

Smart Specialisation Strategies: An online platform for strategy design and assessment

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Abstract. Regions in the European Union (EU) are called to design and implement Research and Innovation Strategies for Smart Specialisation (RIS3), as a prerequisite to receive funding for research and innovation from the European Regional Development Fund (ERDF). To facilitate and streamline this process, the European Commission (EC) has published a Guide to RIS3 and a handbook for implementing Smart Specialisation, providing a set of methodological steps on how to design a RIS3 strategy. Although these publications provide valuable resources to facilitate RIS3 design and implementation, their inputs are focused mostly on the methodological framework, without pointing out any operational directions that could support an undertaking of the proposed methodological tasks in a streamlined and user-friendly way. The Online-S3 project, funded under the Horizon 2020, tries to address this challenge, by developing an online platform for policy advice. This study explores the information links amongst a set of methodologies, across the six phases of RIS3 design process, highlighting underlying relationships in a logical manner, based on the information flows that are detected. The results reveal parts of the overall mechanism for RIS3 policy making processes, providing guidance to regional authorities and encouraging them to use additional methods throughout their RIS3 strategy-design process, that could be managed and delivered through online platforms and applications. This prepares the grounds for future, empirical investigations of this currently under-researched topic, which appears to be crucial for policy-makers.

Keywords: Smart Growth; Regional Development, Smart Specialisation, Strategy; Platform, Information Flow

1 Introduction

Strategy design and implementation is a complex and demanding effort and takes multiple forms depending on the organisation and the context of the initiative. Large companies, non-governmental organizations (NGOs), utility companies, cities and regions, governments and international institutions, all these organisations use strategic planning methods and design strategies to succeed in their mission. Strategy de-

sign is characterised by uncertainty and ambiguity and requires transdisciplinary knowledge and skills, as there is a plurality of values and opinions to bridge within the organisation, many possible futures, and power games between interest groups internally and externally.

Information systems that support strategy design are becoming mainstream, but also more and more complex [1]. A literature review of information systems for strategic planning reveals a series of factors that influence their success and shortcomings [2]. Apart from pure information systems and dataset feeding the strategy with data, many other IT-based strategy design tools have become available, offline and online. They are used either as e-learning assistants or as step-by-step roadmaps to strategy elaboration. Within this framework, the present paper focuses on Research and Innovation Strategies for Smart Specialisation and on online, web-based, environments that can support the design, implementation, and assessment of such strategies.

Smart Specialisation Strategies (S3) constitute the main growth approach of the EU for the period 2014-2020. These strategies should be formulated by a process of discovery and innovation: as a process of ‘choosing races and placing bets’ rather than ‘picking the winners’. Consequently, strategy interventions should be informed and precise as possible, guided by evidence appropriate to the context, and outcomes that should be monitored and evaluated using quantitative and qualitative metrics and data. The elaboration of Smart Specialisation Strategies is an *ex ante* conditionality for the ERDF investments of the Thematic Objective 1 (Strengthening research, technological development and innovation), but also it is relevant to the *ex ante* conditionality of the Thematic Objective 2 (Enhancing access to, and use and quality of information and communication technologies) and Thematic Objective 3 (Enhancing the competitiveness of small and medium-sized enterprises). *Ex ante* conditionalities are commitments that should be fulfilled to get financial support from the European Structural and Investment (ESI) Funds.

To date, various contributions and preliminary RIS3 evaluation reports have highlighted the difficulties in designing and implementing a RIS3 strategy [3]-[6]. The initial European Commission’s RIS3 planning documents provided some guidance to regional policy makers in the rather complex process of RIS3 design policy [5], [7]. Furthermore, even though entrepreneurs are in better place to identify opportunities, still, the bottom-up approach of the entrepreneurial discovery process (EDP), which is one of the main pillars of the RIS3 strategic planning, requires conscious moderation and careful guidance [5], [8]-[10]. Both [5] and [11], explain different methodological ways to overcome the theoretical vagueness of the RIS3 guide in selecting priority sectors, while [9] discuss how technological relatedness can provide significant input to the EDP process. Finally, we recently see the development of online tools, through the JRC S3 platform, offering the opportunity to policy-makers to detect any emerging landscape of specialisations more effectively and benchmark regions for improved cross-border learning.

Under this framework, digital platforms have been considered as a key element for enhancing capacity-building for policy-making activities, aiming to upgrade institutional capabilities [12]. Added value, when developing policy-making platforms, can be found on the strengthening of the stakeholder engagement processes, as well as the

analytical skills of the users. Both of these issues, are strongly related to a higher degree of RIS3 effectiveness, in terms of better identifying regional assets and features, as well as promoting opportunities for transferring good policy practices between regions.

It has been argued that quality of government, alongside with its contextual and structural characteristics, is related to the quality of outcomes of processes constituting key pillars of the RIS3 approach, such as the EDP process [13], [14]. Moreover, a recent evaluation of a number of implemented RIS3 strategies, highlighted a set of governance-related challenges, including the lack of capability to design and implement regional policies, as well as to actively engage actors in EDP processes [3]. At the same time, regions illustrating a satisfying level of implementation of the RIS3 policies indicate stronger possibilities to reinforce that kind of policy-making processes, through the development of novel toolsets and policy practices.

Given the fact that the original concept of the RIS3 approach has been based upon an accurate and targeted governmental intervention logic to support a number of promising activities [15], the definition of potential areas of intervention should be made through an extended set of methods, including descriptive, benchmarking and discovery exercises. As a result, any existing gap between the EU regions, in terms of high analytical skills and thus, administrative capabilities, could lead to increased levels of inequality regarding the RIS3 effectiveness. Under this context, ICT tools and online platforms target to minimize this gap, in order to reinforce the opportunities, even for less developed regions, to design an evidence-based policy, tailored to their regional specificities.

Under this scope, the Online-S3 Platform (www.onlines3.eu), being developed in the framework of a Horizon 2020 project (ISSI-4-2015), has been designed to address challenges and shortcomings of S3 implementation and assessment. Deploying a connected intelligence approach, the Online-S3 platform uses smart assistants and roadmaps to standardise and automate the tasks of strategy elaboration; give access to databases guiding the strategy formulation by evidence and datasets; and enable participatory design that awakes the potential for collaboration among users and organisations. With all these features, the Online-S3 Platform creates a community of actants (people, organisations, machines) of higher creativity, effectiveness and collective intelligence. It is a web environment that enables a number of stakeholders and users to go through the six steps/phases of strategic planning, proposed by [16] and [17], elaborate an informed RIS3 strategy, and monitor its implementation and impact.

The paper tries to shed light on the process of development of the Online-S3 Platform, through investigating the information links that arise between the different applications that are being used. The development of the applications is based on the selection of a number of methods for each phase, that has been performed throughout the early stages of the project [18]. Some of the key questions that are being explored in this study, include the interoperability between the different applications, as well as the existence of any sequential orders that might arise within each phase, or between different phases.

The structure of the paper is the following: Section 2 presents a short overview regarding the selected methods, being used as a baseline for the application design, pointing out some of their key features and functionalities. Section 3 provides a more detailed analysis of the three most critical applications within the Online-S3 Platform, analyzing the ways in which a set of different tools are interconnected, through the investigation of information flows during a RIS3 design process. Finally, some discussion and further potentials for the Online-S3 Platform are presented in Section 4.

2 Selection of methods for the Online-S3 Platform

Fig. 1 illustrates the key phases penetrating an entire RIS3 policy-design process. As it is shown, the six phases included in this process try to capture a comprehensive set of components that are essential to a RIS3 strategic planning procedure. Starting from Phase 1, governance refers both to government and stakeholder engagement, implying a quadruple helix approach, as the key process of the innovation production. This phase is essential to be placed at the start of a RIS3 strategy design, setting the framework of the entire procedure, as user engagement and participation penetrate the whole policy-making process.



Fig. 1. Phases included in the RIS3 policy-design and implementation process on the Online-S3 Platform. (Source: Authors' elaboration based on [16] and [17])

At the same time, analysis of the context (Phase 2) is a common process for retrieving background information, necessary for any strategic planning process to identify regional specificities and provide information regarding the existing institutional setting to be considered. This phase includes a broad set of methods, targeting to a descriptive, as well as a comparative analysis of a region. Analysis of the regional context targets on pointing out the strengths and weaknesses of a region, when compared to other regions, similar to it. Phase 3, including shared vision and strategy formulation, denotes the strategic and project oriented character of RIS3, highlighting the

existence of a bottom-up approach in defining the vision, as well as the priority setting objectives (Phase 4). Policy mix (Phase 5) refers to the definition of the implementation process of the strategy through action plans' design, stressing the need for a structured project-driven approach to RIS3 implementation. Finally, monitoring indicates the need for developing a set of tools for data collection and processing, as key instrument for evaluation of the implemented actions.

It is important to highlight at this point, that the RIS3 policy-design process is not a linear procedure. In many cases, information coming as an output from the implementation of a method might be used as input to others. Therefore, potential links of information exist between several tools, belonging not only to the same phase, but also to different phases. Thus, it is important to clarify that information flows, as in many cases they overcome the RIS3 phases' sequential logic. Stakeholder engagement, intervention logic, as well as monitoring constitute three characteristic cases of methods, receiving and transmitting information from and to a wide number of other methods.

The selection of the 29 methods, corresponding to the 6 phases of the RIS3 strategic planning process, has been based on a set of methods that have been collected through a mapping exercise, as well as a gap analysis between these methods and a review for good practices [18]. The mapping exercise revealed that regions did not follow the RIS3 steps [16] as a baseline for the design of their methodological approaches, and thus, the robustness of the implemented methods in many cases is questionable, as even the key concepts of the various RIS3 steps were not fully understood. These results also point out that there is no real link between the level of innovativeness of a region and the methodological sophistication of RIS3 design. Hence, it cannot be claimed that moderate and modest innovator regions generally use fewer and less rigorous methods, than leading innovation regions.

At the same time, literature review on good practices has indicated several emerging methodologies that still have not been used by the regions during their RIS3 design, but could possibly enhance the overall effectiveness of the process. These include foresight exercises and diagnostic tools to identify new activities, possible synergies and complementarities that may arise within the regional context [19]. Furthermore, the use of unstructured data could reveal potential emerging areas of technological and economic activity in a more accurate way [20]. Focusing on strengthening the evidence-based and participatory character of the RIS3 design, policy-makers could also include crowdsourcing priority setting methods and social media analysis for assessing stakeholders' views, through opinion mining and sentiment analysis techniques. Finally, the lack of policy intelligence tools and methods, reflecting the ways in which the monitoring process could be used with a view of a continuous RIS3 update process, was noticeable throughout the literature review on good practices. The use of open data could work on a positive way towards this direction, as it would allow to track progress in terms of objectives and visions, as well as to see how they match with the overall RIS3 approach.

The results, alongside with a short description of the application that has been developed for each method, are presented in **Table 1**. The description includes the main functionalities of each application, which have been derived based on the key con-

cepts of the corresponding methodology. Information presented in Table 1 provides a baseline, upon which we can further understand the main features of the Online-S3 Platform mechanism, as well as the arising links between the developed applications. A detailed analysis regarding these issues is given in the following section. It should be noted that in all cases, the name of each method corresponds to the name of the developed application. Moreover, the terms method and tool are being used interchangeably in this paper.

Table 1. List of the selected methods/tools for the Online-S3 Platform. (Source: [18] and authors' elaborations)

Name of the method	Short description
Phase 1: Governance	
1.1 RIS3 Vision sharing	An application that allows RIS3 managers to create visually attractive infographics that can be used to communicate to a broad audience what RIS3 is about, what are the priority sectors, roadmap and action lines.
1.2 Stakeholder engagement	Application providing the opportunity to invite RIS3 stakeholders to use online deliberation functionalities, specifically tailored for entrepreneurial discovery process. Key features of the tool focus on: (1) facilitating discussions; (2) co-creation of procedures including provision of feedback; and (3) a reputation management system.
1.3 RIS3 debate at a glance	Application enabling participatory deliberation, in order for policy makers and stakeholders to visualize and share networks of thought, make their reasoning transparent and open to collaborative and iterative reflection.
1.4 RIS3 legal and administrative framework related to ESIF	An application providing an overview of ERDF regulations and EU processes of selecting and funding projects in the framework of national/regional Operational Programmes (OPs).
Phase 2: Analysis of the context	
2.1 Regional assets mapping	Application that draws together information on key regional assets. The objective is to support descriptive analysis of regional assets including a number of key categories.
2.2 Research infrastructure mapping	An application for mapping the existing research infrastructures across the EU regions, providing basic background information for regional policy makers in their RIS3 process.
2.3 Clusters, incubators, and innovation ecosystem mapping	An application for mapping the innovation ecosystem of a region, in terms of existing clusters, incubators, co-working spaces, start-up support, and the challenges of openness, funding and sustainability of such 'soft' innovation infrastructure.
2.4 Benchmarking	An application for comparing the performance of a region with regions that are structurally similar, through providing comparative measures for a series of indicators imported by the user.
2.5 Science and technology profile and performance	Application producing 'scientific profiles' for regions, based on Web of Science (WoS), Scopus and Google Scholar data.
2.6 Specialization indices	The application produces technological and economic specialisation indexes, for understanding the position of regional technological and economic activities in global value chains.
2.7 SWOT analysis	An application for completing the SWOT analysis results, including regional strengths, weaknesses, opportunities and threats.
Phase 3: Shared vision/Strategy formulation	
3.1 Collaborative vision building	This application capitalises on the outputs obtained in 3.2 and 3.3 and provides tailored online guidelines on the necessary additional phases to arrive at a shared vision for regional smart specialisation strategy.
3.2 Scenario building	An application supporting RIS3 scenario building exercises, through the development of baseline scenarios and data projections for scenarios building.

3.3 Delphi - Foresight	An application to provide a supportive function to run Delphi-type methods for RIS3.
Phase 4: Priority setting	
4.1 EDP focus groups	Application providing a roadmap for the implementation of EDP, including the definition of industry activities and groups, the selection of stakeholders to be involved, the communication of conclusions about opportunities and emerging innovation ecosystems, and the use of EDP conclusions by the regional and national authorities for drafting calls for actions.
4.2 Extroversion analysis	Application to detect possible industry segments in which regions present increased extroversion, in terms of exports, attraction of FDI, or other forms of regional openness.
4.3 Related variety analysis	Application for calculating the Related/Unrelated variety entropy indexes, estimating whether specialisation or diversification objectives should be given priority.
Phase 5: Policy mix/Action plan implementation	
5.1 Intervention logic	Application where users can build intervention logic roadmaps, essential to achieve the regional vision and priorities. It is a central application that gathers and comprehensively illustrates information from a number of other tools.
5.2 RIS3 action-plan co-design	Application for enhancing collaboration between citizens and policy-makers, throughout the design of an action-plan.
5.3 RIS3 budgeting	Application for providing a framework for using different budgeting methods to capture the funding dimension of the RIS3 action plan and the needs for funding across the defined implementation period.
5.4 RIS3 administrative framework conditions	Application for helping the user/policy-maker to identify, if their policy instruments included in its RIS3 policy mix/action-plan is eligible for State aid.
5.5 RIS3 calls consultation	Application enabling RIS3 stakeholders to assess calls for projects under SF operational programmes that are made by regional authorities.
5.6 RIS3 innovation maps	Visualisation tool teasing out information about regional technological trends, using grant data that is collected from S3 programmes and initiatives.
5.7 RIS3 actions tracker	Application allowing to track relevant actions from EU research projects available on CORDIS.
Phase 6: Monitoring	
6.1 RIS3 monitoring	Application to define the overall process/roadmap for RIS3 monitoring.
6.2 Definition of RIS3 output and result indicators	Application to provide an online guidance on indicator selection and data processing of the results from the implemented actions.
6.3 RIS3 beneficiaries and end users' satisfaction online survey	Application for collecting information regarding levels of satisfaction of the RIS3 beneficiaries.
6.4 Balanced scorecard	Application drawing together all monitoring indicators together with the results and outcomes achieved to date.
6.5 RIS3 social media analysis	Application analysing RIS3 data coming from social media.

In many cases, policy-makers and regional authorities do not perfectly understand the rationale behind the design process of a RIS3 strategy [8], not only from a theoretical perspective, but also in terms of data processing and management. This results to the development of fragmented approaches regarding the implementation regional RIS3 strategies, which try to combine many outcomes deriving from several methodologies, characterized by missing links between them. This, of course, is an essential parameter that decreases the overall effectiveness of the decision-making process, as it does not take full advantage of the underlying information hidden in the existing data.

The next section tries to further explore the main functional characteristics of three of the abovementioned set of applications, in order to provide a deeper analysis, which could reveal the rationale behind the selection and use of a concrete set of methods, instead of random selections, based mostly on data availability

3 The Online S3 applications: three cases

Within the Online-S3 Platform, stakeholder engagement, intervention logic and monitoring are, perhaps, three of the most critical applications, penetrating the whole process of evidence driven policy-design and assessment. In this section, we further explore their internal structure and highlight their role throughout the design of a RIS3 strategy.

3.1 Stakeholder engagement

The stakeholder engagement tool, together with the RIS3 vision sharing application, provide the users with all the essential information and utilities, related to definition of the stakeholders' groups, as well as engagement and dissemination activities. Given that the RIS3 strategic planning process is largely characterized as a bottom-up approach, in terms of stakeholders' participation, these two tools constitute vital ingredients for establishing an effective link between policy-makers and stakeholders. Previous policy and innovation processes research [21] has emphasized that successful stakeholder participation is characterized by an interplay of quality dimensions which enables to better design public participatory processes of new online service development projects. **Fig. 2** presents relevant information flows starting from these two applications, towards several other tools, belonging to the same or different phases of the overall RIS3 process. As it can be seen, stakeholder engagement and RIS3 vision sharing apps provide feedback to almost all phases of the design process.

Looking more carefully at the type of applications linked to stakeholder engagement, someone can find traditional methods, such as Foresight and EDP focus groups, as well as novel approaches, like collaborative vision building, calls consultation and action-plan co-design. All these strengthen the evidence-based and participatory character of the RIS3 design. At the same time, RIS3 debate at a glance and RIS3 end users' satisfaction survey both target on increasing the overall regional policy intelligence, in terms of crowdsourcing priority setting, through opinion mining and sentiment analysis.

It is essential to notice, that the added value from developing a stakeholder engagement application refers to the cumulative positive feedback that can be raised through public participation. Users are given the opportunity to systematically organize their stakeholder engagement strategy, without being experts in that field, and thus, expand the administrative capabilities of their region.

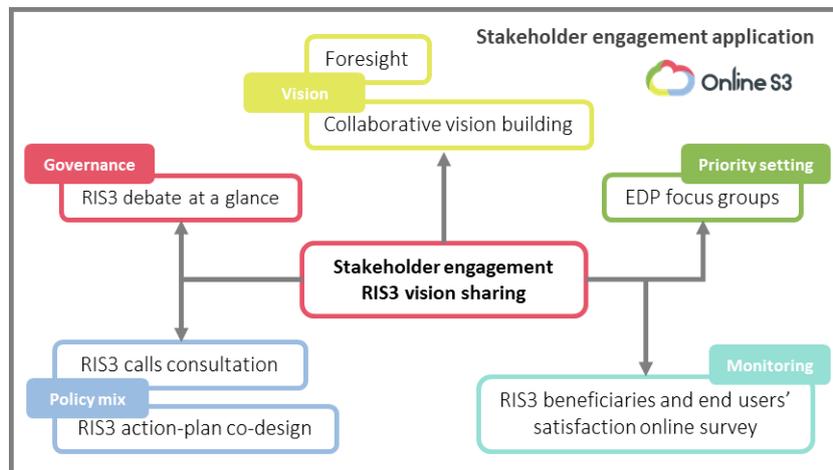


Fig. 2. Main structure of the Stakeholder engagement application. (Source: Authors' elaboration)

3.2 Strategy intervention logic

The intervention logic application is in the heart of the policy-design process. It is the only application characterized as a solely input application, since it acts as a central information point. It has a dual character. First, it collects information from a number of peripheral phases, in order to depict the overall rationale behind the RIS3 strategy design. Second, it works as a basis upon which policy-makers can detect possible vulnerability points, regarding the implementation of RIS3 actions, based on the feedback that it receives from the monitoring application. Knowing the rationale behind the vision and the implemented policy actions, can be extremely useful to better understand and correct any existing variations between the expected (result indicators) and the actual results (output indicators).

Its main structure is given in **Fig. 3.** Main structure of the Intervention logic application. (Source: Authors' elaboration based on [22]) As it is shown, the existing discrete building blocks of the tool guide the user to provide input regarding the regional context, the vision and priorities' setting, the policy mix, as well as the monitoring process. Information referring to the context of a region comes from the outcomes of Phase 1, including descriptive analyses, benchmarking and SWOT analysis. These should then be related to the overall vision and priority setting of the region, which have been defined through EDP, foresight, and extroversions and related variety analyses. The set of result indicators is connected to the selected priorities, as they express the overall vision of the region. In addition to this, the main outcomes of Phase 5, referring to the policy mix, including actions and ways of implementation, are also part of the Intervention logic application. Moreover, the user should relate these with the corresponding output indicators, to get a clear picture of the connection between the policy mix and the monitoring process.

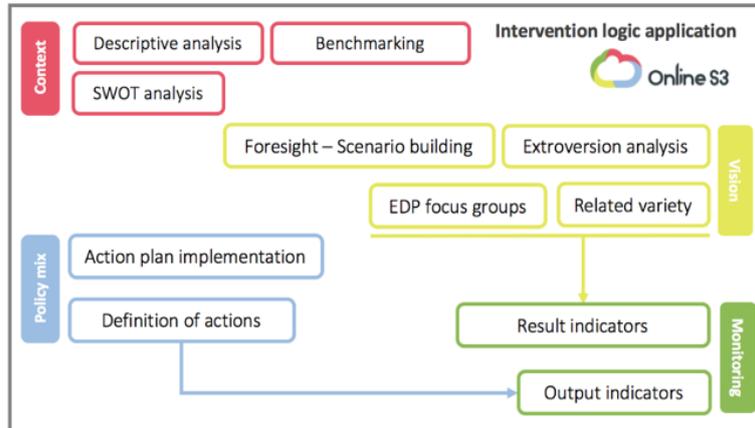


Fig. 3. Main structure of the Intervention logic application. (Source: Authors' elaboration based on [22])

3.3 Monitoring and assessment

The monitoring application is characterized as an input/output application, in terms of data interaction. Its main goal is to monitor and evaluate the overall RIS3 implementation process, providing a comprehensive and continuous feedback to decision-makers, regarding the degree to which the actual results are in line with the expected outcomes.

This application works as an umbrella for Phase 6, using as its main input the outcomes of the other four tools included in this phase. Thus, the evaluation process, offered by the Online-S3 Platform, goes one phase further, incorporating a set of different sources and methods for data processing. These consider, not only the output and result indicators, but also the RIS3 beneficiaries' satisfaction and social media analysis outcomes, strengthening in this way the constructive involvement and participation of the stakeholders.

Fig. 4. Main structure of the Monitoring application. (Source: Authors' elaboration) illustrates the abovementioned information flows. Amongst them, the relationship between Monitoring and Intervention logic applications has been previously described. At the same time, RIS3 innovation maps uses monitoring results as input, to visualize available information about regional technological trends funded by RIS3 initiatives, whereas the RIS3 open data tool is a form of a data repository, including information about RIS3 projects linked to specific priorities. Both these applications are means for communicating the achieved results of the RIS3 strategy, making it comprehensive to the public.

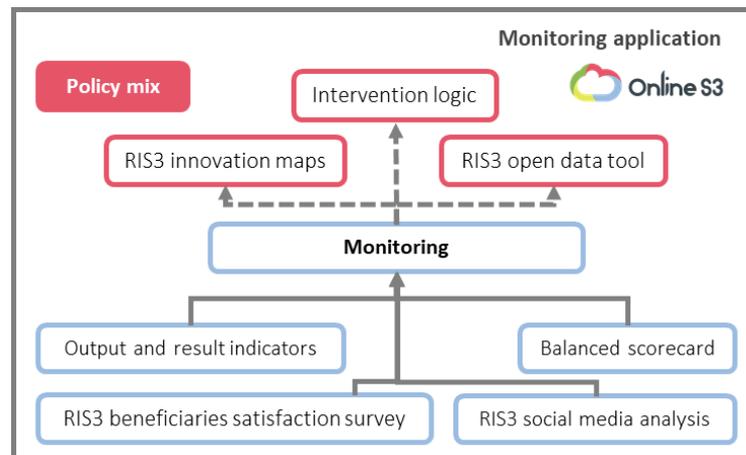


Fig. 4. Main structure of the Monitoring application. (Source: Authors' elaboration)

4 Discussion and further potentials for the Online-S3 Platform

Enhancing the analytical skills of regional authorities, as well as the participatory character of the RIS3 policy-design process, should be kept in the spotlight of innovative actions towards a more comprehensive evidence-based strategic planning. Integrated solutions for policy-design, such as the Online-S3 Platform, should be considered as key elements reinforcing this vision.

Although the initial design of the RIS3 approach included a wide set of methodologies to be applied throughout its implementation, the robustness of the applied methods in many cases is questionable, as even the key concepts of the various RIS3 steps were not fully understood by the regional actors. Lack of empirical guidance, as well as low levels of analytical skills of the policy-makers, both resulted in low levels of effectiveness regarding the RIS3 outcomes. Given this, the Online-S3 Platform aims to expand and facilitate administrative capabilities of regional institutions, and thus, become an essential tool for improving the effectiveness and efficiency of decision-making processes.

Taking into consideration the 29 applications that have been developed throughout the Online-S3 project, and are related to the 6 phases of the RIS3 design-process, this study has tried to reveal the existing information flows between a set of crucial tools within the platform. The three examples presented here indicate that there is a complex underlying network of information that links these applications to a number of other platform tools. More specifically, the design of the stakeholder engagement strategy, through the corresponding applications in Phase 2, provides essential feedback to applications based on public participation. Collaborative vision building and EDP are both further strengthened through the use of the vision sharing tool, as it becomes possible to better communicate the aims and targets of RIS3 to the groups of stakeholders involved. Moreover, the development of applications related to opinion

mining and public assessment of the RIS3 implemented policies, contribute towards a more effective stakeholder-driven monitoring and evaluation mechanism. As a result, the role of public participation is fostered, not only in priority setting, but also in monitoring the RIS3 process, following its bottom-up principles.

In terms of controlling the overall strategic planning and monitoring RIS3 process, the intervention logic application can be used as a central point for collecting the key outcomes of all phases, included in the Online-S3 Platform. Having a control panel for the strategy, including its rationale for selecting the vision, priorities, policy mix and measurement indicators, can help policy-makers to have an overall picture regarding the expected outcomes of the process. Thus, any deviation of the actual results could be translated and explained through the intervention logic application. Definition of possible corrective actions may always refer back to this application, in order to update the overall intervention logic or a part of it.

In order to better understand the overall added value of the Online-S3 Platform, it is important to further explore and highlight the existing information flows, as we have done in this paper for the three applications. Given the fact that the abovementioned applications have been developed as standalone apps, further potentials of this platform include the development of an interoperability mode. This could provide a missing link between the 29 applications, facilitating the information flows between them, giving the opportunity to policy-makers to design even more comprehensive RIS3 strategies. Analytical capabilities and public participation should be further enriched and expanded in that case, promoting the effectiveness of the implemented RIS3 strategies.

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