) and timing coordination. A reader may not be surprised by the argument that the governance solution should include a third hybrid solution combining the two approaches.

However, which solution is more appropriate will depend on various factors, including the political system, administrative governance, political culture and governing political party. It should probably also include the extent to which regional governance is developed. It will also depend on the nature of the transformation challenges (see Sabel and Victor, 2022) and the type of coordination failure among the relevant stakeholders. For example, in sectors comprised of globalised and highly concentrated industries (automotive, semiconductors, steel etc.), EU value chains should be the dominant perspective and policy framework. The involvement of PRI in these sectors may be quite different from place-based sectors or challenges such as residential and commercial construction and power grids incorporating clean energy sources. Here the adaptation of already known technology solutions and optimising them to local conditions is of essence (e.g., urban heating). Sabel and Victor, (2022) also point to the hybrid cases or sectors like forestry where '*the inputs are predominantly local, but the markets—and the standards and trade barriers that control access to them—are international (p27)'*. These challenges require PRI to be embedded locally, globally, or EU-wide. Regional actors must actively engage at higher levels of governance but also respect or follow imposed top-down framework goals. In this process, clear directionality is essential for efficient vertical coordination.

Finally, uncertainty or difficulty in clearly defining from the outset all objectives of sociotechnical transformations, including missions, may lead to changes in the character of PRI over time. Only some missions' targets can be defined, measurable and time-bound. Also, missions may differ in the extent to which they are transformative. They may be confined to S&T or be broadly defined as socio-economic

transformative, or their nature can change over time. These often-unforeseen changes should be accommodated; hence, fixing governance to one model may be counterproductive.

In a nutshell, in this section, we argued in agreement with Ulmanen et al. (2022) and Radosevic et al. (2023) that we do not have a governance solution and set of useable guidelines or 'good' practice on how to engage in the process of transformative innovation policy and coordinate a variety of stakeholders. This may be expected given the complexities of experimental governance where, as Sabel and Victor (2022) point out, '*the precise outcome of collaboration cannot be determined ex-ante, and therefore goals and methods have to be elaborated provisionally—step by step through experimentation across a wide range of opportunities, along with joint reviews of progress in which partners assess and come to rely on one another's capacities (p46)*'. Indeed, it would be misleading to preach specific governance solutions. Still, it does make sense to articulate governance (*what to govern*), and methodological (*how to govern*) principles whose application to a specific region will always be context specific. However, we also want to demonstrate that some of the know-how required for devising these principles and successfully governing PRI has already been developed within the EU policy practice. Hence, in sections 4 and 5, we draw the key lessons for PRI based on four cases of policy practice in the network or multistakeholder context. First, we draw on experiences of Slovenian Strategic research and innovation partnerships (SRIP) which are very much akin to the idea of PRI endorsed by the JRC Playbook. Second, we draw on three cases of EU-funded programs implementing learning network approaches in innovation policy as the most relevant for designing and implementing PRI.

4 Implementing PRI: learning from the policy practice of Slovenian S4 (medium development level case)

Implementing RIS3 strategies in the EU, during the 2014-2020 period offers valuable practical experiences based on which important lessons can be drawn on designing Partnerships for regional innovation (PRIs). In this regard, Slovenian governance approach to the S3, referred to as the S4 already in 2015, seems to provide an interesting case demonstrating that PRIs represent a vital ingredient for transformation while also showing governance weaknesses that offer valuable lessons.

Before presenting how and why Slovenian approach merits particular attention, one needs to appreciate the context in which the S4 governance system was introduced. Namely, the one of a country at a medium level of development, with relatively well-developed linkages among the business and academia, but with a relatively weak role of the government, especially regarding funding (IMAD, 2023). Weak government support, combined with often changing policy direction due to political cycles, meant that stakeholders knew each other, and have, by and large, collaborated on an ad-hoc basis. Furthermore, traditionally Slovenian development policy had been horizontal, where direct collaboration and engagement with the business sector had been seen more as a (corruption) risk than a virtue leading to experimentation, innovation and value creation. This contrasts with Northern and Western countries' practice, where innovation systems have been founded on the premise of collaborative action directly involving the state, with greater emphasis on finding common grounds as part of an institutional tradition. The latter matters and needs to be kept in mind as different contexts will likely require different institutional approaches.

The following part will present key ingredients of the Slovenian transformative S4 approach.

4.1 Precondition 1: Directionality and intentionality

The S4 was prepared in 2014 and 2015 as part of the ex-ante conditionality to access European Structural Funds, representing Slovenia's greatest source of research and innovation funding. That made the strategy more important than other strategies that often end up without having practical consequences. Furthermore, the EC, jointly with the JRC, strongly pushed the argument that the RIS3 is "the strategy of all strategies", allowing Slovenia to present the S4 as an implementing strategy of the already existing industrial and innovation strategies[8]. This was important as it allowed for an integrated whole-of-the-government approach from the start.

Secondly, the S4 had a strong business orientation. Its smart, transformative orientation has been wrapped in a mission for Slovenia "to transform itself from a follower to co-creator of global trends in identified niche areas"[9]. Its focus has been on three measurable objectives, productivity (value added per employee), the structure of the exports and strengthened entrepreneurial activity. This gave a strong signal that the essence of the S4 is not in promoting research as such but that its focus is on changing market outcomes via what today could be termed as the knowledge valorisation approach (Council Recommendation on the Guiding Principles for Knowledge Valorisation, 2022).

Finally, the "specialisation" part, the engrained niche orientation, has been instrumental in paving the way for at least a gradual break with the traditional horizontal policy approach. Furthermore, it broke with the sectoral logic as the identified priority domains where merging actors with complementary activities targeting the same markets but coming from different industries. Prioritisation has not been important just from the policy perspective, allowing flexibility and adjustment to different needs, but it also represented a vital ingredient from the governance perspective as it allowed for differing approaches in different priority domains.

[8] For a conceptual discussion on the relationships or rather overlaps between these policies see Radosevic et al (2023)

[9] Examples of niche areas are "modular and mobile dwelling units", "regenerative gastronomy" or "ultra-clean steels and alloys". For a detailed list see https://evropskasredstva.si/app/uploads/2023/05/S5_Verzija-1.0_lektoriran-cistopis_23.1.2023_3-eng-dodatek.docx.

4.2 Precondition 2: Open leadership from the top

Countries at the medium level of development need to transition to innovation-driven growth, which requires a much stronger collaborative component and ecosystems approach (IMAD, 2023; Ringel et al., 2019). This is not so obvious at lower levels of development when individual firms can more easily benefit from lower costs of production inputs. In transitioning to a more collaborative environment, the question arises of who should lead the transformational process. While conceptually, these could be done based on stakeholders' self-organisation, the practice does not seem to confirm this. Indeed, Slovenian experience suggests that stakeholders, particularly firms, expected the government to take the leading role.

This happened in Slovenia via the S4 process, where the government developed a draft plan for achieving the above mission. The proposals were openly discussed, which gradually strengthened the ownership of the S4 by the stakeholders. Critical in this process was strong leadership by the administration, which spent a lot of time interacting directly with the stakeholders. At the same time, the whole process had, at least initially, strong political support, which represented a vital signal to stakeholders, giving the process the necessary credibility that strategy design will reflect itself in real policy change.

Apart from the open, collaborative, forward-looking approach, the credibility of the S4 process has been further strengthened by an ambitious, whole-of-the-government approach, which broke with the previous tradition in at least two ways: by promising a comprehensive package of cross-departmental support also based on upgraded internal functioning of the government that would transition from co-operation to collaboration (cf. JRC Playbook, p. 22). This was achieved by setting up a dedicated operational office to coordinate the government's S4-related activities daily while introducing cross-department coordination by the deputy ministers to handle political matters. The key was that both had an explicit mandate to directly interact with the stakeholders via the S4 governance structure, which was expected to result in more tailored and with the needs adjusted policies and measures.

4.3 PRIs: Orchestrated experimentation and discovery from the bottom

In times of the fourth industrial revolution, technology complexities and speed of change are forcing firms into more open relationships with their peers (Ringel et al., 2019), into strategic partnerships and business ecosystems (Gackstatter et al., 2019; Klassen Jamjoum et al., 2021). Regions and countries can accelerate and upgrade such firm-level networks into institutionalised ecosystems that promote experimentation and collaboration on a systems level. Such systemic, government-facilitated collaborative environments allow companies to develop relationships quicker and, more importantly, deeper, as other stakeholders, including knowledge institutions, are simultaneously encouraged to move in the same direction, thus creating synergies and lowering friction.

Such collaborative environments are not easy to set up, though, as each domain has different challenges, opportunities, habits, and starting positions requiring different approaches. The government intervention must recognise the need to accommodate different approaches by setting the framework conditions and allowing stakeholders to find the best course of action.

Secondly, while the entrepreneurial discovery process can initially be driven by the government or any of its agencies, stakeholders must strengthen and deepen their relationships via formalised collaborative structures via Partnerships for Regional Innovation. Slovenia formed Strategic research and innovation partnerships (SRIPs) in 2016, bringing together firms, knowledge institutions and other stakeholders relevant to innovative break-through in each of the S4 priority domains.

In doing this, the government has only set the framework conditions and allowed stakeholders of each SRIP to decide on their specific business model. The evaluation of SRIP functions during the 2017-2021 period showed that SRIP significantly improved the collaboration among the members and enhanced their innovation potential, even though the government lost their full commitment after a couple of years (Bučar et al., 2022).

There are four main takeaways that the Slovenian experience seems to demonstrate:

1. Intermediaries, the PRIs, via their leadership, represent a necessary condition for a meaningful and continuous entrepreneurial discovery of new opportunities, their enactment and promotion of joint learning, not just among the stakeholders but also with the government.
2. For PRIs to perform this task, they need to have proper capacity and PRIs leaders seem to be of particularly decisive importance in this regard.

3. While PRIs, at least in the case of Slovenian SRIPs, are quadruple-helix entities, it seems that those performing best paid particular attention to the business sector interests (while fully engaging emerging opportunities as recognised by knowledge institutions).

4. Setting up and functioning of PRIs and SRIPs is fraught with challenges. Here, the government can play an important role by creating and setting up the necessary framework conditions, mediating among the stakeholders, and creating momentum. The latter has turned out to be important in the case of Slovenia, as setting up PRIs initially requires investment, primarily time. At the same time, the benefits for the stakeholders only get reaped at a later stage.

   Thus, the government can create an encouraging environment, a movement that encourages firms to get engaged.

4.4 Taking the two approaches to the next level: towards systems innovation and upscaling

While putting both top-down and bottom-up components in place is hard enough from a policy perspective, it does not suffice for smart transformation, as aspired for by the RIS3 or transformational innovation policy concepts, to materialise. Real smart transformation requires a virtuous cycle of mutually reinforcing top-down and bottom-up approaches. And here Slovenian S4 governance system with the SRIPs also serves as a good case.

First, for the virtuous cycle to materialise, the government must have a system of checks and balances. These relate to:

1. Monitoring for accountability within PRIs / SRIPs by preventing capture by particular interests. This is easier said than done, but with strong institutional capacity on the national level, it seems possible to gather enough information to intervene should the operation of the PRIs / SRIPs derail off-course or be captured by incumbents.

2. While the government should constitute a real partner to the PRIs / SRIPs, it should also serve as a principle, a guardian of the framework conditions as initially set out. Slovenian SRIPs provide a useful case as the status of a SRIP has not only been guarded with respect to the initial conditions (e.g., the leading role of the business sector in the decision-making process) but has also been subject to independent evaluation. Financing of the SRIPs foresaw an automatic sunset clause for those SRIPs, which would seriously underperform. In practice, the clause has not been activated, which could be described as a step against putting a virtuous cycle to take place in practice.

3. The government also has a role in preventing what happened in Germany, where agreed actions have not been sufficiently transformative (OECD, 2022). Slovenian case confirms that mediocre ambition or mismanagement can indeed take place. However, it is relatively easily accommodated with the government's proactive role. In the case of Slovenia's SRIPs, action plans are approved by the government's group of deputy ministers, and it is via this process, backed up by soft daily interaction and also co-financing of SRIP actions, that forward-looking and ambitious agenda can also be promoted in practice.

Secondly, PRIs must integrate into the broader innovation, business, and start-up support ecosystems. There are multiple complementarities, and given limited capacity and resources, PRIs should leverage every possible complementarity. And it is the role of the government to facilitate such optimisation processes to take place.

Thirdly, for the system to upgrade, the policy mix must also be constantly adjusted to the changing and rising needs of the PRI / SRIP stakeholders. Such adjusted policy mixes fuel not just accelerated networking but also accelerated ambition and upscaling beyond sporadic pilots. Slovenia has seen such new opportunities being opened based on the initial round of research and innovation funding, especially more complex ones. Unfortunately, this has not been followed up by government action[10].

[10] Which also opens the question to what extent the EC, as the principal of the RIS3 process, could, or should, get more actively involved to prevent backsliding by the government. This is an especially relevant question in view of the debate on cohesion policy's design for the 2027-2035 period.

Finally, and most importantly, governments must ensure long-term commitment and political ownership to initiate the virtuous cycle. Such a sustainable and predictable environment provides time for the stakeholders to get to know each other and develop trust. And in a highly uncertain world, trust represents a key ingredient for joint action and investment (Aguiar et al., 2021; Wostner, 2017), with trust needing to be developed both among stakeholders and between stakeholders and the government.

5 Three case studies of innovation networks from institutionally advanced contexts[11]

A Slovenian case in section 4 is a good example of an attempt to establish a version of the PRI ab novo in an institutionally semi-developed context. Three cases in this section briefly overview the challenges of establishing collaborative networks in Sweden, Netherlands, and Denmark in a much more developed institutional context.

5.1 A good regional practice of the VINNVÄXT programme (Sweden)

The programme was initiated in 2001 by VINNOVA, and regions could compete for funding for over ten years. The programme aimed to promote sustainable growth in regions by developing internationally competitive research and innovation milieus within specific growth areas through:

• *Regional and national strategic processes* are about setting the region's strategic direction and developing an action plan with identified needs and bottlenecks in the regional innovation system.

• *Regional meeting arenas* provide opportunities for the 3-Helix actors to meet. These interactions drive the operational element of the programme and help matchmaking and collaboration.

• *Competence supply* mainly through researcher training and funding research posts, but also contributing to company training and competence development.

• *Needs-driven R&D* through collaboration between industry and universities make up most of the programme, with the expectation that 50% of funding will be directed towards collaboration.

• *Funding* with the levels of direct funding are relatively low, but with initiatives helping companies and researchers to apply for other funding sources.

• *Internationalisation* is upgrading by integrating companies into international markets by promoting exports, monitoring foreign markets and fostering international networks.

A task force comprising different regional players was set up to create a development plan that envisioned the future based on events and experience-based business and technology. On the back of this, a *collaborative business platform*, the Peak of Tech Adventure AB, was established as a limited company to drive the programme; the following year, it was rebranded as "Peak Business and Sports AB" (i.e. "Peak Business and Sports Ltd"). Peak Business and Sports AB has about 55 shareholders, mostly local industry companies. Peak Business and Sports AB established the Peak Innovation programme as a "4-Helix agreement" between (a) Mid-Sweden University; (b) the local municipalities and the regional council; (c) the Jämtland-Härjedalen Sports Association; and (d) the region's industry.

Three research centres at Mid Sweden University were involved: (i) ETOUR with research in tourism and destination management; (ii) Swedish Winter Sports Research Centre (SWSRC) engaging in research and development relating to elite sports, physical activity and health; (iii) Sportstech focuses on research in technology related to sports and outdoor recreation. The funding centred around *needs-driven research,* which seeks to engage businesses, customers, and other stakeholders (see Box 1 as a good practice example of need-driven research in the Peak Innovation programme).

Box 1: The involvement of SWSRC in the programme covers three main areas: (a) establishment of a laboratory for product development and manufacturing of prototypes; (b) building closer links between academia, business, the public sector and the sports movement (e.g. the Swedish Olympic Committee), which in practice means responding to a variety of requests for collaboration from sports and industry; (c) an alpine research and testing centre that focuses on the field-based analysis of biomechanical movement and the optimisation of sporting techniques and training regimes.

The programme successfully supports innovative ideas and companies (primarily SMEs) and academics to work together (see Box 2).

[11] The sections 5.1-5.3 draw on Tsekouras, G. (ed). 2012,

Box 2: More than 650 companies or organisations and 44 academics have been involved in the programme. The initiative has been instrumental in forming 43 new companies and 115 new employees. The programme has supported introducing 5 new products and eight new services into international markets. There have been 62 prototypes produced and three patents registered.

An initiative of the programme is the so-called "Open Door", a business development initiative that seeks to identify and support promising business ideas and connect entrepreneurs with other parties who can help them develop and commercialise their ideas. The initiative involves actively searching for ideas from various sources, including researchers, laboratory staff and students, entrepreneurs, R&D and business development staff in companies, and other 'idea donors'. This initiative supports *prospecting, brokering, and commercialising ideas*; companies are invited to become part owners in new business ideas or ventures. The Oppen Dörr initiative attracted around 250 ideas, of which 100 were chosen for further investigation in the last three years. Of these, 20 are being pursued as having the potential for longer-term success.

Business ideas are *subject to a formal evaluation methodology* based on the so-called TEMPOR approach, structured under the headings of technology, economy, market, product, organisation, and research. These are further considered in the light of selection criteria such as export potential, development potential, novelty or uniqueness of contribution, infrastructural and strategic significance for the region, links with research, and the competence and motivation of the entrepreneur or idea developer. A programme board of industrial representatives with extensive business experience oversees this evaluation and selection process.

Those proposals that are selected are supported in a variety of ways. Firstly, they are offered *advice and mentoring* to help them develop and bring the idea to market. Secondly, they are offered *funding* to carry out pilot studies. Thirdly, a special company, *Soft Financing AB*, was established to *help enterprises to apply for public sector development funding*. The rationale is to help SMEs access 'public' funding to allow them to reach a level of maturity to attract bank finance or venture capital. The initiative includes several financial experts advising on identifying funding sources, helping in writing funding applications, and assisting in managing and reporting on successful projects. During the three years, 31 applications for development finance were submitted to various funding sources with the assistance of Soft Financing AB; these ten projects were successful, attracting around €900,000.

The Swedish Ski Association was 'encouraged' to move its alpine activities to the region. Links were also developed with the Scandinavian Outdoor Group (SOG), a collaborative venture bringing together around 40 members across Scandinavia *involved in manufacturing outdoor products*. Peak Innovation with SOG has organised many *export seminars*, participated in the international Sports Business Network trade fair, and undertaken an export drive focused on Asia. An advisory group of 45 members from universities, industry, the public sector, and sporting bodies in the region was added to the governance structure of the Peak Innovation programme.

This (regional implementation of the national) programme VINNVAXT demonstrates several novelties that are worth emphasising:

- The programme, from inception until implementation, was driven by a collaborative business platform with the integral participation of the regional industry. This participation was even formalised as a limited company with several local companies made shareholders.
- The programme involves the local municipalities in a "4-Helix approach" to ensure that local problems and issues are considered for innovation support and development.
- The programme acts as a broker, enabling "idea donors" (who can be not only entrepreneurs but also individuals, researchers and even students) to connect with established enterprises and develop innovation projects.
- The selection criteria of the supported programmes include a clear sense of directionality in upgrading the infrastructure and supporting the internationalisation of the regional industry.
- The programme supports promising innovation projects and pilot studies to facilitate the emergence of innovation projects.
- Innovation projects are need-driven, with the needs of the local SMEs being the primary criterion for deciding whether to support the programme.
- Supported individuals and enterprises are being fostered to acquire public finance before they seek finance from banks and/or venture capitals (Soft Financing AB).

- An active strategy to attract stakeholders to provide input to the innovation activities of the companies and help them connect to international value chains.

5.2 A good regional practice of the Innovation Performance Contracts programme (Netherlands)

The Innovation Performance Contract (IPC) is one of the Netherlands' most popular national innovation support schemes. It targets SMEs that seek to innovate collectively. The scheme was developed in an iterative process between many industry organisations and a public funding agency for enterprises and innovation. The programme has several unique design elements:

- It is a bottom-up programme with no specific thematic focus or sector priorities. First, groups of 15-35 companies are formed. The participating companies may be in the same value chain, region or from the same industry. The group formation is bottom-up, and there are no thematic restrictions.
- IPC aims to facilitate innovation activities of groups of related SMEs via a value chain, sector, region or theme. IPC participants have to plan and implement both individual and collective innovation projects. Part of the activities are carried out through collaborative projects.
- Combination of financial support to individual and collective innovation projects, network activities, consultancy and support from a secretary who can work e.g. for an industry association. The whole process, including the application for a project, is supported by the secretary.
- The IPC process consists of the pre-IPC-phase (preparation) and IPC-phase (implementation). For both phases, a separate grant is required. The scheme also offers SME networks financial support to explore (international) cooperation possibilities.

The pre-IPC process consists of three phases: (i) information provision related to the IPC scheme, especially relevant to new SMEs or new secretaries); (ii) conducting an innovation study aims to gain knowledge about innovation opportunities, formulating innovation objectives and designing future collaboration and (iii) building a coalition, where the applicant organisation acts as a facilitator to bring together the IPC group, i.e. a group of companies and perhaps Universities and RTOs. The pre-IPC was enhanced with an international section, offering SME networks financial support to explore international cooperation possibilities.

The role of the secretary is important. Secretary is usually a person knowledgeable in a particular industry and able to provide support on technical issues, as well as contacts to knowledge sources. First, they take much administrative burden from the companies in the application phase. Second, they guide in drafting innovation plans. During the implementation stage of an IPC project, the secretary provides administrative support (e.g. reporting), checks out if there is sufficient progress and encourages knowledge exchange and network activities by bringing companies together and promoting new cooperation opportunities.

The programme foresees individual enterprise and collective innovation plan development. IPC participants' plan and design individual and collaborative innovation projects. In any IPC, both individual and collective innovation projects are important. At least 20% of an IPC regional programme budget should be spent on joint projects - cooperative projects range from new product development and innovation in production and management processes (e.g. new business models) to knowledge building (e. g new materials).

In individual innovation projects, more than 60% of the expenses should be spent externally –for external contractors and experts. This is not limited to publicly supported research organisations; private research institutes and companies can also be involved. The majority of external knowledge organisations are consultants and public or private RTOs.

The collective projects usually include 2-6 companies, ranging from new product development, innovation in production and management processes (e.g. new business models), sustainability (e. g new materials) etc. There are different types of collective projects. Almost half focus on industry (e.g. construction, furniture manufacturers), with other projects focusing on a theme e.g. sustainability (about 25%) or a region (about 25%). There are also several IPCs based on value chains. These collective projects enable participants to look into other companies' internal processes and gain more insight into the expertise of others, so they can learn from each other, share knowledge, etc. Network activities with other companies in the IPC facilitate knowledge exchange and learning. There are also meetings for all IPC companies to exchange their experiences and learn from each other.

Participants follow different routes to join IPC. Participating SMEs have little experience in knowledge and technology transfer programmes. Some companies show their initiative and apply for an IPC project (about 30%), while others join through other companies i.e. competitors, suppliers, and customers (about 20%). Most companies (about 50%) are approached by a trade association or an industry organisation they are affiliated with. Trade associations or industry organisations are leading in building awareness and mobilising companies through mass campaigns (e.g. newsletter to all affiliated companies) or focused approach of individual companies (e.g. session with an individual company).

SMEs regarded the IPC programme as an accessible instrument due to its light administrative burdens and the help they receive from the secretary towards the administration requirements. The IPC scheme also foresees the possibility of advance payment to make it easier for SMEs to participate.

The IPC projects have a duration of (usually) 3 years, and their innovation is broadly defined. They go beyond the support of R&D to include the support of other aspects of the innovation process. This means that the IPC scheme offers more space for companies to determine their innovation agenda. Although the projects have a clear and pre-defined innovation plan, they also have sufficient flexibility. The IPC project process changes if market conditions or companies need to change.

The programme aims to use the funded project to trigger innovative behaviour. The programme enables entrepreneurs to learn; for instance, the collective projects activities for existing knowledge acquisition from external sources are complemented by learning from each other (usually, a joint project includes 4-6 companies). There are also arrangements for meeting all IPC companies, i.e. companies participating in different innovation projects, to exchange experiences. Network activities with other companies in the IPC are organised to facilitate knowledge exchange and learning.

By participating in the IPC programme, enterprises are encouraged to improve innovation processes in their organisations and gradually learn a lot about execution. Enterprises, therefore, see IPC as a suitable tool to accelerate innovation and the growth of their businesses. In other words, the IPC programme's primary aim is to develop the companies' capability to carry out innovation activities - the funded projects are just an opportunity to develop and exercise this innovation capability.

This programme demonstrates several novelties that are worth noting:

- There are no specific thematic focus or sector priorities - the focus of a regional implementation is decided by groups of 15-35 companies related via a value chain, sector, region or theme.
- The programme includes individual and collective innovation projects, namely for one company or a group of 2-6 companies– both projects include external partners.
- Innovation is broadly defined and goes beyond the support of R&D to include the support of other aspects of the process. The scheme offers space for SMEs to determine their innovation agenda.
- The programme funds a secretary, a kind of broker, who fosters relationships between partners and supports them with implementing activities and the administrative burden.
- Supported SMEs do not necessarily have large experience in knowledge and technology transfer. Half of the participating companies are recruited via focused sessions through a trade association or an industry organisation they are affiliated with.
- The innovation agenda of the projects is flexible - the IPC process can change if market conditions change or companies need to change; they can create another plan.
- Supported enterprises are encouraged to learn about the execution of innovation activities through knowledge-sharing sessions within collective projects and between various innovation projects.
- The primary aim is the development of the companies' capability to carry out innovation activities - the funded projects are an opportunity to develop and exercise this innovation capability.

5.3 A good regional practice of the Innovation Networks programme (Denmark)

The Innovation Network scheme merged three previous schemes - Hi-Tech Networks, Regional Technology Centres and Regional IKT Skills Centres. The "Innovation Networks" scheme must be based on a clearly defined professional or technological area defined by the network itself. This might, for example, be a particular technology, a key business strength, a problem relating to a defined business area, or a sector, cluster, business segment, or similar. It is vital that within the selected focus area, there is a significant group of companies and considerable business innovation and growth potential as well as Danish knowledge institutions with relevant knowledge.

Innovation Networks have different histories. Some were created as a result of regional strategies. Others started building a permanent network for 20-30 companies and researchers. The key drive of the scheme is that many different networks should complement each other and that companies and their advisors should be able to find out what each network can offer quickly and easily. A joint 'industry organisation' was established for the innovation networks – called Netmatch – whose function, among other things, is to help to develop a joint 'language' for network services to make the innovation network offerings to companies more transparent.

The innovation network provides a platform within a specific technical or professional area where companies, universities, research institutions and other relevant players – e.g. regional business promotion players, the regional authorities, municipalities, industry organisations, professional organisations, etc.- can meet and exchange ideas and knowledge and launch shared projects. However, it is up to each innovation network to define the exact target group for the network.

Innovation Networks offer services with three objectives: Bridge-building and establishing meeting places, Partnership Projects, and Knowledge communication (Table).

Activities of Innovation Networks
Bridge-building and establishing meeting places (Conferences, seminars etc., Themed networks; Matchmaking, Idea generation)
Partnership Projects (Pre-projects; Innovation projects; Business-to-Business partnerships)
Knowledge communication (Consultancy and sparring; Skills development)

Table 2: Core services for enterprises in the Innovation Networks

The networks are to act as midwives to forge permanent relationships and contacts between companies and researchers. Innovation Networks are expected to facilitate the coordination and designing of the knowledge institutions' research and education in line with the needs of business and industry. The companies' needs guide the networking process. The aim is that companies will themselves become more proactive in seeking out partners and that they will actively make use of the relationships that are built up during projects.

Unlike many other regional or local networks that aim to strengthen interaction with a single type of knowledge organisation, the Innovation Networks are a portal for enterprises to access a wide range of knowledge environments – anywhere in Denmark or abroad. Innovation Networks offer individual matchmaking to enterprises wishing to find, for example, a university researcher with knowledge in a specific scientific area anywhere in Denmark or abroad. Thus, they can generate projects that include partners beyond the scope of the specific network.

Box 3: *Offshore Center Denmark (OCD)* is an Innovation Network whose main objective is to foster innovation for the offshore sector (the production processes for oil and gas and wind energy and all the connected activities).

OCD use their services to facilitate the SME innovation journey. The first step, up to 3 years, is for the SME to recognize what innovation is, why it should be for them strategic and why they should be part of networks. Then the process becomes more focused on development projects by getting the companies to know each other via participation in these activities etc. This has been key in that the process is not just about developing a product or a solution, but for the SMEs to gain confidence so that the next time, they could do their projects by themselves; this would last from year 3 to year 5. And then after that, the next issue is to look more

internationally. When companies arrive at the stage where they consider participating in projects in the international market, then OCD can create access to large companies nationally and internationally.

This programme demonstrates several novelties that are worth noting:

- The network focus is a clearly defined professional or technological area, as defined by the network itself in a bottom-up way, for example, a particular technology, a key business strength, a problem relating to a designated business area, or a sector, cluster, business segment, or similar.
- A key driver is a portfolio approach with many different networks complementing each other, so companies and their advisors can find out what each network offers quickly and easily.
- A joint 'industry organisation' for the innovation networks whose core function is to develop a mutual 'language' for network services to make company offerings more transparent.
- Special platforms within technical or professional areas and a range of bridge-building activities where companies meet with universities, RTOs, regional authorities, municipalities, and industry organisations to exchange ideas and launch shared projects.
- A range of bridge-building activities allows companies and researchers to meet, network and exchange ideas and create the basis for shared activities, e.g., innovation projects.
- Matchmaking activities help individual companies or researchers find suitable partners for a specific project or solution to a particular problem.
- Structured workshops for idea generation and generating new partnership projects - for example, based on an identified market need and a new technology to meet this need.
- Pre-projects whose purpose is to fund the basis of a true innovation project e.g. may be focused on mapping the market potential for a new idea, patentability and small-scale trials.
- Consultancy and sparring to facilitate researchers' provision of consultancy to businesses, including advice on project financing and assistance in submitting applications to EU or Danish programmes.
- Activities whose purpose is to generate business-to-business partnerships to work on specific challenges, issues or business opportunities.
- The intermediary agent with sustainable finance, staffing and a management organisation, which plays the role of an 'integrator' facilitating the development of innovation projects.
- The most important element in a network with a combination of influential large companies and many SMEs is that all members have a voice, and the intermediary agent is established, respected and neutral.
- The intermediary agent offers professional services to address the members' needs through a one-to-one support system for all SMEs.
- The first step, up to 3 years, is for the SME to recognize what innovation is and why it should be strategic for them. Then the process becomes a lot more focused on development projects.
- The process is not just about developing a product or a solution, but for the SMEs to gain confidence so that the next time, they can do their projects by themselves.

5.4 Implications and lessons of relevance for the PRI

We pointed out earlier that four cases have already faced and resolved some of the challenges the PRI will face. In that respect, we consider that it is not necessary to entirely 'reinvent the wheel', ie. solutions for some of their issues can be found in the policy practice of the day. Table 3 summarises the key features of four cases that contain relevant lessons for the PRI.

Elements of institutionalisation of PRI	Features of institutionalisation	Slovenian Strategic Research and Innovation Partnerships	VINNVÄXT programme (Sweden)	Innovation Performance Contracts (IPC) programme (Netherlands)	Innovation Networks programme (Denmark)
Facilitators	Through different **institutional facilitators** with continuous feedback loops with stakeholders throughout the planning and implementation phases	The S4 strategy has been designed **jointly, between the government and stakeholders**, from the start, with the definition of niches, at a more granular level, being transferred **to SRIPs** in the implementation phase (=continuous EDP).	A collaborative **business platform** with the integral participation of the regional industry	**IPC** as the facilitator of innovation activities of groups of SMEs that are related via value chain, sector, region or theme.	Via "**Innovation Networks**" based on a clearly defined professional or technological area defined by the network itself.
Forms of collaboration	Space for communication and interaction to explore new options and new solutions	Promotion and sourcing of new ideas have sprung from **various forms of inter-stakeholder collaboration**: within dedicated SRIP activities (e.g., joint discussions), but also from research programmes and projects, etc., thus creating positive feedback loops.	"**4-Helix approach**" adopted to ensure that local problems and issues come into consideration for innovation support and development	**IPC participants** engage in **individual and collective innovation projects**. Joint projects enable participants to look into the internal processes of other companies, so they can learn from each other + meetings for all IPC companies to exchange their experiences	Innovation Networks offer a range of services with the aim of bridge-building and establishing meeting places, **initiating partnership Projects, and facilitating Knowledge communication**
Moderators (brokers)	Specific allowance of the funding programme for a broker to make connections and develop the relationship between different innovation actors	The government provided 50% of funding for the SRIP coordinators, with the rest coming from the business sector. SRIPs set up a group of coordinators focusing on specific areas of their engagement, which also acted as brokers.	The programme is a broker, enabling "idea donors" to connect with established enterprises and develop innovation projects.	Secretary (industry expert) fosters relationships between partners and supports them with implementing activities and the administration.	Individual networks act as midwives, forge permanent relationships and contacts between companies and researchers + Netmatch: a joint 'industry organisation' to develop a joint basis for the network services which innovation networks offer
Scope of moderation (brokerage)	Broker is assigned the role of facilitating connections between regional players and	SRIP functions have been defined in rather broad terms, from RTDI and human resource	Activities include advice and mentoring to develop the idea, funding to carry out pilot studies, and a special	Secretary guides in drafting innovation plans and provides administrative support during the implementation stage of	Assistance in: Bridge-building activities, Partnership projects, Knowledge communication

	international actors and value chains	development to internationalisation, especially internationalisation of R&D activities, of the business sector in particular, emphasising different functions to be agreed upon by stakeholders. In this process, the government also played a facilitating role.	company, Soft Financing AB, to help enterprises to apply for public sector development funding.	an IPC project.	
Tailoring of support	Tailored coaching and support to individual actors with the specific mission of upgrading the capabilities of individual companies	The need for such coaching and support to individual actors has been identified. However, support was not extensive enough, representing one of the missed opportunities at the time. This experience also demonstrates how important it is that support to intermediaries must be significant.	Coaching includes advice and mentoring to help SMEs develop the idea, bring it to market and help them connect to international value chains.	In the pre-IPC process: (i) information provision; (ii) conducting innovation study about innovation opportunities; and (iii) building a coalition, where the applicant organisation acts as a facilitator to bring together the IPC group. During the IPC: a combination of financial support to individual and collective innovation projects, network activities, consultancy and support from a secretary	Matchmaking activities to help individual companies or researchers to find suitable partners; Structured workshops for idea generation; Pre-projects; Consultancy and sparring to facilitate researchers' provision of consultancy to businesses; Facilitate business-to-business partnerships to work on specific challenges, issues or business opportunities.
Diagnostic monitoring (flexibility because of new insights)	Continuous data flow on strategic and operational aspects of the programme and between management and ongoing evaluation loops.	In best case examples, continuous collaboration among stakeholders at different levels resulted in thick interpersonal networks that started to ripe towards deeper trust relationships, a key for more ambitious and strategic behaviour.	The programme supports promising innovation projects and pilot studies to facilitate innovation projects. Innovation projects are need-driven, with the needs of the local SMEs being the primary criterion for deciding whether	The scheme offers space and flexibility for SMEs to determine their innovation agenda.	A portfolio approach with many different networks complementing each other. The companies' needs guide the process. All members have a voice, and the intermediary agent

		However, at the crucial stage of transitioning into strategic collaboration more extensively, the government started to retreat in its commitment, which seemed to halt further upgrade of SRIP operations (but has not meant a reduction of at the time existing activities either).	to support them.		is established, respected and neutral.

A summary of four cases shows that in institutionally different but functionally similar ways, network-based programs are characterised by the following distinctive features:

First, networks emerged driven by institutionally different facilitators, establishing feedback loops with stakeholders throughout programme activities' planning and implementation phases. In Slovenia, these facilitators were SRIP; in Sweden, business platform; in the Netherland IPC programs, and Denmark 'Innovation Networks'

Second, facilitators have created space for communication and interaction to explore new options and solutions. In Slovenia, ideas and actions have emerged from various forms of stakeholder collaboration. In Sweden, the Quadruple Helix approach was the main organising principle which enabled consideration of local problems and issues. In the Netherlands, IPC participants have been allowed to engage in individual and collective projects as modes of collaboration and mutual learning. In Denmark, Innovation networks have enhanced collaborative links, initiated partnerships, and facilitated knowledge exchange. The point is that in all cases, the collaboration will not happen by itself but has to be actively supported by the facilitator organisations.

Third, for collaboration to happen, facilitators should actively engage in brokering activities. Hence, the funding programme enables a broker to connect and develop the relationship between different innovation actors. In Slovenia, SRIP coordinators were funded by the government and businesses on a 50/50 basis. The program funds brokering activities in Sweden, enabling "idea donors" to connect with established enterprises and develop innovation projects. In the Netherlands, IPC funds secretaries (industry experts) to foster relationships between partners and supports them with implementing activities and the administration. In Denmark, Netmatch supports Industrial networks that act as midwives, aiming to forge permanent relationships and contacts between companies and researchers.

Fourth, brokers are assigned to facilitate connections between regional players and international actors and value chains. This scope of their activities is not confined to R&D. In Slovenia, SRIP functions have been defined broadly, from RTDI and human resource development to internationalisation of the business sector. In Sweden, activities include assistance in mentoring, pilot studies and help to apply for public funding. The aim is to bring companies to reach a level of maturity to attract bank finance or venture capital. In the Netherlands, assistance is in drafting innovation plans and providing administrative support during the implementation stage of an IPC project. In Denmark, activities are bridge-building, partnership projects and knowledge communication.

Fifth, the key feature of successful networking programs is that they have matched support to individual needs. Hence, the scope of support was specific to individual actors with the particular mission of upgrading the capabilities of respective companies. The need for tailored coaching and support to individual actors has been identified in Slovenia. However, support was not extensive enough. In Sweden, coaching was individual in all aspects of the innovation journey. In the Netherlands, support was specific in pre-IPC and during the IPC. It was tailored to enhance not only individual companies but also groups of companies working on collective projects. In Denmark, support was comparatively the most extensive, stretching from matchmaking activities, idea generation, pre-project and project facilitation to business-to-business partnerships.

Sixth, a distinctive feature of successful networking programmes is flexibility in all stages in the light of new insights. This is a specific form of diagnostic monitoring possible due to continuous flows of data on the strategic and operational aspects of the programme and between management and ongoing evaluation loops. In Slovenia, continuous collaboration among stakeholders at different levels resulted in the development of thick interpersonal networks. However, these networks have not been transformed further into strategic partnerships due to the government backing down on its commitments. In Sweden, projects are driven by the needs of the local SMEs based on pilot projects. In the Netherlands, the IPC enables SMEs to determine their innovation agenda. In Denmark, the nature of innovation networks ensures that all members have a voice, and the company needs guide the process.

Finally, the success of network-based programs depends on the region's overall institutional and organisational context. The 'thicker' the innovation networks in the region, the easier it is to initiate network or PRI-type programs. A Slovenian case represents an excellent example of a medium development level case which illustrates well the type of challenges the PRI will face in institutionally less 'thick' regions. The close collaboration between SRIPs and the government was expected to lead to tailored or targeted measures. However, it never came that far in practice, also for administrative reasons.

6 Methodological foundations of Partnerships for Regional Innovation (PRI)

Based on four cases elaborated in sections 4 and 5, section 6 develops three characteristics of PRI: their strategic features, key strategic activities, and mode of work of PRI.

6.1. Strategic features of PRI

The main target is to develop PRI as dynamic ecosystems where the density and the number and intensity of interactions are highly important for the technological transformation of regions, taking into account the new social and environmental challenges and opportunities. This can be achieved by following some ***basic principles***:

- *mutually reinforcing top-down and bottom-up approaches for choosing innovation projects and transformative activities*; a typical example of the former is *missions identified by policy-making bodies* or other social groups, while a typical example of the latter is *market opportunities identified by companies*;
- mutual interaction between *structure and flexibility*, whereby structures (organisations and programs) provide confidence and opportunities for interaction - based on the developed structures, experimentation, knowledge flows and serendipity emerge.

The ***objective*** of this strategy should be three-fold:

- Meeting *the specific needs and resolving the issues of the innovation players enabling them to complete the innovation journey*, including scale-up;
- *Facilitating change of attitudes and the development of new behaviours* which can support transformative regional innovation partnerships (e.g. addressing regional grand challenges and opportunities);
- *Supporting access of innovation players in the region to strategic resources* (inside or outside the region) to develop business outcomes and final solutions;
- Enabling *a continuous interaction between policy-makers and regional innovation players allows accountable experimentation*, including adjustments and the evolution of the relevant strategy.

The **elements of a regional transformative strategy** will be as follows:

- Connect and mobilise various social actors and economic players to identify *grand challenges and opportunities of the region* (e.g. particular forms of environmental pollution, water shortage);
- Allow the development of *key individuals* in the region who can act as innovation coaches (e.g. SMEs), network champions and brokers of relationships among different players enabling the formation of different constellations of innovation players with a common mission;
- Identify and connect with a *critical mass of (small or large) companies* with innovation potential and mobilise them to engage in relevant innovation activities in pursuit of a common direction;
- Provide a *portfolio of resources* (e.g. services and activities) to cover the full innovation journey (identification of opportunities, fundraising, training, etc.), including innovation coaching services to companies with innovation potential;
- Foster *relationships with other innovation players* in the region (e.g. local university) or beyond, including access to international value chains (if relevant) through active brokerage;
- Enable the *emergence of many innovation projects, programmes and actions* pursuing the stakeholder's innovation objectives, a significant part of which should generate sustainable offerings to the market.

The following section presents the main features of three strategic activities of regional transformative innovation partnerships.

6.2. Strategic Activities of Partnerships for Regional Innovation (PRI)

The strategy of PRI should be realised via three groups of activities (figure 2):

A. Identify Regional Challenges and Opportunities relevant to the specific group of stakeholders active within specific (priority) domains[12];

B. Mobilise and Connect by engaging with regional companies to agree on a common direction[13] in which experimentation would be taking place and in which stakeholders would be developing their innovation potential by connecting with other innovation players inside or outside the region;

C. Facilitate innovation projects, programmes and actions via special value-added services.

These clusters of activities will run in parallel and will carry out throughout the programme. The vision is that the activities will generate insights and feedback that will be used to calibrate the overall programme and allow experimentation and adjustment to the ongoing (and possibly changing) challenges and opportunities. More specifically, experience gained from the implemented projects, programmes and actions should feed back in the adjustment and evolution of identified challenges and opportunities. Strengthened relationships and trust allow for a more intensive, deeper learning process, leading to upscaling and even stronger mobilisation of stakeholders, thus creating a virtuous cycle.

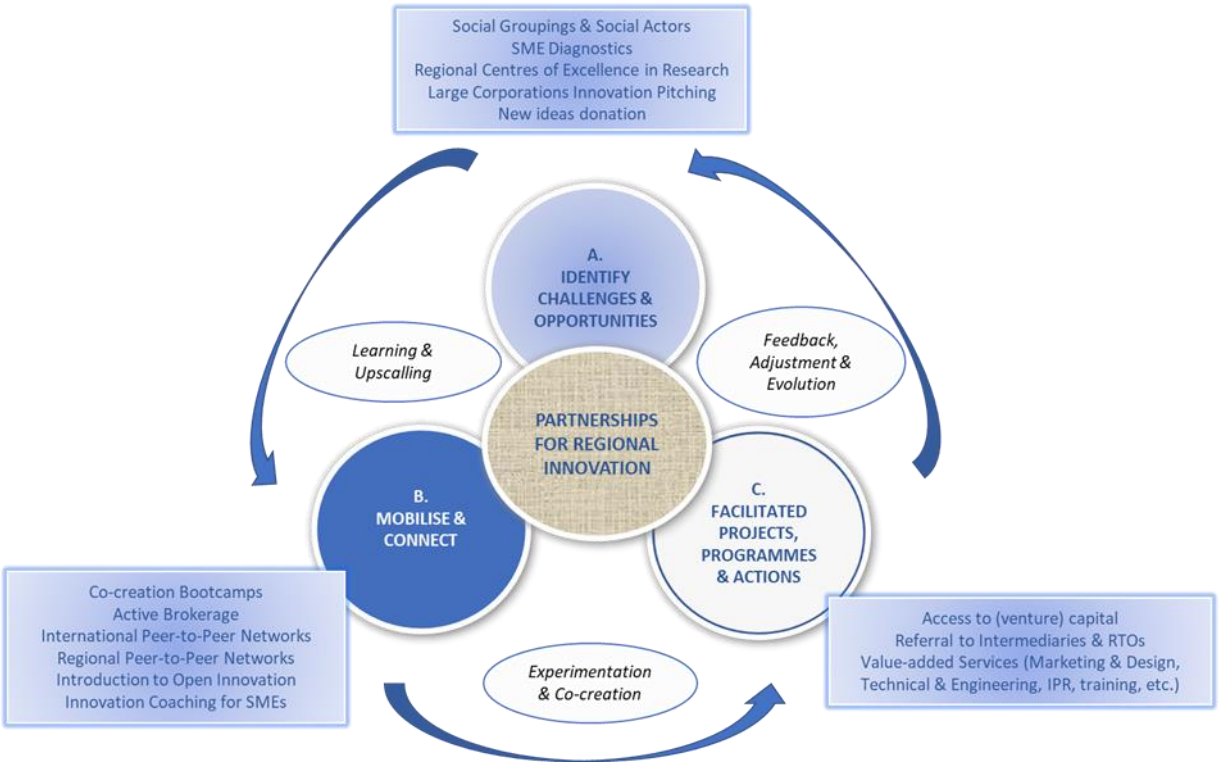

Figure: The strategic activities of transformative innovation partnerships

Below is a more detailed explanation of each step.

A. Identify Regional Challenges and Opportunities

These will be the ongoing activities that will gather intelligence from various sources within a given domain. The activities will be gathering input continuously from a range of sources:

- Social groupings and social actors' needs, challenges and requests.

[12] Priority domain in this case refers to fields of complementary activities that address the same market, challenge or opportunity.

[13] Directionality itself is to be agreed among the stakeholders. It is to provide broad guidance, building on existing strengths and capacities, as to where new ventures would be sought.

- Diagnostics with regional SMEs with innovation potential and/or innovation aspirations.
- Centre of Research Excellence in the region related to the region's main strengths and grand challenges and opportunities.
- Innovation pitches from large corporations.
- Donation of new innovation ideas from any other source e.g. a community of craft companies.

This intelligence will shape the activities to mobilise and connect the regional innovation players.

B. Mobilise and Connect

This is a key element of the whole strategy since it will serve several purposes simultaneously. On the one hand, these activities will prepare regional companies for effective innovation partnerships with a transformative agenda. On the other hand, these activities will provide the forum for the PRIs to receive continuous feedback on the programme's deployment, the relevance of the identified Challenges and Opportunities and the success of the formed project, programme and action-level innovation partnerships. This feedback will in turn, enable a fully accountable programme while at the same time facilitating continuous experimentation and adjustments within the set direction throughout the lifecycle of the programme.

These activities will occur through a portfolio of services available for the regional companies. Each company will choose which of these services will use and which not, with the help and guidance of the regional PRI. The services could be the following:

- *Innovation coaching* offered to local companies
- *Regional peer-to-peer networks* with local SMEs with a related innovation agenda
- *International peer-to-peer networks* with regional companies and others outside the region
- *Active Brokerage* where the PRIs will connect engaging companies with potential partners
- *Co-creation boot camps* where space and facilitation will be offered to potential partners to develop their partnership
- *Joint training sessions*

The innovation coaching will be offered to local companies. The main objective will be to address their strategic challenges (e.g. a declining market) and develop an innovation strategy to deal with them. The innovation coaching will aim to identify the appropriate innovation actions for the enterprise and allow the entrepreneur to 'learn' the new (transformative) innovation approach.

The regional peer-to-peer networks will follow the method of Action Learning where local SMEs with a related innovation agenda[14] (or innovation aspiration) will present their challenges and/or opportunities to the group, provide feedback to each other and explore the space for joint innovation activities. Specially trained facilitators will facilitate these networks. Social groupings and other important (for innovation) social actors and policymakers will have the chance to present in the networks, sharing their challenges or promoting their agenda (see 6.3).

Furthermore, a manager of the PRIs will also be sitting in these sessions to identify needs for partnerships either with regional players (e.g. regional RTOs, other local SMEs etc.) or innovation players outside the region. This information will be used to form international peer-to-peer networks, provide an Active Brokerage service or set up relevant Co-creation boot camps.

International peer-to-peer networks where the regional companies will engage with other companies outside the region to explore joint innovation activity and/or joint business development activity. A typical example is a network between sports clothing companies in Malmo (Sweden) with design companies in Emilia-Romagna (Italy) or between food producers in Donegal (Ireland) with food retailers in Berlin (Germany) or innovative agriculture farmers in Andalucia (Spain). Here again, these networks will be facilitated by specially trained facilitators with the presence of a TRIH/TRIP manager.

[14] Hence, organisation of PRIs by domains.

The PRIs will use the gathered feedback from these sessions to introduce potential partners to the engaging SMEs through their Active Brokerage service. The Active Brokerage service will use the innovation pitches from large corporations and the social challenges from social groupings to develop the appropriate partnerships (collected in the first cluster of activities – Identify Grand Challenges).

Finally, trained facilitators will run dedicated workshops to allow engaging companies to explore potential partnerships with other innovation players (RTOs, large corporations, international value chains etc.) and form an Action Plan for developing such transformative partnerships.

C. Facilitate innovation projects, programmes and actions

Either from the second cluster of activities (B.) or directly from mature projects, the intermediaries (brokers) will provide specialised services to develop partnerships. These services will be on demand and focus on support activities that will add value to the developing partnerships, such as marketing and design, technical services and engineering, IPR, training, etc. Specialists in the region will be identified to offer these services to the developing partnerships.

These value-added services will be complemented by the referral of the developing innovation project to other intermediaries (e.g. other regions with relevant expertise) or RTOs inside or outside the region that needs know-how. Furthermore, once a developing innovation project reaches a certain level of maturity, the project will be introduced to venture capital organisations and other financial organisations.

The biggest advantage of the proposed arrangement for regional Innovation partnerships is that they will provide an effective mechanism for enabling transformative innovation journeys in the region and, more significantly, allow the region to develop a transformative innovation agenda following an 'accountable experimentation' approach. In particular, as the engaging companies share their strategic challenges and opportunities, the present policy-making authorities will 'learn' and get valuable feedback on the required adjustments and the wider changes in the innovation policy for the region (Figure).

6.3. Action Learning as the underlying mode of Work of Partnerships for Regional Innovation[15]

The mode of work of PRI should be based on principles and experiences of 'action learning' and 'learning network' (LN) as its generic governance expression. The LN or PRI should rely on 'action learning' principles in their work mode. Action learning arises from the business sector and is defined as: "… a continuous process of learning and reflection, supported by colleagues, to get things done. Through action learning, individuals learn with and from each other by working on real problems and reflecting on their own experiences." (McGill and Beaty, 20021: 11). The core 'action learning' process requires participants to report the actual experience of 'doing things' and discuss this experience within groups to propose concrete actions (Kolb, 1984; McGill and Beaty, 2001). In turn, group participants report on the proposed actions' success (or not), which becomes the focus of further group deliberation (Revans, 2017). The focus is on complex or ill-defined problems. The absence of a single problem-solving definition and procedure makes 'action learning' a 'highly situational' practice (Gifford, 2005:2) and relevant to experimental innovation policy, particularly PRI.

LN or, in our case, PRI, are not networks that facilitate learning as a product of the policy process. This learning comprises conventional monitoring & evaluation (M&E) activities, public sector innovation initiatives (policy labs, see section 2) or policy learning exercises. LN are *inter-organisational arrangements established primarily to enhance network members' knowledge and capacity to act*. They:

- include *representatives from different organisations, including SMEs, and ideally, all stakeholders* in the innovation policy process, contributing as designers, implementers and beneficiaries;
- are *formal arrangements* with clear and well-defined thresholds for participation;
- have an *explicit operational structure* and business model that includes regular processes and actions;
- have a primary target *–specific learning/new knowledge about the experiential innovation policy implementation process* enabled by the network;

[15] This section partly draws on Radosevic et al (2023)

- assess *learning outcomes which provide feedback on network operation* (Tsekouras and Kanellou, 2018; Radosevic et al., 2023)

LN allow the individuals involved in the design and/or implementation of different programmes to identify gaps, simplify processes, enable synergies and find new solutions as implementation proceeds. Hence, LN are suited to improving and adapting previously agreed processes and procedures to emerging new problems which demand new solutions. In this context, LN becomes a de facto 'diagnostic monitoring' mechanism (Dutz et al., 2014 ; Kuznetsov and Sabel, 2011).

Experimentation in innovation policy requires diverse coalitions, and LN or PRI, in our case, are a solution to this issue. Optimum experimentation involves incremental changes and is aimed at minimising trial and error. The more comprehensive the changes, the riskier the transformation and the stronger the case for co-creation and collaboration. The sign of successful experimentation in innovation policy is that entrepreneurs in LN (PRI) member organisations can initiate and manage implementation independently. The potential of LN (PRI) lies in the facilitated (and, therefore, managed) interaction among a diversity of stakeholders and participants. Some participants provide power, others problem awareness; some provide ideas or resources, and others act as connectors or bridges (Andrews et al., 2012). Successful implementation of LN requires negotiation among topics and individuals and skilled balancing of different perspectives or interests (Marshall and Tsekouras, 2010). The inclusion in LN (PRI) of policymakers, programme administrators, firms and RTOs allows them to contribute to identifying solutions to maintain these strategic partnerships. By bringing together the civil servants involved in national innovation policy and Operational Programs (OP) and their design and implementation with business and RTO community, PRI can help make strategy and OP more coherent and ambitious. Taking the ongoing EU S3 as a test case or PRI as the future test case, the critical challenge is ensuring the conversion into implementable programmes and projects and avoiding the emergence of a range of separate activities based on conventional Structural Funds criteria.

The mechanism of Learning Networks (LN) has been developed to operationalise the potential opportunity among network members given the diversity of their experiences and types of knowledge accumulated. As a formalised structure, LN (PRI) should include the following actors:

- a *network moderator* to manage and coordinate activities, people and time; match learning needs to knowledge resources and monitor relationships among members;
- *group facilitators* to enable structured reflection among groups of practitioners and balance and convergence of the interests of all group members;
- *network members with executive power* who represent the organisations (stakeholders) involved in the design and/or implementation of the policy;
- *experts* not members of the network, who are invited to participate for a specific reason (such as a presentation of a particular topic) for a defined period.

Participants need executive power in an area relevant to (or affected by) the focal innovation policy. Participants representing a public organisation should be involved directly in the design and implementation of innovation policy, which suggests that they should be senior or middle-level administrators 'sufficiently elevated to observe differences across offices but low enough to know the necessary details about programs' (Carpenter, 2001: 22). Participants representing firms should be senior managers or partners (owners). Participation must be voluntary, not mandatory, but participants must commit and develop a sense of ownership, which is why the leadership of PRIs is critical.

7 Conclusions and policy implications

The motivation for our paper is the lack of solutions in the literature and practice for institutionalising policy experimentation beyond pilots. We explore the issue in the context of the European regional innovation policy, and we draw on the experience of four diverse cases of policy programs implemented in Slovenia, Denmark, Sweden and the Netherlands.

The four cases and the overall analysis have been explored from the perspective of planned Partnerships for Regional Innovation (PRI). These have been envisaged as the main governance form for implementing transformative regional innovation policy in the EU in the next planning period. In that respect, our analysis and conclusions *should have analytical and practical policy relevance.*

Transformative regional innovation policy represents quite a new, conceptually and institutionally challenging shift for which policymakers do not have ready answers. While its novelty, compared to regional innovation systems and S3 approach, is significant, our departing point is that policy practice has already generated relevant insights and lessons that could be used to implement transformative regional innovation policy, particularly PRI. However, this does not mean that the policy practice has all the answers to the PRI challenge, and we also point to that issue.

First, the evidence in the four cases confirms our initial argument that pilots and policy labs as the mainstream institutional solution to experimentation are insufficient. They seem to represent the suboptimal approach to the issue for several reasons. Both pilots and policy labs assume that the main challenge is in the program's upfront design, which is decisive for good implementation. However, our cases suggest that the implementation is impossible to separate from the design, which gets modified during the implementation as stakeholders discover new opportunities and mutually adjust in ways not envisaged in the initial stage of the programs. Each region represents a unique institutional context, and replicability of programs across regions seems possible only in broad contours as the mutual learning among stakeholders shapes the program in directions initially not envisaged. The unforeseen outcomes are due to unexpected directions in which strategic collaborations develop among stakeholders.

We do not deny the relevance of pilots for simpler programs like innovation vouchers which can also trigger collaborations, but they are usually sporadic, one-off, and unintended outcomes. Also, the pilot and policy lab-driven approach requires institutional capacities beyond many EU regions. It seems more feasible and realistic to be successfully implemented in countries with developed policy capacities.

Second, transformative regional policies require mutually reinforcing top-down and bottom-up approaches or state (regional government) facilitated but bottom-up driven partnerships for regional innovation (PRI). Slovenian SRIPs are a good example of this issue. Also, all four cases show that allowing the industry to define agenda and lead in co-creating R&D and innovation projects is essential. The role of government is to set the framework, but what happens within the framework is up to stakeholders and intermediaries. This is probably the most challenging issue from the perspective of conventional public policy concerned with outcome accountability. Elsewhere (see Radosevic et al, 2023), we elaborate on this issue and suggest ways to reconcile such programs' experimental and bottom-up nature with the accountability rules of public policy. However, our case studies show that the issue can be addressed as long as (regional) government can establish the working framework and transparent and enforceable rules of engagement, including the authority to discontinue unviable programs and allow for flexibility and mutual adjustment.

Third, internally, PRI should build on the accumulated experiences, some of which are presented in our four cases. From a functional perspective, networks presented de facto operate as PRI. It is worth underlining, however, that the 'thicker' the initial institutional environment, the easier it is to introduce more advanced PRI functions, especially upscaling. In particular, this applies to lacking intermediary organisations, those that should be brokers, moderators and 'boundary spanners', but it also has repercussions concerning accountability.

The immediate response would be to 'appoint' organisations that could be intermediaries. However, this may be like the 'picking winners' approach, which may pick up the wrong organisation. Who can be an intermediary may differ not only from region to region but also there can be different intermediaries appropriate for different missions or challenges. In some regions, that can be an agency, ministry, RTO, business association, chamber of commerce, industry association, non-governmental organisation, or newly formed partnership. What matters is whether the region or government can establish a collaboration framework and institutionally legitimate process in which all stakeholders can articulate their interests and where common goals (short and

long-term) can be negotiated and agreed upon. As a result of that process, the emerging intermediary should be the organisation with the required capacities and legitimacy.

The EU represents a perfect framework in which various experiences regarding intermediary organisations and institutionalising and organising regional partnerships can be made transparent. Also, the EU level is the most appropriate for the transfer of the experiences from institutionally 'thick' to institutionally 'thin' regions and how to build capacities for intermediation activities.

The real danger for the regional transformation innovation policy and PRI is the political cycle and electoral change, after which often successful partnerships are not seen as legitimate in the eyes of the newly elected government. Yet, on the other hand, stability is essential for building institutional capacities for intermediation and for the activities of programs whose aim is strategic collaboration. A key to this is the establishment of not only 'outcome (result) accountability' but also 'process (deliberation) accountability' [16] Deliberation accountability is about checking whether the interaction process among network members has been appropriately conducted based on the agreed principles and rules of the operation (Radosevic et al., 2023:10). In a nutshell, it is essential to make existing accountability mechanisms and standards 'explicit and subject to deliberation and negotiation'. However, once agreed, governments and the EC must ensure that these rules are adhered to during the planning period(s).

Fourth, methodologically, partnerships for regional innovation (PRI) would benefit from the accumulated knowledge of successful 'learning networks' and the application of 'action learning' principles. The four cases suggest that these principles exist but not articulately and much less as part of the institutionalisation of regional networks or partnerships. Yet, in the context of transformative regional innovation policy where the process (deliberation) accountability is important as accountability for the result, it is essential to introduce these principles through the institutionalisation of PRI.

These principles are essential to ensure successful intermediation and to facilitate the policy process in all stages (prioritisation, design & management, implementation & monitoring, and identification of societal and company needs). Alternatively, bringing consultants and experts may be essential but cannot replace interactive problem-solving, which characterises all issues involved in transformative regional innovation policy. As a result of interactions, members of PRI will acquire a different perspective on their problems and find new solutions through mutual adjustment and co-creation. This may not be possible without the implementation of methodologies which will ensure that the process is transparent and legitimate and does not reflect the existing power structure among stakeholders (see further Radosevic et al., 2023).

Fifth, our core argument is that many of the issues that transformative regional innovation and PRI will face already have solutions in the practice of successful network-based programs in the EU. However, it would be naïve to argue that we have all answers by researching current and past policy practices. The key novelty of transformative regional innovation policy and PRIs is that the focus is not only on the economic competitiveness of specific industries or regions. PRIs are not simply a new name for clusters, which tend to be innovation-driven. However, the breadth of stakeholders, objectives, and strategic nature of PRI separates them from clusters.

PRI is a mechanism of transformative regional innovation policy whose aim is the socio-economic transformation of the region and the country. Economic growth and competitiveness are not objectives unless they are carbon neutral, environmentally friendly, and socially cohesive. The challenge is that short- and medium-term economic, social and environmental goals may not often coincide. The issue is obvious in the case of fossil fuel-dependent regions and industries, but it also permeates all regions and industries to a lesser degree. Integrating economic, environmental, and social objectives and addressing trade-offs among them is an institutionally par excellence challenge.

In a transformative regional innovation policy perspective, PRI, or rather PRIs, would need to gather a much broader range of stakeholders in a given domain as their challenges go well beyond the portfolios of several regional 'innovation journeys' and stretch into the transformation of our energy, mobility, urbanisation and health systems whose boundaries extend well beyond individual regions. Yet, without the active role of regions, none of these global issues can be effectively addressed.

[16] Radosevic et al (2023) define substantive' (outcome) accountability as being about the outcomes of decisions, i.e. whether they have led to the goals sought. Deliberative' (process) accountability is how a particular decision is delivered (p8)

For PRI, this poses a challenge to make stakeholders sensitive to long-term market and societal and environmental needs. Methodologically this further reinforces the need for action learning and PRI as its governance expression to address emerging new problems which demand new solutions. Like Lindblom (1990:34), we think it is essential to establish the institutional context 'in which an outcome will emerge from interaction among decision-makers, each of whom is in pursuit of solutions to his own problems', but who, at the same time, commit towards the same goals and converge their actions in the same direction.

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