Towards a Capability Maturity Model for Regional Innovation Strategies

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Abstract. This paper presents the methodical approach of an INTERREG project aiming to improve the implementation and evaluation of European Research & Innovation strategies. The P2L2 project applies interregional policy learning and exchange of experiences on aspects influencing the regional innovation ecosystems in the field of advanced materials. The key enabling technology "advanced materials" complements the regional economic and research tissue of six participating regions with a stable opportunity for future growth and jobs. P2L2 goes beyond traditional 'good practice sharing' and results are expected not only to improve policy instruments. All activities related to the definition, implementation and evaluation of the RIS3 and smart specialization strategies are described in terms of an ISO/IEC 330xx conformant Process Reference and Assessment Model (PRM/PAM).

The improved process capability aligns regional policies and strategies between sectors in order to facilitate the establishment of real innovation ecosystems beyond administrative regional boundaries and identifies overlaps, gaps and complementarity for European collaboration.

Keywords: Research and Innovation, Smart Specialisation Strategy, Entrepreneurial Discovery Process, Process Capability Maturity Modeling, Process Reference Model, Process Assessment model

1 Introduction

The work described in this paper is part of the INTERREG EUROPE Project "Public Policy Living Lab" (P2L2). The project has started in 2016 and is running for four years. The overall objective of the P2L2 project is to improve the effectiveness of regional development policies in fostering research and innovation in advanced materials and related sectors thereby contributing to the economic modernisation and increased competitiveness of Europe. Advanced materials have been identified as one of the priority areas in many Research and Innovation Smart Specialisation Strategies

(RIS3) [11] and have developed to a vital field of activity. P2L2 is coordinated by the Innovation Capability Center of the University of Bremen and brings together ten partners from six European countries (Germany, Denmark, France, Italy, Lithuania and Poland). The following sub-objectives will be achieved:

1. **Improved, coordinated and more effective innovation policies** fostering on regional level through evidence-based policy-making by applying a process oriented approach to RIS3 definition and implementation.
2. **New knowledge of the European innovation supporting mechanism** and how to coordinate and align them, by exchanging experiences between partner regions and developing a joint information base.

Pioneers of Research and Innovation Smart Specialisation Strategies stress the fact that RIS3 defininion and implementation is a process oriented activity. This idea is confirmed by many authors from Dani Rodrik who declares: „When it comes to industrial policy, specifying the process is more important than specifying the outcome“ [13] to Roberta Capello and Henning Kroll: „As one of the founding fathers of Regional Innovation Strategies for Smart Specialization (RIS3) Dominique Foray claims that RIS3 is „largely about the policy process to select and prioritize fields or areas whether a cluster of activities should be developed, and to let entrepreneurials discover the right domain of future specialization” [7]. Such characteristics of the area give the ground for the P2L2 project to apply a process capability maturity modeling approach for RIS3 improvement as a process oriented activity. Therefore, one core activity is a limited mapping, i.e. policy evaluation methodology of the RIS3 policy instruments of the participating regions. Starting from the RIS3 strategies of the regions, the project identifies activities, initiatives and practices the partner regions have used to support innovation in advanced materials domain. This will allow to identify the best possible policy climate for fostering innovation in priority areas and mainstream this into policy recommendations and a strategic policy framework.

This paper describes the initial steps towards a methodology to address the process capability of activities related the the RIS development, implementation and monitoring. The process oriented approach provides a solid starting point for regional analysis in the participating regions. Guiding principle of this approach is to analyse the process capability of a regional innovation eco-system to develop a strong and successful RIS3 – following the ideas of quality management that “product quality is the result of processes quality”[14].

1.1 The need for Policy Learning

Innovation policy is a strongly interconnected area. In [9] it is described that systemic approaches are currently the most accepted models for promoting the development, diffusion and efficient use of new products and processes. The different actors in an innovation system are part of a very complex network of relations and dependencies. Developing innovation policies therefore has to deal with this complexity in an adequate way. In [2] it is stated ”that many regions have faced notable difficulties in implementing e.g. RIS3 strategies for reasons related to lack of

interest, lack of ability and general politics" and that "with great likelihood, therefore, many RIS3 exercises that had been implemented at inadequate […] levels of governance, in political cultures averse to bottom-up participation or simply in regions where limited administrative and professional capacities precluded meaningful RIS3 processes from the outset will fade out and, at some point in time, become discontinued".

Based on this observation a basic assumption of the P2L2 project is that the development of a suitable research and innovation strategy needs a certain capability on personal, organizational but also on system level. Furthermore, to be able to manage the development of a RIS and to monitor and improve this process accordingly, a management framework on different dimensions is needed. In these terms process improvement can be understood as "policy learning".

1.2 The need of effective Smart Specialization and Regional Innovation Strategies

The principles of "Smart Specialization" are an important element of the 2014-2020 cohesion policy of the European Commission. The Guide to Research and Innovation Strategies for Smart Specialisation (RIS3) of the European Commission explained the need for smart specialization as follows [5]: "Europe is facing major economic challenges that require an ambitious economic policy for the 21st century. Investing more in research, innovation and entrepreneurship is at the heart of Europe's 2020 strategy and a crucial part of Europe's response to the economic crisis. So is having a strategic and integrated approach to innovation that maximises European, national and regional research and innovation potential." The following definition of RIS3 is given [5]: "National/regional research and innovation strategies for smart specialisation (RIS3) are integrated, place-based economic transformation agendas that do five important things:

- […] policy support and investments on key national/regional priorities […];
- […]build on each country's/region's strengths, competitive advantages and potential for excellence;
- […]support innovation and aim to stimulate private sector investment;
- […]get stakeholders fully involved and encourage innovation and experimentation;
- They are evidence-based and include sound monitoring and evaluation systems."

"Smart specialisation relies on key concepts and stages: knowledge of the economic fabric and innovation ecosystem, "entrepreneurial discovery" (close involvement of the private sector), specialisation in specific technological fields or sectors, an associated diversification strategy to ensure a sustainable economic fabric over time, openness to other European regions, definition of an action plan and budget, establishment of a governance and coordination of the innovation ecosystem, implementation of a monitoring and assessment system" [10]. Each region applying the concept of smart specialization is characterised by a specific context relating to unique socio-economic attributes. Its RIS3 strategy should rely on a territorial innovation diagnosis. These characteristics determine its approach towards the

concept and therefore are constituative in the definition and deployment of the RIS3. Analysing a number of indicators helps to underline the economic and innovation diversity of the European regions and helps distinguish territorial characteristics. Hence, the development of a RIS3 strategy can be understood as a process oriented activity. The Guide to RIS3 proposes six steps to design a RIS3:

- **STEP 1.** Analysis of the regional context and potential for innovation
- **STEP 2.** Governance: Ensuring participation and ownership
- **STEP 3.** Elaboration of an overall vision for the future of the region
- **STEP 4.** Identification of priorities
- **STEP 5.** Definition of coherent policy mix, roadmaps and action plan
- **STEP 6.** Integration of monitoring and evaluation mechanisms.

Based on this six step approach and an identification of three critical factors for each of these steps a (self-) assessment approach is presented in [6]. The assessment results in a spider graph.

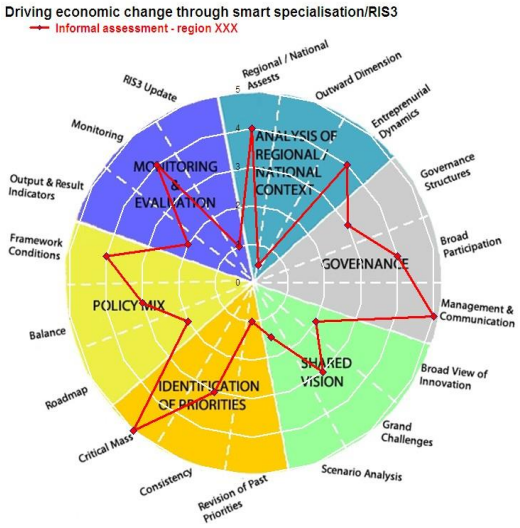


Fig. 1. RIS3 Assessment Wheel [6]

RIS3 is a new policy approach applied for the first time during the ESIF 2014–2020 programming period. This policy instrument has never been field-tested before, hence leading to a necessary in-itinere evaluation aiming at constantly improving it.

2 Project Setup

P2L2 follows an novel approach for improving innovation delivery policies: the focus on a specific policy field (advanced materials and sectors of application) selected as a regional priority area of specialization, varied policy instruments and a partnership

with different regional combinations. It goes beyond the traditional 'good practice sharing' and results are expected not only to coordinate the evaluation of implementation of S3 strategies, but are expected to add value identifying overlaps, gaps, complementarity and opportunities for cross-border collaboration.
Starting from the S3 strategies of the regions, P2L2 identifies activities and initiatives the partner regions have used to support innovation in the advanced materials domain. At the same time, the participating regions will exchange experiences in the methodology for implementing, monitoring and evaluating their S3 strategies. Core activities of project phase 1 are the development of a limited mapping model and policy effectuation.

The limited mapping methodology is based on the ISO/IEC 330xx[1] conformant process capability maturity modelling approach. It will result in a process reference model (PRM) and a corresponding process assessment model (PAM). Guided self-assessment within each partnering region will evaluate the limited mapping model during the first project year. The process capability determination detects the current innovation capability and helps to further increase the ability to improve the regionally selected policy instruments. The assessment reports form the basis for future policy recommendations and a strategic policy framework. The project follows a bottom-up approach in line with the entrepreneurial discovery process followed for the definition and improvement of the regional S3 strategies. This will be ensured through the active participation of a remarkable stakeholders group representing interest of the industry.

The partner regions started their initiatives within the ERDF[2] and RIS3 context already in the last programming period. Hence, political decisions which had been taken are currently being implemented in the period 2014-2020. P2L2 is thus complementing ongoing policy actions with a collective approach. The regional Policy Instruments (PIs) which are due for adjustment in the mid-term review of the Operational Programmes initiate, support and accompany industrial and research activities. Considering information obtained from analysis (assessments) and the feedback obtained during study visits, 3 case studies will be performed in order to define scenarios considering regional variables, best practices and lessons learnt. With these results, each partner region will prepare one policy brief with recommendations to be adopted at regional level and will submit to the internal procedures for the regional approval (regional internal procedures for preparing the adoption of the recommendations and the improvements in the selected policy instrument) informing all involved authorities at the highest level. After making necessary modifications to be approved, the partners will prepare 6 regional Action Plans, with a clear roadmap for the implementation of the improvements and all legal, administrative and political procedures for ensuring the success of the process.

Key stakeholders will play an important role in both phases: Formall, they take an advisory role but, the project will apply a ‘bottom up’ learning approach that

[1] Currently in revision – see chapter 3.1

[2] ERDF = European Regional Development Fund, OP = Operational Programme of the respective region

represents a move away from the top down planning of previous regional innovation strategies where public authorities were expected to steer innovation processes. In this new model, priorities are supposed to emerge out of the entrepreneurial discovery process and the role of public authorities is rather to create the right conditions for and support the entrepreneurial process of discovery building continuously on the innovation capability of the actors.

3 Limited Mapping Approach

The above described task of the INTERREG project P2L2 is to assess existing regional innovation strategies. There are a number of tools available including [6], but we aim at a standardized methodology that recognizes challenging areas of the RIS3 development, defines improvement efforts and determines data-driven monitoring mechnisms in a comparable and repeatable manner. „Regional contextual factors must always be considered, and a pure copying of good practices is seldom successful.“ [9]. Therefore we initially put emphasis on analysing the corresponding processes of the genesis of a regional innovation strategy and assess for each participating region which needs and background measures led to the description of the current strategy. This process-based approach is using the ISO/ IEC 33001:2015 SPICE methodology and adapts principles of the entrepreneurial discovery process (EDP). According to Forray entrepreneurial discovery has two faces in the design and deployment of a RIS3:

- “First, it is a mechanism to integrate and combine dispersed and fragmented knowledge in order to open and explore a new domain of (market and technological) opportunity. As such it is the initial step in many processes of structural changes.
- Second, it is a mechanism to produce information about the value of the considered domain, in terms of potential innovations, spillovers and structural changes. This information should be used by government when the time comes to choose.” [4].

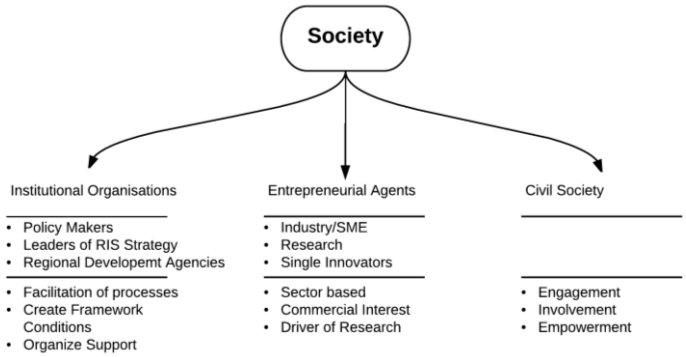


Fig. 2. Entrepreneurial Discovery Process Roles

According to [12] societal model actors within a regional innovation eco-system assume different roles (see Figure 2). Each of the three "role groups" shall have a benefit from the respective intervention. The impact of each action shall be verified. In the scope of the project's limited mapping model, we focus on activities to foster innovation in the domain of new and advanced materials in six piloting regions. Other connected and adjacent policy or commercial areas obviously have links with this model, but will be regarded as fixed for the analytical time frame (ceteris paribus assumption).

3.1 A Process Capability Modelling Approach for RIS3

For more than two decades, capability maturity models are applied in different type of organisations to assess and improve the level of capability of relevant business processes. "There are well accepted Process Capability / Maturity Models (PCMMS), such as ISO/IEC 15504, CMMI, iCMM. […] These models are used as an evaluative and comparative basis for process improvement and/or assessment, assuming that higher process capability or organizational maturity is associated with better performance in terms of predictability of process results." [8].

A process in this syllabus is a collection of activities designed to produce a specific outcome for a particular purpose. The ISO/IEC 15504 conformant process reference models imply a strong emphasis on what should be done. How the specific practices are performed remains in the responsibility of the defined process owner. A process is thus an organization specific or independent ordering of activities across time and place, with a defined beginning and end, defined inputs and outputs.

As the P2L2 project aims to apply a methodology allowing European regions to assess, compare and improve their materials-related regional strategies, the well established process capability determination approach is fullfilling the requirements of all phases of regional innovation eco-system management. Latter processes allow to modify the strategy where appropriate. Different levels of measurable capability and their expected improvements are the benefits for the societal actors (institutional organisations as facilitators and demand-driven entrepreneurial agents).

The proposed model takes into account each of the role agents' (see above) expectations and presumed (both explicit and tacid) action paths. The interaction of the specific competences and process knowledge is based on the acknowledgement of each role actor's competence. Industry, for example, will know exactly what knowledge area including staff resources and machinery they have, whereas a regional development agency has specific connaissance on policy processes and to how to apply for ERDF funding. The newly drafted process reference and assessment model cope with this role-oriented approach and condense the activity model into a generalizable and standard conformant format.

As the development, implementation, monitoring and improvement of RIS3 in a region is connected with the transparency and the democratic level of public consultation whilst defining the discoveries and priorities, it is included into the model on process level. Likewise, the drafting of the regional strategy (RIS3) brings together various elements of demand-for-support (DfS). The DfS result in being

implemented in concrete actions. These concrete actions lead to Policy Instruments being evaluated by each region.

Both, the RIS3 definition and its implementation are processes of transformation to a region. Supposedly, a center piece of the RIS3 establishment is the consulatation process embedded into the Entrepreneurial Discovery process (EDP). In contrast to a traditional top-down regional development strategy, RIS3 is understood as a bottom-up exercise in terms of its decision-making. The direction of decision-making processes depends on the process owners. As it is indicated in Figure 2, RIS3 and EDP have three roles of actors: institutional organizations, entrepreneurial agents and the remainder of civil society. Conventional top-down decision-makers for regional development strategies are institutional organizations. In the case of RIS3, they are also main decision-makers; the difference is that in RIS3 the decision-making process is a distributed one. The degree and extent depends on the institutions' and entrepreneurial agents' capability to engage in a shared decision-making process. Like an elephant cannot be eaten at once, the challenge of RIS3 development cannot be resolved at once. This "elephant" is the accumulated knowledge for regional transformation. RIS3 cannot dispense without regional macro level analysis, context of neighbouring regions, EU strategies and global trends. The phase of drafting the macro level analysis is very sensitive to undesirable (dominant) influences from any of the role actors. It must be performed in mutual trust and very consciously and treated as preliminary, informative, non-binding. A further psychological factor has to be considered as well: The threshold to change a decision is much higher than the threshold to take decisions.

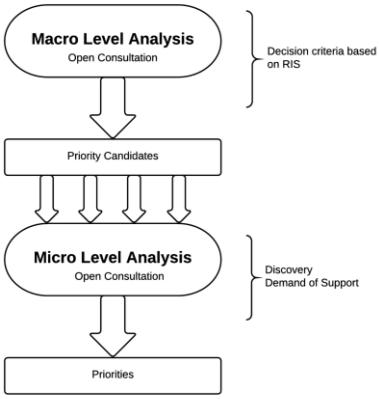
The RIS3 Guide defines "Identification of priorities" as follows: "Priority setting in the context of RIS3 entails an effective match between a top-down process of identification of broad objectives aligned with EU policies and a bottom-up process of emergence of candidate niches for smart specialization, areas of experimentation and future development stemming from the discovery activity of entrepreneurial actors." [5]. According to project experience, the establishment of RIS3 often is not a bottom-up process as stressed by many RIS3 related materials.

As provided above in subsection 1.2, RIS3 consists of six structural parts according to the RIS3 wheel. At logical level, these structural parts can be divided into three groups as RIS3 process capability process model categories and subcategories: governance, macro level and micro level.

- The governance group consists of Step 2 "Set up of a sound and inclusive governance structure" and Step 6 "Integration of monitoring and evaluation mechanisms".
- The macro level group consists of Step 1 "Analysis of the regional context and potential for innovation" and Step 3 "Production of shared vision about future of the region".
- The micro level group consists of Step 4 "Selection of a limited number of priorities for the region" and Step 5 "Establishment of suitable policy mix".

	RIS Wheel	Process Owner	Process Name
Strategy Definition	b	inst.	Patron / Leader
	b	inst.	Budget definition
	b	inst.	Expert identification
	b	inst.	Facilitation of open consultation
	a	entr.	macro analysis of regional assets
	d	entr.	priority candidate definition
	d	inst.	priority candidate alignement
	c	inst.	Shared vision draft
	b	inst.	Criteria definition for allocative rules
	a	entr.	Analysis of discoveries
	d	entr.	Critical Mass assembly
	d	entr.	Identification entrepreneurial discovery candidate
	d	entr.	Discovery definition
	f	inst.	Monitoring
	b	inst.	Acceptance of discovery definition
	c	inst.	Refinement of vision
	d	inst.	Priority final formulation
	d	entr.	Priority formulation acceptance
	c	inst.	Allocation Rules
	b	society	Allocation rules
	c	inst.	Strategy draft
	d	inst.	Definition of actions
	e	inst.	Elaboration of actions
	e	entr.	Negotiation on actions
	e	inst.	Acceptance of action
	e	inst.	Transformation of allocative rules
	b	inst.	Define strategy evaluation criteria

	RIS Wheel	Process Owner	Process Name
Strategy Implementation	d	inst.	Strategy finalisation
	c	inst.	Policy definition
	e	inst.	Define policy monitoring indicators definition
	e	inst.	Vision refinement
	c	inst.	
		inst.	Action plan elaboration /
	e	inst.	Action launch
	e	inst.	Action
	e	inst.	Discovery Implementation
		entr.	Monitoring action
	f	inst.	Evaluation of action
	f	inst.	Adjustment of policy
	e	inst.	Acceptance of adjustments of policy



RIS3-Wheel	Section of RIS Wheel
a	Analysis of regional / national context
b	Governance
c	Shared Vision
d	Identification of priorities
e	Policy mix
f	Monitoring & evaluation

Fig. 3. RIS3 development process and RIS3 model's primary process category

In terms of process capability maturity modelling, the macro and micro level groups together compose the primary process category while the governance group is the organizational process category.

Macro and micro levels groups are ilustrated here in Figure 3, where macro level ends by strategic vision and allocative rule formulation and micro level – by action plans as a response to the discoveries' demand for support. A published analysis of regional RIS3 strategies discovered some gap between the macro and micro levels or more precisely between the RIS3 development and implementation. The expert group concludes: „Across all RIS3, the elaboration of the implementation plans was very weak. […] More problematic would be the explanation that the RIS3 strategy is disconnected from the implementation of the Operational Programmes. This could be due to functional divides (other authorities responsible for the OPs than the RIS3), inertia of existing policy programmes and measures, local lobbying for certain policies or lack of capacity with the public authorities to adapt and improve the policy mix on the basis of the RIS3 exercises." [3]. The authors agree on diagnosis "lack of capacity", however they discovered that the reason for such capacity lacking is a methodological gap within the RIS3 explanatory materials – the link between RIS3 definition and its implementation is insufficient. The link provided is at very high level only: {objectives} ~ {roadmaps, action lines}. There is an obvious need to link the strategy definition and its implementation at lowest level: {discovery activity} ~

{actions, policy instruments}. The proposed process capability model therefore addresses explicitly such linkage on process level. The RIS3 process capability assessment model is an abstract generic model suitable to assess any regional RIS3 process. The process assessment model defines what to do, whereas the real process must include knowledge on how to do it.

As a starting point for development of the RIS3 process capability assessment model, the current preliminary RIS3 development process model is also provided in Figure 3, containing process identification by process name for strategy definition including macro and micro analysis levels and strategy implementation including monitoring and evaluation.

The mapping of the identified processes to the RIS3 Assessment wheel [6] at the level of its six steps is provided. The process owners in terms of institutional organizations, entrepreneurial agents and remainder of civil society is indicated, too. The purpose of the RIS3 process capability assessment model is the assessment and continuous improvement of RIS3 process capability performed by institutional organizations aswell as entrepreneurial agents.

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