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Abstract

In the frame of the Stairway to Excellence project, country analysis was performed for the EU MS that joined the EU since 2004, with the objective to assess and corroborate all the qualitative and quantitative data in drawing national/regional FP7 participation patterns, understand the push–pull factors for FP7/H2020 participation and the factors affecting the capacity to absorb cohesion policy funds. This report articulates analysis on selected aspects and country-tailored policy suggestions aiming to tackle the weaknesses identified in the analysis.

The report complements the complex qualitative/ quantitative analysis performed by the IPTS/KfG/S2E team. In order to avoid duplication and cover all the elements required for a sound analysis, the report builds on analytical framework developed by IPTS.

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EXECUTIVE SUMMARY

Facilitation of Horizon 2020/ESIF synergies in Lithuania

Ensuring synergies between Horizon 2020 and cohesion funding, the smart specialisation strategies are foreseen to have a key role to play in terms of capacity building and providing a stairway to excellence. They are expected to consider both upstream and downstream actions to and from Horizon 2020 as key actions for the CP funding. The key upstream actions for cohesion funding include - but are not strictly limited to - the investments in innovative solutions and research infrastructures and equipment, in particular those of European interest. This includes support for „"satellite infrastructures"" linked to the ESFRI-related research infrastructures (RI), national/regional research facilities and technology centres, competence centres and science parks, with a clear focus on enhancing applied research, through reinforced cooperation with industry to leverage private research and innovation (R&I) investment.

Before 2015 there were no targeted national instruments facilitating synergies between Horizon 2020 and EU SF in Lithuania. The interviewed experts noted, that since Lithuanians are not active nor successful at FP7 calls, there is a lack of pressure from the interest groups on the policy makers and so there is no strong impulse to create mechanisms facilitating synergies. However, a number of upstream and downstream actions indirectly contribute to the synergies between the national and international sources. For example, upstream interventions were supported, including smaller research partnering facilities of national importance upgrading into research excellence, the modernisation of research organisations RIs, improvement of research skills of students and researchers, including also their mobility visits which have contributed to both research excellence and integration into the international research networks. Targeted incentives aimed at facilitation of national participation in FP7/Horizon 2020 are also available, for example the compensation of application preparation and VAT costs, international partner search and information campaigns in firms and technology centres to stimulate and facilitate participation in Horizon 2020. As of 2015, more targeted upstream actions are planned (mainly by the Ministry of Education and Science and the Research Council of Lithuania), including:

- Co-financing from the national funds to Lithuanian applications selected by the Horizon 2020;
- Funding for projects that were positively evaluated, shortlisted, but not funded under Horizon 2020;
- Funding for parallel labs located in Lithuania and partnering countries.

Factors limiting the synergies and participation in Horizon 2020

A number of factors limit Lithuania's participation in the FP7/Horizon 2020 projects and reducing the synergies between the ESIF and national policy instruments and Horizon 2020 as well as other international programmes. Among the key factors are weak links to the European networks and limited international visibility, limited number of strong private R&I performers and the overall level of absorptive capacities ("the regional innovation paradox"), availability of other more attractive (national) funding opportunities, and specific features of the FP7/Horizon2020 projects. For example, Horizon 2020 projects are less attractive for private enterprises because they are perceived as very risky (low success rate), having high administrative load and being very far away from the market.

Moreover, specific weaknesses in the current R&I governance system contribute to the limited synergies between the national R&I instruments and FP7/Horizon 2020. Among these weaknesses are:

- Poor coordination at the implementation and strategic levels, rivalry between two key ministries;
- Weak programme management capacities;
- Fragmentation and failure to leverage different funds and create synergies;
- Fragmentation and duplication of R&D infrastructures and institutions promoting research-business cooperation and supporting innovation;
- Present governance mode, mirrored by process-oriented policy implementation *vs* partnership-based programme management;
- Lack of targets and incentives for internationalisation, and lack of awareness and related capacities at the EU SF/ESIF intermediate bodies and implementing agencies level (e.g. a prevailing opinion at the Ministry of Economy is that facilitation of synergies will inevitably lead to duplicated funding).

Policy suggestions

To better facilitate synergies between Horizon 2020 and cohesion funding, the remaining challenges are:

- First, to reduce fragmentation and improve policy capacities, for example, by ensuring better links between the fragmented policy routes, granting attention and resources to effective programme management.
- Second, the policy spotlight has to move from "hard" infrastructure development to absorptive capacity strengthening and acceleration of new ideas pipeline through the innovation support services. Also the policy mix has to acknowledge the different maturity of existing and potential innovators: need for diversified and tailor-made instruments.
- Third, weaknesses in creating strong science-industry partnerships and facilitating science entrepreneurship need to be addressed, for example, by optimizing the current network of public R&D services and innovation promotion infrastructure. Also, in order to achieve economies of scale by using funding of various state institutions, it is advisable to have a balance of larger and small-scale projects and the combined use of policy instruments, especially when it comes to public private cooperation and further development of mature R&D based innovators (see Table 4 in Chapter 3). Larger projects usually involve several stakeholders, do not rely on a single source of funding, and have large budgets, longer period of implementation and a few groups of beneficiaries. While the potential innovators (e.g. companies in traditional industries looking for new business models) would benefit from "soft" innovation support and smaller experimentation projects, mature innovators (larger R&D based SMEs, e.g. biotech or laser tech companies) could immediately start with larger and more long term innovation projects combining various funding sources.
- Fourth, there is a need for better streamlined targets, policies, incentives for internationalisation, for example, none of the smart specialisation priorities should include purely national agendas. There is a need for capacity building of the policy makers and staff of various ESIF managing authorities that are not aware on the possibilities/needs of creating the synergies between ESIF and Horizon 2020, remain reluctant and view the synergies as a risk for "duplication of funding".
- Fifth, creation of motivation and skills at the individual (researchers) level, by promoting science entrepreneurship, e.g. researchers' contracts should be adjusted to provide time to work with business and Horizon 2020. A similar change should occur at institutional level (incl. IPR policies).
- Sixth, weak integration in the European networks is a key challenge, which could be addressed by extending and strengthen measures like InnoConnect to fund various networks, increased attention to researchers mobility visits.
- Finally, Horizon 2020 projects are less attractive for private enterprises because they are perceived as very risky due to low success rate, having high administrative load and being very far away from the market. To address this challenge there is a need to strengthen the national framework for proactive position of Lithuanian entities in project preparatory activities through dedicated project assistance and partner search grant scheme available for both public and private R&D (currently financial assistance is mainly available for PROs only). At the EU level the administration rules of Horizon 2020 need to be reviewed (e.g. the rule on accounting for the salaries and calculating the cost on man-days reduces the motivation to participate in those countries where salaries are lower[1]).

[1] More specifically, this comment refers to calculating hourly rates according to usual accounting practice based on actual personnel costs. First, actual personnel salaries at the public research organisations are very low - on average, several times lower compared to EU-15 (especially early career researchers, PhDs). Second, in many SMEs in Lithuania still employees get compensated (apart from their salary) using other sources with lower tax rates (for example, gifts, stipends, car fuel, etc.). As a result, many Lithuanian participants can only declare relatively low actual personnel costs. Staff involved in the FP7/Horizon 2020 projects have to perform the same complex R&D tasks as their colleagues from other (better paying) countries, whereas funding for personnel costs in these projects is several times lower. This reduces the motivation of both staff and institutions to participate, especially when early career researchers are involved. Also, it reduces possibilities to attract highly qualified researchers (competitive funding projects are often seen by organisations as an additional funding source for more/better human resources). The afore mentionned rule is different from, for example, the European Commission's public procurement rules, which imply categories of experts (and fixed rates per category) that are equal to all experts despite their countries of origin, their actual salaries or average salaries at their institutions etc.

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Disclaimer

1. Introduction

Background of Stairway to excellence project

The European Commission Framework Programme (FP) for research and technology development has been vital in the development of European knowledge generation. However, there is considerable disparity across EU countries and regions in terms of FP participation and innovation performance.

Horizon 2020 will continue to provide funding on the basis of excellence, regardless of geographical location. However, it will also introduce novel measures for "spreading excellence and widening participation" by targeting low Research & Innovation (R&I) performing countries - most of whom are eligible for innovation funding under Cohesion Policy for the period 2014-2020.

In addition, the new regulations for ESIF aim to use funds more effectively to build regional/national excellence and capacities. By doing so, the key funding sources (ESIF and Horizon 2020) can complement one another along the entire innovation process.

Objective of S2E

The Stairway to Excellence (S2E) project is centred on the provision of support to enhance the value of the key European Union (EU) funding sources for research, development and innovation: European Structural and Investment Funds and Horizon 2020 but also the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME), Erasmus+, Creative Europe, European Union Programme for Employment and Social Innovation ("EaSI") and the digital services part of the Connecting Europe Facility by actively promoting their combination. The project has two main objectives, namely:

- Providing of assistance to regions and countries that joined the EU since 2004 in closing the innovation gap, in order to promote excellence in all regions and EU countries;
- Stimulating the early and effective implementation of national and regional Smart Specialisation Strategies.

Main purpose of the document

In the frame of the project, complex country analysis is performed for all 13 EU MS with the objective to assess and corroborate all the qualitative and quantitative data in drawing national/regional FP7 participation patterns, understand the push–pull factors for FP7 participation and the factors affecting the capacity to absorb cohesion policy funds. This report articulates analysis on selected aspects and country-tailored policy suggestions aiming to tackle the weaknesses identified in the analysis.

The report complements the complex qualitative/ quantitative analysis performed the IPTS/KfG/S2E team. In order to avoid duplication and cover all the elements required for a sound analysis, the report builds on analytical framework developed by IPTS.

2. QUALITY OF THE GOVERNANCE

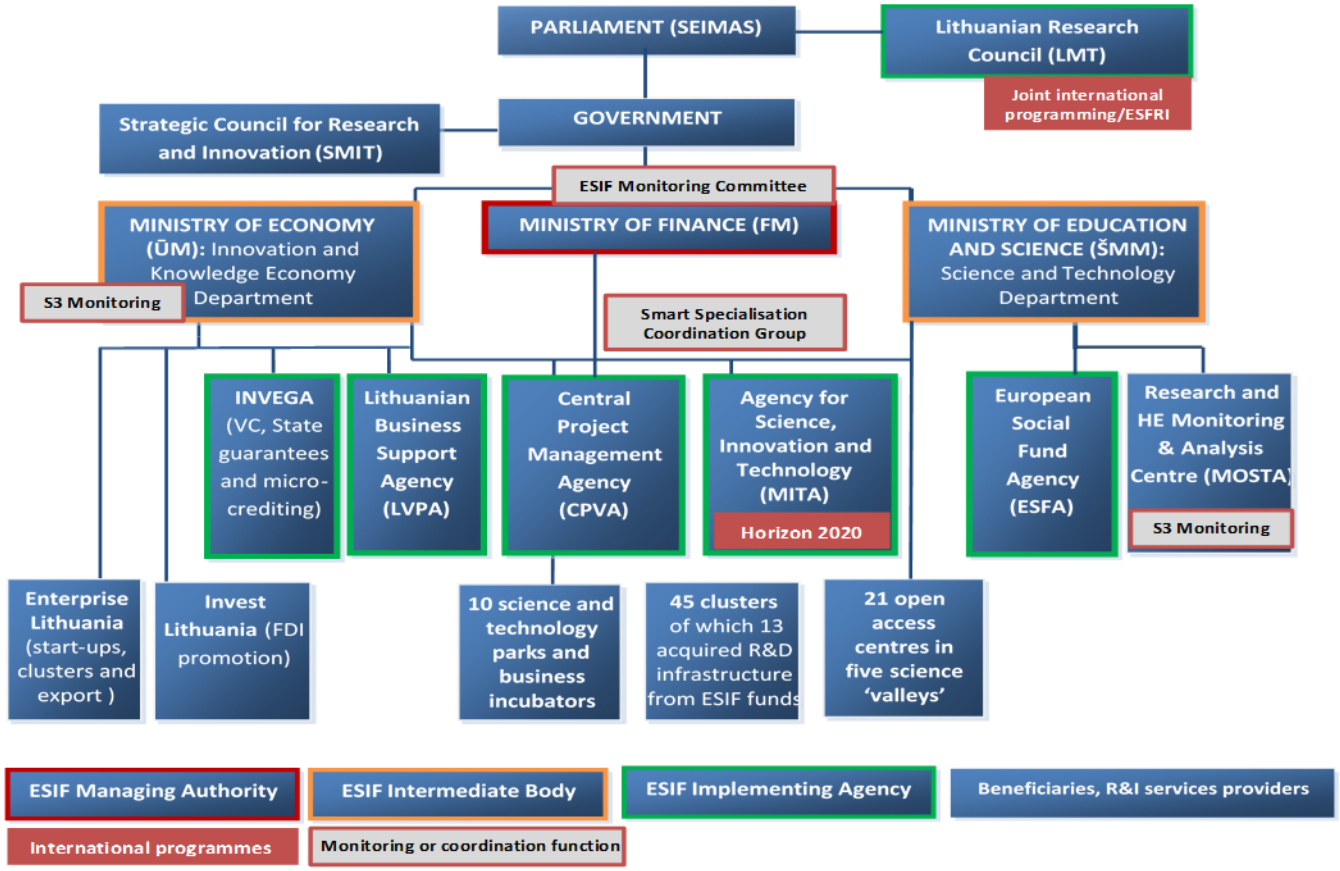
The governance system: status quo and recent changes

An organogram below presents the relevant actors involved in the design of the ESIF instruments for R&I funding, the relevant managing authorities, funding/evaluation agencies, the institutional role of the regions, the inter-institutional relation and coordination, and key public R&I services providers. The Ministry of Finance (its EU Structural Assistance Management Department) is the Managing Authority of ESIF funds. The two interim authorities - Ministry of Economy (ŪM) and Ministry of Education and Science (ŠMM) - are the principal R&D and innovation policy forming institutions in Lithuania. ŪM is responsible for innovation policy, ŠMM is responsible for higher education and public R&D policy. Six agencies are responsible for administering ESIF funding of research and innovation (incl. general business access to finance):

- **CPVA** (R&D infrastructure, four measures with €303m in total for 2007-2015);
- **LVPA** (nine key ESIF measures for R&I in business with around €237m in 2007-2015);
- **ESFA** (ESIF funds for training and education, researchers" placements in companies, €116m in 2007-2015 for the priority "Strengthening of researchers' capacities", €21m in 2013);
- **LMT** (competitive funding for R&D in public research organisations and researchers mobility, €17m in 2013);
- **MITA** (innovation vouchers);
- **INVEGA** (general access to finance, e.g. VC, micro-crediting and State guarantees).

Both LMT and MITA are responsible for coordinating national participation in the international programmes. MITA coordinates Horizon 2020, Eureka, Eurostars and Bonus. LMT coordinates involvement into the joint programming initiatives. Until the reorganisation in 2009 the Lithuanian Research Council also served as an advisory board for the Lithuanian Parliament. The Strategic R&D and Innovation Council (2013) now has a mandate for the coordination of R&D and innovation policy at the highest political level.

Figure 1. Organogram – governance of R&D funds (including structural funds for R&D)



Source: prepared by the author based on Paliokaitė (2015).

In terms of legislative or regulatory actions such as laws, framework laws addressing research and innovation with the (articulated or indirect) objective to improve the environment for innovation, the Law on Research and Higher Education (2009) defines the terms R&D, science and technology parks, integrated science, studies and business centres („valleys"), R&D institutes, and regulates funding and governance of R&D. Since mid-2009, there have been considerable changes in the innovation governance system, especially the institutional set-up and strategic policy documents (see Table 1 below). The Lithuanian Innovation Strategy was adopted in 2010, extending the definition of innovation by including social, customer-oriented, non-technological, demand-oriented, and public innovation. The Strategy was upgraded in December 2013 into the Lithuanian Innovation Promotion Programme 2014-2020. In April 2014 the Lithuanian Government approved the Programme on the Implementation of the R&I Priority Areas and Their Priorities, which provides the basic principles for implementing the smart specialisation priorities, such as the rules for selecting and approving the new priorities, monitoring and review procedures, key implementing bodies and their responsibilities. This Programme provides that specific implementation plans will be designed for each of the 20 smart specialisation priorities.

Table 1. Key R&I and EU SF/ESIF related strategies and programmes

Date of approval	Document
2009	Law on Research and Studies. Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys).
2010	Lithuanian Innovation Strategy 2010-2020 (abolished in 2014).
2012	Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) updated. National Development Strategy "Lithuania 2030". National Development Programme 2014-2020. National R&D and Studies Programme for 2013-2020.
2013	Regulation by the Government on Smart specialisation priority areas and their specific priorities. Lithuanian Innovation Promotion Programme 2014-2020.
2014	SF Operational Programme for 2014-2020 approved by the EC in September. Programme on the Implementation of the R&I Priority Areas and Their Priorities.
2015	Updated Law on Research and Studies (new version presented by ŠMM). Not yet approved by June 2015. New Law on Innovation Promotion (presented by ŪM). Not yet approved by June 2015. Implementation plans of 20 smart specialisation priorities. New sets of 2015-2020 policy measures planned by the ministries, but not yet approved by June 2015.

Source: prepared by the author.

Drawing on an argument that current Law on Research and Studies and the subsequent implementing bylaws, decrees and regulations apply a narrow and inaccurate definition of R&D activities (equated with "research" only), which impacts on the related policy measures and institutional as well as competitive R&D funding, in 2015 the Ministry of Economy initiated the Innovation Promotion Law and systemic review which should tackle the above-mentioned problems. The working group under the Lithuanian Government, consisting of the representatives of key ministries and interested parties, was formed in January 2015 to discuss the need for this new Law and the reform of the national innovation system. Among the discussed options is the restructuring of the existing institutional system. For example, the Ministry of Economy proposed creation of the Innovation Fund and Innovation Agency (merging the existing LVPA and MITA agencies), as well as clearly separating the functions of LMT and MITA. In 2015 the Ministry of Education and Science also presented an updated version of the Law on Research and Studies, which incorporates the definition of innovation.

SWOT and remaining bottlenecks

There is a number of weaknesses or barriers of the R&I system and policy governance, that may affect negatively the participation of the R&I performers in ESIF and H2020 calls. There is insufficient leverage of different funds as well as few synergies between ESIF 2007-2013 measures, or the synergies between ESIF and other national and international programmes. Bottlenecks remaining in the current governance system are discussed below.

First, **lack of coordination leads to huge fragmentation of policy instruments, programmes, institutions, infrastructures and monitoring systems**. R&D policies have not been sufficiently coordinated at both highest political level and between the different policy implementing institutions. This results in overlapping measures and lack of effective attempts to create synergies between different measures e.g. valleys and clusters or enterprises and public research institutions projects. The valleys were build but limited effort to stimulate the activities in valleys or attract scientists to valleys has been made until 2015.

- **Lack of coordination and rivalry between the key R&I policy making institutions**. Among the reasons - different concepts of innovation ("science push" *vs* innovation systems and "demand steering") and different administrative cultures fostered by the key ministries, which results in their constant rivalry and lack of trust. Existing coordination instruments (the Strategic R&D and Innovation Council under the Government) have not been effective in creating any consensus and ownership based solutions. Examples:
  a. Introduction of two competing laws regulating R&I (Law on Research and Studies, and Law on Innovation Promotion) in 2015, and both ministries are "blocking" the initiatives of one another.
  b. The Programme on the Implementation of the R&I Priority Areas and Their Priorities provides for the programming of "joint initiatives" in implementing the priorities, i.e. programming a pipeline of several related R&D, education, infrastructure projects funded by several sources. The „joint initiatives" were proposed by the Ministry of Education and Science, but the idea was not supported by the Ministry of Economy. By the time when this Report was produced the Ministry of Finance was trying to moderate the discussion between key ministries.
  c. Trust issues led to a lack of agreement on a single agency responsible for monitoring of smart specialisation and hence the ministries appointed two institutions, each "their own" – ŠMM appointed MOSTA (for monitoring of public R&D instruments) and ŪM appointed themselves (monitoring business R&I instruments), see Figure 1.
  d. In the 2015-2020 both ministries may duplicate funding of new infrastructures (ŠMM will finance the construction of competence centres, ŪM – the technology centres), while similar uncoordinated actions in 2007-2014 already led to high fragmentation (open access centres and "valleys" *vs* science and technology parks and clusters).
- There is **fragmentation of functions at the national agencies' level** (LVPA, CPVA, MITA, LMT, and ESFA). The paradox is that the creation of MITA did not decrease the fragmentation as intended, but on the contrary – contributed to further fragmentation. Instead of merging the previously existing functions, MITA was established as yet another agency with a small role and partially overlapping functions. There is room for improvement in terms of coordination of the different objectives and calls of ESIF, national programmes or international programmes. MITA is responsible for the promotion of national participation in FP7/Horizon 2020, but it is an isolated function, not linked in any way with the programming or launch of the ESIF calls.
- **Various service-providing institutions**, for example, MITA, Lithuanian Innovation Centre, 21 open access centres, 10 science and technology parks and their technology incubators, technology transfer centres, 45 clusters, business associations and so on, **often play a similar role**. All these institutions compete for limited State funding, making it impossible to provide professional services or attract qualified professionals. Furthermore, establishment of new types of institutions (centres of excellence, technology centres, competence centres, innovation centres, technology transfer centres and so on) is planned in 2015-2020, leading to further fragmentation.
- Many instruments and programmes over 2007-2013 were not coordinated, despite continued efforts to do so. Therefore **the complementarity of various instruments** (e.g. the open access centres in the science "valleys", industry clusters and direct support for R&D) **is limited**. There is lack of effective and systematic programme management skills and mechanisms. One example - "valleys" development, which essentially took place in an uncoordinated manner and depended on the universities' interests and abilities.
- Lack of coordination has led to **parallel monitoring systems**. For example, in the 2007-2015 period there existed an EU SF monitoring system and separate system for monitoring the results of science "valleys" and "complex R&D programmes" (although both instruments 100% funded by EU SF). Due to limited complementarity, accountability of the beneficiaries and lack of management capacities at the policy making/ implementing institutions, none of those costly systems are effective in accelerating change.

Collaboration across all the relevant funding and development agencies and funding sources has to be ensured to facilitate streamlined, joined-up implementation of the smart specialisation priorities. In practice, it also means that there has to be **a coordinating centre** assigned with a responsibility to monitor synergies between the programmes and measures, to monitor calls for proposals, and review how successful are the different priorities in moving from stage to stage in the implementation process. Failure to create programme management capacities for the implementation of smart specialisation (i.e. a team/teams in one of the implementing bodies, preferably MITA) responsible for supervising the implementation of individual

priorities, encouraging cooperation, monitoring, project pipeline development and so on is likely to lead to same problems moving into a new period.

Secondly, **policy design and programme management capacities are weak, especially in the policy designing institutions (the ministries)**. There is a policy-specific "know how" in some of the implementing agencies and their capacities are relatively high. However they have limited impact on the policy decisions and funding rules. The system does not sufficiently integrate cutting-edge industrial expertise and knowhow, and it has developed a culture of risk-aversion, biased against early-stage and high risk innovation ventures, particularly in high-technology sectors. Staff of implementation agencies do not possess sufficient knowledge of the industry, and therefore they will remain limited in their capacity to fashion effective, output-oriented programs maximizing the impact of the funding distributed unless industry expertise is integrated in the instrument design and the selection phases. Also many beneficiaries complain that structural funds management process is too bureaucratic and process rather than results oriented (see Chapter 3). Furthermore, the implementing agencies lacks soft activities fostering innovation. They should focus more on project pipeline development, brokerage between business and public R&D institutions, consultancy for business in order to raise awareness of innovation benefits and increase motivation to practice innovation. The implementing agencies must raise the beneficiaries' awareness that synergies are possible and effective to implement. Now there is fear of violating the rule of double funding and lack of awareness that it is possible to finance the same project from the different sources.

Third, a critical issue is **lack of strategic intelligence systems for policy learning and informing the decision making**, including weak involvement of stakeholders in the process of designing R&I policy. Currently the respective capacities are relatively low and the functions are not embedded into the policy-making cycle. As a result, policy-makers have very little understanding of how economies in principle diversify into new growth paths, and to what extent public policy may affect this process. Why, even if the problems and possible solutions are correctly identified, their successful implementation always fails – a „celebrated birth" of another strategic council eventually turns into a "slow death", and the establishment of a new agency in no way diminishes the fragmentation of institutions, programmes and policy measures? One answer is – rushing the changes, ignoring the effective change management principles (future impact assessment, the search for consensus, the discussion and explanation of the foreseen benefits), and the creation of necessary capacities (in particular - human resources, monitoring, evaluation). In Lithuania, there is excessive focus on legal regulation, without paying attention to the explanation of the benefits of R&D, innovation and/or collaboration to the potential stakeholders (Visionary Analytics, 2014).

Fourth, **the capacity building to improve R&I performance was focused on public R&D infrastructure and acquisition of technology** with limited investments into "soft" absorptive capacities. High proportion of capacity building investments into RI in the previous funding period can be considered as justified in the context where one of the main weaknesses of the Lithuanian R&D funding system has been the shortage of infrastructure investments over the last two decades. These investments however lacked measures fostering technological development, new product and service innovation and respective collaboration with public R&D resources. Also, the investment in human potential to work with the research infrastructures (RI) were not substantial enough. This can lead to a risk of not having enough human resources to work with the new infrastructure and equipment. The existing target group in Lithuania for the excellence-based competitive research measures is rather limited – consisting mainly of the limited number of top-tier research groups and few knowledge-based (spin-off) companies (see Chapter 3). Raising the allocations for direct R&D measures without simultaneously dealing with the pipeline creation through capacity building results in problems with absorption and stagnation in terms of participation in Horizon 2020. More sophisticated approach to the capacity building is needed taking into account that the current capacity levels and the potentials to move up in the „stairway to excellence" largely differ within the target group (Paliokaitė and Kubo, 2013; Paliokaitė and Martinaitis, 2014). 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, brokerage and matchmaking, acceleration and mentoring, etc.

Finally, from the governance perspective today's practice reflects that **FP activities (NCPs), cohesion funded and national programmes and transnational cooperation (under ETC and EUSBSR) activities are all rather separate streams of planning and actions**. Transnational partnering has to be among the key national interests of small economies like Lithuania – when they shift to higher-value exports, they often lack the capital markets to rapidly develop innovation as well as the required skill sets. Success thus depends on early internationalisation of the science base and ability to reach the global value chains.

However, Lithuania does not have clear R&I internationalisation policy (although here and there exist fragmented targets that are discussed in Chapter 4), and the public R&D system can be characterised as rather closed with limited institutional incentives and targets for internationalisation. The 2007-2013 EU SF policy mix did not have internationalisation related measures (except for researchers mobility), and the country did not consult/benchmark with other countries when making its investments, which resulted in some unjustified decisions. The Lithuanian authorities have indicated specific measures for integration into European research infrastructures (especially ESFRI) in the current version of the OP for 2014-2020, but the international consultation and benchmarking activities were yet again very limited.

To sum up, the main factors restricting synergies both between the EU SF itself and between EU SF and Horizon 2020 are lack of programme management and coordination capacities at all levels (highest political, programming, implementing agencies, as well as institutional). This requires first of all the coordination and consensus between two ministries responsible for R&I policy. Another issue is that internationalisation (incl. Horizon 2020) is not considered a key issue on the policy agenda.

Table 2. SWOT

Strengths	Weaknesses
• R&D capacities (R&D infrastructures in new production technologies) substantially strengthened during 2007-2015. • Smart specialisation priorities approved. • Multiannual research and innovation agendas (roadmaps) and priorities' implementation plans developed, which could serve as starting point of ensuring the synergies. • A number of new formal coordination instruments (Strategic R&D and Innovation Council, Smart Specialisation Coordination Group), although not yet effective. • A more comprehensive policy mix for 2015-2020, including support for international collaboration (InoConnect LT and ESFRI), see Chapter 4.	• Poor coordination at the implementation and strategic levels. Rivalry between two key ministries. • Weak programme management capacities. Fragmentation and failure to leverage different funds and create synergies. • Fragmentation and duplication of R&D infrastructures and institutions promoting research-business cooperation and supporting innovation. • The present governance mode, mirrored by process-oriented policy implementation *vs* partnership-based programme management. • Limited "soft" absorptive capacities building**.** Lithuanian R&I policy mix mainly targeted existing R&I performers, thus leaving the vast bulk of existing economy players and possible newcomers out of the scope. • Fragmented investments (lack of focus and priorities). • Limited investments into R&D human resources as compared to R&D infrastructures. • Transnational cooperation and looking for synergies with FPs etc. has rather stayed outside of national policy efforts. Limited incentives and targets for internationalisation. • The priority implementation roadmaps lack internationalisation agendas. • Lack of strategic intelligence (monitoring, evaluation, foresight) capacities.
Opportunities	**Threats**
• Systemic review and reducing fragmentation (merging and closing ineffective institutions). • Orchestration of policies affecting R&I performance and better streamlining of ESIF funds could lead to economy transformation towards higher value added. • Using ESIF funds as financial incentive for optimisation of R&D infrastructures and their commercialisation and internationalisation agendas. • Different strategies (two tier process) targeting new, potential and mature innovators (Table 4, Chapter 3). • There is scope for more intensive and better coordinated transnational collaboration in developing the research infrastructures, especially within the Baltic Sea Region. Coordinated integration of the strongest Lithuanian RIs into the European networks of RIs, and stimulating connections of all the constructed RIs with related RIs in other regions.	• Further fragmentation and duplication of efforts at national and international scale, if existing coordination problems not solved, will lead to limited impact of ESIF and national funds for R&I. • Limited absorption and low quality projects if soft capacity building will not be streamlined. • "Stewing in own juices", if pressure and targets for internationalization not strengthened. • Lithuania's transition to national funds in the post-2020 period will increase pressure on innovation policy effectiveness. If programme management capacities and thematic capacities are not created at the agencies before 2020, the existing system based on "smooth administration of EU funds" will become irrelevant, and the system will collapse.

3. FACTORS THAT SUPPORT OR LIMIT NATIONAL PARTICIPATION IN R&D CALLS FUNDED BY SF/ESIF

Motivation to participate and factors supporting participation in ESIF

Interviews with project participants allowed to summarize key motivations of companies and public research institutions to participate in SF/ESIF (see Table 5 below). The key motivation is capacity development - according to most interviewees, companies are interested in covering the cost of human resources and new R&D infrastructure. Low salaries and poor access to academic databases, libraries and world class equipment have been the principal obstacles to the attractiveness of a research career in Lithuania. Lithuanian universities pay very low salaries to early career researchers (including PhD stipends), constituting about 20% of early career researchers' salaries in some other EU Member States. Only 30% of researchers are satisfied with their salaries (Idea Consult, 2013). There is a significant gap between remuneration levels in the public and the private business sector, as remuneration of researchers working in the higher education sector was 43% lower than that of those working in the business sector.

Factors that limit ESIF absorption in research and innovation

Data on the absorption of SF funds are presented in Annex 3. Overall, the balance between direct funding for research activities and innovation activities (including R&D for innovative products development) over 2007-2013 was not productive in terms of focus on innovative output, commercialization and growth. First, the set of enterprise policies reinforced a general systemic tendency to favour technology absorption through capital investment over innovation. Second, policies targeting specifically R&I favoured investments into public research infrastructure and centres of competence versus commercialization of public research (e.g. through spin-offs), science-business collaboration and professional technology transfer services, or even direct funding for business R&I activities. This has tended to reinforce the existing trend of low investment in R&D and innovation by business sector and „passive" adoption of technologies developed elsewhere. Third, the measures related to direct R&I funding in business (Intellect LT, Idea LT) also faced relatively lower demand, compared to other measures aimed at SME"s growth (e.g. Leader LT that funded technology upgrading). Limited attractiveness of the SF/ESIFs in the domain of R&I can be explained by several factors discussed below:

a. Current structure of the Lithuanian economy based on low value added, thus limited absorptive capacity for research projects and high demand for capacity building (incl. technology upgrading).
b. Design of policy instruments neglecting the role of "soft" innovation support measures and pipeline building.
c. The effect of economic crisis and competition between the measures (companies chose the most relevant for surviving and focused on short term).
d. Extremely bureaucratic, inflexible and process rather than results based "administration of funds".

First of all, **a low innovation capacity of the majority of businesses** is hampering the absorption of respective public support measures. The "regional innovation paradox", clearly visible in Lithuania, 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). Lithuania does not have a strong track record of innovation, and the private sector, in its current "specialisation", does not perceive innovation as critical factor to long-term competitiveness. As shown below, export and competitiveness in Lithuania are highly dependent on relatively large traditional sectors, which come under the titles „current locomotives" and „sectors in transition" in the overview. For the time being, the majority of enterprises in these sectors are consumers rather than creators of innovation. The analysis of the economy structure and knowledge has revealed that (see Figure 2), first, sectors described as „"natural priorities"" and "„rising/niche sectors"" tend to earmark the largest amounts of R&I investments and tend to create and adopt innovations most actively. These sectors can also be characterised as potential creators of future innovations. Most of them are relatively small (in terms of both value added and employment).

Figure 2. The map of economy competitiveness

Source: Martinaitis et al. (2013)

Moreover, most of R&D intensive companies in Lithuania lack critical mass – 55% of business R&D investments are made by companies having less than 250 employees, while only 21.77% of investments are made by companies having above 500 employees. This means that the key Lithuanian producers (large companies) generally do not invest into R&D and innovation, and those companies that invest have very limited capacities.

Table 3. Business investments into R&D, according to company size, €m

Year	2007	2008	2009	2010	2011	2012	%, 2012
500 employees and more	25,342	17,696	21,751	20,853	25,66	10,774	21,77
249-500 employees	3,36	13,757	5,908	5,937	7,183	11,498	23,23
250 and more	28,702	31,453	27,659	26,790	32,843	22,272	45,00
50-249	16,711	9,644	9,702	11,208	9,5	9,529	19,25
10-49	6,053	6,285	2,78	6,603	11,324	16,161	35,75
1-9	0,463	0,348	2,433	3,447	1,535	1,535	
Total, €m	51,929	47,729	42,574	48,048	55,202	49,496	100,00

Source: Eurostat [09-03-2015]

Considering that the majority of Lithuanian companies don't have R&D activities and respective capacity, there is indeed more demand for (production) technology upgrading measures helping them to increase efficiency in the context of decreasing labour-cost competitiveness and postpone the need to move up in the value chain (which assumes R&D and innovation) for a while.

Second, **EU SF did not invest into „new" and „potential" innovators" capacities and pipeline building**. For Lithuania capacity building is an important way to improve its R&I performance in terms of excellence. The "regional innovation paradox", clearly visible in Lithuania, 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). The existing target group in Lithuania for the excellence-based competitive R&D measures is rather limited – consisting mainly of the limited

number of top-tier research groups and few knowledge-based (spin-off) companies. Raising the allocations for direct R&D measures without simultaneously dealing with the pipeline creation through capacity building might result in problems with absorption of available funding. Given the current innovators structure, SF policies should have focused on capacity strengthening and acceleration of new ideas pipeline through the innovation support services, seeking to encourage more "potential" and "new" innovators to invest into the development of new business fields, business models and products. One of the reasons why companies in traditional industries are less engaged in R&D activities and partnership with universities and research institutes is their lack of competences related to the acknowledgement of the value of innovation and/or capabilities related to the management of innovation process. This failure justifies the additionality of State's intervention and the need for innovative ideas facilitation and acceleration services. However, in Lithuania 2007-2013 investments into innovative capacities and project pipeline building constituted a marginal share of R&I investments (7.7%, see table 3.2 in Annex 3). Moreover, a large bulk of SF dedicated for „innovation services" (Innogeb LT group of measures) focused on infrastructure of incubators and S&T parks, but not on innovative services, and the funds of these measures dried out around 2011-2012.

Table 4. "Competence stairway" and the different needs of existing and potential innovators

Type	Technology consumers	Potential innovators	Emerging / new innovators	Mature innovators
Type of companies	Manufacturing companies and services providers (including public sector) that lack modern technological and managerial capacity and productivity.	Generally large(r) 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.	Moving to higher impact innovations, large scale R&D projects, new international markets, spin-outs.
Needs	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 (open innovation platforms). 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				

Source: Paliokaitė, Martinaitis (2014)

The 2007-2013 policy mix in Lithuania was mainly designed for 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 the 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 differs within the target group. While 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 (see Table above) (based on Paliokaitė, Kubo, 2013; Paliokaitė, Martinaitis, 2014).

Third, the already limited **capacities of Lithuanian companies were further limited by the economic crisis**. The country's economy experienced the European Union's second-worst recession in 2009, when real GDP per capita fell by 14% compared to 2008 and stood almost 70% below the EU28 average (€6,900 per inhabitant). In 2009 the Lithuanian Government launched the €1.65 billion Economy Recovery Plan aimed at restoring market stability and providing greater access to capital for business in 2009-2011. This plan re-allocated about €100 million from the Economy Growth OP Priority Axis I to venture capital funds (mainly the Controlling fund). Investments into technology absorption (both financial engineering instruments and grants for technology upgrading) helped the Lithuanian economy withstand the global financial and economic crisis in better shape than its regional peers (the **anticyclical role**) and had a positive effect on firm viability, even if for a short period. One of the reasons behind low take-up of funding for more selective policy instruments has been **the simultaneous organisation of calls for proposals under different measures**, which, in the opinion of the beneficiaries and experts, has led to competition between the measures. The already limited capacities of Lithuanian companies were further limited by the economic crisis. When the SF measures were launched at the very peak of the crisis (2008-2010), companies chose very carefully where to co-invest, given also the high administrative load of the SF projects. Some of the competing financing instruments were not used at the appropriate stages of the innovation process, e.g. technology absorption was funded via grants, not revolving instruments. The existing portfolio of measures for firms created competition for administrative funds – businesses chose the „easier" and more popular measures for technological upgrading (e.g. Leader LT where the demand was very high) versus R&D measures like Idea LT and Intellect LT. Therefore, the absorption of the funds of the latter measures was lower than of other measures for firms on average. The managing authorities have already taken this into account – during 2015-2020 in cases involving less risk — such as technology absorption — matching grants will be replaced by loans or other revolving instruments, since market failure related to credit constraints may not be as much of a threat.

Finally, **the efficacy of public support and the absorptive capacities were reduced by the formal, technical and „desk-top" selection and administration procedures**. Implementation agencies in Lithuania are somewhat reluctant to use public resources to finance high-risk innovation projects as it cannot be warranted that the R&D sponsored by the state will translate into commercially viable products. Therefore, there is a marked tendency in the system to finance low-risk technology projects, with tangible and guaranteed outcomes. Due to alleged concerns over potential corruption, officials from the implementation agencies (esp. LVPA) have to follow strict rules concerning the face-to-face interaction with applicants throughout the selection process (for example, at least two agency employees have to be present in a room where an interview with potential applicant is taking place). The „paper-based" application procedure provides incentive for firms to hire consulting companies to draft grant applications that appeal to the reviewers but favour form over substance. Other issues:

- Strict requirements that are unnecessary and do not add value to the project (for example, public procurement or the situation when the young enterprise has to search for partners with institutional experience just to satisfy the institutional requirements, while they could implement the project on their own);
- Long lasting evaluation procedures - in some cases companies received funding for the project after 2 years have passed since submitting the application. During this time the cost of equipment can increase, new ideas occur, some ideas can become irrelevant.
- Very limited flexibility to address any changes in the project design. Companies were not allowed to change their procurement plans, for example buy different equipment or R&D trainings etc.

The above-mentioned weaknesses create high administrative load for beneficiaries and reduce experimentation. Some interviewees noted that it is less costly to implement the R&D project with a company's own means or a business loan than with the SF grant. Moreover, only those companies that are implementing large scale planned (hence, not new) projects, are encouraged to apply. Hence, public support may be replacing, rather than complementing, private expenditures on innovation and R&D. In the survey of beneficiaries, carried out in 2011, 69% of beneficiary firms that received support for R&I, concluded that

they would have implemented the funded projects even without the public support (although to a smaller extent or in a longer timeframe) (Paliokaitė et al. 2011).

In summary, the current strategy has made very important investments into the public research capacity as well as firms' technological upgrading and their research capacity. These investments were necessary considering the previous worn out state of the research base. However, this strategy has proven relatively weak in leveraging private sector investments into R&I and fostering public research commercialisation, mainly due to (1) investments into intermediary organisations instead of focusing on the entrepreneurial capabilities of research institutions and creating professional innovation services, (2) lack of „soft" measures for entrepreneurial discovery and innovation capacities building in firms; (3) non-systemic innovation governance, characterised by limited synergies, networks, clusters and associations (see also Chapter 4); and (4) various small mis-steps in measures design e.g. launching all measures at once, subsidising technology absorption, etc.

Table 5. Factors (motivations) supporting and limiting participation in R&I related ESIF

	Companies	PROs / universities
Supporting factors / motivation	• Covering the cost of R&I human resources. • Covering R&D infrastructure development costs. • Previous R&I experience and experience with SF/ESIF. • Availability of high quality consultancy services (most of companies hire a consultant to write an application).	• Covering R&D infrastructure costs. • Possibility to raise the otherwise low researchers' salaries. • Developing young generation of researchers.
Limiting factors	• Absorptive capacities - the majority of enterprises in these sectors are consumers rather than creators of innovation. • Investments into intermediary organisations instead of focusing on the entrepreneurial capabilities of research institutions and creating professional innovation services, lack of „soft" measures for entrepreneurial discovery and innovation capacities building in firms • Non-systemic innovation governance, characterised by limited synergies, networks, clusters and associations. • Various small mis-steps in measures design e.g. launching all measures at once, subsidising technology absorption, etc. • Capacities limited by the economic crisis. • High administrative load of SF/ESIF projects, process oriented procedures and strict requirements (e.g. procurement), lack of flexibility.	• Focus mainly on public R&D base. • High administrative load of SF/ESIF projects, process oriented and strict procedures (e.g. procurement), lack of flexibility. • Limited human resources and limited programme management (administrative) capacities.

Source: compiled by author

4. PUSH – PULL FACTORS FOR R&I PERFORMERS TO PARTICIPATE IN FP7/H2020

Overall, compared to other EU countries Lithuania participation in FP7 looks weak. Lithuania is 24th by number of participants who signed contracts and 26th by budget share of EC contribution. Compared with the Baltic States Lithuania outscores Latvia by intensity of finance and participants activity but not in the indicator of success rate. However Lithuania is behind Estonia for all indicators. The majority of Lithuanian participants in FP7 project are public R&D institutions (see Annex 4).

Push factors

Public research institutions and business enterprises share two sets of factors motivating them to participate in FP7/Horizon 2020 projects:

- **Financial support.** Firstly, additional financing from the EC (next to the national and private funding) enables to implement difficult and expensive projects which require a lot of resources and which could not be implemented without additional support and sharing the risk. Secondly, FP7 and Horizon 2020 projects are an additional source of organizational funding allowing to retain good quality staff. For example, during the economic crisis public research institutions received less R&D sub-contracts from the Lithuanian companies. FP7 projects became another opportunity to compensate the loss of R&D funding from business.
- **Scientific interest**. FP7/Horizon 2020 projects allow to participate in large and interesting projects with partners from other countries. Participation in projects also enables to increase competence and build experience. Scientific interest plays an important role because both public research institutions and business enterprises do not apply for the projects which are not in their interest sphere.

Public research institutions respond to additional push factors that motivate them to participate in FP7/Horizon 2020.

- **Institutional funding for PROs.** The Government decision (adopted in 2009 and subsequently amended in 2010 and 2012) on the method for allocation of budgetary appropriations for R&D for public higher education and research institutions stipulated that higher share of institutional funding should be linked to research performance. The Decision established that 50% in 2011 and subsequent years of institutional funding will be allocated to public HEIs and research institutions on the basis of results of assessment of R&D activities. The remaining 50% as of 2011 are allocated on the basis of "normative number of staff" that is approved for each institution by the decree of Minister of Education and Research. The ministerial decree adopted in November 2012 stipulates that one of four criteria on which the assessment of R&D activities is funding received from participation in international research projects (see Table 6 below).

Table 6. Institutional funding formula per field of science (international projects)

	Humanities	Social sciences	Natural sciences	Biomedical sciences	Agricultural sciences	Technology sciences
Share of "competitive half" of institutional funding calculated according to funding received from participation in international research projects	5%	10%	15%	15%	15%	20%

Source: Government's Regulation No. 597 of 17-06-2009 on the Procedures for allocating State budget funds for research and (social, cultural) development and artistic activities of public education and research institutions. Latest amended version valid as of June 2014.

- **Ambition to become an internationally acclaimed and appreciated institution (the prestige factor)**. Successful participation in FP7/Horizon 2020 allows the institution to become more internationally recognized. International recognition enables, for example, to attract researchers and interns from all over the world. For this reason increasingly the strategic focus of the largest universities in Lithuania is on the international projects, including FP7 and Horizon 2020.

Next to the above mentioned push factors, it must be noted that the new strategic Lithuanian documents (the OP for 2014-2020, the National Progress Programme for 2014-2020, the Science and Research Programme for 2013-2020) have set specific targets related to internationalisation of R&D. By 2020 it is expected that PROs' revenues from participation in the international programmes will be €7.45m (it was €6m in 2011) and that Lithuania will be the member of four international research infrastructures (Lithuania was not a member of any international research infrastructures in 2012). Accordingly, a set of specific measures focus on facilitation of national participation in FP7/Horizon 2020 (see next Chapter).

To conclude, main factors that motivate to participate in FP7/Horizon 2020 are: scientific interest, opportunity to receive additional financial support, and ambition to become internationally recognized and high level institution.

Pull factors

As noted in the beginning of this chapter public research institutions participate in FP7 projects more actively. Lithuanian organisations are much less active in FP7/Horizon 2020 projects because of these key factors:

- **Lack of individual motivation and skills**. The career system of Lithuanian researchers does not sufficiently support orientation towards results or international projects (researchers are mostly evaluated for papers and teaching hours). Also, most scientists have too much administrative work and high teaching loads. As they are not motivated by universities in any way to participate in the FPs/Horizon 2020, many good opportunities are missed, unless there are motivated students who can drive projects as part of their learning process. Often there is a lack of administrative personnel who could manage administrative load created by the FP/SF/ESIF projects.
- **Lack of organisational motivation due to the rules of calculating personnel costs.** More specifically, this comment refers to calculating hourly rates according to usual accounting practice based on actual personnel costs. First, actual personnel salaries at the public research organisations (especially early career researchers, PhDs) are very low - on average, several times lower compared to EU-15. Second, many SMEs in Lithuania still use „double accounting", when formal salaries of their employees are very low, but employees get compensated using other sources with lower tax rates (for example, gifts, stipends, car fuel, etc.). As a result, many Lithuanian participants can only declare very low actual personnel costs. Their staff involved in the FP7/Horizon 2020 projects have to perform the same complex R&D tax as their colleagues from other (better paying) countries, but the funding for personnel costs in these projects is several times lower. This reduces the motivation of both staff and institutions to participate, especially when early career researchers are involved. Also, it reduces possibilities to attract highly qualified researchers (competitive funding projects are often seen by organisations as an additional funding source for more/better human resources).[2] The above-described rule is different from, for example, the rules applied by European Commission's public procurement rules, which imply categories of experts (and fixed rates per category) that are equal to all experts despite their countries of origin, their actual salaries or average salaries at their institutions etc.
- **Most of FP projects are long-term projects**. This makes them **harder to administrate**. Business product developers are not interested to participate in FP projects, as they perceive them as too bureaucratic (Eriksonas et al., 2011). For example, interview respondents calculate that "commercialization in FP7/Horizon 2020 projects can be done only after 5 and more years after the project proposal submission[3]". Time span for investment in R&D project of Lithuanian companies when they might agree to share the risk is not more than 2-3 years (Eriksonas et al., 2011). Also, sometimes it is difficult see all the challenges in advance. Sometimes when the partners are less flexible to adapt to the changing situations, participants may need to change partners during projects. To sum up, companies often prefer to implement their projects without partners and with fewer own funds, because it is a much quicker way to get the result.
- **High competition and specific restrictions**. Especially private companies acknowledge that the success rate is several times lower than any other funding opportunity (e.g. the average success rate is about 20% in FP7 compared to up to 50% in the national R&D measures). The competition is lower in the national policy instruments, so many participants choose them instead of FP7/Horizon2020.

[2] Source: two interviews with the PRO representatives/experts.

[3] NB: it is not a legal limitation, rather a dominant perception that "evaluation of FP7/Horizon 2020 projects takes very long and projects themselves take much longer than it would take if a company implements an internal project". To overcome this barrier, better awareness raising and dissemination of good practices (related to SMEs' projects leading to commercialisation of products) is advised.

- **Weak links with European networks**. Lithuania is a small country and Lithuanian companies are not well-known in Europe. This creates a difficulty in finding consortium partners. Most of the already formed consortia are not willing to open up to new partners. The main link between the FP/Horizon2020 (incl. KETs) research agenda and the national research agendas is provided by the EU technology platforms and European clusters and (through their mirror groups) by the national clusters and technology platforms. However, most of national clusters are not involved in the European clusters, and national technology platforms are nearly non-existent (no State support was provided for facilitation, so they are facing "natural death"). To a very limited extent the continuation of a national platform existence has been secured through the national complex programmes and clusters. However these institutions are very young and their international links are very weak. Also, Lithuania does not have a considerable lobbying power in the EC. Many interviewed FP7/Horizon 2020 participants believed that sometimes it prevents them from winning the project.
- **Limited number of private R&I performers and a lack of critical mass**. High and medium high technology manufacturing enterprises comprise less than 1% of all Lithuania enterprises. There is a low number of R&D performing enterprises in Lithuania (only 181 company used the R&D tax incentive in 2013). Hence, there is a lack of critical mass of mature innovators to co-invest in large and long term R&D projects.

To conclude, the main factors limiting participation in FP7/Horizon 2020 projects are: weak links to the European networks and limited international visibility, limited number of strong private R&I performers, availability of other more attractive (national) funding opportunities, and some specific features of the FP7/Horizon2020 projects, e.g. the fact that the evaluation and project implementation takes very long, there are specific budget and accounting rules, etc.

5. POLICY INSTRUMENTS FACILITATING THE PARTICIPATION IN (FP7) H2020 / (SF)ESIF

There are measures taken in order to increase the participation in 7th Framework Programme/Horizon 2020. These instruments are implemented and administrated by MITA and LMT. These measures are described below:

- **Partial compensation of participant's contribution to FP7 project.** Partial compensation of participant's contribution to the FP7 project is available since 2008. Since 2010 MITA is responsible for the administration of this instrument. Support is available only for public research institutions. Up to 25 percent of contribution can be compensated. The compensation is given for one year period independently from the duration of FP7 project. During 2010-2014 €840,000 were compensated for 161 FP7 participants (MITA, 2011a; MITA, 2012; MITA, 2013; MITA, 2014; MITA, 2015).
- **Compensation of FP7 application preparation costs.** PROs can apply for compensation of FP7 application preparation costs. The application does not have to be selected by the EC to be compensated, but it must be appropriate for the EC's evaluation. Up to €4,300 preparation costs can be compensated (MITA). This instrument is running from 2012 and is administrated by LMT and MITA. 215 compensation contracts have been signed and awarded with €652,000 over 2011-2013 (LMT, 2015).

  However, this instrument has a serious bottleneck – application costs are only compensated for public research institutions, and not private enterprises, although participation of private enterprises in FP7/Horizon 2020 is much weaker. For example, in the case of JSC Vittamed, which coordinated two FP7 projects (see the JSC Vittamed case study) and prepared the application themselves, the coordinator could not apply for compensation of the application preparation costs, so the project partner Kaunas University of Technology received the compensation. This is an unfair restriction in the current system of facilitating national participation in Horizon 2020.
- **Baltic Bonus.** In December, 2014 MITA launched another instrument "Baltic Bonus". It allows PROs partnering with the other Baltic states (Latvia or Estonia) in the application for Horizon 2020 to apply for additional €1,000 compensation of preparation of Horizon 2020 application costs (MITA).
- **VAT expenses compensation.** In FP7 projects VAT expenses are not funded by the EC. In 2010 LMT launched an instrument, which enables FP7 participants to apply for compensation of VAT expenses paid by purchasing goods and services in Lithuania. 86 FP7 participants received their VAT expenses compensation worth €844,860 over 2010-2014 (LMT, 2015).
- **Compensation of international events costs.** MITA is covering the researcher's travel expenses to conferences or other events related to international programmes (e.g. Horizon 2020, Eureka, Eurostars). This way it helps potential participants finding partners for participation in international projects. This instrument also supports consortia meetings in foreign countries, intended for preparation of new applications and establishing new contacts. The consortia meetings in Lithuania can also be compensated (the equipment and rental costs are compensated).
- **Technical assistance and dissemination of information about FP7/Horizon 2020.** MITA facilitates national participation in FP7/Horizon 2020 by implementing "soft" measures, such as increasing the awareness on rules and opportunities to participate in FP7/Horizon 2020. MITA with its NCP network organize consultations, presentations and other events for enterprises and PROs. In addition, LMT provides technical assistance for potential participants of FP7/Horizon 2020. For instance, LMT helps scientists to find international partners by using the NCP network, consults potential participants and proofreads their applications.

6. EVALUATION AND MONITORING MECHANISMS

Five agencies (MITA, LVPA, ESFA, LMT, and CPVA, see Figure 1) are responsible for allocations of SF/ESIF funding on research and innovation in Lithuania. There are two main groups of SF/ESIF measures (this chapter is mainly based on Paliokaitė 2015):

- **Grants for projects through competitive calls for proposals.** It includes administrative, quality/benefits and financial assessment of projects. The evaluation is based on publicly available proposal evaluation guidelines prepared by each agency separately. These guidelines must include information on evaluation procedures, peer-review process, proposal evaluation supervision, funding decision-making and others. The peer-review can be used in the project quality/benefits assessment.
- **State and regional planning.** Regional development committees or relevant public authorities develop the projects plan. Project implementers are chosen according to the planning based on their administrative and financial assessment. Project management agency approaches potential project applicants offering them to submit their proposals within the time frame. For example, a large proportion of R&D funding over 2007-2013 was allocated for building or updating large R&D infrastructures. The funding was allocated using state planning method (institutional funding with competitive funding elements – only best R&D infrastructures are funded). The funding for the priority "Strengthening of researchers' capacities" (€21m in 2013) is also mainly allocated through the state planning (around 90%).

When Lithuanian funding agencies allocate funds through **competitive calls**, the expert's peer-review is usually used to assess projects quality and benefits. It is based on research excellence criteria that are set in agency's projects evaluation guidelines. The procedures are clear and transparent with some degree of flexibility, for instance, for small calls. Evaluation criteria are systematically applied. Responsibilities are divided according to competences: experts evaluate the quality of projects, while managing authorities take final decision on funding. It is considered that the evaluation is rigorous. The agencies follow the common guidelines on providing funding and, therefore, apply similar rules and procedures (adopted by the Government (2007) regulation).

- **LMT** (the central funding agency for basic research and researchers' mobility) is the main research funding agency in Lithuania. It allocates both budget and EU structural funds through programme-based competitive funding. About 15–20 calls for research funding and about 20 calls for other scientific activities funding are announced annually. The proposals evaluation is based on peer-review and publicly available evaluation criteria (e.g. one of criteria is the significance and validity of research idea). Experts define whether a project satisfies the minimum criteria to be considered eligible to receive funding. When all proposals are evaluated, experts arrange a projects priority list. The relevant programme management group makes the final decision on projects to be financed. The LMT Committees validate the funding decision (LMT, 2010a). The experts' selection to conduct the peer-review in LMT is based on internal LMT decisions (LMT, 2011; LMT, 2008). Experts are chosen by the LMT committees[4] from the confidential LMT experts' database and/or other suggested experts (LRS, 2009). In principle, the participation of international peers is not limited as experts can be any qualified researchers and specialists, Lithuanian and foreign citizens working in Lithuania or abroad. However, in practice the LMT chooses experts according to the financial value of calls. The Global Grant programme is systematically assessed by international experts (in Natural and Technical sciences international peer review covers 100 per cent of calls, while in Humanities and Social Sciences – 2/3 of calls) as it is designed to support world-class scientists and researchers' projects. Other project experts' evaluation is organised according to calls funding amount: if a call assigns less than €29,000, then usually it is reviewed by local experts. In other cases LMT hires Lithuanian experts working abroad or international experts. A majority of grant proposals are submitted in Lithuanian language (with a short summary in English), which poses linguistic barriers to participation of international reviewers[5]. When a project grant (e.g. Global Grant programme) is considered significant, LMT asks to submit both Lithuanian and English versions of proposal what facilitates the international peer-review. Another obstacle is experts' availability. Local experts usually propose themselves to LMT (90% of experts in LMT experts' database), while foreign experts are approached by LMT.

[4] There are two LMT committees: 1 - Human and social science committee, 2 - Natural and technology science committee. They are formed from scientists representing the relevant science field. They are proposed by Research, HE and other institutions.
[5] The State Commission of the Lithuanian Language clarified that all grant proposals must be submitted in Lithuanian language to ensure usage of a State language.

- **Agency for Science, Innovation and Technology (MITA)** uses expert's peer-review (MITA, 2011b) to evaluate proposals quality in allocating programme funding (MITA, 2011c). MITA uses its own experts' database to select experts for peer review.
- **LVPA** administers a number of ERDF-funded business support measures including nine measures devoted to R&D projects. The project applications evaluation are based on peer review. LVPA has a few methods to choose their reviewers. There are project managers in LVPA who coordinate projects. Each of them focuses on a thematic field, and in some cases they themselves evaluate applications. When applications require very specific technical knowledge, LVPA hires external experts. The key requirements for an expert are: five year professional experience and/or a PhD. LVPA has a pool of experts to choose from. Experts from this pool are hired using short term labour contracts. Reviewers are usually hired from Lithuania. Only in rare cases LVPA hires international experts or Lithuanians working abroad, because it is more expensive. LVPA also collaborates with universities to find reviewers. LVPA has signed specific expert service contracts with five Lithuanian universities - universities provide LVPA with experts under their request. A high importance is given to avoid the conflict of interest. Firstly, before signing a contract, experts do not know whose applications they are going to evaluate. Secondly, before hiring expert, LVPA carefully checks whether an expert has a conflict of interest. Finally, while signing a contract expert must declare her/his interests.

In summary, although the Lithuanian public bodies responsible for allocating SF/ESIF funds apply some principles of international peer review to a large extent (i.e. research excellence criteria are applied and the funding agencies are rigorous in their peer review procedures), there are some **obstacles limiting evaluation objectivity**:

a. International experts are used on systematic basis for evaluating large research projects only by LMT, but not by other agencies that provide SF/ESIF funding for research and innovation. Currently, the cost of hiring international peer reviewers is considered too high. Also, using Lithuanian language in the forms and applications in most cases preclude using international peer reviewers for evaluating projects. Use of local experts in a small country like Lithuania raise problems of either (a) competent evaluation of highly technical content of R&D projects, or (b) subjective evaluation, given the very fragmented R&D base in Lithuania, where all experts working in the same field know each other and often compete for funding.
b. The „paper-based" application procedure provides incentive for firms to hire consulting companies to draft grant applications that appeal to the reviewers but favour form over substance. While the administrative burden itself is a drawback for researchers, these consultancy companies, beside the additional cost, may be politically affiliated and affect the objectivity of the evaluation. Evaluation of applications was improved since the first SF calls (see above on the LVPA's system), however avoidance of conflicts on interest in a country as small as Lithuania is a complicated task.

7. ENHANCING OR LIMITING THE SYNERGIES?

Ensuring synergies between Horizon 2020 and cohesion funding, the smart specialisation strategies are foreseen to have a key role to play in terms of capacity building and providing a stairway to excellence (European Parliament resolution, 2011). They are expected to consider both upstream and downstream actions to and from Horizon 2020 as key actions for the CP funding. In this context the metaphor „stairway to excellence" can be also used to mark upstream actions, which aim is to prepare R&I players to participate in Horizon 2020 projects and accessing national funding allocated on a competitive basis. The key upstream actions for cohesion funding include - but are not strictly limited with - the investments in innovative solutions and research infrastructures and equipment, in particular those of European interest. This includes support for „satellite infrastructures" linked to the ESFRI-related RI, national/regional research facilities and technology centres, competence centres and science parks, with a clear focus on enhancing applied research, through reinforced cooperation with industry to leverage private R&I investment. In addition to RI a number of other upstream interventions can be supported, including smaller research partnering facilities of regional importance upgrading into research excellence; the modernisation of universities and research organisations, including the development of post-graduate studies; the improvement of research skills of students, the training of researchers, as well as developing technology auditing, international partner search and information campaigns in firms and technology centres to stimulate and facilitate participation in Horizon 2020 (Non-paper on synergies between Horizon 2020 and Cohesion Policy funds).

Factors limiting the synergies between ESIF and FP7/Horizon2020

As discussed in Chapter 1, the FP7 activities (NCPs), cohesion funded, national programmes and transnational cooperation (under ETC and EUSBSR) activities have rather been all rather separate streams of planning and actions (even if operated by the same organisation) in Lithuania. There is no strategy or tactics of creating synergies between the SF/ESIF or FP7 measures. On the contrary, the prevailing opinion at the Ministry of Economy's Structural Funds Department is that fostering of synergies might lead to duplicated EU funding.

Apart from lack of long term vision and strategy for building a stairway of excellence, no specific rules, legal aspects, or implementation modalities (i.e. timing of the calls, eligibility criteria, and evaluation criteria) for ESIF calls that may limit synergies between ESIF and H2020 were identified. Also, before 2015 there were no direct national instruments facilitating synergies between Horizon 2020 and SF. The interviewed experts noted, that since Lithuanians are not very active or successful at the FP7 calls, there is lack of pressure from the interest groups on the policy makers, and so there is no strong impulse to create mechanisms facilitating synergies.

The interviewees themselves thought that there was no negative impact of the competition between the SF and FP7, because FP7 attracts the highest level research groups who deem it prestigious to take part in FP7/Horizon2020. However, there is potential negative effect of the overall lack of human resources in the PROs and the high administrative load SF/ESIF have created (especially when constructing new R&D infrastructures and procuring equipment), which may be underestimated by the interviewees.

Factors enhancing the synergies between ESIF and BP7/Horizon2020

2007-2013 period

Despite the strong opinion at the Ministry of Economy that facilitation of synergies should be avoided in order not to facilitate double funding, there were some positive, although not very effective, examples in 2010-2014. The **specific rules of measure "Intellect LT"** (LVPA, 2010), which provides direct funding for business R&D (grants), provide that:

- The applicants could apply with partners (companies or research institutions) registered in Lithuania or *abroad.* In practise Lithuanian institutions do not apply with partners from abroad. However, during the project participants collaborated with companies from abroad (e.g. by buying expertise from them). Hence, this could contribute to enhanced international networking and trust and indirectly lead to further international collaboration.
- Business *trips abroad* were among the eligible costs.
- Among the key quality evaluation criteria there was a criterion "*Experience of collaborating* with research institutions and *at international level (implemented Framework or Eureka projects over the last 3 years)".* The author counted 16 Lithuanian companies who have benefited from both the Framework Programmes, and Intellect LT. Given that Intellect LT supported 260 companies, it shows that only a

very small number of current R&I private performers are interested in the EU"s international programmes.

The **Lithuanian Research Council,** while providing grants for public sector R&D (measures "Global Grant" and "Projects of research groups") in 2010-2014, applied those rules (LMT, 2010b):

- Among the key quality evaluation criteria was "Importance of project results, their dissemination and *project internationalisation*".
- *Trips abroad* were among the eligible costs.

Finally, the Ministry of Education and Science in cooperation with Ministry of Economy, MITA, ESFA and LVPA, implemented a **joint projects funding scheme called "The Egg"** in 2012-2014. In this scheme the idea was to fund joint high quality public R&D projects having a business partner. In this case, LVPA funded the business part of the project from the measure Intellect LT (the 2013 call). The public R&D part of the project was funded using the State planning method. The call for preliminary applications of research organisations was launched in 2012. MITA evaluated the applications and invited 30 selected institutions to submit full applications. These 30 selected projects got support up to €1.2m from the measure **„Promotion of high level international research"** (ESFA) in 2013. The latter measure applied those rules (ŠMM, 2012):

- One of the two aims of this measure was to carry out high international quality R&D projects *with the use of international industry companies and (or) international research institutions*. Each project had to contribute to this aim to be eligible for funding.
- Among the quality criteria were those:
  - The applicant and/or partner has previous collaboration experience with international research centres or international companies or international universities and PROs regarding delivering high international quality research (up to 20 points).
  - Experience of implemented Framework, COST or Eureka projects (up to 10 points).
  - High impact of intended project results on the applicant/partner R&D competitiveness (public private partnership, visibility at international level, attraction of researchers from abroad) (up to 5 points.
  - The project implements mobility visits to international research centres/companies/PROs to work on joint international level R&D projects (up to 5 points).

As an example, Kaunas Technology University's Institute of Materials Science participated in the measure „Promotion of high level international research". The institute benefited from the project "Fundamental investigation of surface relief and molecular forces influence on the self-organization of nanoparticles and nanofibers" (€423,600). According to the beneficiary, this project helped the Institute to build research capacity and find solid international partners, which resulted in a twinning proposal for Horizon 2020 ("Boosting the scientific excellence and innovation capacity in novel Functional Nano composites of Kaunas University of Technology and its Twinning partners") and other international projects outside the EU (e.g. with the National Institute for Materials Science of Japan).

Other indirect upstream and downstream synergies were identified:

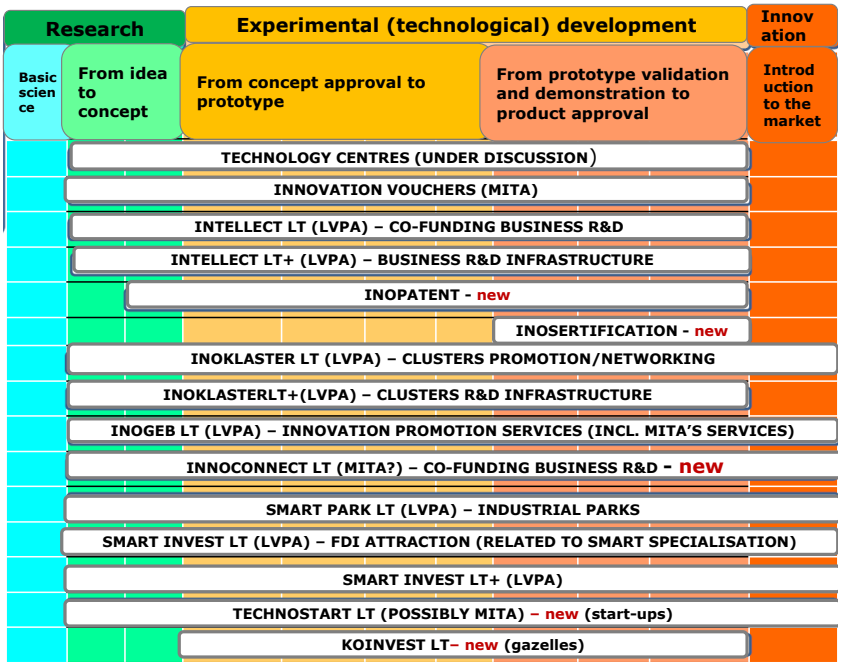
- PROs acquired new R&D infrastructure from the measure „Strengthening of the General Science and Studies infrastructure" (€307m) which allowed them to pursue new lines of research and join international level consortia and opportunities that were not possible before. For example, K. Baršauskas Ultrasound Research Institute of Kaunas University of Technology purchased new equipment (ultrasonic microscope, immersion ultrasound stands, x-ray micro-tomography equipment) under the financing of EU SF project "Creation of national open access R&D centre in Kaunas University of Technology". This new infrastructure enabled K. Baršauskas Ultrasound Research Institute to successfully participate and implement a number of FP7 projects (e.g. "SprinkTest", "CreepTest", "SAFEJOINT" etc.).
- EU SF("New Opportunities" measure) funded export promotion of the products created as a result of FP7-funded R&D projects (introduction to the market). For example, JSC "Vittamed" coordinated two FP7 projects "Brainsafe" and "Brainsafe II". A new, non-invasive absolute intracranial pressure (aICP) measurement device was developed during the "Brainsafe" project. During "Brainsafe II" the device was upgraded and final product created, ready to be introduced to the market. The EU SF measure "New Opportunities" was used for this purpose. The project "JSC "Vittamed" export development and promotion in foreign markets" were used to present the new neurodiagnostics technologies to the world market, find new business contacts and start product export.

Plans for 2015-2020

What regards business R&I projects, there is no debate nor specific plans on fostering synergies between ESIF and Horizon 2020 in the new 2015-2020 period. However, there was a discussion that the newly developed **pre-commercial procurement (PCP) measure "Smart procurement"** could be linked to Horizon 2020. Consortia of public procurers working together on joint PCPs can receive 70% worth co-financing from EC under Horizon 2020. Lithuanian authorities are creating legal framework for PCP and are aware of the opportunity to receive co-financing under Horizon 2020. The final decisions on the measure (and its funding sources) have not been made by the time this Report was prepared.

A new measure **"InnoConnect LT"** (€1.5m, see Figure 5 below) will tackle the problem of weak involvement in international clusters and other networks. Up to €2900 can be provided for participating in the initiatives facilitated by the Enterprise Europe Network.

Figure 5. ESIF measures for business R&I, 2015-2020



Source: Ministry of Economy, December 2014

The Ministry of Education and Science has increased attention to international level R&D and internationalisation in the new 2014-2020 OP:

- **Creation of excellence centres** (about €27m will be allocated for excellence centres and parallel laboratories). This measure aims to create internationally competitive R&D centres having high quality competence and critical mass of R&D infrastructure and researchers and engaged in structural partnerships with leading foreign R&D centres. It is discussed that this measure would provide co-financing to Lithuanian applications selected by the Horizon 2020 action "Teaming". Preliminary, two Lithuanian applications have been submitted.
- **Parallel funding for Horizon widening participation schemes.** ŠMM is following the EC recommendations to link ESIF with Horizon 2020 and is planning to co-finance the Lithuanian participants in Horizon 2020 measures as "Twinning".
- **Creation of parallel laboratories** (about €27m will be allocated for excellence centres and parallel laboratories). The aim is to create physical and virtual infrastructure required for structured partnerships with leading research centres abroad. Parallel laboratories would allow the partners to use each other's infrastructure, and thus lead to joint R&D projects.
- **Creation of European RIs and integration into ESFRI/ERIC** (about €27m)**.** Creation of the European RIs would be implemented according to the Roadmap of the national RIs (2011). Funding will be allocated for integration into ESFRI and meeting the necessary requirements.
- Finally, ŠMM plans for continuation of **„joint research projects" („The Egg" scheme)** and funding has been allocated for it (preliminary, about €72m). The final decision on the implementation scheme has not been reached by the time when this Report was submitted (June 2015).

There is also a discussion regarding allocation of ESIF funding (from the measures administered by LMT) to the Horizon 2020 projects that receive high evaluation score but are not selected. No decision has been reached by the time when this report was prepared.

8. TAKE-UP OF PUBLIC SECTOR RESEARCH RESULTS

Given the historical separation of science and industry and the prevailing differences in culture, a lack of productive collaboration between the industry and public research sectors is one of the most challenging issues in the Lithuania's innovation system. In spite of the current policy effort to strengthen science-industry links, deficiencies are present on both sides – poor commercialisation endeavour and a lack of commercially-valuable results in the academy, on the one hand, and low ability to look outside the short term company's horizon, to identify and exploit external knowledge, on the business side. Information asymmetry, lack of motivation from both sides and sometimes too rigid setting of public policies only reinforce the weaknesses mentioned above. Few EU SF funded instruments attempted to address this challenge and faced mixed success, due to both lack of well-thought design and the lack of more substantial efforts.

Better cooperation between public research and private enterprises as seen as a key focus to promote knowledge transfer. The instrument "Integrated science, studies and business centres – valleys" worth around €400m was introduced for fostering open innovation and transfer of knowledge between public research and private enterprises. Under this instrument 21 open access centres (R&D laboratories, which should provide R&D services for business and other interested applicants for a particular price) have been constructed in the "valleys". So far, only two Technology Transfer Offices started operation in Kaunas Technology University and Vilnius Gediminas Technical University. Despite the huge investments the involvement of the private enterprises in these projects have been limited. All the investments allowed public research institutions to modernise infrastructure rather than foster collaboration between public research and private enterprises. The new Operational Programme plans to finance operation of new technology transfer offices in other universities as well.

Measures supporting R&D cooperation between public/academic/not-for-profit sector research institutions and enterprises (High technology development programme 2011–2013, the Industrial biotechnology development programme 2011–2013) were implemented. Also there were measures supporting investments in innovative clusters development (Inocluster LT, Inocluster LT+, Inogeb LT-3). However direct financial support for collaboration of science and business in joint R&D projects and cluster development projects was relatively low, compared to other policy instruments (Paliokaitė, 2015).

Evidence of poor Lithuanian knowledge transfer and open innovation performance is presented in Table 7. In the majority of measures presented in the table the experimental research activities are implemented. The results of projects are prototype and just in a rare cases a product ready to be installed to the market. It is unclear whether created prototypes are tested, upgraded and introduced to the market after the projects are finished.

Table 7. Project results 2007-2013.

		ATPP 2011-2013	PBPP 2011-2013	FP7 2007-2013	Eureka	Eurostars	Total
EC contribution to Lithuania participants, in €m		3,40	0,80	8,69	14,01	0,89	27,79
Number of projects		21	6	12 (7 finished)	33 (27 finished)	6 (4 finished)	78 (65 finished)
Product development cycle	Results	ATPP 2011-2013	PBPP 2011-2013	FP7 2007-2013	Eureka	Eurostars	Total
Research	Patent applications	7	3	N/A	N/A	N/A	10
Experimental development	New products, services or prototypes	85	9	5	N/A	-	99
	New products, services or prototypes tested.	-	-	1	N/A	-	1
Innovation	New products, services or prototypes created and introduced to the market	-	-	-	N/A	4	4

Source: MITA, 2014, EC, 2014.

Notes: a) ATPP – High technology development programme, PBPP - industrial biotechnology development programme. b) Only high technology and knowledge intensive services sectors are presented in the table. Also only projects coordinated by Lithuanian participants are included into FP7 projects analysis. c) FP7 and Eurostars projects results were summed up using projects final and interim reports. Not all the relevant information may be provided in these reports (e.g. registered patents). d) FP7 and Eurostars projects results were summed up by authors while ATPP and PBPP projects results were summed up by MITA. As a result, the results between these programmes should be compared with caution.

In Lithuania, often the experimental development (especially at the 6-9 technology readiness levels[6], i.e. prototype testing and pilot manufacturing) is the missing link. Companies lack related financial and technological services. About 30% of surveyed manufacturing companies (Visionary Analytics, 2014) lack prototype testing and pilot manufacturing services. The EU SF implementing agencies, especially during the first calls for tenders, hired scientists from the academia to evaluate the applications, and these evaluators were looking for "hard" R&D (i.e. the first stages of research and development in the innovation cycle, focusing on the Frascati manual). However, at the current stage of development, there is a great need also for rapid experimentation and prototyping (later stages of technology development). So far there have not been close to market policy instruments in Lithuania. Some new measures fostering close to market operations will implemented during the 2014-2020 ESIF period (see figure above, Innosertification, also Intellect LT now includes prototyping and pilot manufacturing activities).

One of the most successful instrument fostering cooperation between public research institutions and enterprises is **Ino-vouchers LT**. The pilot innovation vouchers scheme was launched in 2010 and after the confirmed success was upgraded to the Ino-vouchers LT scheme in 2012 (the annual budget is €1.65m). The voucher enables an SME to buy R&D expertise or knowledge from a research or higher education institution. Supported activities: industrial or applied research; technological development (experimental or development, design and technological works); technical feasibility studies. 1026 ino-vouchers (€4m) were funded over 2010-2014 from both ERDF and national sources. As an instrument facilitating first science-business collaboration contacts innovation vouchers were not expected to achieve a significant effect on R&D and innovation. However its effect on facilitating the networks and collaboration culture could not be underestimated. Many interviewed beneficiaries as well as respondents of beneficiary surveys (Visionary Analytics, 2014) highlight high satisfaction and perceived usefulness of this instrument even despite its small value. Apparently, the innovation vouchers instrument, intended as a "candy" for otherwise unsuccessful university-industry collaboration has been very successful due to these conditions:

- An easy and "no stress" administration - no restrictions, no administrative load, fast evaluation according to "first come – first serve" principle, which is very different from the SMEs' experience with any other SF-funded instrument. The mode of delivery based on a fixed sum principle, standardized activities and outputs, also creates less administrative cost for the implementing agency, and thus could be mainstreamed for other easy-to-standardize incentives in the next period.
- Meets the high demand for quick experimentation / rapid prototyping / incremental innovations which is not otherwise supported.

However, the experience of working with the university researchers has not been always smooth, there has been a lot of disappointment and misunderstandings. Overall, according to the interviewees and available studies (e.g. Visionary Analytics, 2014), bbusiness and public research sectors collaboration will not work effectively unless the current researchers' career system and public R&D institutional funding mechanism are changed. The current system does not encourage public sector researchers to focus on commercialising R&D results or providing R&D services for business.

Despite above described measures, the current policy mix did not have an expected impact on the collaboration between the science and business sectors. A few explanations of poor current policy mix performance is outlined in Lithuanian R&I Country Report: lack of a proper legal base for the successful commercialisation of scientific projects, information asymmetry, low quality of scientific research, and – especially - the insufficient in-house capabilities and the passive and bureaucratic stance adopted by universities as well as a lack of a collaboration projects pipeline.

Another reason for the low science-business collaboration is fragmented innovation and knowledge transfer policy. Different strategies (and their institutional "owners") focus on separate elements (Paliokaitė, 2015). For example the "clusters" approach fostered by the Ministry of Economy has not been coordinated with the "valleys" approach encouraged by the Ministry of Education and Science. As a result, firstly, there is a huge fragmentation - 45 business clusters in a country as small as Lithuania (most comprised by less than 10 companies). Secondly science valleys are mainly university projects without the considerable involvement of enterprises.

Finally, universities, research institutes and their researchers still lack motivation to commercialize research and work with industry. The lack of motivation is a result of career system in universities and a huge teaching workload of the researchers. The career system in universities supports indicators such as teaching hours,

[6] Some sources: http://en.wikipedia.org/wiki/Technology_readiness_level; http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf

academic papers and similar and does not support knowledge transfer to industry. Ministry of Education and Science tried to solve these problems with the results-based university funding model (more value is attributed to R&D contracts with industry) and the Recommendations on the intellectual property management in universities. However, studies (Technopolis Group and Ernst & Young, 2014; Paliokaitė et al, 2015) reveal that the current measures are not effective enough.

9. COUNTRY TAILORED POLICY SUGGESTIONS

To sum up, there is a number of factors limiting Lithuania's participation in the FP7/Horizon 2020 projects and the synergies between the EU SF and national policy instruments and Horizon 2020 as well as other international programmes. The remaining challenges and related policy suggestions are discussed below.

General policy suggestions

1. Lack of coordination leads to huge fragmentation of instruments, programmes, institutions and infrastructures. A key challenge is thus **to reduce fragmentation and improve policy capacities:**
   - Ensure better links between the fragmented policy routes, by reducing duplications and ensuring synergies. An example: in the previous programming period, a cluster, a science park and an open access centre all operating in the same R&D sector (say, food industry) would compete for SF funding for delivering similar innovation promotion and technology transfer services. To ensure synergies, the State should review the currently existing structures, for example, some clusters can become part of the existing science and technology parks (STPs). In some cases, science parks could lead the activities of clusters. The strongest organization can become a project leader of "joint project" or "joint initiative". Another example – ensuring links between the development of R&D programmes, higher education programmes and R&D infrastructure using SF/ESIF funding.
   - Coordinating agency (e.g. MITA) with good programme management capacities and links to thematic teams in all other agencies. Improve existing framework (Strategic Council and MITA need to be strengthened) and policy intelligence.
   - Attention and resources granted to effective programme management, with a focus on simplification, abandoning the risk-averse and process-oriented approach, strengthening the implementation capacity in the agencies.
2. The existing target group in Lithuania for the excellence-based competitive R&D measures is rather limited – consisting mainly of the limited number of top-tier research groups and few knowledge-based (spin-off) companies. Raising the allocations for direct R&D measures without simultaneously dealing with the pipeline creation through capacity building might result in problems with absorption of available funding. Policy mix thus lacked focus on the pro-active incentives to encourage companies, entrepreneurs to become involved in the discovery of opportunities for diversification and innovation. In the new 2015-2020 period **the policy spotlight has to move from "hard" infrastructure development to absorptive capacity strengthening and acceleration of new ideas pipeline through the innovation support services**, such as:
   - Mechanisms (e.g. vouchers) to boost experiments and discoveries while encouraging connections among economic agents;
   - 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,
   - Innovation scouting / 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).
   - Lack of skilled specialists is an emerging challenge for innovation development in SMEs which needs to be addressed.
   - Policy mix has to acknowledge the different maturity of existing and potential innovators: need for diversified and tailor-made instruments.
   - Furthermore, at the lowest level of the „competence stairway" 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, given that the market is strongest force for innovation facilitation.
3. In spite of the current policy effort to strengthen take up of public sector R&D results, deficiencies are present on both sides – poor commercialisation endeavour and a lack of commercially-valuable results in the academy, on the one hand, and low ability to look outside the short term company's horizon, to identify and exploit external knowledge, on the business side. Information asymmetry, lack of motivation from both sides and sometimes too rigid setting of public policies only reinforce the **weaknesses in creating strong science-industry partnerships and facilitating science entrepreneurship**:

- Effects are limited due to overall non-systemic governance, characterised by limited synergies, networks, clusters and associations; for example, failure to re-align the science „valleys" and industry clusters; as a result Lithuania has 45 clusters, 21 „open access centres", 10 science and technology parks, etc. In a country with extremely low social capital, even the emergence of many small clusters as "closed clubs" can be viewed as a first step towards more effective collaboration. The task for the second step is to strengthen the clusters and create incentives for merging them or "killing" the unproductive ones. Connect the current public R&D infrastructure into a single R&D services network (in the open access centres, clusters, etc.).
- Innovation voucher is considered an effective and highly demanded instrument considering the current stage of Lithuanian SMEs (demand for rapid experimentation and prototyping) and could be mainstreamed as a mode of delivery in the next period.
- In order to achieve economies of scale by using funding of various state institutions, it is advisable to focus on larger rather than small-scale projects and the combined use of policy instruments, especially when it comes to public private cooperation concerning mature private innovators. These larger projects usually involve several stakeholders, do not rely on a single source of funding, and have large budgets, longer period of implementation and a few groups of beneficiaries.

Specific policy suggestions

1. There is **a need for better streamlined targets, policies, incentives for internationalisation, for example:**
   - None of S3 priorities should include purely national agendas.
   - Limit the RI infrastructure investments to those consortia who are able to demonstrate strong industry commitment and international collaboration dimension (incl. linking with EU RIs and BSR clusters) integrated into their research strategies.
   - Implementation of the „parallel labs" instruments and ESFRI-related measures.
   - Capacity building of the policy makers and staff of various ESIF agencies that are not aware on the possibilities/needs of creating the synergies between ESIF and Horizon 2020, remain reluctant and view the synergies as a risk for "duplication of funding".
   - Creating an EU level benchmark on Horizon2020 and the synergies, or a similar EU level benchmark, as an additional trigger.
2. **Lack of motivation and skills at the individual level (researchers)**. The career system of Lithuanian researchers does not support orientation towards results or international projects (researchers are mostly evaluated for papers and teaching hours). Also, most scientists have too much administrative work and high teaching loads:
   - Promoting science entrepreneurship, e.g. researchers' contracts should be adjusted to provide time to work with the business community and Horizon 2020.
   - A similar change should occur at institutional level (incl. IPR policies).
3. **Weak links with European networks**. Lithuania is a small country and its companies are not well-known in Europe. This reason creates a difficulty to find a consortium partners. Most of the already formed European consortia are not willing to open up to new partners:
   - To reinforce existing science-industry partnerships and their linkages with EU counterparts establishing framework for wider national participation in new types of EU level RTD collaboration.
   - Extend and strengthen measures like InnoConnect to fund various networks, and continue funding researchers' mobility.
4. **Horizon 2020 projects are less attractive for private enterprises** because they are perceived as very risky (low success rate), having high administrative load and being far away from the market:
   - Strengthen national framework for proactive position of Lithuanian entities in project preparatory activities through dedicated project assistance and partner search grant scheme available for both public and private R&D (currently financial assistance is mainly available for PROs only).
   - Different routes in providing ESIF funding for business R&D:
     - Strengthen capacity building and fund many smaller R&D projects of „potential" and „new" innovators

- Less but large scale projects of mature innovators linked to „joint initiatives“, also simultaneous funding for selected Horizon 2020 projects, also providing ESIF funding for the nearly selected projects (not just PROs, but all types of applicants).

- At the EU level the administration rules of Horizon 2020 needs to be reviewed (e.g. the rule on calculating hourly rates according to usual accounting practice based on actual personnel costs (see Chapter 4) reduces the motivation to participate in those countries where salaries are lower).
- Better awareness raising and visibility of good practices (related to SMEs' projects leading to commercialisation of products) is advised to overcome a dominant perception that "evaluation of FP7/Horizon 2020 projects take very long and projects themselves take much longer than it would take if a company implements an internal project".

Abbreviations

ATPP	High technology development programme
BONUS	Joint Baltic Sea Research and Development Programme
BSR	Baltic Sea Region
CP	Cohesion Policy
CPVA	Central Project Management Agency
EC	European Commission
ESFRI	European Strategy Forum for Research Infrastructures
ERIC	European Research Infrastructure Consortium
ESIF	European Structural and Investment Funds
ERDF	European Regional Development Fund
ESFA	European Social Fund Agency
ETC	European Territorial Cooperation, formerly the INTERREG Community Initiative
EU	European Union
EUSBSR	European Union Strategy for Baltic Sea Region
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP6	6TH Framework Programme
FP7	7th Framework Programme
GDP	Gross Domestic Product
HEI	Higher education institutions
ICP	Intracranial Pressure
ICT	Information and Communication Technologies
IPR	Intellectual Property Rights
IPTS	Institute for Prospective Technological Studies
JSC	Joint Stock Company
KET	Key Enabling Technology
LVPA	Lithuanian Business Support Agency
LIC	Lithuanian Innovation Centre
LRS	Seimas of the Republic of Lithuania
LMT	Lithuanian Research Council
MITA	Agency for Innovation, Technology and Science
MOSTA	Research and higher education monitoring and analysis centre
MS	Member State
NCP	National Contact Points
OP	Operational Programme
PBPP	Industrial biotechnology development programme
PCP	Pre-commercial procurement
PRO	Public Research Organisations
R&D	Research and development

RI	Research infrastructures
R&I	Research and innovation
RTD	Research and Technological Development
SCM	Social sciences and humanities
SF	Structural Funds
SFMIS	Structural Funds Management Information System
SME	Small and Medium Sized Enterprise
S&T	Science and Technology
ŠMM	Ministry of Education and Science
ŪM	Ministry of Economy
Valley	Integrated centre of studies, science and business
VAT	Value added tax
VC	Venture Capital

ANNEX 1. LIST OF INTERVIEWS

No.	Interviewees	Date of interview	Place
1.	Dr. Linas Eriksonas, manager of the Plastics cluster, FP7/Horizon 2020 consultant	23-01-2015	Vilnius
2.	Dr. Arūnas Beržinskas, Head of international programmes department, MITA	13-02-2015	Vilnius
3.	Prof. dr. Gintaras Valušis, director, Center for Physical Sciences and Technology	19-02-2015	Vilnius
4.	Dr. Rolandas Urbonas, deputy director, Lithuanian Energy Institute	23-02-2015	Vilnius
5.	Edvardas Satkauskas, Lithuania Office director, JSC "Vittammed"	23-02-2015	Vilnius
6.	Assoc. Prof. Leonas Balaševičius, director, Kaunas University of Technology, Department Of Research Affairs	25-02-2015	Vilnius
7.	Dr. Renaldas Raišutis, Principal Researcher, Kaunas University of Technology prof. K. Barsauskas Ultrasound Research Institute	28-02-2015	Vilnius
8.	Rokas Bagdzevičius, project coordinator, JSC "Light Conversion"	27-02-2015	Vilnius
9.	Dr. Aistė Vilkanauskytė, Head of LMT International Programmes Unit	17-03-2015	Vilnius
10.	Ramunė Rudokienė, Head of ŠMM Science Division.	17-03-2015	Vilnius
11.	Ignas Paukštys, Deputy Director, Project Management Department LVPA	17-03-2015	Vilnius
12.	Prof. habil. dr. Sigitas Tamulevičius, Director of the Institute of Materials Science, Kaunas University of Technology	10-04-2015	Vilnius

ANNEX 2. REFERENCES

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ANNEX 3. ESIF FUNDING FOR R&I RELATED MEASURES

Table 3.1. ESIF funds, 2007-2015

Category	Measure name	Funding, €m	Amount paid, €m	No. funded projects	Success rate*
Research funding (PROs)	Support of scientists and researchers mobility and students scientific work	€36.7m	€33.7m	11	100%
R&D infrastructure	Improvement of the Qualifications and Competencies of Scientists and Researchers (scientific databases, e-documents)	€21.2m	€19.9m	6	100%
	Development of the High Level Research Centres and Competence Centres	€8.6m	€8.6m	5	100%
	Creation of National Open Source Scientific Communication Centre	€29m	€29m	1	100%
	Creation of Infrastructure, aimed at the Improvement and Dissemination of Knowledge about R&D, Technologies and Innovation	€1.1m	€1.1m	1	100%
Research funding (PROs)	Promotion of high quality international research	€13.8m	€12.9m	30	100%
Research funding (PROs)	Implementation of national research programs and other research and technological development projects	€7.2m	€5.2m	13	93%
R&D infrastructure	Strengthening of the General Science and Studies infrastructure	€307m	€232.6 m	33	92%
Research funding (PROs)	Implementation of R&D activities under national complex programme thematic topics	€10.2m	€9.2m	19	76%
Innovation promotion services	Inogeb LT-2	€35.1m	€20.9m	10	71%
Knowledge transfer, networks	Strengthening of R&D thematic networks and associations	€10m	€9.1m	41	67%
Innovation promotion services	Inogeb LT-3	€9.3m	€4.7m	4	67%
Knowledge transfer, networks	Ino-vouchers LT	€3.5m	€2.3m	815	58%
Researchers placements	State Support for Employment of skilled personnel in companies	€0.94m	€0.7m	4	57%
Innovation promotion services	Inogeb LT-1	€6.4m	€6.2m	14	52%
Direct funding for business R&D	Intellect LT	€60.3m	€42.5m	261	51%
	Intellect LT +	€69.8m	€46.8m	132	42%
	Idea LT	€4.3m	€3.8m	178	37%
Knowledge transfer, networks	Inocluster LT	€3.6m	€2.2m	19	35%
	Inocluster LT+	€18.9m	€9.7m	13	30%
Research funding (PROs)	Support to the scientific work of scientists and other researchers (Global Grant)	€33.2m	€29.2m	106	30%
Technology upgrading	Leader LT	€97m	€92m	91	25%

Source: Lithuania EU Structural assistance webpage http://www.esparama.lt/patvirtintos-priemones

NB: Marked in grey are the measures potentially facing problems with absorption.

* The term „success rate" shows share of applications which were successful (received ESIF funding). Low(er) success rates point to high(er) demand for ESIF instruments, and vice versa.

Table 3.2. ESIF funds transferred to the beneficiaries in 2013 (annual funding figures)

Classification	Measures	€m	%
R&I FUNDING Target group – business companies. Managing agencies: LVPA, MITA			
Innovation-friendly environment	• Innovation support services and investments into institutional/absorptive capacity (Inogeb LT 1-3), • Assistant-2 (construction of technology and art incubators)	14.08	7.70%
Knowledge transfer and cluster cooperation	• Inocluster LT/ LT+, R&D thematic networks and associations • Innovation vouchers.	5.92	3.24%
R&D in firms	• Idea LT, Intellect LT, LT+	15.21	8.31%
INDIRECT INNOVATION FUNDING Target group – business companies. Managing agencies: LVPA, INVEGA			
Creation and growth of enterprises	• Leader LT (production technology acquisition/upgrade in firms); • Process LT (organisational innovations); • Invest LT; Invest LT+, Invest LT-2, Assistant-3 (FDI attraction measures and development of industrial parks); • Controlling fund, Compensation of SMEs" credit interests, and Guarantees fund.	54.70	29.9%
RESEARCH FUNDING Target group – HEIs and PROs and their researchers. Managing agencies: LMT, CPVA, ESFA, MITA			
R&D Infrastructure	• Economy Growth OP, Priority 1, investments into the development and upgrade of research infrastructures in the science, studies and business „valleys"	50.63	27.68%
Human Resources for research	• „Global grant", research mobility and other measures under the HR Development OP, Priority 3, including the funding for R&D governance and policy analysis, thematic networks etc.	42.40	23.07%
	Total	~€182.94	100%

Source: based on Paliokaitė (2015), www.esparama.lt

ANNEX 4. DATA ON LITHUANIAN PARTICIPATION IN FP7/HORIZON 2020

According to European Commission data, by October, 2014, the number of Lithuanian applicants for FP7 reached 2058 (MITA, 2015). 419 Lithuanian participants have signed 320 projects with a success rate of 20% (EU28 average – 21.8%). These projects received 55.11 m euro contribution from EU. 28 projects were coordinated by Lithuanian participants. Comparing to FP6 Lithuanian applicants" activity has increased but the success rate decreased. During FP6 1335 Lithuanian applicants signed 354 projects (success rate 22.2%). Also Lithuanian participants in FP7 received more funding from EC and coordinated more projects than in FP6 (see Table 4.1). While comparing FP6 and FP7 results it should be noted that the structure of framework programmes and their goals differ. For example, FP6 included special instruments aiming at involvement and better integration of the new EU Member States. Under FP7 Lithuania competes equally with other EU countries.

The majority of Lithuanian participants in FP7 project are public R&D institutions. 88 SMEs are participating in FP7 projects with their contribution from EU of €17.56 m (32% of all EU contribution for Lithuanian participants). Among all organisations, SMEs are second to universities by their share of received EU funds. SMEs activity has increased significantly comparing to FP6. In FP6 31 SMEs projects received €3.15 m (11.7% of total EU contribution for Lithuanian participants).

The top foreign collaborative links of Lithuanian participants has not changed and is the same both in FP6 and FP7. It is United Kingdom, Germany, Italy, France and Spain.

Table 4.1. Comparison of FP7 and FP6.

	FP7	FP6
Number of participants	419	354
Number of applications	2058	1335
Applications success rate	20%	22.2%
Number of projects	320	275
Total EU contribution, € m	55.11	26.9
EU contribution per participant, € thousand	131.5	76
Number of coordinated projects	28	21
EU contribution in coordinated projects, € m	55.11	6,9
SME participants, % of total EU contribution	32%	11.7%
Top collaborative links	1. UK - United Kingdom (539) 2. DE - Germany (511) 3. IT - Italy (419) 4. FR - France (386) 5. ES - Spain (364	1. UK 2. Germany 3.Italy 4.France 5.Spain

Source: European Commission, 2014 and MITA, 2015.

Overall, compared to other EU countries Lithuania participation in FP7 looks weak. Lithuania is 24th by number of participants who signed contracts and 26th by budget share of EC contribution. Compared with the Baltic States Lithuania outscores Latvia by intensity of finance and participants activity but not in the indicator of success rate. However Lithuania is behind Estonia for all indicators.

Table 4.2. Lithuania"s, Latvia"s and Estonia"s performance in FP7

Country	LT	LV	EE
Number of participants	419	326	540
Applications success rate	20%	21.6%	20.6%
Total EU contribution, € m	55.11	48.19	88.64
EU contribution per project participant, thousand €	131.5	147.8	164,1
Total number of SME participants, total EC financial contribution € million	88 SMEs receiving €17.56m	45 SMEs receiving € 5,32 m	179 SMEs receiving € 27,90 m

Source: EC data, July, 2014.

While analysing fields where Lithuanian participants are most successful ICT, energy, health, Nanotechnologies, Materials and new Production Technologies and food and biotechnology (see figure 3 and 4). It is expected that these themes will have a highest potential and perspective in Horizon 2020 programme.

Figure 4.1. Number of Lithuanian participants in FP7 projects by thematic fields

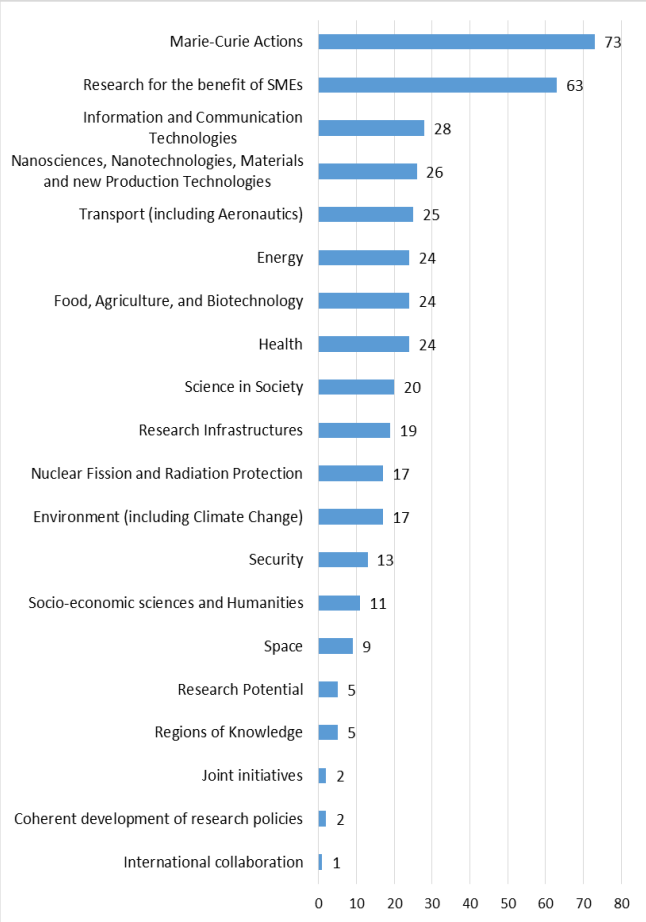
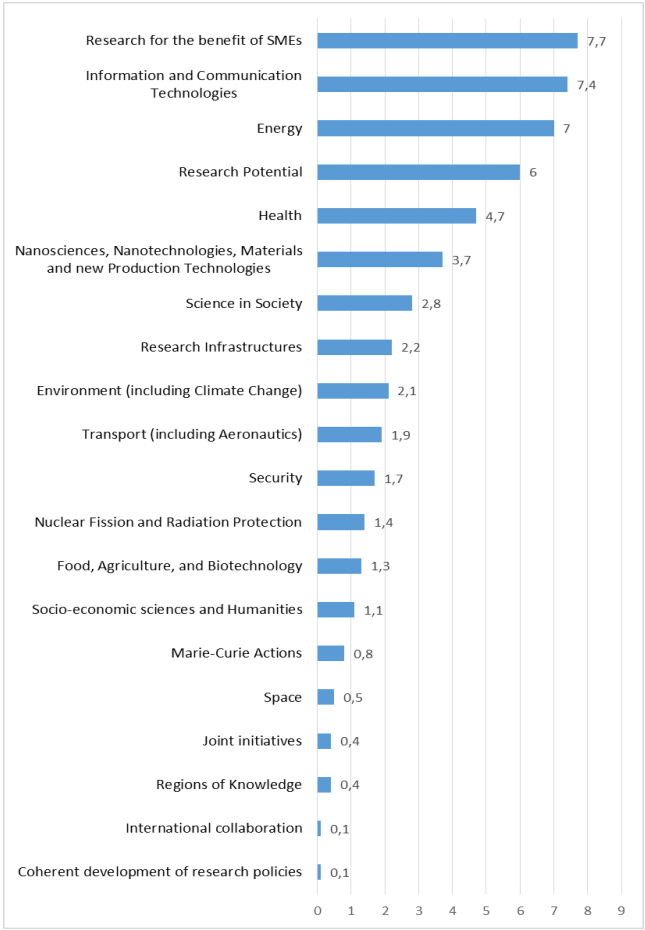


Figure 4.2. EC contribution to Lithuanian participants in FP7 projects by thematic fields



Source: MITA data October, 2013.

Lithuania Smart Specialisation strategy priorities almost match Horizon 2020 challenges (see table 4.3). Smart specialisation strategy could enable more strategic use of Horizon 2020 opportunities to support Lithuanian key economic priorities, by improving the engagement and supporting key sectors of economy and research fields.

Table 4.3. Lithuania"s smart specialisation priorities and societal challenges addressed by Horizon 2020

Horizon 2020 priorities	LT smart specialisation priorities
Health, demographic change and wellbeing	Priority area „Health technologies and biotechnology": • Molecular technologies for medicine and biopharmacy. • Intelligent applied technologies for personal and public health. • Advanced medical engineering for early diagnostics and treatment.
Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy	Priority area „Agroinnovation and food technologies": • Safer food. • Functional food. • Innovative development, improvement and processing of bioresources (biorefinery).
Secure, clean and efficient energy	Priority area „Energy and sustainable environment": • Smart systems for generators, grids and users energy efficiency, diagnosis, monitoring, accounting and management. • Energy and fuel production from biomass or waste, storage and disposal of waste.

Horizon 2020 priorities	LT smart specialisation priorities
	• Solar energy equipment and their use for power, heat and cool production.
Smart, green and integrated transport	Priority area „Transport, logistics and ICT“: • Intelligent transport systems and ICT. • Models/technologies for management of the international transport corridors and integration of different types of transport.
Climate action, environment, resource efficiency and raw materials	Priority area „Energy and sustainable environment“: • Smart low energy buildings development and maintenance technology – digital construction.
Europe in a changing world - inclusive, innovative and reflective societies	Priority area „Inclusive and creative society“: • Modern learning technologies and processes. • Technologies and processes for breakthrough innovations.
Secure societies - protecting freedom and security of Europe and its citizens	-
	Priority area „New processes, materials and technologies for industry“: • Photonic and laser technologies. • Functional materials and coatings. • Construction and composite materials. • Flexible technological systems for product design and manufacturing. Priority area „Transport, logistics and ICT“: • Technologies for developing advanced e-content and information interoperability. • Solutions and services for ICT infrastructure and cloud computing.

Source: Paliokaitė (2015).

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