IMPLEMENTING SMART SPECIALISATION ROADMAPS IN LITHUANIA: LOST IN TRANSLATION?

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Abstract

Purpose - This practice based paper discusses application of Future-Oriented Technology Analysis (FTA) methods for entrepreneurial discovery process and the design of S3 policy mixes. Key interest of this paper is how bottom-up FTA translates into policy decisions. The objectives are threefold: to explain the selected methodological approach; to discuss the results, key lessons and risks that unfolded during the process; to discuss scenarios of how the roadmaps will be implemented.

Methodology – The paper builds on a case study from a post-soviet country where a three-staged FTA process was adopted for defining the smart specialisation (S3) priorities and their implementation strategies. Specifically, focus is on the last stage - developing roadmaps for the implementation of selected S3 priorities. The methodological assumptions are presented, including a 'stairway of competence' model of four potential and current innovators type.

Findings – The paper finds that participatory FTA approach created ownership of the selected priorities, fostered trans-sectoral dialogue and learning, and helped to distil measurable results where public and private efforts should be focused. However, design of the policy mixes in the roadmaps moved away from the proposed guidelines. The paper offers a discussion of the two logics that govern the behaviour of organizational actors - logic of consequentiality versus logic of appropriateness. An outlook to implementation of the S3 roadmaps is provided by discussing three alternative scenarios.

Keywords: technology roadmap, entrepreneurial discovery, innovation policy mix, logic of consequentiality, logic of appropriateness.

1. Introduction

Smart specialisation (S3) is a place-based economic transformation agenda, implicitly aimed at strengthening regional innovation systems by concentrating resources in innovation and linking them to a limited number of priorities. What distinguishes S3 from traditional industrial and innovation policies is entrepreneurial discovery - a bottom-up collective reflection process that

gives a pivotal role to market forces and private stakeholders in discovering information about new activities and translating specialisation strategies into economic and social outcomes (Foray, 2012; OECD, 2013).

The Smart Specialisation Strategy is an economic transformation agenda aimed at increasing competitiveness by concentrating resources on selected priorities. Economic transformation is structural change that leads to growth of economic activities characterised by high productivity knowledge and human capital intensity. According to Foray (2011), first, entrepreneurial discovery concerns new domains of specialisation that might be very beneficial for the country given the existing productive assets. Second, it is about imitative entry: when the initial experiment and discovery are successful and diffused, this is likely to induce other agents to shift investments away from the old domain to the new one. It is thus important to provide incentives to help the system generate more experiments and discoveries. In fact, the ultimate objective is to diffuse the knowledge regarding the value of a new activity for future specialisation in order to generate collective emulation and imitative entry towards the new domain. The policy instruments involve various types of public-private partnerships, ranging from direct public funding of entrepreneurial projects to collaborations at national laboratories between firms and government scientists as well as prizes and bonus mechanisms.

This paper discusses application of Future-Oriented Technology Analysis (FTA) methods for entrepreneurial discovery process and the design of S3 policy mixes. It builds on a case study from Lithuania where a three-staged FTA process was adopted for defining S3 priorities and their implementation strategies. Specifically, focus is on the last stage - developing roadmaps for the implementation of selected S3 priorities. S3 roadmap is defined as guidelines for implementation of a specific S3 priority over 2014-2020. It is a time-based chart comprising a number of layers including the evolution of specific targets (products and technologies), priority implementation stages and the preconditions for development of technologies and products (required policy steps), and portraying linkages between the layers.

S3 roadmaps in Lithuania were developed using a bottom-up process with top-down methodological support. Following the premise that change is shaped by means of interaction, the process was led by expert panels involving researchers, business leaders and policy makers. Key methodological assumption is the different maturity of the priorities, based on the concepts of the ‘stairway of competence’ (availability of mature innovative companies and linkages within the knowledge triangle) and ‘time to market’. This suggested different types of policy interventions and different implementation pace (‘two-tier’ process). Background analysis elaborated five groups of policy interventions aimed at: (1) potential innovators, (2) emerging innovators, (3) mature innovators, (4) commercialising public research results, and (5) horizontal policy interventions relevant to all priorities.

The roadmaps and expert discussions should feed into specific R&I policy mixes designed to implement the priorities and funded by the EU Structural Funds in 2015-2020. These roadmaps should become the basis for thematic R&I priority development programmes. Furthermore, it was expected that the consensus-building discussions should contribute to the development of innovative partnerships between businesses and S&T and education communities. The consensus on the R&I priorities development achieved in the course of expert panels and other activities should create a platform for further concerted actions and policies that are consistent not just with national strategies but could be shared by all parties involved in their implementation.

Key interest of this paper is how bottom-up FTA translates into policy decisions. The objectives are threefold:

- To explain the selected methodological approach.
- To discuss the results, key lessons and risks that unfolded during the process.
- To discuss scenarios of how the roadmaps will be implemented.

2. Methodological approach

2.1. The process

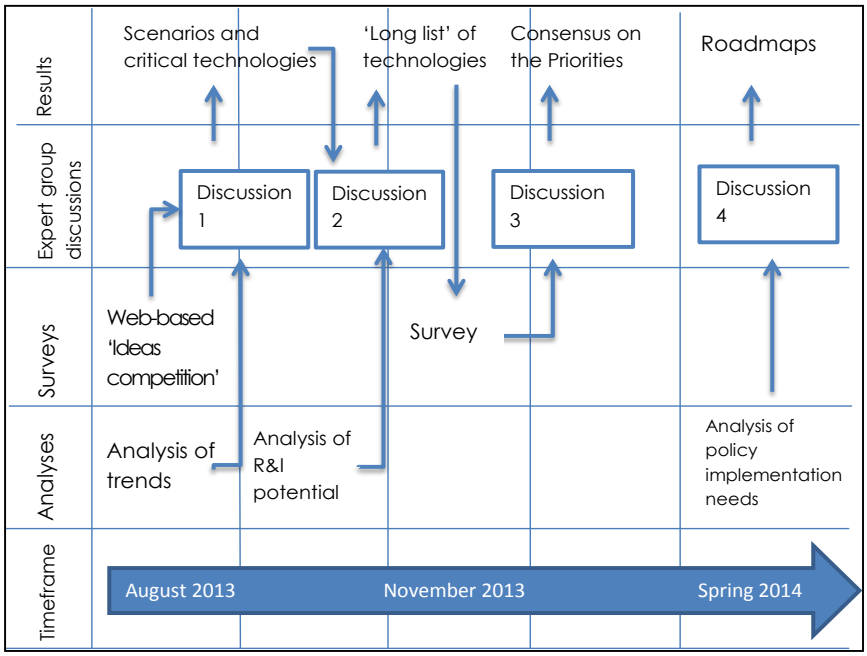
Lithuania adopted a three-staged national foresight approach to the definition of smart specialization priorities. Each stage could be viewed as a separate project, since: a) at the start of the exercise there was lack of policy commitment for the whole process, hence each stage could proceed subject to satisfactory results achieved at previous stages; b) while Stage 0 included drafting of guidelines for the whole process, each stage revised the initial approach taking into consideration the outcomes of previous stage. The process and its methodological assumptions are discussed by Paliokaitė et al. (2013).

The *Stage 0* was devoted for scoping – developing and discussing the methodology, awareness-raising, building consensus between the policy makers on the methodological choices. The *Stage 1* was aimed at identifying the broader priority areas, and was based on the analyses of the long-term national challenges, the current research and economy potential and discussing it with the key stakeholders and representatives from research and business in the 7 expert panel discussions. This stage resulted in six priority fields that were too broad and all-inclusive, hence it was the task of the *Stage 2* to come up with more specific specialisations within those fields. This process involved a more detailed analysis of trends and challenges in each of the priority areas, followed by discussions of six experts groups comprised of business and research representatives in each of the priority areas (about 150 experts and 24 discussions in total). Each of the six expert groups was chaired by two group leaders – one acknowledged scientist and one business leader. Policy makers were part of the expert groups, involving also representatives from the ministries of interest (e.g. Transport, Health, Education). In order to determine the smart specialisation priorities (critical technological solutions) and their implementation roadmaps, the following steps were implemented:

1. An analysis of future trends was performed and specific challenges and future markets for each priority area were defined. This step produced a long-list of key trends and critical technologies, as well as the long term development scenarios for economic activity in six broader priority areas.
2. An analysis of existing interest and capacities to develop the identified technologies and processes in Lithuania was performed. This step included the analysis of existing R&I potential and a web-based ‘ideas competition’ where research and business communities’ actors were able to express their interest in developing research and innovation ideas;
3. The trends, challenges and long-list of critical technologies were discussed with expert groups (discussions 1 and 2 in a Figure 1) in order to determine the preferred and probable long term development scenarios, and to test the impact and feasibility of the potential ‘priorities’ in a survey involving a broader community of experts from science and business in the determined priority areas.
4. Consensus was built regarding the specific R&I priorities in each of the broader priority areas, where the collaborative efforts of private and public sector actors should be focused during 2014-2020 (Discussion 3).

5. Key barriers to further development of the proposed priority areas were identified and policy roadmaps were proposed in the Discussion 4, following the approval of the selected priorities by the Strategic R&D and Innovation Council and later by the Government in December 2013. The expert groups' discussion on these outputs were supported by methodological guidelines (discussed in the next sub-section) and specific analytical papers discussing the effectiveness of previously implemented R&I policy mixes and different routes to leverage private R&I investment.

Figure 1. Foresight methods and process adopted in Stage 2



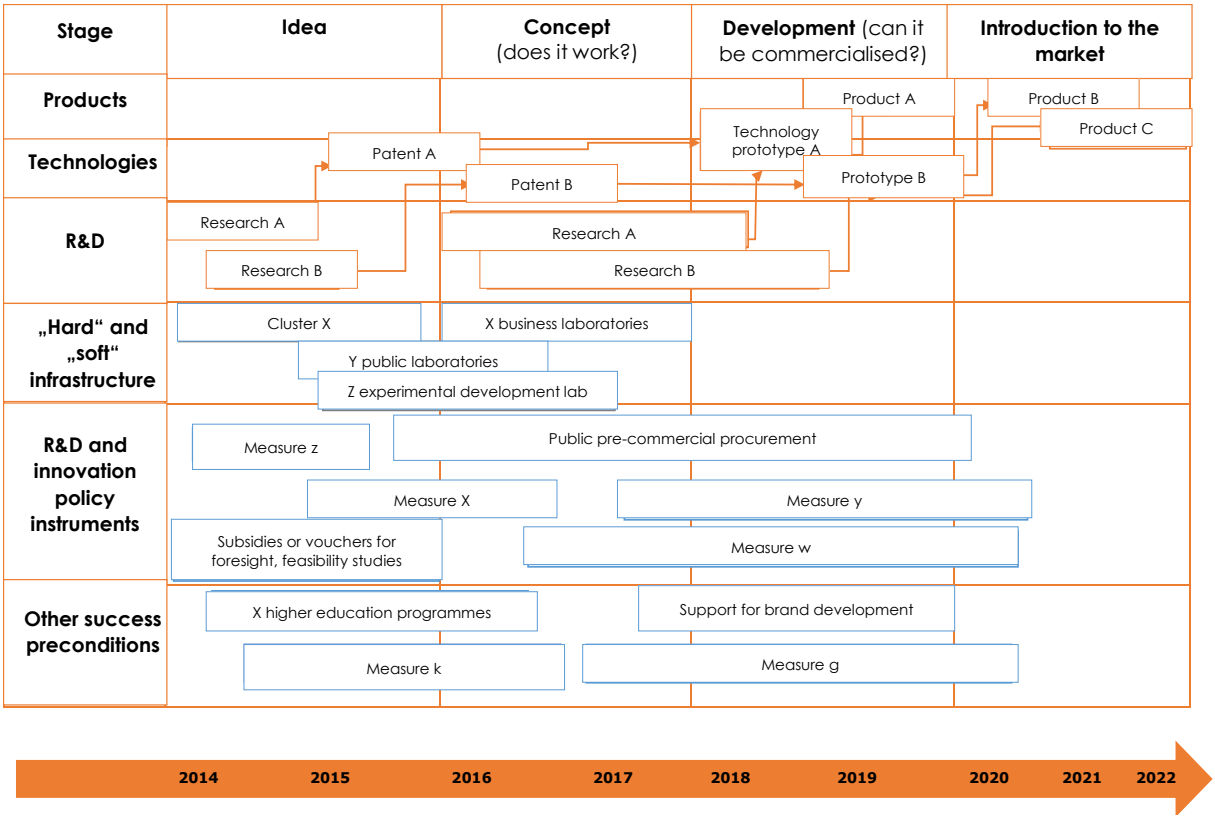
2.2. Smart specialisation roadmaps

The methodological approach to the roadmaps consisted of several principles. First, each priority is to be implemented in stages, in order to ensure orientation towards results - critical technologies and products. The major change needed in Lithuania, where the R&D efforts are dominated by the public science sector, is the shift from 'research for the sake of research' to the 'research for the sake of economy and society' and economic innovation results. Implementation of S3 priorities should thus follow a 'stage-gate' approach where the priorities can be reviewed and funds reallocated if the priority is not viable (does not achieve the targets at some stage in the implementation process). The responsible coordinating institution should assess the risks related to priorities viability and for proposing shutting down the priorities and/or allocating the funds to other more viable or new (emerging) priorities. The stages are defined according to the technology readiness stages (see Figure 2):

- Idea – search for new solutions. This stage comprises the results necessary for finding new solutions to existing problems and challenges and/or problems that have not been defined during the smart specialisation process.

- Concept – an R&D activity contributing to the development of a technology concept, model methodology, up to the stage where a prototype is created.
- Development – development and testing of technology prototypes, as well as pilot manufacturing.
- Introduction to the market – manufacturing of new products and delivery of new services to the market.
- Generation of critical mass of new companies: activities for knowledge transfer and diffusion to as many potential users as possible. This activity is a necessary precondition for successful transformation and structural change in the economy.

Figure 2. Example of an S3 roadmap



Second, roadmaps should take into account the different maturity of the priorities. An allocative rule should be applied as to keep the balance. For example, it is highly relevant to foster the synergies between the existing ICT, materials sciences and engineering research potential and the traditional industries (the cornerstones of the Lithuanian economy). However, it can be expected that it will take time for networks and research consortiums to emerge. This suggests different types of policy interventions, different intended results/outcomes from the interventions, and different pace ('two-tier' process) for implementation of the priorities. In the case of lower maturity, the implementation of priorities should start with building the cooperation and absorptive capacities, networks and active generation of R&D projects (brokerage and other innovation support services).

Background analysis elaborated five groups of policy interventions aimed at: (1) consumers of technologies, (2) potential innovators, (3) emerging innovators, including the commercialisation and spinning-off the public research results, (4) mature innovators, and (5) horizontal policy interventions relevant to all priorities, based on the 'stairway of competence' concept, described in the Table 1.

The 2007-203 policy mix in Lithuania was mainly designed for the existing R&I performers ('mature innovators'), with very limited focus on the creation and growth of new knowledge intensive firms ('emerging innovators'), or encouraging the 'potential innovators' in the traditional industries to move up the added value ladder. Although supporting the 'champions' can be a viable strategy, but it cannot be an only strategy in a country with a very limited number of 'champions'. More tailor-made approach to the R&I capacity building is needed taking into account that the current capacity levels and the potential to move up in the 'stairway' largely differ within the target group. While the today's R&D performers would need the boost to expand their R&I activities and engage into different collaborations and alliances, those with the R&I potential, but only modest or no R&I activity at present, would mostly benefit from 'soft' capacity building measures like innovation and technology audits, vouchers, clusters, foresights etc. FDI and spin-off creation are also viable routes. Policy mix thus could focus on providing incentives to encourage companies, entrepreneurs to become involved in the discovery of possible specialisations and opportunities for diversification therein, such as: (i) open innovation platforms keeping in mind the complexity of innovation process and the chain from basic research to product development, design, pre-production, and market placement; (ii) mechanisms (e.g. vouchers) to boost experiments and discoveries while encouraging connections among economic agents; (iii) prizes and bonus mechanisms for entrepreneurial discovery to reward those entrepreneurs who discover new domains and activities; (iv) industry, technology and market foresights, studies on long term future trends and likely development of technologies that could improve the forward looking capabilities and agility, as well as (v) brokerage and other 'soft' innovation support services aimed at emphasizing the value of innovation and linking the activities of different actors in the innovation system (businesses and research institutions). Furthermore, at the lowest level of the 'competence stairway' or 'competence ladder' there is a large group of potential 'consumers of innovations' in both traditional industries and the public sector that are in need of new technological solutions and can thus contribute to the creation of market for innovations.

Table 1. 'Competence stairway' and the different needs of existing and potential innovators

Type	Technology consumers	Potential innovators	Emerging / new innovators	Mature innovators
What type of companies dominate the specific S3 priority?	Manufacturing companies and services providers (including public sector) that lack modern technological and managerial capacity and productivity.	Generally large manufacturing companies or services providers in the traditional sectors ('the cornerstones of economy' facing the loss of competitiveness and thus feeling the pressure to move to new business fields and products.	Generally young and small (below 100 employees) companies, export oriented, fast growing. The priorities where R&I potential is largely concentrated in the public science base are also in this group, with their strategies to be oriented towards economic results via spin-off creation.	Generally R&D-based large (above 100 employees), long time in the market (10 years and above), operating in the high technology sectors, export oriented, having well developed networks with the research institutions and business partners in Lithuania and beyond.
Challenges	Modernisation and strengthening of technology and absorptive capacities (including the human resources).	Diversification and technology transfer, new innovative activities and new business models.	Acceleration of innovative activities, including spin-off creation, attraction of risk capital and other financial resources (incl. FDI) to increase the critical mass, strengthening of capacities (including R&D	Moving to higher impact innovations, large scale R&D projects, new international markets, spin-outs.

Type	Technology consumers	Potential innovators	Emerging / new innovators	Mature innovators
			infrastructure).	
Needs (what should the specific policy mix focus on?)	Demand-side incentives (innovative public procurement, pre-commercial procurement, other market incentives). Capacity development (attracting highly qualified specialists, learning, technology upgrading, networking etc.)	Incentives for transformation (platforms, clusters, foresight), support for experimentation and various innovation support services encouraging moving to new products and new business models, such as 'soft' idea development support, brokerage, technology services, R&D subcontracts fostering linkages with research institutions and technology transfer.	Start-up acceleration (mentors, seed and risk capital), FDI attraction, R&D infrastructure and various 'hard' and 'soft' innovation support services, including vouchers for technology oriented services at the science parks and similar (prototype development, validation and pilot manufacturing).	Large joint R&D projects, Horizon 2020 and other international initiatives, export support. R&D infrastructure support – only if moving to new business activities (completely new innovations). Promotion of technology diffusion and transfer from high tech to low tech industries (clusters, networking).
Horizontal pre-conditions and related policy interventions	Ensuring availability of high quality specialists (including upgrading higher education programmes). Clusterisation and networking promotion. Support for experimentation and foresight. Favourable framework conditions (entrepreneurship policies, flexible labour market, tax policy, R&I regulations, talent attraction policies, standardisation, favourable conditions for research careers, etc.)			
THE COMPETENCE STAIRWAY				

When formulating proposals for the policy mixes, these criteria were also suggested:

- There is a market failure that can be addressed by policy interventions – State investments are only justified if the companies or research groups do not have the capacity to create the intended results with their own means. Therefore: (a) State's investment should be largest in those stages of technology development where the risk is highest, investment of business should be largest in the stages of lowest risk; (b) the State should cover part of the cost of quazi-public institutions, such as networking platforms, knowledge circulation and creating ecosystems for start-ups.
- Private sector should be ready to co-invest in the implementation of the priorities during 2015-2020. Creation of large scale R&D infrastructures or large R&D projects is largely unjustified in those fields where there is no previous business innovative activity. In such cases investments into experimentation, innovation capacity building, innovation brokerage and creating a pipeline of smaller R&D projects (including spin-offs and spin-outs) is better justified.
- Policy interventions should take into account the product development cycle and speed of placing it into the market. Large scale joint business-science R&D projects are justified when there is a need to coordinate the development of many components and the development of a technology is a long and difficult process involving many actors (e.g. robotics, industry lasers). If the technology cycle is short (e.g. ICT services), the demand for many small projects is more likely.
- Empowering the technology users. If the created results will be used by public institutions (e.g. in the case of learning, health and transport innovations), innovations should be created with the help of pre-commercial procurement. It would allow the final user to get involved in defining of the product concept, approving and testing the prototype, etc. The involvement of final users in such cases should be ensured starting with the first stages of implementing the related priorities.

Third, the S3 guidelines emphasize the entrepreneurial discovery role throughout the whole smart specialisation implementation period, not only when defining the priorities. This has some implications on the development of roadmaps:

- There are many sources of innovation, and innovation is not necessarily a linear process (research – experimental development – product).
- Search for new ideas and solutions has to be a continuous process. Therefore the entrepreneurial discovery process as well as systemic evaluation of future trends and foresight needs to be institutionalized, experimentation has to be encouraged throughout the whole period of S3 implementation. Sufficient time and incentives for entrepreneurial search should be granted, taking that even for the more advanced priorities the S3 approach assumes change and alignment of activities. In practice, it means that the State should support collaboration and provide incentives for experimentation to encourage entrepreneurs and other organisations to become involved in the discovery of specialisations and opportunities for diversification therein. But it also means *embedding foresight* into the strategy design, implementation and renewal at various (from macro to micro) levels, and moving from project-based approach towards more continuous horizon scanning activities that aim at spotting technological as well as societal weak signals (Weber, 2012). One alternative is to engage industry associations and other open innovation platforms (technology platforms, clusters) as agents of change, especially within the traditional sectors. Equipping these platforms with industry, technology and market foresights on long term future trends and likely development of technologies could create the forward looking capabilities and improve agility. Such 'embedded' foresight at the level of value chains could kick-start the processes of entrepreneurial discovery and thus enable the restructuring, modernisation, and diversification of the 'sleeping giants' (Paliokaitė et al., 2013).
- Implementation of the priorities will unavoidably face many risks, therefore there is a need for timely and effective monitoring information on the success of the implementation progress. The design effort of S3 implies it does not come to an end when the strategy moves on to the implementation phase. A strategy for smart specialisation should evolve and adjust to changes in economic and framework conditions, as well as to emergence of new evidence during implementation. It implies that, first, multiannual research and innovation agendas and priorities' review procedures should be put in place. Some 'priorities' can fail, and new prospective fields can emerge, hence intelligence and review procedures should allow for flexibility. The priority areas should set the multiannual R&I agendas (roadmaps) for the coming seven years. A process for regular review of the priority areas must be put in place, with the possibility to renew the priorities based on specific reported outcomes. Reviewing the priorities should be organised so that the support will not be discontinued too soon, nor continued so long that subsidies are wasted on non-viable priorities. The challenge is to prevent the evaluation process from being captured by the interest groups or by rivals who would like to see it discontinued (Paliokaite and Kubo, 2013).

3. Results, discussion and implications

3.1. Impact and benefits

There are several key benefits and areas of impact that can be highlighted. First remarkable achievement is abandoning the previously dominating sectoral approach to priority setting, i.e. identification of research fields or R&D sectors, such as ICT, biotechnology or agriculture. The focus on sectors or R&D fields had a number of drawbacks: it impeded rather than facilitated inter-

sectoral cooperation, neglected cross-sectoral challenges (for e.g. climate change) or opportunities, and emphasised competitiveness or growth of identified sectors, which does not necessarily lead to tackling the most prominent challenges faced by the society (Paliokaitė et al., 2013). In contrast to the traditional approach, the current exercise aimed to foster interactions between sectors by linking priorities with emerging opportunities and challenges and focusing on measurable outcomes. It led to identifying many priorities of horizontal and trans-sectoral nature (see Table 2) exploiting existing public and private R&D capacities in several fields and sectors.

Second, the adopted focus on critical technologies and processes put more emphasis on measurable outcomes and hence the results oriented approach. The six expert groups that developed 20 S3 roadmaps managed to focus on specific groups of technologies leading to specific groups of products. Specific interim and final outputs and outcomes can be reported for each of the priorities. This should allow better management of implementation and accountability to the society, avoiding the previously dominating 'research for the sake of research' approach. The discussions brought together representatives from many fields that have never had a roundtable discussion on the technologies they could develop together. Hence, the selected outputs and results included many trans-sectoral technologies that possibly would have not been created without this process.

Third, the FTA process had a direct impact on the R&I strategy planning. The specific priorities and their implementation roadmaps were took up by the ongoing strategy planning processes in the context of preparation for the 2015-2020 Structural Funds implementation period. These roadmaps became the basis for thematic R&I priority development plans. The priorities implementation plans are in progress (to be completed by early 2015). In April 2014 the Lithuanian Government also approved the Programme on the Implementation of the R&I Priority Areas and Their Priorities. This Programme sets out the Lithuanian smart specialisation priorities and discusses some elements of the implementation and monitoring instruments.

3.2. Weaknesses of the 'bottom-up' approach and the two logics that govern actors' behaviour

The participatory FTA approach created ownership of the selected priorities, fostered trans-sectoral dialogue and learning, and helped to distil measurable results where public and private efforts should be focused. However, design of the policy mixes in the roadmaps moved away from the proposed guidelines.

The weaknesses of the achieved results can be explained by the two logics that govern the behaviour - logic of consequentiality versus logic of appropriateness, which are juxtaposed to each other and used separately to explain the behaviour of institutional actors. The logic of appropriateness is 'action seen as driven by rules of appropriate or exemplary behaviour; rules (methodologies) are followed because they are seen as rightful, expected and legitimate. Actors seek to fulfil the obligations encapsulated in a role, an identity, processes of reasoning are not primarily connected to the anticipation of future consequences as they are in most contemporary conceptions of rationality'. This logic accepts that rules solve problems of groups by coordinating activities. The logic of consequentiality assumes 'self-interested and rationally calculating actors, instrumentalism and consequentialism' (March and Olsen, 2006). In other words, the participants involved in the process of defining the S3 priorities and their implementation roadmaps and representing different groups of actors in the innovation system, where expected to behave according to the logic of appropriateness (i.e. behave according to the methodologies and rise above their own interests), instead many of them acted according to the logic of consequentiality, i.e. calculating rationally 'what's in it for them'.

To map the different actors involved, there are generally five groups of organizational actors which shaped the process and the results, or will define the final impact. First, '*the methodological group'* consisting of policy analysts and foresight experts, coordinators and organizers of the process, who produced the methodological support, evidence-based analyses and controlled the process, but did not define the final results. The list of priorities, their immediate outputs and results (the intended technologies) as well as the policy roadmaps were fully developed by the expert groups.

Second, *'the experts'*, including the group leaders, represented by the scientists and business company managers, business association leaders from the selected priority areas. Overall the expert groups produced outstanding results, however they faced two types of difficulties:

a. It was difficult for them to 'kill' the priorities (or groups of technologies) with relatively weak potential, due to the pressure from the interest groups. Some expert groups managed better than others. As a final result 20 specific priorities were approved, each concentrating on several groups of technologies. One could discuss whether the number is not too high. On the other hand, the relatively large number of priorities is justified on several grounds. First, it would be too risky to concentrate available resources and potential only on few strictly defined areas in such small countries as Lithuania. Instead it is expected to promote experimentation and entrepreneurial discovery: it is likely that some priorities deliver high return, while others will not live up to the expectations. Hence, successful implementation crucially depends on a properly functioning monitoring system that could provide information leading to termination of 'unsuccessful' priorities. Second, proposed priorities are specific and strongly linked with expected results, i. e. development/application of explicitly defined technologies/processes. If the process followed a sectoral approach the nominal number of priorities would be smaller, but this would not lead to higher concentration of resources (Visionary Analytics et al., 2013).

b. The expert groups struggled to prioritize the policy instruments required to develop 'their' priorities. As depicted by Table 2, only two of the 'mature' priorities could start with research collaboration projects immediately, while many others, especially those with limited collaboration experience, would need a longer preparation process and specific instruments for entrepreneurial search (technology platforms, 'soft' step-by-step projects for cluster development and industry foresight). A large proportion of these priorities do not have the capacity at the moment to absorb investments into business R&D infrastructure and other larger scale R&D investments. Despite that, many of the policy roadmaps at their initial stage viewed all possible policy instruments as horizontal and planned for their implementation immediately (hence, ignoring the staged approach and different maturity). Therefore, the policy roadmaps had to be peer-reviewed by the 'methodological group' to restore the balance.

Table 2. R&I priority areas and specific priorities

Priorities	Technology users	Potential innovators	Emerging innovators	Mature innovators
Priority area 'Energy and sustainable environment'				
Smart systems for generators, grids and users energy efficiency, diagnosis, monitoring, accounting and management	X	X		
Energy and fuel production from biomass or waste, storage and disposal of waste.		X		
Smart low energy buildings development and maintenance technology – digital construction.	X	X		
Solar energy equipment and their use for power, heat and cool production.			X	
Priority area 'Health technologies and biotechnology'				
Molecular technologies for medicine and biopharmacy.				X
Intelligent applied technologies for personal and public health.	X	X		

Priorities	Technology users	Potential innovators	Emerging innovators	Mature innovators
Advanced medical engineering for early diagnostics and treatment.	X	X		
Priority area 'Agroinnovation and food technologies'				
Safer food.		X		
Functional food.		X		
Innovative development, improvement and processing of bioresources (biorefinery).		X		
Priority area 'New processes, materials and technologies for industry'				
Photonic and laser technologies.				X
Functional materials and coatings.			X	
Construction and composite materials.	X		X	
Flexible technological systems for product design and manufacturing.	X		X	
Priority area 'Transport, logistics and ICT'				
Intelligent transport systems and information as well as communication technologies.	X	X		
Models/technologies for management of the international transport corridors and integration of different types of transport.	X	X		
Technologies for developing advanced e-content and information interoperability.	X		X	
Solutions and services for ICT infrastructure and cloud computing.	X		X	
Priority area 'Inclusive and creative society'				
Modern learning technologies and processes.	X		X	
Technologies and processes for breakthrough innovations.	X		X	

Third, the *representatives of the ministries' policy departments* in general were supportive of the priority setting process as it generated a lot of new knowledge to feed their policy planning processes. These actors however had their own firm understanding on what policy instruments should be implemented, therefore the roadmaps did not have the freedom to propose new instruments. The foresight process revealed an overall lack of strategic intelligence and knowledge on 'what works in the innovation system and why'. Moreover, the process revealed rivalry between the different ministries and consequential failure in coordinating their policies.

The fourth group comprises the *actors from the ministries' Structural Funds administration departments*, including the Ministry of Finance. At the end of the process this specific group became the most influential as smart specialisation in Lithuania will be solely funded by the 2015-2020 Structural funds. From their perspective, many of the proposed ideas are seen as problematic and may be abandoned, for example:

- The trans-sectoral and horizontal priorities pose a threat to smooth administration of funds since it requires additional resources to monitor and evaluate the progress, and to evaluate the applications. Previous experience was based on pre-determining quotas for specific statistically defined sectors, which is no longer a solution.
- The suggested 'stage-gate' monitoring and funding approach requires additional programme management and intelligence resources, thus was seen as costly and unnecessary.
- Entrepreneurial discovery implies that it is a continuous process. This goes counter to the logic of programming Structural Assistance that implies that priorities should be set at the beginning of programming period and implemented during the rest 7 years. Although the review of the selected priorities is foreseen in 2017-2018, it is questionable how it will be possible without the properly functioning monitoring and programme management capacities, and if there will be the political will to 'close' the unsuccessful priorities.
- The main challenge relates to the idea that S3 should focus on new activities and encourage experimentation and risk-taking. Some of the R&D projects are likely to be (even should be) unsuccessful. This, however, goes counter to administrative culture that emphasise legality

and legitimacy of decisions and are prone to low risk-tolerance. This again challenges the current SF monitoring framework that is supposed to monitor (and help accounting for) outputs and results (e.g. the current SF rules state that a company is obliged to return the funds if the planned output – product or technology – is not achieved).

An outlook to implementation of the S3 roadmaps can be provided by discussing three alternative scenarios: 'strategic reshape', 'business as usual' and 'delayed wake up'. The strategic reshape of the national policies and the structural change in the economy can still be achieved, if these key remaining weaknesses are addressed in time:

- Lack of strategic intelligence and monitoring capacities and procedures. R&I monitoring and analysis of innovation performance in the selected priorities, ex post policy evaluation and foresight capacity need to be increased substantially and assisted by consultations with the main stakeholders and actors in the innovation system. The continuous monitoring of the priorities should be implemented, and assigned institution should coordinate the actions and instruments implemented by numerous policy agencies.
- Orchestration of policies affecting R&I performance would require strengthened policy coordination processes. Given the number of funding bodies and programmes, departments and agencies should agree to a coherent and consistent approach to the administration of funding programmes.
- Sufficient attention and adequate resources should be granted to effective programme management. This have been one of the weakest links, including the risk-aversion and weak capacities of administration, as well as poor management of programmes. These weaknesses need to be addressed, with a focus on abandoning the process-oriented approach, strengthening the implementation capacity in the agencies, and overall making programmes closer to the needs of companies and researchers.
- Inertia in defining the policy mix, ignoring the different maturity of the priorities, while the latter emphasizes a need to focus on the 'potential' and 'new' innovators, and hence the role of innovation platforms, 'soft' assistance in brokering the linkages and developing the human resource capacity, foresight as well as innovation capacities in previously non-innovative or even non-existing firms.

However, it is most likely that the 'business as usual' scenario will prevail, with largely continued previous policy mix, favouring investments into 'hard' infrastructure instead of human resource and innovative capacities, lack of coordination and resources for good programme management. The 'delayed wake up' call will most likely reach the policy makers after 2020, when the structural assistance will eventually dry out and policy making will face unseen pressure for effectiveness, also due to the shrinking labour force and the ageing society.

4. Conclusion

Overall, the participatory FTA process, a precedent in the current policy making practice, can be considered a success. The adopted methodological approach allowed to link science push and demand pull approaches, to provide dialogue and learning process between different stakeholders, to outline fields for trans-sectoral and public-private partnerships, (the priorities) and feed strategic planning processes with clearly defined targets (intended outcomes).

However, the key challenge is not defining the 'right' priorities, but implementing them so that there is a visible impact on the economy competitiveness. To sum up, the main threat to the

implementation of the S3 priorities implementation in Lithuania is the administrative and policy inertia. Much of the value created may be lost in the process of 'translating' FTA results into policy decisions.

The 'regional innovation paradox' refers to the apparent contradiction between the comparatively greater need to spend on innovation in lagging regions and their relatively lower capacity to absorb public funds earmarked for the promotion of innovation and to invest in innovation related activities, compared to more advanced regions (Oughton et al., 2002). Similarly, there is a 'bottom up FTA paradox' which implies that the lagging regions have a greater need for strategic reshape of their policies and innovation systems, and thus require foresight knowledge and discussion with the different actors in the system, at the same time having limited capacities to absorb the generated value. Therefore there is a huge need to first institutionalize and enable the standard strategic intelligence instruments (monitoring, ex post evaluation). As the informed policy making capacities mature, the impact of the new methods such as FTA should gradually increase.

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