

REGIONAL ACTION PLANS FOR THE EXPANSION OF NUCLEI APPROACH AS S3 DRIVING FORCE

Deliverable DT4.2.1

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Introduction

The present document contains the collection of the Regional Action Plans for the expansion of the NUCLEI approach as S3 & ESIF driving force developed by the NUCLEI partners in the final part of the project and discussed with the regional stakeholders involved in the development and management of the Innovation Smart Specialization Strategies in their respective areas.

The Regional Action Plans have been drafted out according to a common format agreed at project level, starting with the analysis of the critical success factors that affect the Smart Specialization Strategy goals in each partner area. This analysis has been carried out using the Business Scorecard model described in Deliverable DT2.3.3 and conceived to assess the project impact on innovation policies at regional/national level, focusing in particular on the potential contribution to the Smart Specialization Strategies(S3) goals.

According to this model the policy mix for innovation in advanced manufacturing and processing sectors has been analyzed from 4 perspectives:

1. Financial perspective
2. Beneficiaries and key stakeholders perspective
3. Internal processes perspective
4. Learning and growth perspective

using Key Performance Indicators (KPIs), defined to measure and monitor the impacts from different point of views. Moreover some points of attention have been highlighted to stimulate reflection on further key issues and complete the analysis with relevant content/ qualitative considerations.

Each Action Plan has been completed with the definition of a list of potential measures and recommendations shared with S3 managers aimed at improving the regional innovation policies, taking into consideration the lesson learnt with the NUCLEI project and putting emphasis on the role of Open innovation approaches.

The final version of the Regional Action Plans took into consideration the input collected during the business continuity and collaborative workshops arranged by the partners in their regional contexts as described at Deliverable DT4.2.2.



DT4.2.1_REGIONAL ACTION PLAN EMILIA-ROMAGNA (IT)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
Emilia- Romagna

Responsible partner: ART-ER



Introduction to the Regional S3 scenario for Advanced Mechanics and processes in Emilia-Romagna

The smart specialization strategy, envisaged by the community regulations for the 2014-2020 programming period, allows the Region to direct and concentrate investments in research and innovation, enhancing the strengths of the regional system and promoting its qualification and diversification. This strategy, for Emilia-Romagna, starts from the need to strengthen the production system in a competitive manner, identifying paths of technological, organizational and immaterial innovation.

The first goal, therefore, is to build a region that is even more dynamic, competitive and capable of generating employment growth, improving the efficiency of the ecosystem through the greater focus on the Smart Specialization Strategy. The second goal is to promote the evolution of the production system towards a greater capacity to manage the intangible part of the value chain: from research, to the interpretation of new needs and new approaches to the market and the involvement of stakeholders, to the development of a new generation of services.

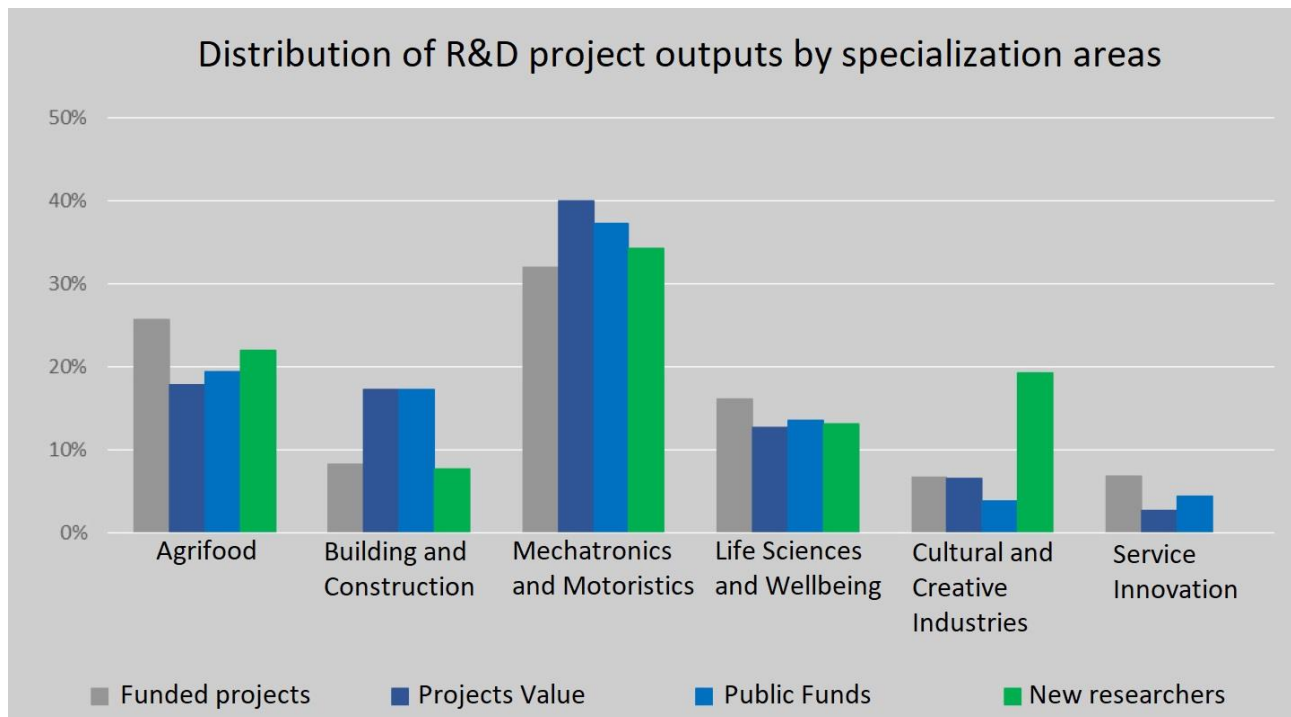
In Emilia-Romagna the regional S3 envisages five specialization areas:

- Agrifood;
- Building and Construction;
- Mechatronics and Motoristics;
- Life Sciences and Wellbeing;
- Cultural and Creative Industries,

as well as Service Innovation as a cross-cutting priority.

In the first years of the present programming period all the identified areas contributed to the implementation of the strategy, using the resources of the various programs available in an intelligent way, albeit with different intensity.

Considering the research and development projects, which are at the heart of the S3, the picture of the specialization areas, in terms of projects outputs, is shown in the following graph. Mechatronics and Motoristics is very active in terms of R&D projects, representing 32% of the total in terms of number of projects and about 40% in terms of financial resources allocated, registering also a great employment intensity with a relevant share of new researchers.



The regional industry infrastructure is funded on Mechatronics and Motoristics, which is actually one of the major drivers of the overall regional economy. This is of course relevant for NUCLEI-objectives and for understanding the figures and considerations presented in this report.

The mechanical area, highly competitive and articulated in multiple sectors and sub-sectors, entails the presence of "leaders" of global importance and of many extremely small and medium enterprises specialized in their respective market niches. In this context Emilia-Romagna can count on important companies with export quotas over 80% of the production, making the mechanical sector the 55.8% of the entire regional export.

Overall, the regional system of mechanics entails over 350,000 employees in the manufacturing industry and services connected and spread throughout the territory, with strategic poles by number of employees in Modena, Reggio Emilia and Bologna.

The main areas of specialization are:

- Automotive, motorcycles, industrial vehicles, nautical and aeronautics, earth-moving tools for agriculture, hydraulic;
- Packaging machines, machine tools, machinery for food industry, ceramics, construction and wood processing;
- Industrial and precision mechanics;
- Automation and controls;
- Components, systems and materials for the different specialization areas;
- Alternative energy production.

These specialization areas correspond to 7 Value Chains of the Mechatronics and Motoristic area that will drive the evolution of the technological trajectories identified in the S3 and



supported in the present programming period (2014-2020). Such Value chains forms also the backbone of the regional CLUST-ER MECH, that support the regional government in the definition of the innovation agenda; they are defined as follows:

- DaAMa - Digital and Advanced Manufacturing
- A&RER - Automation & Robotics
- MoVES - Efficient, sustainable, intelligent engines and vehicles
- MAMM-ER - Advanced Materials for Engines and Mechatronics
- FLY.ER - Avionics and Aerospace
- NAUTICAL - Nautical
- FP - FluidPower.

With reference to the more extensive Thematic Orientations, initially defined along the S3 evolution, it should be emphasized that

- the first three Value Chains (DaAMa, A & RER, MoVES) highlight strong and distributed synergies with the first two thematic orientations (*Integrated, user centered solutions; Smart, adaptive, safe solutions*);
- the remaining four Value Chains (MAMM-ER, FLY.ER, Nautical, FP), more vertical and specialized, show strong correlations in particular with the "*Ecological Solutions*" Thematic Orientation and in some case with the "*Smart, adaptive, safe solutions*".



1. Analysis of S3 performances using BSC model

1.1. Regional policy actions considered in the BSC analysis

In order to understand how the strategy adopted by the Region influenced the actual uptake of innovation and R&D, different actions have been taken into account over a span time of about 4 years (2015-2018). In particular the analysis was focused on those actions supporting innovation in the Emilia-Romagna and dedicated to companies (mainly SMEs and including start-ups) and laboratories of industrial research. These actions are part of the Emilia-Romagna Regional Operational Programme (ERDF- ROP), the planning document that defines the strategy and operations of use of Community funds allocated to the Region by the European Regional Development Fund, in the framework of the cohesion policy, in furtherance of the economic growth and attractiveness of the regional territory.

In particular the specific actions that have been taken into consideration and monitored over time are the following:

- **Action 1.1.1 “Support to research projects carried out by enterprises through recruitment of technical - scientific researchers” and Action 1.1.4 ‘Support to collaborative R&D projects for the development of new sustainable technologies, new products and services”** These Actions were addressed to regional enterprises (both large companies and SMEs), including consortia and networked companies. They were aimed at sustaining and strengthening the R&D enterprise units supporting the employment of new highly qualified personnel and at increasing the collaboration with the Research system, starting from the Emilia-Romagna High Technology Network. **One call was launched in 2015**
- **Action 1.1.2 ‘SMEs projects of innovation and diversification of products or services”** This action aims at supporting SMEs wishing to develop projects for innovative products or services. Two calls have been launched in **2016 and 2017**
- **Action 1.2.2 ‘Support to the realization of complex R&D projects on relevant priority topics and the application of technological solutions necessary to accomplish the S3 strategy’.** The action aims at supporting partnership of Laboratories of the High Technology Network at developing strategic R&D and innovation projects, involving also industrial stakeholders. Two calls have been launched in **2015 and 2018.**
- **Action 1.4.1 ““Support to the creation and consolidation of high-tech innovative start-ups and initiatives of research spin-offs in RIS3areas”** Three calls for proposals have been launched in **(2016, 2017 and 2018)** supporting knowledge intensive start-ups in the early stage of their existence in the economic valorization of research results, exploiting dominant trends and generating jobs opportunities.



1.2. Financial Perspective

For every Action the financial perspective was investigated analyzing the total public funds allocated and their evolution over time. In particular the analysis has been carried out focusing on effective use of resources, taking into consideration the following indicators:

- the volume of generated activities, measured in terms of number of project proposals presented and the number of funded projects;
- the same economic metrics (project cost and funds provided) has been also reported outlining the distribution among the specific thematic areas;
- the compliance of the funds originally allocated with respect to the actual demand (overall amount of public funds requested).

Action 1.2.2		
Year	2015	2018
Public funds originally allocated	37.129.507,53 €	30.000.000,00 €
Public funds finally distributed (TOT all platforms)	48.287.091,06 €	34.647.804,43 €
% of Public funds distributed	130%	115%
Overall Value of the proposals presented	168.207.499,84 €	113.289.215,12 €
Overall amount of public funds requested	118.806.555,88 €	78.718.188,81 €
N. projects overall (across themes) presented	145	105
N. projects overall (across themes) funded	59	46

Action 1.2.2			
Year	2015	2018	
Mechatronic and Transport System			
Project Value x Thematic Area (approved project)	<i>Ecological solutions</i>	8.949.222,05 €	11.309.378,04 €
	<i>Integrated, user centered solutions</i>	4.416.228,19 €	1.117.338,75 €
	<i>Smart, adaptive, safe solutions</i>	4.744.014,35 €	3.597.856,25 €
	<i>TOT</i>	18.109.464,59 €	16.024.573,04 €
Funds provided x Thematic Area	<i>Ecological solutions</i>	6.325.011,83 €	7.919.704,81 €
	<i>Integrated, user centered solutions</i>	2.683.917,99 €	799.962,00 €
	<i>Smart, adaptive, safe solutions</i>	3.370.815,66 €	2.314.914,69 €
	<i>TOT</i>	12.379.745,48 €	11.034.581,50 €

Action 1.1.2		
Year	2016	2017
Public funds originally allocated	8.000.000,00 €	2.424.465,65 €
Public funds finally distributed (TOT all platforms)	3.647.792,50 €	2.473.213,00 €
% of Public funds distributed	46%	102%
Overall Value of the proposals presented	17.104.361,00 €	8.898.691,00 €
Overall amount of public funds requested	8.258.172,75 €	4.449.345,50 €
N. projects overall (across themes) presented	175	152
N. projects overall (across themes) funded	175	152



Action 1.1.2			
Year		2016	2017
Mechatronic and Transport System			
Project Value x Thematic Area (approved project)	<i>Ecological solutions</i>	1.065.800,00 €	1.006.968,00 €
	<i>Integrated, user centered solutions</i>	401.500,00 €	536.250,00 €
	<i>Smart, adaptive, safe solutions</i>	1.067.280,00 €	886.728,00 €
	<i>TOT</i>	2.534.580,00 €	2.429.946,00 €
Funds provided x Thematic Area	<i>Ecological solutions</i>	519.460,00 €	503.484,00 €
	<i>Integrated, user centered solutions</i>	188.175,00 €	268.125,00 €
	<i>Smart, adaptive, safe solutions</i>	515.090,00 €	443.364,00 €
	<i>TOT</i>	1.222.725,00 €	1.214.973,00 €

Action 1.1.1	
Year	2015
Public funds originally allocated	31.673.484,14 €
Public funds finally distributed (TOT all platforms)	38.412.823,44 €
% of Public funds distributed	121%
Overall Value of the proposals presented	243.710.572,22 €
Overall amount of public funds requested	95.022.097,00 €
N. projects overall (across themes) presented	
N. projects overall (across themes) funded	316

Action 1.1.1		
Year		2015
Mechatronic and Transport System		
Project Value x Thematic Area (approved project)	<i>Ecological solutions</i>	25.216.941,22 €
	<i>Integrated, user centered solutions</i>	13.065.270,93 €
	<i>Smart, adaptive, safe solutions</i>	16.081.669,48 €
	<i>TOT</i>	54.363.881,63 €
Funds provided x Thematic Area	<i>Ecological solutions</i>	9.703.555,19 €
	<i>Integrated, user centered solutions</i>	5.125.785,12 €
	<i>Smart, adaptive, safe solutions</i>	6.684.352,31 €
	<i>TOT</i>	21.513.692,62 €

Action 1.4.1			
Year	2016	2017	2018
Public funds originally allocated	6.028.065,00 €	4.500.000,00 €	2.315.987,31 €
Public funds finally distributed (TOT all platforms)	5.417.768,17 €	3.495.440,16 €	1.047.718,52 €
% of Public funds distributed	90%	78%	45%
Overall Value of the proposals presented	All eligible ones were funded (many projects submitted - >500 - were not eligible). So the funds required by the companies (as co-financing)		
Overall amount of public funds requested	correspond to the funds actually spent		
N. projects overall (across themes) presented			
N. projects overall (across themes) funded	54	40	9



Action 1.4.1				
Year		2016	2017	2018
Mechatronic and Transport System				
Project Value x Thematic Area (approved project)	<i>Ecological solutions</i>	834.627,71 €	- €	- €
	<i>Integrated, user centered solutions</i>	786.880,00 €	- €	- €
	<i>Smart, adaptive, safe solutions</i>	1.397.760,00 €	- €	- €
	<i>TOT</i>	3.019.267,71 €	741.747,61 €	314.393,00 €
Funds provided x Thematic Area	<i>Ecological solutions</i>	511.550,00 €	- €	- €
	<i>Integrated, user centered solutions</i>	506.266,00 €	- €	- €
	<i>Smart, adaptive, safe solutions</i>	937.450,00 €	- €	- €
	<i>TOT</i>	1.955.266,00 €	447.248,36 €	200.000,00 €

To analyze the data from the financial perspective we need to separately focus on the 4 actions considered. 2 of them (1.2.2 and 1.1.1), indeed, are mainly related to the activity of laboratories while the others are more related to the industry area.

What is clearly visible in 1.2.2 and 1.1.1 is that the funds requested from the laboratories (to cover the projects costs) exceeded the public funds initially allocated by the Region. For this reason in both the actions the public funds finally spent have been increased with respect to the initial funds at disposition, in order to increase the number of project funded, but, anyway, keeping most of them not funded.

In these 2 cases the thematic area (relevant for NUCLEI-objectives) most attractive for the public funds, is definitely the „*Ecological Solutions*“, while the other 2 („*Integrated, user centered solutions*“ and „*Smart, adaptive, safe solutions*“) are basically equally funded.

Quite different is the situation related to the other 2 Actions (1.4.1 and 1.1.2) more related to enterprises and Start-ups. In this case the number of projects presented is eventually enormous (>500 for the action 1.4.1) but in many cases the projects were not eligible and eventually the public funds originally allocated were sufficient to cover the cost of the whole number of eligible projects.

In these 2 cases the Thematic Areas are more equally distributed in terms of use of funding, with a slight predominance of „*Smart, adaptive, safe solutions*“.

From this substantial difference, could be inferred that, while RTOs could be more oriented to innovative solution less market driven (like „*ecological solutions*“ that could eventually be farer from the market), the enterprises, and in particular SMEs, are mostly market driven and strongly settled in the „*Smart, adaptive, safe solutions*“, which is a Thematic Orientation more oriented to new ideas, more applicative, and end-user driven.

An important consideration is related to the large number of non eligible proposals presented by the Start-ups. This shows a real need for start-up to be supported in the design, elaboration and writing phase of the proposals. Such issue should be taken into consideration in future innovation policies.



1.3. BENEFICIARIES & STAKEHOLDERS PERSPECTIVE -

For every action, the analysis has been carried out from the beneficiaries perspective, being the metrics related to the customers / users value. In particular the focus was put on customers / users value, taking into consideration the following indicators:

- Nr. of projects financed for each most relevant action
- Nr. of enterprises/laboratories financed for each most relevant action
- Average project budget % covered by enterprises/laboratories (if relevant distinguishing per different actions)
- Nr. of SMEs involved
- Nr. of start-ups involved
- Nr. of industrial research laboratories involved

Action 1.2.2			
Year		2015	2018
Mechatronic and Transport System			
Nr. of projects financed x Thematic Area	<i>Ecological solutions</i>	7	10
	<i>Integrated, user centered solutions</i>	3	1
	<i>Smart, adaptive, safe solutions</i>	4	3
	<i>TOT</i>	14	14
Nr. of laboratories financed x Thematic Area	<i>Ecological solutions</i>	27	46
	<i>Integrated, user centered solutions</i>	11	3
	<i>Smart, adaptive, safe solutions</i>	15	12
	<i>TOT</i>	53	61
Average project budget % covered by laboratories	<i>Ecological solutions</i>	29%	30%
	<i>Integrated, user centered solutions</i>	39%	28%
	<i>Smart, adaptive, safe solutions</i>	29%	36%
	<i>TOT</i>	32%	31%
Nr. of enterprises involved	<i>Ecological solutions</i>	32	46
	<i>Integrated, user centered solutions</i>	12	6
	<i>Smart, adaptive, safe solutions</i>	15	9
	<i>TOT</i>	59	61
Nr. of start-ups involved	<i>Ecological solutions</i>	0	0
	<i>Integrated, user centered solutions</i>	0	0
	<i>Smart, adaptive, safe solutions</i>	0	0
	<i>TOT</i>	0	0
Nr. of industrial research laboratories involved	<i>Ecological solutions</i>	0	0
	<i>Integrated, user centered solutions</i>	0	0
	<i>Smart, adaptive, safe solutions</i>	0	0
	<i>TOT</i>	0	0



Action 1.1.2			
Year		2016	2017
Mechatronic and Transport System			
Nr. of projects financed x Thematic Area	<i>Ecological solutions</i>	11	17
	<i>Integrated, user centered solutions</i>	4	10
	<i>Smart, adaptive, safe solutions</i>	13	14
	<i>TOT</i>	28	41
Nr. of enterprises financed x Thematic Area	<i>Ecological solutions</i>	11	17
	<i>Integrated, user centered solutions</i>	4	10
	<i>Smart, adaptive, safe solutions</i>	13	14
	<i>TOT</i>	28	41
Average project budget % covered by enterprises	<i>Ecological solutions</i>	51%	50%
	<i>Integrated, user centered solutions</i>	53%	50%
	<i>Smart, adaptive, safe solutions</i>	52%	50%
	<i>TOT</i>	52%	50%
Nr. of enterprises involved	<i>Ecological solutions</i>	5	0
	<i>Integrated, user centered solutions</i>	5	0
	<i>Smart, adaptive, safe solutions</i>	10	0
	<i>TOT</i>	20	0
Nr. of start-ups involved	<i>Ecological solutions</i>	0	0
	<i>Integrated, user centered solutions</i>	0	0
	<i>Smart, adaptive, safe solutions</i>	0	0
	<i>TOT</i>	0	0
Nr. of industrial research laboratories involved	<i>Ecological solutions</i>	20	16
	<i>Integrated, user centered solutions</i>	12	10
	<i>Smart, adaptive, safe solutions</i>	24	14
	<i>TOT</i>	56	40



		Action 1.1.1	
Year		2015	
Mechatronic and Transport System			
Nr. of projects financed x Thematic Area		<i>Ecological solutions</i>	32
		<i>Integrated, user centered solutions</i>	18
		<i>Smart, adaptive, safe solutions</i>	24
		<i>TOT</i>	74
Nr. of enterprises financed x Thematic Area		<i>Ecological solutions</i>	36
		<i>Integrated, user centered solutions</i>	18
		<i>Smart, adaptive, safe solutions</i>	24
		<i>TOT</i>	78
Average project budget % covered by enterprises		<i>Ecological solutions</i>	62%
		<i>Integrated, user centered solutions</i>	61%
		<i>Smart, adaptive, safe solutions</i>	58%
		<i>TOT</i>	60%
Nr. of enterprises involved		<i>Ecological solutions</i>	54
		<i>Integrated, user centered solutions</i>	29
		<i>Smart, adaptive, safe solutions</i>	32
		<i>TOT</i>	115
Nr. of start-ups involved		<i>Ecological solutions</i>	0
		<i>Integrated, user centered solutions</i>	0
		<i>Smart, adaptive, safe solutions</i>	0
		<i>TOT</i>	0
Nr. of industrial research laboratories involved		<i>Ecological solutions</i>	57
		<i>Integrated, user centered solutions</i>	41
		<i>Smart, adaptive, safe solutions</i>	34
		<i>TOT</i>	132



		Action 1.4.1		
Year		2016	2017	2018
Mechatronic and Transport System				
Nr. of projects financed x Thematic Area	<i>Ecological solutions</i>	4	0	0
	<i>Integrated, user centered solutions</i>	5	0	0
	<i>Smart, adaptive, safe solutions</i>	7	0	0
	<i>TOT</i>	16	6	2
Nr. of enterprises financed x Thematic Area	<i>Ecological solutions</i>	4	0	0
	<i>Integrated, user centered solutions</i>	5	0	0
	<i>Smart, adaptive, safe solutions</i>	7	0	0
	<i>TOT</i>	16	6	2
Average project budget % covered by enterprises	<i>Ecological solutions</i>	39%	0%	0%
	<i>Integrated, user centered solutions</i>	36%	0%	0%
	<i>Smart, adaptive, safe solutions</i>	33%	0%	0%
	<i>TOT</i>	35%	40%	36%
Nr. of enterprises involved	<i>Ecological solutions</i>	0	0	0
	<i>Integrated, user centered solutions</i>	0	0	0
	<i>Smart, adaptive, safe solutions</i>	0	0	0
	<i>TOT</i>	0	0	0
Nr. of start-ups involved	<i>Ecological solutions</i>	4	0	0
	<i>Integrated, user centered solutions</i>	5	0	0
	<i>Smart, adaptive, safe solutions</i>	7	0	0
	<i>TOT</i>	16	6	2
Nr. of industrial research laboratories involved	<i>Ecological solutions</i>	0	0	0
	<i>Integrated, user centered solutions</i>	0	0	0
	<i>Smart, adaptive, safe solutions</i>	0	0	0
	<i>TOT</i>	0	0	0

It can be highlighted that Actions 1.2.2 and 1.1.1 show a predominance of enterprises interested and committed on the thematic area „*Ecological solutions*“, whose relevance was further increased from first to second call, while actions 1.4.1 and 1.1.2 show to be more equally distributed, with an eventual predominance (but not statistically affordable) of the thematic area „*Smart, adaptive, safe solutions*“.

All the actions (a part from the 1.4.1, strictly related to the Start ups) show a high involvement of the Laboratories, bringing a strong support to the enterprises environment. This involvement is quite constant over time, but obviously also depends on the amount of public funding available every year.



1.4. INTERNAL PROCESSES PERSPECTIVE

For every action, in relation to the internal processes perspective, the metrics considered are related to the efficiency and quality of the Policy Mix. In particular the following indicators have been considered:

- Nr. of new registered patents
- Nr. of new jobs created
- Nr. of collaborations established between research and enterprises

Action 1.2.2			
Year		2015	2018
Mechatronic and Transport System			
Nr. of new registered patents	<i>Ecological solutions</i>	0	/
	<i>Integrated, user centered solutions</i>	0	/
	<i>Smart, adaptive, safe solutions</i>	0	/
	TOT	0	/
Nr. of new jobs created	<i>Ecological solutions</i>	62	/
	<i>Integrated, user centered solutions</i>	30	/
	<i>Smart, adaptive, safe solutions</i>	61	/
	TOT	153	/
Nr. of collaborations established between research and enterprises	<i>Ecological solutions</i>	32	/
	<i>Integrated, user centered solutions</i>	12	/
	<i>Smart, adaptive, safe solutions</i>	15	/
	TOT	59	/

Action 1.1.2			
Year		2016	2017
Mechatronic and Transport System			
Nr. of new registered patents	<i>Ecological solutions</i>	8	13
	<i>Integrated, user centered solutions</i>	4	3
	<i>Smart, adaptive, safe solutions</i>	9	11
	TOT	21	27
Nr. of new jobs created	<i>Ecological solutions</i>	16	/
	<i>Integrated, user centered solutions</i>	2	/
	<i>Smart, adaptive, safe solutions</i>	19	/
	TOT	37	0
Nr. of collaborations established between research and enterprises	<i>Ecological solutions</i>	20	16
	<i>Integrated, user centered solutions</i>	12	10
	<i>Smart, adaptive, safe solutions</i>	24	14
	TOT	56	40



Action 1.1.1		
Year		2015
Mechatronic and Transport System		
Nr. of new registered patents	<i>Ecological solutions</i>	32
	<i>Integrated, user centered solutions</i>	13
	<i>Smart, adaptive, safe solutions</i>	31
	TOT	76
Nr. of new jobs created	<i>Ecological solutions</i>	68
	<i>Integrated, user centered solutions</i>	39
	<i>Smart, adaptive, safe solutions</i>	57
	TOT	164
Nr. of collaborations established between research and enterprises	<i>Ecological solutions</i>	57
	<i>Integrated, user centered solutions</i>	41
	<i>Smart, adaptive, safe solutions</i>	34
	TOT	132

Action 1.4.1				
Year		2016	2017	2018
Mechatronic and Transport System				
Nr. of new registered patents	<i>Ecological solutions</i>	/	/	/
	<i>Integrated, user centered solutions</i>	/	/	/
	<i>Smart, adaptive, safe solutions</i>	/	/	/
	TOT	/	/	/
Nr. of new jobs created	<i>Ecological solutions</i>	7	/	/
	<i>Integrated, user centered solutions</i>	7	/	/
	<i>Smart, adaptive, safe solutions</i>	15	/	/
	TOT	29	/	/
Nr. of collaborations established between research and enterprises	<i>Ecological solutions</i>	/	/	/
	<i>Integrated, user centered solutions</i>	/	/	/
	<i>Smart, adaptive, safe solutions</i>	/	/	/
	TOT	/	/	/

The data show that patent activity in the last years was mainly addressed to ecological solutions and in the area of smart, adaptive and safe solutions.

In these two areas is concentrated also the major number of new jobs created.

The greatest effort in collaborations among enterprises and laboratories can be detected in the area of ecological solution.



1.5. LEARNING & GROWTH PERSPECTIVE

In relation to the learning & growth perspective, the main points of attention have been focused on to the skills and competences and how they have been affected by the regional policies.

- **Analysis of actions to align the competences and skills of operators to the new technological challenges**

Emilia-Romagna Region is strongly involved in aligning the competences and skills of operators to the new technological challenges, supporting several education actions at different levels, starting from the ITS system of post diploma course (where highly technical topics are treated), to specific University course connected with new technological challenges. Examples of these are:

1) MUNER - The Motorvehicle University of Emilia-Romagna, where the most famous automotive companies in the world (Automobili Lamborghini, Dallara, Ducati, Ferrari, HaasF1Team, HPE COXA, Magneti Marelli, Maserati, Pagani, Scuderia Toro Rosso), together with the Universities of the Region, put their know-how and the most innovative technologies at the service of students who want to become the new professionals in the automotive field and are willing to design road and racing vehicles, more sustainable propulsion systems and the subsystems for intelligent functions and production facilities in the pursuit of Industry 4.0.

2) the new Master Degree in Artificial Intelligence and a new Interdepartmental Center for Artificial Intelligence recently launched at the University of Bologna.

The Clust-ER MECH network is also engaged with an official Forum where all the partners of the clusters meet up and discuss about the evolution of the regional strategies, proposing some new pivot of these strategy: in particular to foster and increase the number of industrial PhD schools in the field of Industry 4.0, Circular Economy (with education topics on remanufacturing), new mobility (electrification, connected vehicles, shared mobility, etc), new materials.

The forum pointed out also the necessity to:

- increase funding for promoting seminars and stages dedicated to students and parents from middle and high schools;
- strengthen the process leading to new multidisciplinary technical profiles (in the field of mobility, materials, mechatronics, automotive, nautical, etc.);
- stress the importance of acquiring proper skills to work with international groups;
- foster international mobility.

- **Policies supporting the creation of new clusters, technology platforms or networks fostering open innovation**

The Emilia-Romagna Region began to design and develop a regional system for industrial research and technology transfer starting from 2002, involving universities and research institutes, in order to strengthen the collaboration between the research and the production system, through the technology transfer achievements.

The Region supported to the creation of a network of accredited industrial research laboratories and innovation centers called the High Technology Network (HTN) with permanent laboratories and facilities, pooling high level competences, coordinated by ASTER, the regional innovation consortium.

The HTN Network was developed through the integration of regional funding of the Regional Program for Industrial Research and Technology Transfer (Priitt) and the European Regional Development Fund (ERDF).

Between 2010 and 2014 a further network of technology platforms distributed along the region has been established. Such network is composed by 10 infrastructures, called TECHNOPOLES, spread throughout the region, hosting and organizing activities and services for industrial research, experimental development and technology transfer.



The Technopoles Network

In parallel to the establishment of the Technopoles network the regional S3 approach has been developed in years 2013-2014 and later on further implemented.

The last relevant action was put in place in the last 2 years (2017-2018) supporting the creation of Clust-ER Associations, which are communities of public and private bodies that share ideas, skills, tools, and resources to support the competitiveness of the most important production systems in Emilia-Romagna. It is a competitiveness that no longer relies on the ability of individual research centres or businesses to operate on the global market, but increasingly on the ability of the entire local system to be innovative and attractive.



In these Clust-ERs, research laboratories and centres for innovation belonging to the High Technology Network team up with the business system and the higher education system to make up the inter-disciplinary critical mass necessary to multiply opportunities and develop strategic projects with a high regional impact.

With Clust-ER Associations, the regional industrial research and innovation system aims to achieve greater integration and to better place itself on the international stage to:

- maximise the opportunities for participating in European programmes and international research and innovation networks;
- forge synergies and set up coordinated and stable networks and connections with other public/private agglomerations operating in the same sectors at national and European level;
- encourage and support the development and creation of initiatives in higher education and the development of human resources;
- support and encourage the development of new research infrastructure in the general interest of the Emilia-Romagna region.

These clusters, once established and actively working, back-influenced the S3 strategy of the Region, proposing further evolutions and updates of this strategy, with the general aim of improving system competitiveness and impact. This follow up bias coming from the Clust-ER stem from official forums where all the members of the clusters meet up and discuss about the evolution of the regional strategies.

The Mechatronics and motors area has its own cluster (Clust-ER MECH) that fosters the collaboration among companies, research centers and universities of the region, influencing with feedback and follow up the innovative strategies of the region.

- **Policies supporting the build-up of new infrastructure for research and innovation**

As mentioned in the previous paragraph, in the last years the regional policies brought to the establishment of 10 Technopoles, located in 20 different locations throughout the regional territory. These are brand new structures dedicated to innovation, R&D and Technology transfer supporting the connection of the industrial businesses with the most advanced research results. This is the main network of infrastructure established from the region and which is still under development, increasing the number of tools at the Technopoles and also increasing the number of infrastructures (the second Technopole in Bologna will be completed in 2020).

- **Regulation scenario**

All the S3 thematic areas active in the Region have a dynamic regulation scenario that needs to be always updated. Among them the application in the Health area (Bio-med, Regenerative Medicine, Pharma, etc.) is strongly affected by regulation and there are



laboratories and enterprises strongly involved on these topics, under the backing of the regional policies.

Also in this area of interest the Clust-ER MECH provided some new feedback after their official forums, for example showing that also industries that deal with ecological issues need to be compliant with the regulatory scenario. In particular in the field of mechatronics, oleodynamics and fluidpower the need for updated regulation is very strong, additional regulations to control the reduction of the environmental impact of the agricultural and industrial vehicles and to facilitate the coordination with the initiatives related to the development of the hybrid and electrical mobility.

The new Initiatives (legislative, regulatory, etc.) can also help to overcome the resistance to change of companies and end users. For example, Germany first imposed the use in agriculture of biodegradable fluids to protect the environment in the event of accidental spills.

Finally also in the field of new and connected mobility the regulation scenario is complex and prone to variation. In this area, indeed, is essential that any action must be in line with the national and regional digital agenda and with national policies relating to digital infrastructures for transport and industrial development, in order to guarantee harmonious technological and regulatory development.



2. Conclusion and recommendations for policy makers

The Emilia-Romagna Region adopted its own S3 strategy including Mechatronics and Motor as specialization area, with the aim of enhancing and empowering a sector of excellence not only at regional, but also at international level, trying to represent the multiple sub-sectors, characterized by players of global significance and by the presence of many small and medium highly specialized companies, leaders in their respective market niches. The Regional Clust-ER MECH is born with the specific mission to support this ecosystem in following and further implementing the regional S3 strategy.

In this framework 7 value chains has been defined, as reported in the Intro of this report, with specific main strategic objectives that represent the routes with the greatest potential for innovation, with a view to the future development of the regional ecosystem. The NUCLEI partners from Emilia-Romagna worked in strict collaboration with Clust-ER MECH, contributing to the definition of these strategic objectives, taking into consideration also the experience gained with the Nuclei project implementation. As a result here are the main indications to be addressed to S3 managers for the next programming period, whose overall objectives should be:

- Overall evolution of the Mechatronics and Motoristics system, making it more integrated and user-centered; smart, adaptive and secure, having in sustainability a key driver in each context;
- Promote process innovation (more industrialization of processes, more collaboration and networking between the actors involved, adoption of tools for interoperability of information flows);
- Promote the evolution of products through the study of new materials and innovative design methods;
- Develop products and processes characterized by efficient human-machine interfaces and advanced smart maintenance methods;
- Promote product and process innovation, in the direction of larger economic and environmental sustainability of the entire production cycle.

In this perspective the Region has developed also a Plan for Advanced Competences that integrates resources of the European Structural and Investment Funds (ESF, ERDF and EAFRD) together with priorities, objectives, procedures and implementation schedules within a highly integrated and dynamic regional innovation ecosystem (Universities, R&D Centres, Firms, etc.). It is a new generation of policies for integrated development under the framework of the so-called “Regional Pact for Employment”, with activities such as:

- specialized higher education courses;
- research grants linked with regional S3 domains;
- PhD scholarships on key sectors for Horizon 2020 Programme and regional vocational sectors;
- courses for supporting business start-ups;



- Vouchers for attending masters on business innovation and internationalization;
- Traineeships for supporting technological transfer in local businesses.

This vision and the future steps foreseen at regional level together with the BSC analysis of the main policy actions undertaken over the last years, matched with the results of the Nuclei project, show that some tools adopted and implemented within Nuclei deserve to be disseminated and promoted at regional level and to be supported by regional policies.

Actually, the regional approach already entail this orientation and ambition, but instruments like those tested along Nuclei could represent a further step forward to real open innovation. In particular, we would like to mention:

- Transnational working tables
- Transnational open seminars
- Technological tours
- Open Innovation weeks
- Makeathons and hackathons
- Seasonal schools
- Exchanges of experts and / or students

These activities have shown to be very useful in terms of new technology results sharing, according to the Open Innovation paradigm and must be encouraged to be more and more integrated within the regional policies.

The final assessment of the NUCLEI results carried out in the last part of the project proved that transnational cooperation provides added value to the evolution of European manufacturing companies within advanced competitive value chains, nevertheless the new innovation services successfully tested during the project pilot actions are difficult to be effectively organized without availability of public financial contribution.

In particular we would like to propose a couple of potential policy measures to be adopted in Emilia-Romagna to support in the future the most promising transnational initiatives implemented by NUCLEI:

- support to the future organization of interregional working tables among companies of different countries focused on common cross cutting innovation issues, for example sustaining feasibility studies of collaborative projects;
- support to the organization on Open Innovation weeks, to be implemented yearly at regional level, involving the local innovation ecosystem, but including the presence of foreign speakers and trainers in the framework of open seminars or technology showcase, facilitating the participation of European pools of excellence.



DT4.2.1_REGIONAL ACTION PLAN UPPER AUSTRIA (AT)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
Upper Austria

Responsible partner: BIZ-UP



INTRODUCTION

Upper Austria's S3-strategies are summarized in the Strategic Program "Innovative Upper Austria 2020".

Strategic programmes are a proven means of effectively supporting the sustainability of Upper Austria, increasing the value created in the region and ensuring social security. Following three strategic programmes for Upper Austria in the period from 1998 to 2013, a new strategic economic and research programme „Innovative Upper Austria 2020“ has been formulated for the years 2014 to 2020 on behalf of the Upper Austrian Ministries of Economics and Research. This programme follows the modern approach in technology policy of consistent vertical orientation along the education-research-economy innovation chain within defined fields of activity. Four fully formulated core strategies (Location Development, Industrial Market Leadership, Internationalization and Future Technologies) form the basis of the programme.

The relevant details about the smart specialization strategic areas that impact on advanced manufacturing and processing industries are described in the field of activity "Industrial Production Processes":

The key to securing the region's current international position and high earnings lies primarily in the continuous further development of regional production. Overall economic productivity can be increased through technological and organizational improvements in industrial manufacturing processes. In particular, offering industrial services along with products and process technology should be given special attention.

The field of activity "Industrial Production Processes" is clearly represented by strong and dynamic companies, and is therefore especially favourable for the pursuit of a "front-runner strategy".

Almost without exception, the industry sectors relevant to this focal point achieve foreign trade surpluses and, through their production and research orientation, a majority also demonstrate regional specialization as well as a head start in growth compared to the rest of Austrian industry. Some key fields such as mechatronics, process automation, materials and ICT were already identified as clear focal points in the previous Strategic Programme. The challenge now is to combine these sectoral strengths and to develop excellence and critical mass. Supporting and building up research is of special significance in order to launch a greater number of radical innovations.



STRATEGIC OBJECTIVES (relevant for NUCLEI-objectives)

- 1a In 2020, Upper Austria is to be a leading European industrial region, withstanding the pressure of globalization through competitive products and services.
- 1b Technological leadership and systematic increases in productivity and flexibility in the area of industrial production processes and procedures are critically important. In this way, innovative, sustainable production methods will be implemented to facilitate the greatest possible energy and resource efficiency (circular economy/material flows).
- 1c A high degree of wealth creation and thus employment will be secured through technically advanced, adaptive, high-quality production processes.

Topics / Measures

- Manufacturing region 2050 - Industry 4.0 for Upper Austria
- Positioning of Upper Austria as a leading industrial region in the European Economic and Research Area (EU Strategy 2014 to 2020)

RESEARCH POLICY OBJECTIVES (relevant for NUCLEI-objectives)

- 3a Research and production are interrelated. By 2020, Upper Austria will have further developed research across the board in sectors relevant to production and related Key Enabling Technologies (ICT, materials, mechatronics, etc.).
- 3b Upper Austrian research capabilities will have been enhanced to form an internationally visible “Production of the Future” research and transfer network.
- 3c The Upper Austria of 2020 will be a leading region for “interdisciplinary manufacturing research”, with successful participation in national and European research programmes and initiatives relating to the field of production processes.

Topics / Measures

The central research topics in the “Industrial Production Processes” field of activity are information and communication technologies (ICT), materials and lightweight construction, process and product development. Within the scope of these research areas, the following topics and measures have been defined as focal points:

- Mathematical modeling
- Software
- Security of production processes, networks and data
- Hardware
- Surfaces
- Manufacturing processes
- Material and component testing
- Material development
- Process technologies
- Process engineering and optimization
- Energy and resource efficiency



ECONOMIC POLICY OBJECTIVES (relevant for NUCLEI-objectives)

- 4a In 2020, Upper Austria will enjoy attractive conditions for manufacturing companies and will actively support the further development of existing companies and the attraction of new firms through a range of initiatives.
- 4b A balanced ratio of research headquarters, SMEs in specific niches, and leading companies that create an above-average percentage of jobs and contribute significantly to economic and research performance, will secure essential long-term stability.
- 4c Industrial services will be part of the further development of production technologies and will make a major contribution to increased competitiveness.
- 4d Risk capital and professional support will be available for start-ups and spin-offs and will aid their sustained development.
- 4e Industrial value chains will have been strengthened through the regional and international production networks of local companies. The further development of cluster initiatives will strengthen Upper Austria's international positioning as a production region.
- 4f By 2020, Upper Austria will be attractive to international specialists and talent, top managers and distinguished research groups.

Topics / Measures

- Qualitative improvement of the region as a place for industry, as well as marketing of the business region, in particular the central Linz/Wels/Steyr zone
- Increase in innovation competence and the internationalization of companies, especially SMEs
- Establishment of research and transfer platforms, knowledge databases - open innovation and enhanced absorptive capacity
- Support for leading companies and headquarters, as well as SMEs in specific niches with high growth potential, through specific offers in cooperation with innovation system partners
- Preparation of a regional services strategy and programme in coordination with national programmes and initiatives
- Support for company founders and young entrepreneurs
- Further development, joining and alignment of activities in clusters relevant to the objectives in the field of activity
- Recruitment, mentoring, integration and social support of top international personnel

The programme Innovative Upper Austria is corresponding to the NUCLEI project, because in particular, mechatronics, ICT and advanced materials represent key enabling technologies for the Upper Austrian economy and are thus of special importance in all of the defined fields of activity. In recent years, significant research capacity has been created in these areas. The task in future is to strengthen and expand these competences, and to ensure their interdisciplinary connection.

Cross-sectional topics related to these Key Enabling Technologies such as process simulation, data analysis, ICT security, control and sensor technology and lightweight construction are to be found in all of the defined fields of activity.



Right now Upper Austria is working on a new S3-programme. Principle questions there are whether the logic of such programme should follow a framework for funding and legitimization for funded projects or it should follow a strategic scope of action with a clear focus. Nevertheless principles for the new programme are the adaptation and prolonging of „Chain of Innovation“ (Research - Economy - Science, existing core competences, key enabling technologies and interdisciplinary topics are a generally given scope of action, Integration of Open Innovation approach as well as a stronger „Top-Down-Approach“ and focus on few strategic topics and action fields which are important to the development of the region e.g. human resources.

Due in part to the ongoing coordination of the results of the evaluations of the NUCLEI project, one focus of the new programme will be "Digital Transformation in Production". This will reflect findings from NUCLEI. The new programme is to be completed in 2020.



ANALYSIS OF THE UPPER AUSTRIAN S3-PROGRAMME WITH THE BALANCED-SCORCARD-MODEL

The stakeholder coordinators focused on initiating and supporting numerous important projects for Upper Austria as a research and business location, and successfully transferring them to operational processing or completing them.

Overall goal was and still is to support all players of the business location Upper Austria in improving the industrial leadership with following key-strategies:

- Sustainable jobs can only be created if knowledge is transformed into marketable products and services. Research and development in Upper Austria should therefore primarily be promoted in those areas in which there are also fields of strength of Upper Austrian companies.
- Knowledge-based business models and the manufacturing sector with a high export orientation are of particular importance for Upper Austria. In order to be competitive in the long term, Upper Austria must therefore invest in the development of efficient, adaptive production systems of the future in conjunction with new knowledge-based services.
- The global social challenges form the framework for the identification of niches in which long-term topics and technological leadership are to be strived for.
- Crucial for the achievement of competitive advantages is the speed of diffusion of new technologies into the application of new processes and products. Measures to accelerate this diffusion must therefore be adapted to the latest developments. The entire innovation chain must be given priority. Proven approaches include innovative models of technology transfer, the further development of clusters and intelligent project and structural funding. New approaches to solving the major social challenges within the framework of Open Innovation and the increasing importance of the creative communities must be developed.
- The prerequisites must be created to identify global future trends and take them into account at an early stage with new technologies and strategies.
- In addition, the general awareness of the importance of research and development in society must be strengthened by sustainably improving the image of technicians and researchers and thus counteracting skepticism about technology. The spirit of entrepreneurship and research should already be encouraged in secondary and tertiary education.

Concrete examples of projects/activities/actions in the context of NUCLEI-objectives in 2017 as well as Advanced Manufacturing were/are:



Digitisation

- Implementation of the Digitalization Lead Initiative: Goal: Make Upper Austria's economy fit for the digital future; 13 million euros budget in 2017 for the entire Digitization Lead Initiative
- Regional call digitization is completed; also call for tenders Digital Starter and qualification network Digital skills
- Research focus 'Artificial Intelligence' at JKU around Prof. Hochreiter (parallel AI strategy RISC with Burton Lee)
- Capacity building on the subject of IT security at JKU, FH-OÖ and IT clusters (establishment of Information Security Network, joint FE concept RIFAIS FH and JKU)
- Support offensive for broadband expansion at Upper Austrian schools
- Kick-off for the "Year of Digital Education" in the school year 17/18

Industrial production processes

- Construction of LIT Factory at JKU
- LIT Calls, Research Labs, Teaching Labs
- Establishment of the cap.fabricc innovation workshop in the tobacco factory
- Start K2 Center LCM - Symbiotic-Mechatronics
- Start K1 Center pro2future
- Start of Research Factory I4.0 at the FH-Wels
- Roll-out of maturity model I4.0 to other federal states via national platform I4.0
- Cluster of Excellence at FHOÖ

The priorities for the further development of Upper Austria in 2018 which OÖ2020 considered to be important - within the scope of the fields of action - were agreed and confirmed by the funding agencies with the political clients.

Main topics relevant for NUCLEI-objectives are:

- Hybrid materials (integrated sensors, ...)
- Intelligent/smart products or production and services
- human-machine interaction
- artificial intelligence
- industrial security

In the following chapter the results of the analysis of the policy mix for innovation in advanced manufacturing and processing sectors is described within 4 perspectives:

- Financial perspective
- Beneficiaries and key stakeholders perspective
- Internal processes perspective
- Learning and growth perspective

The listed KPIs refer to the area of industrial production processes of the S3-approach of Upper Austria. A distinction is made between projects in the fields of education, research and industry.



1) FINANCIAL PERSPECTIVE - FOCUS EFFECTIVE USE OF RESSOURCES

KPIs:

- Public funds originally allocated (status 12/2017 € in Billion):

Area	Nr. Projects	Fundings in €	Projectvolume in €	Topics (examples)
Education	33	€ 15.6		Technic-Initiatives, Linz Institute of Technology, Production research, process innovations
R&D	19	€ 5.3	€ 29	Regional & national programmes
Economy	197	€ 9.0	€ 38.8	Digitalisation, Smart factory, Prozess Automation, ..

Questions:

- *Were the allocated funds sufficient to support all eligible demand received?*
 The various projects were supported by regional, national and international funding programmes. To this extent, a large number of projects were supported by the public sector. In this context it must be noted that there is a need for action in Upper Austria in the use of international funding programmes such as H2020.
- *Which were the most attractive actions? (Analysis of technologies or measures with the highest demand, in term of financial request)*
 In the context of Advanced Manufacturing a various number of project were initiated and realized. Advanced Manufacturing, Industry 4.0, Digitisation, HMI, Generative Manufacturing, Simulation were the main important topics addressed.

Examples:

Flagship Initiative Digitisation

- o 20 activities to make Upper Austria's economy fit for the digital future.



- 22.035 million Euro budget in 2018 for the entire flagship digitisation initiative
- The overall coordination of the 20 projects (excluding broadband) will be handled by Business Upper Austria.
- The projects of Business Upper Austria within the framework of the flagship initiative Digitisation (budget and content) follow a three-year plan with a total budget of EUR 1.5 million.

Activities

Nr.	Maßnahme	Bereich
1	Breitbandausbau OÖ	Infrastruktur
2	OÖ DESI (Digital Economy and Society Index)	Wirtschaft
3	Koordinierungsstelle Digitalisierung	Wirtschaft
4	Information Security Hub - Ausweitung des IT-Cluster	Wirtschaft
5	Schwerpunktsetzung in den Clustern	Wirtschaft
6	Co-Working in den OÖ TZ	Infrastruktur
7	Ausweitung des Reifegradmodells	Wirtschaft
8	CKP Programm	Wirtschaft
9	Innovationsassistenz Digital	Wirtschaft
10	Beratungsschwerpunkt Digitalisierung	Wirtschaft
11	Ausschreibungen zum Thema Digitale Transformation	Wirtschaft/Forschung
12	Anschlussförderung an <u>aws proTrans</u> / I4.0 Programme	Wirtschaft
13	High Tech Fond - Digital	Wirtschaft
14	<u>MidTech</u> Initiative - Digital	Wirtschaft
15	Accelerator Hagenberg - Ausbau	Wirtschaft
16	Informations-Kommunikations-und Unterstützungsplan	Wirtschaft
17	IQV - Impuls Qualifizierungsverbund Digital	Arbeitsmarkt
17	Digital Skills <u>needed</u> - Kompetenzvorschau	Arbeitsmarkt
18	Go Digital! - Ausbildung, Arbeit, Zukunft in der Digitalregion OÖ	Arbeitsmarkt
19	Digital Coaching	Tourismus
20	Smart Data im Tourismus	Tourismus

KPIs / Success Stories within this initiative

- 22 approved innovation assistants Applications
- 11 Cluster cooperation projects in the field of digitisation and industry 4.0
 - 40 companies as project partners
 - Project volume: € 2,256,687 (funding applied for: € 600,821)



- 152 Submission to the tender Consultant focus on digitisation.
- 14 approved projects for Call Digitisation (5.68 Mio€ volume)
- 31 workshops/lectures of the coordination office on the topic of digitisation with approx. 750 participants
- 24 project submissions from the biz-up for the LID funding year 2018

New K2 Center Symbiotic Mechatronics

The new centre of excellence will develop mechatronic systems that go far beyond the functionality of existing systems. All components inside and outside the technology are to be virtually and digitally networked with each other. The components are to interact independently with their environment, taking into account the human user as well as the real and digital environment.

This close networking of systems is the fundamental basis for future technologies such as autonomous vehicles, intelligent production plants, predictive assistance systems, self-learning machines and much more. In 2018, the new K2 Centre 'Symbiotic Mechatronics' will be run under the umbrella of Linz Center of Mechatronics GmbH. The center is an initiative of leading industrial companies in cooperation with renowned technical research institutions - among them the Johannes Kepler University Linz - as well as selected international partners. Over the next four years, the province of Upper Austria will contribute a total of eight million euros to financing the K2 Centre.

2) BENEFICIARIES & STAKEHOLDERS PERSPECTIVE - FOCUS CUSTOMERS/USERS VALUE

KPIs Topic Industrial Production / Advanced Manufacturing

- Nr. of projects financed for each most relevant action (2016/2017)
37
- Nr. of enterprises financed for each most relevant action (2016/2017)
2016: 1159 // 2017: 1407
- Average project budget % covered by enterprises (if relevant distinguishing per different actions) (2017, overall)
40.29 % (Overall Project Budget Billion € 104,7 / Coverage by companies Billion € 42,20)
- Nr. of SMEs involved
2016: 196 // 2017: 272
- Nr. of start-ups involved



- Nr. of industrial research laboratories involved (scientific partners)
Regional: 291 // National: 278 // EU: 316 // International: 68

Points of attention:

- *Analysis of most relevant industrial sectors benefitting from policy Actions:*
Automotive, Mechatronics. Plastics, Energy, Medtech,
- *Indication of the most promising emerging technologies, if any:*
Artificial Intelligence, Blockchain Technology, Integrated Systems, Smart Production

3) INTERNAL PROCESSES PERSPECTIVE - FOCUS EFFICIENCY/QUALITY OF THE POLICY MIX

KPIs:

- Nr. of new registered patents (2017)
 - o submitted patents 64
 - o granted patents 14
 - o licenses 45
 - o exploitation rights 1
 - o utility models 4

Points of attention:

- *Stakeholders involved in the definition of S3 policy mix (was the quadruple helix fully represented?)*
Yes, involved stakeholders were Universities, Research Institutions, Companies, Intermediaries

- *Highlight on outcomes of the most innovative actions*

LIT FACTORY: UPPER AUSTRIA PILOT FACTORY 4.0

The new pilot factory LIT Factory takes an important step into the new era of production and is of strategic importance for the Upper Austrian industrial region. The pilot factory will research, develop and test future technologies in the field of "process engineering production" under production conditions that are as realistic as possible. The focus of the LIT Factory is on the process engineering production of polymer lightweight structures, composites and foams including re- and up-cycling. The LIT Factory serves the cooperative research with the economy and is to convert research results faster into marketable innovations for the industry and KMUs alike. The centre also serves as an open platform for knowledge transfer. The LIT Factory enables the teaching of innovative technologies and the demonstration of the potentials of digitisation along the entire value chain. In the test laboratory, domestic companies will in future be able to test and trial digitised production technologies - without disrupting their own operations - and thus significantly increase their innovative capacity.



The Johannes Kepler University in Linz is in charge of the pilot factory. The centre is headed by Professor Dipl.-Ing Dr. Jürgen Miethlinger MBA. In the final phase, the LIT Factory will employ around 25 people. The establishment of the LIT Factory will bring about a sustainable structural development at the LIT. The Ministry of Infrastructure is investing two million euros in the site, about the same amount will come from partners from industry and science in the initial phase. The province of Upper Austria and the city of Linz are also providing two and a half million euros for the building. With the active support of the clusters, a total of around 10 million euros in company participations were raised for the construction and use phase of the pilot plant. This is far above the relevant volume for the application.

23 domestic companies are involved in the project. The strong participation of innovative companies and leading Upper Austrian companies testifies to the fact that the content orientation of the LIT Factory addresses strategically important and future-oriented topics. Research institutions - among them the Johannes Kepler University Linz - as well as selected international partners are prominently represented. Over the next four years, the province of Upper Austria will contribute a total of eight million euros to financing the K2 Centre.

- *Analysis of communication/promotion campaign (which actions or projects outcomes caught most attention by media?)*

Most attention was caught by a **regional Call Digitalisation**

The Regional Call for Proposals of the Department of Economics and Research promotes Digital Transformation in Upper Austria. As part of the strategic economic and research programme "Innovative Upper Austria2020", the province of Upper Austria is initiating a regional call for proposals on the future-critical topic of digitisation with funds from the new "STAR" research funding initiative and additional funding from the Upper Austrian Ministry of Economic Affairs. A total of 6 million euros will be made available to finance innovative research projects in this area. The regional call for proposals is intended to give Upper Austria an innovative edge in the digital race. The contents were presented at a press conference on 20.1.2017. The call for proposals comprised two focal points in order to support companies with different levels of digital maturity:

- o DigiFIT is intended to make it easier for industrial companies to make a start in the direction of digitisation and a rapid connection to digital change.
- o DigiVALUE is intended to allow companies with an advanced degree of automation to make better use of their data and add value.

14 projects have been approved (Projectvolume € 5.68 Bill. / Funding € 1.26 Bill / 27 companies (15 SME) / 6 R&D-Intstitutions).



4) LEARNING & GROWTH PERSPECTIVE - FOCUS CULTURE, HUMAN CAPITAL, REGIONAL ECOSYSTEM; EVOLUTION; INTERNATIONAL SCENARIO

Points of attention:

- *Analysis of actions to align the competences and skills of operators to the new technological challenges (for example: new apprenticeship in higher education and research, industrial doctorate, professional paths, etc.)*

No detailed data available - in the following you find information about new degree programmes at the University of Applied Sciences Upper Austria, which are referring to the main topics of the S3-strategy

FH OÖ: 6 new degree programmes as of autumn 2018

The FH Oberösterreich is expanding its range of training courses by 6 new courses in the relevant subjects of automotive, logistics, robotics, agriculture and medical technology. More than 100 additional students per year will be trained for the digital future in order to promote technological change in companies and society in their fields of competence. In future, 67 Bachelor's and Master's degree programmes with more than 6,000 students will be offered at the FH Oberösterreich in Hagenberg, Linz, Steyr and Wels. With the new degree programmes, the FH Oberösterreich again offers many specialisations that are unique in the German-speaking world. By the fast adaptation of trends the study contents at the FH Upper Austria are always up-to-date, the graduates have the relevant know-how sought by the economy and the appropriate digital skills. That's what it's all about: More than 200 companies come to the career fairs at the FH OÖ every year in order to establish contacts with potential employees.

"Agricultural technology and management" (FH OÖ Campus Wels, bachelor's degree programme): In addition to the trends in agriculture 4.0, the study programme also focuses on the efficient marketing of products, yield optimisation, animal health, food quality and sustainability. The graduates thus combine technical and business management knowledge that qualifies them to make agricultural enterprises as well as food and agricultural engineering companies more competitive on an international level and fit for the future in terms of globalisation and digitisation.

"Applied Technologies for Medical Diagnostics" (FH OÖ Campus Linz in cooperation with FH Gesundheitsberuf OÖ / Joint Master Programme): With this study a new occupational field at the interface technology / natural science and technology-oriented health professions develops, in order to close the gap between development engineer/in and product user/in. Technologically qualified specialists will be trained to combine medical device competencies and health-scientific application competencies for analytical-diagnostic medical devices in modern health care.

"Automotive Computing" (FH OÖ Campus Hagenberg, Bachelor's programme): A revolution is currently taking place in the automotive sector before our very eyes. In addition to new types of drive, digitization is becoming increasingly important, both in the vehicle itself and in the surrounding road infrastructure. Modernity



Together with communicating vehicles, assistance systems offer completely new possibilities for making road traffic safer, more efficient and more environmentally friendly.

"Digital Transport and Logistics Management" (FH OÖ Campus Steyr, Master's programme): The Physical Internet is based on the principles of the digital Internet. The analogy is that materials in containers are to be moved automatically through intermodal transport networks in analogy to data packets. The result is an open cooperative system that moves and stores physical objects and thus guarantees optimal use of resources. The graduates are qualified for the digitization and networking of the transport flow and the associated material flow. The study focuses on technology-supported design, the realization and optimization of digitized transport networks.

"Electrical Engineering" (FH OÖ Campus Wels, Master's programme, English-speaking): New technologies such as electric cars or renewable and ecological energy supply systems require research in electrical engineering or in electrical energy technology. DC grids, which are necessary for batteries, hydrogen systems or for environmentally friendly distribution and transport of electrical energy with the help of cable networks, electric cars and power electronics are the latest technologies which aim to establish green and environmentally friendly energy systems.

"Robotic Systems Engineering" (FH OÖ Campus Wels, Master's programme): Keyword Industry 4.0: Robotic systems are currently undergoing a major change. Away from classical full automation to the production of large numbers of pieces to an individual variant-rich manufacturing of small series. In the coming decades, the future of production will lie in the area of conflict surrounding collaborative robots, autonomous transport vehicles and self-learning algorithms. As a result, working and production conditions will change considerably.

- *Has the implementation of policies pushed for the build-up of new infrastructure for research and innovation?*

No detailed data available -but yes, different new infrastructure was build up. One example is the **CENTER OF EXCELLENCE FOR SMART PRODUCTION AT THE FH OÖ**. Intelligent production processes lead to intelligent products. These products are the guarantor for companies, but also the basic prerequisite for being able to survive in future competition. The Center of Excellence for Smart Production is an innovative partner to industry and specializes in research and transfer in the field of intelligent production. The coordination and networking of all relevant faculties enables a lively exchange of information between the faculties (Hagenberg, Steyr and Wels) both in research and teaching.

The main focus of the CoE for Smart Production results from cross-faculty activities and three site-specific departments:

- Virtualization: Modeling, Simulation and Optimization
- Distributed intelligence and adaptive production systems
- Advanced Manufacturing and Generative Manufacturing

In the course of the event FORSCHUNG#INDUSTRIENAH on Tuesday, September 26, 2017 at the FH OÖ Campus Wels, where the 6 Centers of Excellence were discussed, the research factory "Center for Smart Manufacturing" was also opened. In this digitized



factory of the future, humans and robots work hand in hand. Machines and plants, robots, goods and products cooperate and are networked. The future becomes the present. The vision of intelligent, fully automated (smart) and self-optimizing production is being driven forward here together with renowned industrial companies and innovative SMEs.

- *Has the implementation of policies pushed for the creation of new clusters, technology platforms or networks fostering open innovation?*

No detailed data available - one example is **PIER 4**

The merger of industry and start-ups has long been regarded as a recipe for success in the creation of innovation. For this reason, the Upper Austrian incubator tech2b has developed the pilot project PIER4 and is now searching for local and global start-ups and their solutions of tomorrow for eight Upper Austrian industrial enterprises. The leading companies stand for innovative strength, which will be further strengthened by the merger with the Upper Austrian incubator tech2b. The goal is to create a win-win situation: the start-ups get a strong partner for sales or research support and the leading companies gain new ideas and solutions. The selected start-ups have the unique opportunity to use the full power of the companies behind the initiative, from the development of prototypes, a first industrial application of their solution to sales support or even an investment.

The focus, however, is not on an investment or even the purchase of start-ups, but on a sustainable partnership and industrial projects that should contribute to Upper Austria's reputation as an innovative industrial region far beyond its borders.

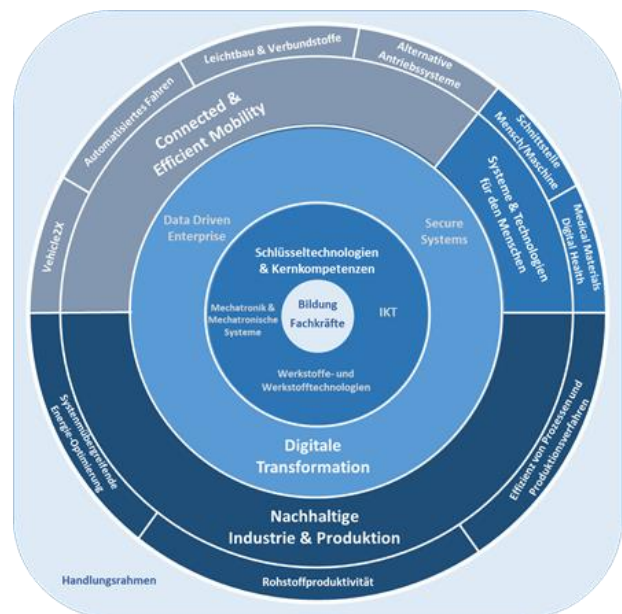
- *Regulation scenario: is there any new framework condition or emerging need in term of standardization or certification?*

No specification.

CONCLUSIONS FOR A REGIONAL ACTION PLAN REFLECTING THE NUCLEI APPROACH

Right now Upper Austria is working on a new S3-programme. Principle questions there are whether the logic of such programme should follow a framework for funding and legitimation for funded projects or it should follow a strategic scope of action with a clear focus. Nevertheless principles for the new programme are the adaptation and prolonging of „Chain of Innovation“ (Research - Economy - Science, existing core competences, key enabling technologies and interdisciplinary topics are a generally given scope of action, Integration of Open Innovation approach as well as a stronger „Top-Down-Approach“ and focus on few strategic topics and action fields which are important to the development of the region. The new programme is to be completed in 2020.

At the heart of the new strategy are key technologies and core competencies, which are fields of strength in Upper Austria's research, education and business sectors. These are essentially the technological competencies in the fields of mechatronics / mechatronic systems, information and communication technologies and materials / material technologies. With these, the challenges of the future around the digital transformation are to be mastered successfully and, in addition, three new fields of strength based on global trends are to be supported. These are Sustainable Industry & Production, Connected & Efficient Mobility and Systems & Technologies for People. This framework will be taken into account in all future strategic decisions.



Regarding the NUCLEI approach the new strategic programme reflects a lot of aspects of the models and strategies in fostering know-how-exchange and open innovation from regional to a transnational level.

Following overall key-messages can be pointed out:

- Long-term securing of the Upper Austrian economic, industrial and research location and maintenance of international competitiveness through the development of products and technologies.



- Upper Austria at the forefront of technological developments through "Smart Specialisation" and rapid implementation of results from research into applications. Goals are the early detection of disruptive developments, early identification of fields of application, increased risk management in dealing with uncertainties.
- Early recognition and identification of customer needs and fields of application and development of corresponding new business models
- Bridging the gap between previously separate disciplines, overcoming system and sector boundaries, and creating value in different sectors
- Positioning as a modern technology location for creating and maintaining sustainable jobs and increasing the attractiveness and visibility of the location for qualified employees and talents.
- Fostering existing regional and national networks and pushing ahead with internationalization.
- Redesigning value chains using the latest digital technologies and ensuring regional value chains through cross-sector cooperation.
- Thinking increasingly in interdisciplinary and holistic approaches and using existing competences/experts and new actors.

Conclusions regarding key-enabling technologies (reflecting NUCLEI topics) are:

- Digitisation is an enabler in the priority fields of action mentioned above: sustainable industry and production, development of systems and technologies for people and for proactive access to structural change in the mobility sector.
- A responsible approach to digital transformation requires a holistic approach and must include this in the sense of an interdisciplinary approach. Digital transformation must be seen as an opportunity in companies. The drivers of digital transformation are digital technologies on the one hand and exploitation options such as digital business models and value chains on the other.
- Generating knowledge and added value from data and to exploit the innovation potential of new technologies, e.g: to raise Big Data, AI, etc. in the priority fields of action and to apply them.
- Technologies are linked with domain knowledge. Competent users use tools, methods, models and technologies and can rely on making creative decisions based on trustworthy data and the correct use of information. The technological basis will be further developed for this purpose. Data-driven architectures require a legal framework, recognized certifications and the setting of common standards.



- The support of companies is also being driven forward in order to identify innovative products and services and to successfully launch them internationally. The use of the latest technologies in data-driven companies is increasingly having an impact on organizational forms and work organization.
- A basic prerequisite for the digitization and networking of machines and processes in the sense of a "digital factory" is the acceptance of the new technologies by the user. We therefore focus on the entire chain of creating and using secure and correct software and hardware systems.

Regarding the NUCLEI focus of Advanced Manufacturing following conclusion can be pointed out:

- Increasing the efficiency and sustainability of processes and production methods by means of new technologies, e.g. Big Data, AI, Data Driven Modelling & Simulation, etc. in the sense of "Responsible Technologies".
- Development of technological processes which increase flexibility with regard to the use of raw materials, enable cascading or coupled use of raw and residual materials and thus generate additional added value. The recycling economy and the closure of cycles in process engineering processes should lead to an increase in raw material productivity and make a significant contribution to a CO₂-reduced economy through the reduced material requirement.
- Fostering networked, semi-autonomous and autonomous systems at the human-machine interface in many areas of economy, production, mobility and medicine (human-machine-collaboration)

Conclusions regarding NUCLEI Tech-Transfer-Business Models

- Clusters and networks in Upper Austria will play an important role in the networking of business and science in the future. The primary objective is to initiate and support innovation projects that will significantly strengthen the competitiveness of companies.
- Tech-transfer-models like Open Seminars, Working Tables, B2B-Matching will be operated as daily business within the Upper Austrian clusters.
- Cross-border cooperation in specific fields of technology will be unavoidable. In this respect, the establishment and maintenance of international relations will be a critical success factor. Relationships from projects such as NUCLEI are therefore becoming increasingly important and should be used to derive further transnational measures.
- In order to use synergies and avoid duplication, a certain transparency about existing core competencies and key technologies is important. Databases such as the NUCLEI Web Atlas are a good way to do this and should be continuously expanded at EU level.



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- In order to coordinate regional S3 strategies in the best possible way, a network of responsible persons would also be necessary. NUCLEI has made this possible, but further efforts should be made to establish this on a sustainable basis.
 - The involvement of regional S3 managers was very positive. Through the regular exchange, valuable approaches could be derived both towards the project and towards the development of the regional strategic programme uppersvin2030.



DT4.2.1_REGIONAL ACTION PLAN LOWER SILESIA (PL)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
Lower Silesia

Responsible partner: PWR



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Smart specialisation - regional context

Regional Innovation Strategy for Lower Silesia Province for the years 2011-2020 constitutes currently applicable strategic document defining challenges the region faces in terms of knowledge-based economy and innovation growth in Lower Silesia. This strategy was adopted by the Provincial Board in 2011. Although the title of the document does not refer to the Smart Specialisation Strategy (the RIS3 concept was formulated after the Regional Innovation Strategy for Lower Silesia Province has been adopted), it contains elements recommended by the European Commission as regards this concept. In the RSI for Lower Silesia Province, the so-called key industries and scientific and technological specialisations according to research centres and enterprises operating in the region were identified. The document is based on the SWOT analysis and describes a system for monitoring objectives, evaluation of the entire programme and the proposed sources of financing the identified actions. In addition to the RSI, the Strategy Implementation Plan for the years 2012-2014 was developed. The document was drafted by various working groups involving business and science; their representatives had a seat on the RSI Steering Committee.

The most important development challenges of the province in the field of innovation and regional specialisations have also been included in The 2020 Development Strategy for the Lower Silesia adopted by the Provincial Assembly in February 2013. The main objective of the Strategy ('modern economy and high quality of life in an attractive environment') is accomplished as part of eight specific objectives. According to the authors of the Strategy, the region development is to be based primarily on endogenous potential. The necessity to build stronger ties between private sector and research environment with active participation of local self-government is stressed out as well. In order to accomplish the Strategy objectives, actions to be taken will be integrated in eight key groups called macrospheres, which are aimed at strengthening economic development of Lower Silesia. Among macrospheres listed in the Strategy, attention should be paid to the 'Entrepreneurship and Innovation' macrosphere which covers a number of actions to support the development of micro-, small and medium-sized enterprises, the implementation of scientific solutions and patents and the transfer of knowledge from science to economy.

The Strategy is aimed at making Lower Silesia become a region where innovative companies from industrial and service sectors will form business clusters to increase productivity and where the manufacturing sector, universities and research organisations will closely cooperate. The Strategy provides for the formation of the so-called 'Motorway to New Economy', which is an area of dynamic development of industry based on the latest technologies and modern services clustered around the existing and planned routes (transport and ICT).¹

In general, innovation rankings (such as the one carried out by the Polish Agency for Enterprise Development), Lower Silesia Voivodeship is at the forefront of Polish regions (3rd place after Mazowieckie and Śląskie Voivodeship). The report prepared by Bank Pekao SA in 2014 also indicates last year's favourable trends in innovation of micro- and small enterprises

¹ Strategic Framework for Smart Specialisations of Lower Silesia, Wrocław, 2015



in the region. According to the report, micro- and small companies from Lower Silesia implemented more product and process innovations than on the average in Poland. In the last 12 months, 30% of companies from Lower Silesia launched product innovation, while 16% delivered process innovation. The range of innovation process is much higher than on the average in Poland: 45% of companies have introduced innovation across the whole Community market, while 29% in the country. Entrepreneurs participating in the survey declared an increase in expenditures on modernising their businesses this year.

In recent survey of innovation of European regions, Lower Silesia Voivodeship was ranked among the so-called moderate innovators; only five Polish voivodeships qualified for this group (other voivodeships were assigned to the group of modest innovators). As for features relevant to the development of innovation, the highest rated indicators for Lower Silesia included: population with higher education degree, employment in industries of high and medium technology and knowledge-based services and the share of revenues from sales of innovative products and services in companies' general revenue (on market or businesses scale).

The most important challenges of Lower Silesia related to improving innovation, building and maintaining a sustainable competitive advantage of regional economy include:

1. increasing expenditures on R&D by the private sector,
2. exploiting research potential of R&D centres and universities by the business sector,
3. extending an offer of R&D centres and universities to include licenses and know-how,
4. supporting the process of bringing new products or services to market and their expansion and promotion in domestic and foreign markets,
5. increasing the percentage of innovative companies, both in the industry and service sectors,
6. increasing the level of cooperation between enterprises and between business and science within a network of connected businesses, suppliers and associates (cluster initiatives),
7. promoting creative and innovative attitudes through educational programmes for children and young people,
8. focusing public support on regional specialisations of the biggest development prospects in the area of innovation,
9. making an offer for pro-innovation services provided by Business Environment Institutions - BEIs more professional.

Almost all of these challenges, except challenge no. 4, are the objectives of the Nuclei project and for each of them the appropriate tools and services have been developed, proposed and finally tested.

Lower Silesian Intelligent Specializations are one of the instruments supporting the achievement of the objectives of the Regional Innovation Strategy for the Lower Silesian Voivodeship 2011-2020. They are a process, the effect of which is to concentrate funds in selected innovative areas of our region. The basis of these areas are economic



specializations, ie sectors with high innovative and competitive potential as well as scientific and technological specializations, ie areas with high implementation and patent activity.

Both at the national and regional levels the Smart Specializations were identified with the participation of companies - therefore they reflect not only the point of view of the authorities, but also the actual needs of the industry. This approach is consistent with the EC recommendations. Smart Specializations of Lower Silesia are concentrated in the following sectors:

	Smart Specializations of Lower Silesia
DIS 1	Chemical and pharmaceutical industry
DIS 2	Spatial mobility
DIS 3	High quality food
DIS 4	Natural and recyclable materials
DIS 5	Production of machinery and equipment, material processing
DIS 6	Information and communication technologies

Regional RIS3 areas addressed at regional level

CHEMICAL AND PHARMACEUTICAL INDUSTRY (biomaterials, genetic engineering, nanocarriers, drug delivery systems)

1. Elaboration and development of innovative technologies for acquisitions and manufacture of active substances, mixtures with active substances and excipients (in the chemical and pharmaceutical industry, including medicine, veterinary medicine, cosmetology, household chemistry).
2. Creation and development of innovative synthetic methodologies, technologies and chemical processes.
3. Elaboration, development and implementation of innovative medicinal products, medical devices, cosmetics and household chemicals.
4. Development of innovative materials, biomaterials and specialist chemicals.
5. Development of biological drugs and methods for their preparation and description.
6. Investigation of the mechanism of active substances impact on human body.
7. Development of innovative processes and manufacture technology of medicinal products, cosmetics, medical devices and other materials applicable in medicine and veterinary medicine, household chemicals, and biocidal products.
8. Innovative ways of delivering active substances.



9. Design, manufacture and introduction of innovative infrastructure, including specialist equipment, facilities and production lines for the chemical, pharmaceutical and medical industry.
10. Design and manufacture of nanotechnology products.
11. Design and development of new analytical and diagnostic techniques.
12. Design and implementation of new methods of application tests.
13. Development and implementation of advanced medical technologies, including cell therapy, for the development of personalised medicine.

SPATIAL MOBILITY (auto parts, airplane and components for aviation production)

The specialization covers the following subareas:

1. Devices and components for means of transport
2. Unmanned facilities, including autonomous ones
3. Drive and power sources
4. Electromobility
5. Improving transport safety
6. Systems and components for the space industry
7. Systems increasing the efficiency of transport (also in terms of pro-ecological)

HIGH QUALITY FOOD (biotechnology, bioactive food components and prevention of lifestyle diseases, food technology, biomedical preparations)

The specialization covers the following subareas:

1. Foodstuffs used in initial or follow-up prophylactic and therapeutic procedures.
2. Dietary supplements and foodstuffs for particular nutritional uses.
3. High-quality feed and alternative medicines in the pharmacotherapy of livestock and farm animals.
4. Specialistic foods and food supplements for pets.
5. Organic, traditional, regional and local food.
6. Functional food and nutraceuticals.
7. Foods with increased nutritional properties.
8. Packaging and storage technologies for sub-areas of smart specialization.
9. Methods for assessing the quality of funds from sub-areas of smart specialization.
10. Technologies in the production of resources from sub-areas of smart specialization.



NATURAL RESOURCES AND RECYCLABLE MATERIALS (photonic technologies, nanotechnology, measurement technology, raw materials as functional additives for composites, polymers, advance waste recovery technologies, sensors in the control systems of technological processes of extraction)

1. Natural resources (acquisition, advanced processing and use):
 - a. technologies for acquisition, processing and use of mineral resources,
 - b. technologies for acquisition of new products from the main mineral,
 - c. integrated systems for monitoring of threats in the vicinity of mining plants,
 - d. technologies for acquisition, purification and use of ordinary, thermal and mineral waters,
 - e. technologies for acquisition, processing and use of wood and plant materials in innovative products,
 - f. new therapeutic and spa services based on the use of natural resources.
2. Technologies for useful materials recovery, recycling and waste treatment.
3. Advanced materials:
 - a. new forms of raw materials (powders, microstructures, nanostructures, amorphous materials, etc.),
 - b. composite materials,
 - c. intelligent materials,
 - d. materials for industrial applications,
 - e. design and development of technology for manufacturing materials of functional properties.

MACHINES AND EQUIPMENT MANUFACTURING, MATERIALS PROCESSING TECHNOLOGY

(nanotechnology, polymers, material technologies for equipment used in extreme conditions)

Also Machines and equipment manufacturing, material processing technology specialization seems as a very strong asset of Lower Silesian region.

This specialisation covers the following sub-areas regarding the design and development of new technologies for manufacturing of all kinds of machinery and equipment (including their components and parts):

1. general and special purpose,
2. energy-related,
3. electronic,
4. optoelectronic and photonic,
5. for manufacturing and processing of materials.

An important area, of high prospect for growth, which should be noted is the design engineering and manufacturing of power and energy generation equipment, such as:

- a) machinery and equipment for renewable energy sources (photovoltaic systems, water power generators),
- b) heat recovery units,
- c) hydrogen production and storage devices,



- d) LNG (liquid natural gas) storage systems,
- e) installations for the production of electricity, heat and cooling from hydrogen and LNG,
- f) systems for supplying LNG and hydrogen to vehicles,
- g) electrical apparatus for power supply, monitoring and controlling the above devices.

In view of the fact that the above specialisation covers the entire process of machines designing, building and manufacturing, the tools and methods to build machines and devices are also important. Therefore, the specialisation covers:

- development of new methods and tools for parametric design in a 3D environment along with models for virtual reality environment as well as calculation models and optimizers,
- elaboration and development of technologies for additive layer manufacturing (using both plastics and metals) and integration of 3D models from CT as well as from visualisation, navigation and digitisation systems,
- development of new technologies for processing materials, multi-material components, superhard materials and composites as well as fragile and widespread structures,
- development of new technologies for manufacturing and modifying functional surfaces and coatings,
- development of laser technologies, cutting technologies and plastic forming technologies,
- development of intelligent methods for modelling and optimising production systems allowing rapid implementation of process innovations in production processes,
- development of systems for video quality control in machine building,
- development of advanced test methods that verify the correctness of design and manufacturing methods by means of dedicated test sites and laboratory equipment.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) (programming, mobile applications, internet of things)

The specialization covers the following subareas:

1. Predictive methods for large, heterogeneous sets of data: acquisition, analysis and reporting.
2. Application of mechatronics and robotics in improving the quality of life of citizens.
3. Processing, modeling and analysis of image and multimedia data.
4. Digital security systems
5. Management decision support systems (Business Process Management).
6. Solutions for "smart houses" (smart buildings).
7. Solutions for "smart cities".
8. Support systems for people with disabilities, chronic diseases and the elderly (Ambient Assisted Living).
9. Mobile applications.



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10. Creating computer games.
 11. E-Services and devices for the health care sector.
 12. E-learning systems.
 13. Creating software available in the SaaS model.
 14. Innovative methods of human-technology interaction.
 15. E-commerce systems.
 16. Intelligent information systems for the financial and insurance industry.



List of Policy Measures/Actions adopted by the Region to address their RIS3 areas

With respect to funding structures for supporting the transfer of technologies between science and economy, European funds are one of the determining factors of the model of technology transfer in Poland and there will be about 360 million € provided for financing of projects under Priority Axis 1 *Entrepreneurship and Innovation* in the Regional Operational Programme 2014 - 2020 for the Lower Silesia region. It is worth emphasizing that in the new EU financial perspective (the 2014-2020 EU Financial Framework) projects with commercial potential are of overriding importance. This regulation places businesses in the centre of innovative process when it comes to the EU support. Hence, SME's (innovation takers), being beneficiaries of European support, are largely the initiators of the technology transfer. With requirement for a new product, technology or service, which will make them competitive in the market, they search for a scientist partner (the innovation giver).

In the case of large companies, the transfer of technology can be initiated by these companies themselves or by universities, which present their offers to large companies in order to sell them their scientific results. The chosen large companies have financial, human and organizational resources to purchase them and to take full advantage of them. The model of transfer of technology in which the transfer taker is a large company with its own financial resources is much more flexible than the model in which the technology transfer is financed by European funds. Regulations of Cohesion Policy in general determine largely the model of technology transfer initiated by SME's.

Another model of transfer consists in creating spin-off companies usually by scientists who have decided to commercialize their own innovative ideas. The financial resources for such initiatives can come from European funds or business angels and venture capital which provide capital usually in exchange for convertible debt or ownership equality.

In addition to the above mentioned forms of funding, Program of financial support for micro, small and medium-sized enterprises from Lower Silesia was launched. The program is implemented by the Lower Silesia Development Fund, the Company which is 100% owned by the Lower Silesia. The mission of the fund is to promote the economic development of Lower Silesia, by supporting micro, small and medium-sized enterprises including financing technology transfer initiatives.

In the long term Lower Silesia entrepreneurs will be able to obtain the support of up to 1 billion zloty consisting of two funding streams, i.e. 450 million zloty are the funds that have been loaned to entrepreneurs in the previous financial perspective in the framework of the EU Jeremie initiative. By contrast, 530 million zloty will be allocated for the program to support entrepreneurs from the Regional Operational Programme 2014-2020.

To support above mentioned Smart Specializations a number of Action and Measures has been proposed by regional authorities and politicians.

Most of them are available within Priority Axis 1 of Regional Innovation Strategy.



Based on the Nuclei project results and verification of developed tools and services we are able to proposed a number of actions that could support listed below Measures and make them more effective, feasible and accessible for the regional beneficiaries.

Priority Axis 1 ENTERPRISE AND INNOVATION

Increase competitiveness and development of the regional economy based on research and development, innovation and new solutions for the enterprise

Two thematic objectives: strengthening research, technological development and innovation (CT1) and strengthening the competitiveness of SMEs (CT3).

CT1 allocation: 163 503 787 Euro

CT3 allocation: 252 042 931 Euro

Support for measures under CT1 is directed only to the areas identified in the regional smart specializations.

Type of beneficiaries

- public research units and their consortia
- public universities / colleges and their consortia
- contractors;
- contractors spin-off;
- intermediary organizations, Including non-governmental organizations;
- Units local government in terms of instrument types bon innovation / coordination of pro-innovation services;
- consortia of enterprises with research units, universities / colleges or therapeutic entities, or the special purpose companies created by these entities;
- Special economic zones

Type of implementation tool

Measure 1.1

The measure will support the development of research and development infrastructure in public scientific institutions (and their consortia) and universities (as well as in their consortia).

The support will be aimed at:

- The purchase of fixed assets (including research equipment and equipment of specialist research laboratories) necessary to conduct research and development activities for enterprises;



- Purchase of intangible assets necessary to conduct research and development activities for enterprises.

Also construction projects in the construction, reconstruction or extension of R & D infrastructure can be supported.

Support for public R & D infrastructure will be selective, focusing on strategic areas for the development of the region and implemented only to the extent determined by the smart specialization in the region.

Measure 1.2

The support is focused on SMEs. As part of the schemes 1.2 A and 1.2 B support for large companies will focus on areas of high risk / low profitability or projects of an exceptional nature that cannot be realized by SMEs.

The support will comply with the areas of smart specialization in this region also based on key enabling technologies (KET).

Under the following support directions will be possible to deliver actions related to innovative solutions (technologies) on combating climate change (e.g. The development of zero-emission and low-emission technologies), which in turn provides for the reduction of negative environmental effects.

Measure 1.2 A support for companies wishing to start or expand R & D activities:

a) the expenditure of enterprises in the area of development work (including experimental development) and industrial research.

Research projects of enterprises to serve the development of new or significantly improved products and production processes (product innovation, process).

Funding for the entire process of the creation of innovation, the project may involve different stages of conducting R & D work, including the first stage of the production.

NUCLEI outcomes that can be implemented and support that Measure are:

- TECHNOLOGY SHOWCASE (A.T3.2) - open, regional seminars (Open Seminar)
- KNOWLEDGE SHARING (A.T3.3) – international workshops (Transnational Working Table) for industry and academia
- Methodology for collecting and analysing data for the Enterprise Innovation Assessment Tool (A.T2.3 / D.T2.3.2)

Projects that may be supported, among others:

- conducting industrial research and experimental development
- technological innovation (including the first implementation of the technology)
- the development of pilot lines,



- the development of demonstration prototypes (at this stage of R & D will be conducted verification of the new solutions under realistic conditions and operational)
- assessment of the commercial potential of the project, etc.

Projects can be implemented by the company alone or as the leader of the consortium in cooperation with external entities, m.in .: scientific institutions, universities, BEI or therapeutic entities.

b) the purchase and adaptation to implement results of R&D and intellectual property rights (including patents, licenses, know-how or other unpatented technical knowledge).

Implementation (adjustment) purchased the results of R & D is only possible in case of the need for complementary / adapting technologies to the specific enterprise, experimental development. These works will be able to be carried out independently by companies itself, as well as in the form of external orders.

Beneficiaries may have spent that are beyond the scope of R & D and which are the necessary complement part linked to the project, in terms of:

- the creation or development of research and development infrastructure,
- protection of intellectual property created by the project, so the financing costs of the patent, utility model and industrial design to patent offices (excluding costs related to the litigation)
- industrial design,
- develop the skills of staff (in the framework of cross-financing).

As a result of the above types of projects can be achieved stage of advancement of innovative solutions (product, service, process) that could allow it to run production. Each project of initial production must also include preceding steps (development / demonstration phase and validation).

1.2 B Creation and development of R & D infrastructure:

Projects involving the creation and development of research and development base of enterprises in relation to:

- specialized laboratories and R & D departments in enterprises,
- R & D centres in enterprises, which are the organizational company units or independent units starting or developing activities, whose main task is to conduct research and development work in enclosed and adapted for this type of business locations using the technical infrastructure and qualified staff.

The applicant is required to submit a plan for R & D work to be performed based on R & D infrastructure which is the subject of the project.

Investment in equipment, technology and other necessary infrastructure should lead to the creation of innovative products, processes and services.



Investments in infrastructure can be complemented by activities related to the development of the skills of the company personnel on the use of new infrastructure / research equipment (in the framework of cross-financing).

NUCLEI outcomes that can be implemented and support that Measure are:

- TECHNOLOGY SHOWCASE (A.T3.2) - open, regional seminars (Open Seminar)
- KNOWLEDGE SHARING (A.T3.3) – international workshops (Transnational Working Table) for industry and academia
- Methodology for collecting and analysing data for the Enterprise Innovation Assessment Tool (A.T2.3 / D.T2.3.2)

1.2 C Services for companies:

a) professional innovation services provided by business environment institutions, among others, technological parks, technology transfer centres, academic incubators and other organizations supporting innovation processes in enterprises.

Specialized services for enterprises in the area:

- specialized laboratory services, measurement, diagnostics, certification,
- services assistants innovation brokers and innovation,
- stimulating cooperation between enterprises and research units,
- consultancy and technology brokerage, technology transfer and information about new technologies,
- protection and valuation of intellectual property,
- technological audit,
- implementation of innovative products and services,
- agency cooperative,
- the development of technology companies,
- individual support and strategic advice to support the innovation processes of enterprises, including preparations for participation in EU research and innovation programs of the EU.

The immediate beneficiary will be companies that get the support offered by the dedicated institutions (demand nature of support), this support should contribute to the promotion of innovation processes (process or product) in enterprises and efficient use of the development potential of companies.

b) measures leading to an increase in the activity of innovative micro, small and medium-sized enterprises and stimulate their cooperation with universities and other scientific institutions (for small-scale projects). Support for SMEs through the instrument of "innovation voucher" - implemented in the formula grant (non-returnable support formula voucher - financing services to SMEs).



Support may be granted:

- R & D services for the implementation and development of the product or technology:
 - development of a new or improved product or service,
 - test execution and implementation,
 - perform pre-implementation analysis,
 - research and analysis of product optimization.
- consultation and advice, e.g. the search for qualified research teams to work within the framework of the voucher,
- technological audit - to diagnose the needs of research and technology, and to help identify the needs of implementation, the implementation of which will be in the service voucher.

Contractor services can only be scientific entity referred to in Article. 2 points. 9a-f of the Act of 30 April 2010. Principles of financing science (Dz. U. No. 96 item. 615) running in a continuous research and development.

Research service must be obligatory subject of passed voucher.

The result of use of "innovation voucher" should be, among other:

- Improvement of the product, owned technology,
- Initiating contacts micro, small and medium-sized enterprises and scientific units which will result in the improvement of business activity, based on knowledge derived from scientific environment.

NUCLEI outcomes that can be implemented and support that Measure are:

- TECHNOLOGY SHOWCASE (A.T3.2) - open, regional seminars (Open Seminar)
- KNOWLEDGE SHARING (A.T3.3) – international workshops (Transnational Working Table) for industry and academia

1.2.D Development and professionalization of the offer of support innovation-oriented business environment (Projects to complement R & D infrastructure - IOB)

Projects related to the infrastructure required to deliver specialized laboratory services, including the launch of specialized laboratories and research space for companies - with equipment.

Support infrastructure will be possible, provided that the investments in infrastructure:

- is complement existing resources,
- are necessary for the implementation of high-quality pro-innovation services (specialist)
- are subject to the demand of companies for the creation of this infrastructure,
- can help to reduce costs for individual companies related to the purchase / creation of similar infrastructure, business incubation and pursuing R & D.



Support are excluded expenditure on administrative infrastructure (eg. Such as office buildings).

NUCLEI outcomes that can be implemented and support that Measure are:

- IT tool: transnational ATLAS network (pool of excellence) (A.T1.4 / D.T1.4.2)
- Database "Technology Digital Periscope" - searching and evaluating the most promising and ready to implement R & D results in manufacturing companies. (A.T2.2/D.T2.2.1/O.T2.1)

1.3.A. Preparation of investment areas

In terms of infrastructure for SME, projects on land use for economic activity will be supported, including for purposes of economic activity zones and business parks, eg .:

- ordering and preparation of land (eg. Work study and conceptual, geotechnical studies, archaeological, demolition, removal of bushes, shrubs, trees, waste disposal, land leveling, replacement of the earth);
- construction of new or adaptation (reconstruction, expansion) of existing buildings, eg. Production halls (only as a complementary element of the project);
- the purchase of land for the creation and arming of investment areas (only as a complementary element of the project);
- construction, modernization of internal communication infrastructure (only as a complementary element of the project) - are ineligible expenditure on external communications infrastructure;
- information and promotion activities concerning the dissemination of information on investment opportunities in the region (only as a complementary element of the project and scope related to its implementation).

Areas covered by the project must be intended for production or services (in accordance with the local development plan or zoning and land development), excluding the possibility of placement of residential and large-format stores (over 400 m²).

Projects can create a new zone in investing or expanding / expansion of existing zones by connecting it to other parcels.

Allowed to projects involving investment areas adjacent plots, plots adjacent (ie. Separated by a road), or sites containing the scattered plot, located in several places of the municipality.

The applicant is required - from its own resources or through a complementary project funded by the ERDF - to ensure proper access to investment areas (ie. External communications infrastructure inclusive area in the existing network of transport - road or rail).

Projects must not duplicate existing infrastructure, unless the limit of available space with similar parameters in a given municipality has been exhausted.



Failure to achieve full occupancy levels of investment areas at the end of the lifetime of the project will result in accordance with the principle of proportionality appropriate return of the aid.

Preference will be given to:

- projects on wasteland, degraded areas, areas located in the vicinity of transport investments;
- regeneration projects included in the program of revitalization of the municipality;
- projects appellants greater than the required minimum own contribution.

1.3.B. Support infrastructure dedicated for entrepreneurs

In terms of investment projects for the creation of infrastructure dedicated for entrepreneurs (e.g. Business incubators, business parks):

- construction / expansion / reconstruction of infrastructure, together with a comprehensive technical infrastructure designed for business activities and associated infrastructure (e.g. Car parks, internal roads, etc.).
- the purchase of fixed assets and intangible assets necessary for the proper functioning of the supported infrastructure.

The support of projects would be subject to the following conditions:

- the project is in line with the defined needs of SMEs;
- organization activity is part of the smart specialization in the region;
- the applicant has a strategy / plan the use of infrastructure;
- project is co-financed from private sources;
- the project does not duplicate available in the municipal infrastructure of a similar profile, unless the limit has been reached / is running out.

Preference will be given to:

- projects related to business incubators, improving conditions for the development of enterprises);
- projects appellants greater than the required minimum own contribution.

NUCLEI outcomes that can be implemented and support that Measure are:

- IT tool: transnational ATLAS network (pool of excellence) (A.T1.4 / D.T1.4.2)
- Database "Technology Digital Periscope" - searching and evaluating the most promising and ready to implement R & D results in manufacturing companies. (A.T2.2/D.T2.2.1/O.T2.1)



In terms of the scheme 1.3.A. and 1.3.B.:

1. The direct result of the projects will be as follows:

- number of small and medium-sized enterprises located in the supported infrastructure (scheme 1.3.B)
- or
- occupancy levels of investment areas (diagram 1.3.A)
- and
- the number of jobs created in SMEs (both above).

The direct results will be indicated in the financing agreement.

2. The use of the created infrastructure by a large undertaking will result - in line with the principle of proportionality - the right of return of the aid at the end of life of the project.

1.3.C. Consultancy for SME

The support targeted at SMEs, including SMEs that are in the early stages of development (up to 24 months) will be provided to SMEs directly (1.3.C.1 scheme) or through projects grant IOB or LGD (scheme 1.3.C.2). Services may be provided only by the Business Environment Institutions through advisory activities in the following directions:

a) services in the field of broadly understood consulting support, as diagnosed with the needs of the company, including advising on:

- support the initial development phase of the company (eg. Business plan development, enterprise development strategy, the monitoring of business);
- obtaining and renewing certificates of conformity for products, services, raw materials, machinery and equipment, measurement and control equipment;
- design, implementation and improvement of systems of quality management and environmental management;
- the use of advanced information technology in the enterprise;
- specialized management tools and mapping of risks / risk in the organization and creation of a risk management strategy;
- implementation of schemes aimed at environmental issues and corporate social responsibility (eg. FSC / PEFC, SBP et al.)
- legal and tax consulting related to the development of the company on the market.

b) services in obtaining external sources of financing enterprise activities (also in the early stages of development), including preparation of documents and analyses necessary for acquiring external sources of financing, assistance in obtaining investor needs analysis and identification of sources of financing of the project - with the exception of related

NUCLEI outcomes that can be implemented and support that Measure are:

- TECHNOLOGY SHOWCASE (A.T3.2) - open, regional seminars (Open Seminar)
- KNOWLEDGE SHARING (A.T3.3) – international workshops (Transnational Working Table) for industry and academia



documentation applying for funds of European funds.

It is also worth mentioning other tools already verified in practice under the Nuclei project that support innovation and entrepreneurship, such as Innovation Week and Makeathons / hachathons. Especially the latter action perfectly suits one of the above-mentioned, key challenges of the region which is **promoting creative and innovative attitudes through educational programs for children and young people.**



Conclusions

At present, work is in progress in the region of Lower Silesia related to updating the regional innovation strategy and smart specializations. We hope that the above recommendations regarding the use of project results to increase the efficiency of the regional innovation system will be taken into account. This assumption can be based on the results of D.T4.2.2, in which the regional S3 managers saw great potential in the results of the Nuclei project, especially in i-services, such as TECHNOLOGY SHOWCASE (A.T3.2) - open, regional seminars (Open Seminar) and KNOWLEDGE SHARING (A.T3.3) - international workshops (Transnational Working Table) for industry and academia.

Clusters and networks in Lower Silesia will play an important role in networking business and science in the future. The main goal is to initiate and support innovative projects that will significantly strengthen the competitiveness of companies.

To coordinate the S3 regional strategies in the best possible way, a network of responsible people would also be needed. NUCLEI has enabled this, but further efforts need to be made to establish this in a sustainable way.

Cross-border cooperation in specific areas of technology will be inevitable. In this respect, the establishment and maintenance of international relations will be a key success factor. Reports from projects such as NUCLEI are becoming more and more important and should be used to obtain further transnational measures.



DT4.2.1_REGIONAL ACTION PLAN BAVARIA (DE)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
Bavaria

Responsible partner: CMAB



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1. Analysis of S3 performances using the BSC model

The program of the Bavarian S3 strategy is directly linked to the objectives of the Europe 2020 strategy. It includes the following six priorities:

1. **Strengthening research, technological development and innovation**
2. Strengthening the competitiveness of SMEs
3. Climate protection
4. Flood control
5. Sustainable development of functional spaces
6. Technical support

The first priority, being the most relevant for NUCLEI, contributes to the region's research system with a total amount of € 132,900,000 and contains the following two actions:

- **Action 1.1 Promotion of research and competence centers**

“Strengthening research and innovation infrastructure and capacities for the development of R&D excellence; promoting centres of excellence, in particular those of European interest”

Public funds allocated: € 74,000,000

- **Action 1.2 Technology transfer "university/research institution - SME"**

“Encouraging investment by enterprises in R&I, building links and synergies between enterprises, research and development centres and the higher education sector, in particular encouraging investment in product and service development, technology transfer, social innovation, eco-innovation, public service applications, demand stimulation, networking, clusters and open innovation through intelligent specialisation and support for technological and applied research, pilot lines, early product validation measures, advanced manufacturing capacity and initial production, particularly in key technologies and the diffusion of all-purpose technologies”

Public funds allocated: € 58,900,000



1.1 Financial perspective:

- **Action 1.1 Promotion of research and competence centers**

Public funds allocated: € 74,000,000

Public funds granted so far: € 46,500,000 / 62.8%

Projects approved²: 11

Average project budget: € 4,227,273

Minimum budget: € 100,000

Maximum budget: € 15,000,000

- **Action 1.2 Technology transfer "university/research institution - SME"**

Public funds allocated: € 58,900,000

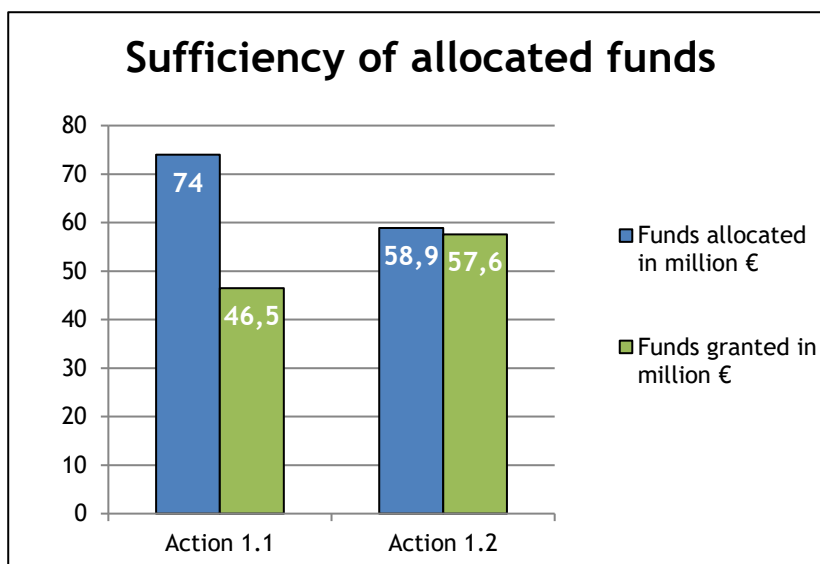
Public funds granted so far: € 57,600,000 / 97.8%

Projects approved: 42

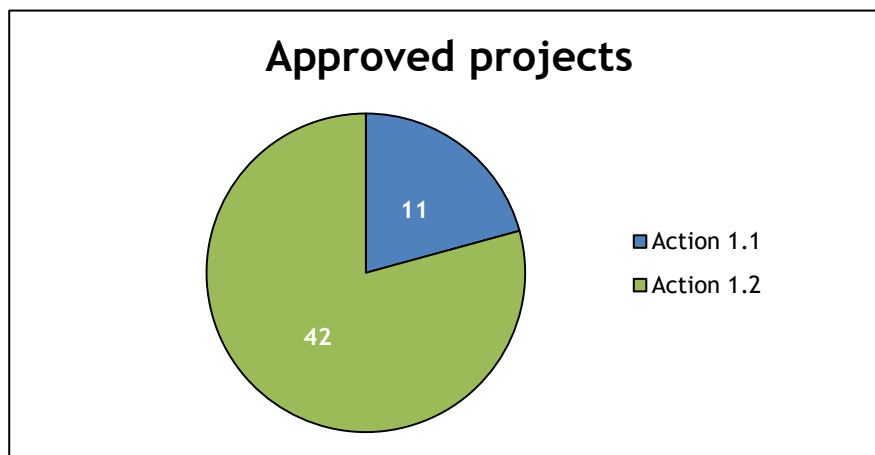
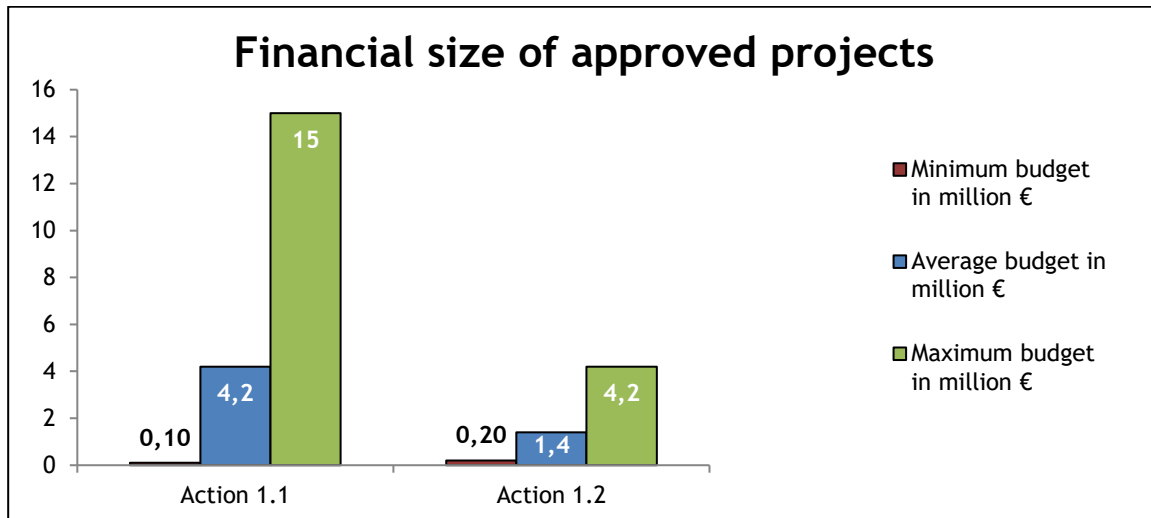
Average project budget: € 1,371,429

Minimum budget: € 200,000

Maximum budget: € 4,200,000



² The project applications are made after prior consultation with the approving bodies. A personal interview is held to check whether it makes sense to submit an application. Therefore, project applications are usually not rejected.



So far, the allocated funds were sufficient to support all eligible demand. However, the budget of action 1.2 is almost exhausted although the program lasts until 2020. For this action, fewer funds were allocated, yet more projects were conducted. For action 1.1, the allocated funds were used for a smaller amount of projects. The financial interest in action 1.1 is greater than in action 1.2, while there are almost four times as many projects conducted for action 1.2 than action 1.1. Therefore, both actions can be regarded as very attractive.

1.2 Beneficiaries and key stakeholders perspective:

- **Action 1.1 Promotion of research and competence centers**

Projects approved: 11

Enterprises financed³: 0

³ No financial support for enterprises, but for research and competence centers.



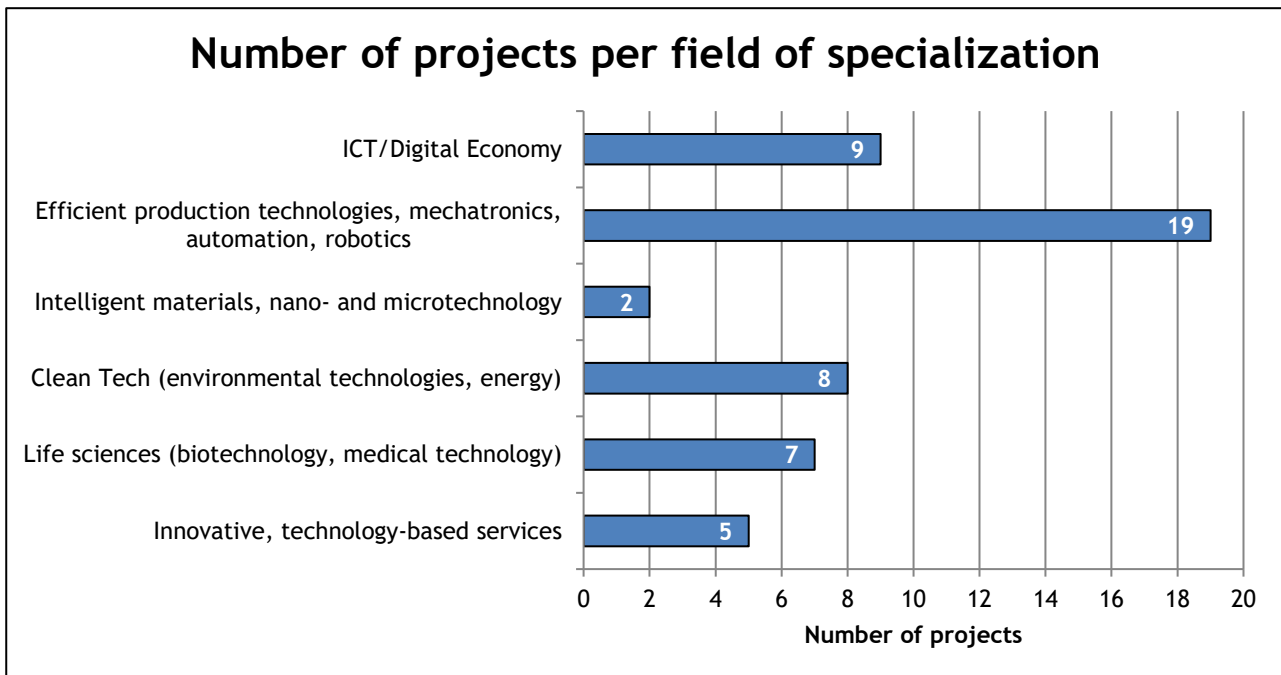
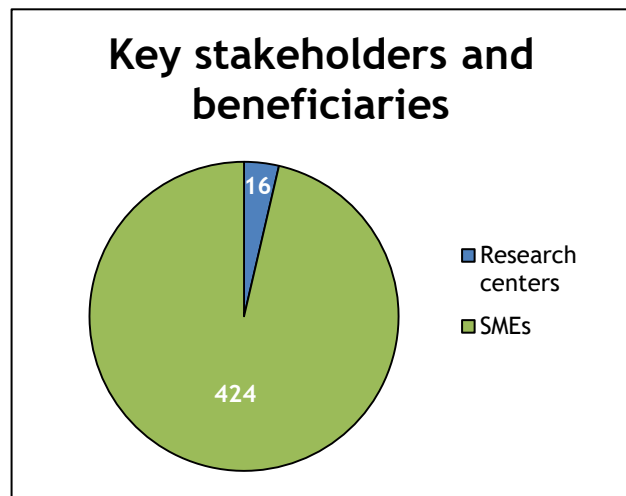
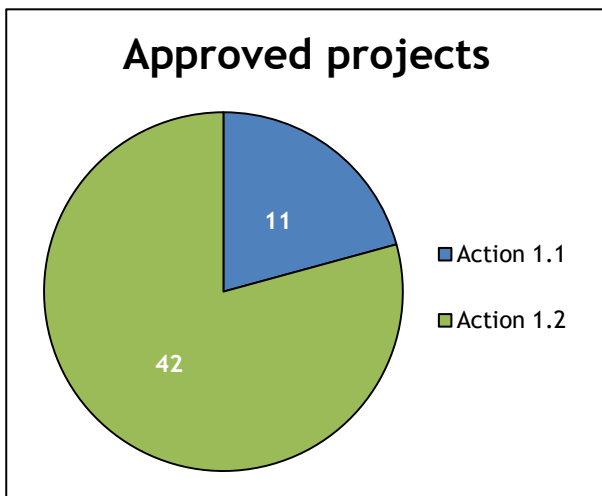
Number of scientists benefiting from action 1.1: 430

- **Action 1.2 Technology transfer "university/research institution - SME"**

Projects approved: 42

Enterprises financed⁴: 0

- SMEs involved: 424
- Research institutions involved: 16



⁴ The companies do not receive financial support. Grant recipients are universities, which pass on knowledge to the companies.



The biggest part of projects is done within the scope of action 1.2 and the largest part of beneficiaries of both actions is SMEs. With regard to the size and age of the SMEs involved, no differentiation is made.

In action 1.1, 430 scientists could benefit from the promotion of 16 research and competence centers. Thus, involving even a small amount of research institutions seems to have a big effect.

When it comes to topics/industries/fields of specialization, the largest number of projects is conducted in the area of efficient production technologies/mechatronics/automation. Very few projects can be associated with the area intelligent materials/nano- and microtechnology. Also, there is a lack of focus on innovative, technology-based services.

1.3 Internal processes perspective:

- **Action 1.1 Promotion of research and competence centers**

Projects approved: 11

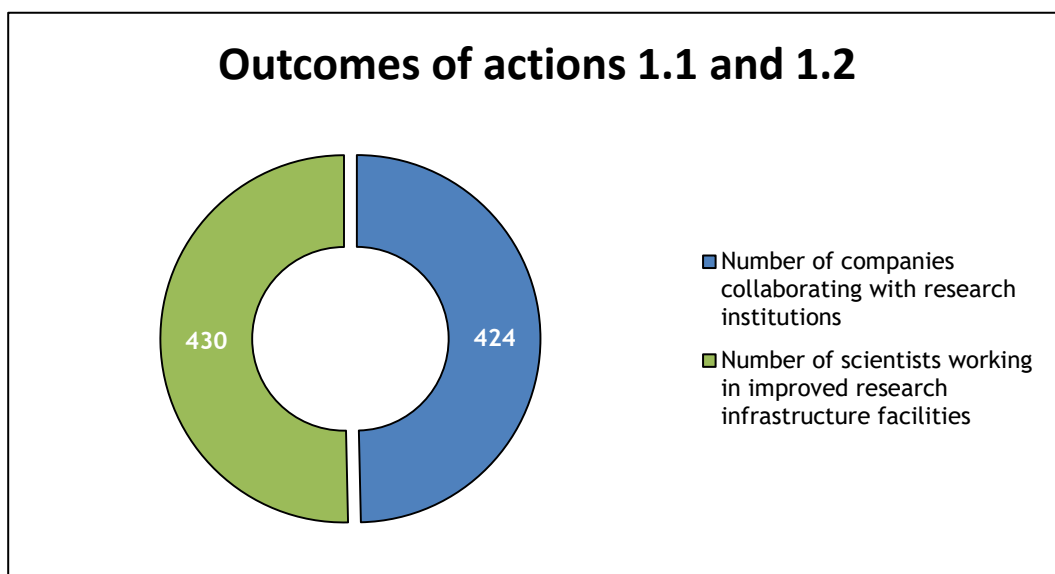
Number of scientists benefiting from action 1.1: **430**

- **Action 1.2 Technology transfer "university/research institution - SME"**

SMEs involved: **424**

Research institutions involved: 16

Collaborations established between research and enterprises: **424**





Within the scope of action 1.1 and the promotion of a small amount of research and competence centers, a large number of jobs was improved.

For action 1.2, universities and research centers are the recipients of the grants. They involve companies in the projects, which is why all of the companies participating in projects are part of collaborations.

1.4 Learning and growth perspective:

	Yes	No	Not specified
Actions to align competences and skills of operators to new technological challenges		X	
Build-up of new infrastructure for research and innovation	X		
Creation of new clusters, technology platforms or networks fostering open innovation		X	
New framework condition or emerging need in term of standardization or certification			X

Questioning of the Bavarian S3 manager showed that the learning and growth perspective has been neglected in the regional strategy. While the dimension “Build-up of new infrastructure for research and innovation” is directly covered by action 1.1, the other dimensions are not included. There are no actions to align competences and skills of operators to new technological challenges. Also, the creation of new clusters, technology platforms or networks forstering open innovation is not part of the strategy.

2. Matching the analysis with NUCLEI outcomes

The analysis of the most relevant actions of the Bavarian S3 strategy identifies a clear focus on creating collaborations between research institutes and companies. The NUCLEI project also aims at building bridges in order to bring together stakeholders from industry and research.

In particular, SMEs are at the center of attention in both the regional S3 strategy and the NUCLEI project. This is necessary, because it is difficult for smaller companies to establish cooperations with research and competence centers. Other than large companies, they don’t have well-established processes for innovation. Instead, they need an opportunity, like projects, open seminars, working tables and other initiatives, to gain experience and get to know practices of open innovation. The formats developed in NUCLEI can be regarded as a good example for SMEs



to make contacts, gain knowledge and get motivated to participate in national, transnational or international open innovation initiatives.

For this, the work of clusters is essential. The analysis of the Bavarian S3 strategy shows, that the promotion of clusters, technology platforms or networks fostering open innovation is neglected. Therefore, NUCLEI and similar initiatives, which intend to guide companies towards open innovation, need to be further promoted.

While the regional strategy of Bavaria focuses on improving research and competence centers in order to promote technology transfer and open innovation, it doesn't include any actions to align competencies and skills of operators to new technological challenges. Further education and qualification of stakeholders, achieved within NUCLEI open seminars or other Interreg CE programs like InnoPeerAVM, needs to be taken into account.

Lastly, the crucial sectors identified within the NUCLEI survey, are represented in the Bavarian S3 strategie's fields of specialization. Particular attention when it comes to making investments should be paid to the areas of advanced manufacturing processes and systems, modelling and simulation as well as ICT.

3. Conclusions and indications for policy makers

The results of the NUCLEI project and the BSC analysis imply a strong need for networks promoting collaboration on topics of innovation. Clusters, in particular, provide a big opportunity for small and medium-sized companies to participate in open innovation practices. Therefore, regional policies should be adapted accordingly and include the promotion of networking.

NUCLEI project results imply that this can be achieved with the following actions:

- Transnational open seminars
- International working tables
- Open innovation weeks
- Student competitions, like makeathons and hackathons
- Seasonal schools
- Platforms for sharing technological knowledge and findings (e.g. digital periscope, pool of excellence, web-atlas, results repository)

In order to resume the work of NUCLEI and its impact on the regional S3 development, a "NUCLEI Collaboration Network will be created after the official end of the project. The alliance consisting of former NUCLEI project members and further affiliated members from EU countries will focus on the following objectives:



- Promoting and supporting each partner's work, activities and business opportunities through involvement of other partners
- Continuously involving regional S3 development and initiatives
- Cooperating with other organizations in the fields of mechatronics and advanced manufacturing (e.g. European Mechatronic Alliance, EUREKA, MANUFUTURE, EFFRA)
- Joining new project calls and proposals (Interreg and other programs)
- Providing a catalogue of each partner's competences to easily match the needs and exchange solutions
- Supporting the innovation process and technology transfer

In addition, the work of the NUCLEI project partners led to the development of 10 "Golden Rules" for successful collaboration, which should be considered in the further development of regional policies.

- 1) A shared background concerning the technology areas that will be collaborated in, as well as a common understanding of challenges, needs and expectations is fundamental for an effective collaboration.
- 2) Face-to-face meetings help with maintaining successful business relationships and therefore with disseminating technological results amongst stakeholders.
- 3) A follow-up of meetings is crucial in order to achieve deals. The best way to support business contacts created is to involve the stakeholders in common transnational activities such as research projects.
- 4) Companies, specifically smaller ones, need to be guided to and in the innovation process. Thus, the role of cluster managers as transnational contact points in specialized technological fields is essential. Cluster managers are experts at establishing and developing business relationships as well as involving companies in transnational initiatives.
- 5) It is essential to build bridges between partners from local authorities, industry and research institutions in order to promote innovation and transfer of technologies. Again, clusters are suitable points of connection for this purpose.
- 6) Small and larger companies need to equally be involved in collaborations, as they can benefit from each other. However, while larger companies are looking for technological benchmarking, SMEs search for business opportunities as well as an exchange of best practices. Therefore, a successful collaboration needs to take into account all stakeholders specific needs.
- 7) Technological tours and demonstrations can be a good way to align practical understanding and share concepts among the different stakeholders of a collaboration.
- 8) Digital platforms are indispensable when it comes to transnational collaboration. Stakeholders located in different parts of the world can use them for internal and public communication as well as a way to make new contacts.



-
- 9) It is crucial to involve new generations of innovators, researchers and technology experts in innovation activities of today. Event formats like makeathons and hackathons can arouse young peoples' interest in innovation and technology.
 - 10) The presence and supervision of S3 managers is essential. It is necessary to constantly compare topics and activities (national and international) to S3 priorities in order to be in line with the regional strategy. For this, building relationships with local S3 managers can be helpful.



DT4.2.1_REGIONAL ACTION PLAN SLOVAKIA(SK)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
SAlovakia

Responsible partner: AT+R



Analysis of S3 performances using the BSC model

1. Financial perspective

Focus: effective use of resources

The main Operational Program in Slovakia for National Actions/Measures supporting industrial research, technology transfer and innovation implemented in the programming period (2014-2020) is the Operational Program for Research and Innovation (OP Val) which is managed by the Ministry of Education, Science, Research and Sport of the Slovak Republic in cooperation with the Ministry of Economy of the Slovak Republic.

<https://www.opvai.sk/>



KPIs

- **Public funds originally allocated:**

The total allocation of OP Val for EU resources is EUR 2 231 032 482.00, of which more than three quarters of all funds are intended to strengthen research, technological development and innovation and the remainder is allocated to support the increase of the competitiveness of small and medium-sized enterprises.

- **% Public funds eventually spent**

approximately 30% of funds (information from the media, the exact number is not available) while 71% time of the programming period has elapsed

Points of attention:

- **Were the allocated funds sufficient to support all eligible demand received?**

The amount of the funds spent is significantly affected by the law on public procurement which has been simplified from 1 January 2019 for funding intensity below 50%.

The overall amount appears to be sufficient. However, the lengthy evaluation procedure for applications for non-repayable financial contributions, and the resulting shortage of time to implement projects and obsolescence of certain solutions at the time of implementation, is a problem.



- **Which were the most attractive actions?** (Analysis of technologies or measures with the highest demand, in term of financial request)
 - direct investments focused on general innovations of products, processes and business models in companies using investment activities;
 - direct investments focused on innovations of products, processes and business models in companies directed at building Smart Factories and implementation of Industry 4.0 elements using investment activities;
 - projects focused on research and development activities through building links between industry and academia;
 - projects focused on the support of IPR in companies;
 - projects focused on building quality systems etc.

2. Internal processes perspective

Focus: efficiency, quality of the Policy Mix (set of key Policy Actions)

KPIs

- **Nr. of new registered patents**

There are available statistics:

TABLE 4.1 The Innovation Potential of Slovak Regions

Region	Number of Researchers and Technical Staff, 2015	Gross Domestic Spending on Research and Development, € Million, 2015	Patent Applications, Percent of National Total, 2012	Patents Granted, Percent of National Total, 2012
Bratislava	15,705	320	32	35
Trnava	1,898	40.6	9	9
Trenčín	1,530	56.1	14	15
Nitra	2,642	37.1	8	7
Žilina	3,607	59.2	12	10
Banská Bystrica	2,272	38.4	9	9
Prešov	1,389	24.8	7	5
Košice	4,209	61.53	11	10

Source: Data from the Statistical Office of the Slovak Republic (2 left columns) and from the Industrial Property Office of the Slovak Republic (2 right columns) 2018.

- **Nr. of new jobs created**

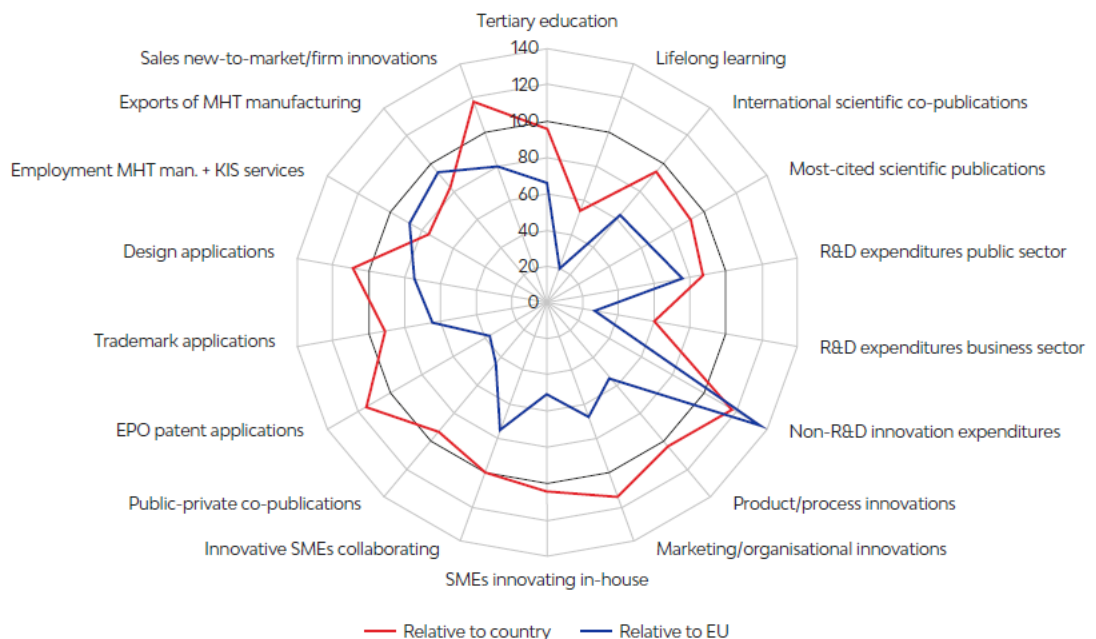
There were no overall up-to-date statistics available to us, only fragmented data for the programming period 2007-2013, but our estimate is there were approximately 20 thousand newly created jobs in Slovakia.

- **Nr. of collaborations established between research and enterprises**



Similarly, there were no overall up-to-date statistics available to us, only fragmented data for the programming period 2007-2013, but our estimate is there were about 200 new collaborations established between research organizations and enterprises.

FIGURE 4.11 Slovakia and the Regional Innovation Scoreboard



Source: European Commission 2017.

Points of attention:

- **Stakeholders involved in the definition of S3 policy mix (was the quadruple helix fully represented?)**
 - companies (SMEs, large companies, companies with specific orientation)
 - associations and clusters
 - universities
 - Slovak Academy of Sciences institutions
 - regional authorities (Prešov and Košice self-governing regions)
 - national authorities (the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Ministry of Economy of the Slovak Republic)

Relevant issues:

- lack of international and trans-regional perspective
 - not in tune with the industrial and economic fabric of the region
 - too narrow vision of innovation
 - just copying the best performing regions
- **Highlight on outcomes of the most innovative actions**
 - seminars focused on building Smart Factories and implementation of Industry 4.0 elements using investment activities
 - building of common workplaces between industry and academia for applied research of Smart Factories and Industry 4.0 element implementation and in other related fields (robotics, automation, mechatronics)



-
- building of links between industry and academia for applied research of new materials also in other branches of industry (eg. tourism, wood processing, metal processing, mechanical and electrical engineering industry, services, textile industry, orientation on hi-tech areas - automation, robotics, IT etc.)

 - **Kind of new jobs created**
 - production operators
 - CNC machine operators
 - CNC machine programmers and setters
 - robotic line programmers
 - mechatronic engineers and technicians

 - **Analysis of communication/promotion campaign (which actions of projects outcomes caught most attention by media?)**
 - seminars a workshops



3. Learning and growth perspective

Focus: culture, human capital, regional innovation ecosystem evolution, international scenario

Here we would like to quote from the report of a current local regional development project called Slovakia Catching-Up Regions which is focused on the east Slovakian region of Prešov, one of the two main regions where Cluster AT+R is operating. It was produced as a collaboration of The World Bank and the European Commission (EC) and published in 2018:

Here are some reasons why the Prešov region economy lacks dynamism (a macro view):

- **Industrial transformation of the economy:** Professional services, manufacturing, and hospitality have been growing more vigorously. Although structural transition of the local economy may lead to some economic distress, it is critical that new tradable specializations emerge. This will depend both on external circumstances and on positive changes in the business environment in Prešov.
- **Out-migration and de-urbanization:** The departure of working-age people deprives cities of their economic potential.
- **Skills gaps:** The region has the highest rate of unemployment in the country for those with secondary and trade school diplomas which raises questions about the quality of education, and how relevant the curricula and instructional practices are to the employers' needs and to the types of skills and competences they require.
- **Weak innovation ecosystem:** The region is at the bottom of national rankings on both innovation inputs, e.g., the number of researchers and the amount of investments, and outcomes, e.g., patent applications and patents granted. The region seems to lack the fundamental conditions for innovation.
- **Quality of governance and weak minimal ability to absorb EU funds:** The lack of government capacity is manifested in the region's difficulties in absorbing EU funds, which in turn may be depressing growth rates. In the 2007-13 EU programming period, of all Slovak regions Prešov's applications had the second lowest success rate – and it had the lowest rate of utilizing the funding allocated.



Points of attention:

- **Analysis of actions to align the competences and skills of operators to the new technological challenges (for example: new apprenticeship in higher education and research, industrial doctorate, professional paths, etc.)**

We create direct cooperation with the Technical University of Košice for new technology directions: mechatronics, automation, robotics, introduction of the Industry 4.0 elements in practice, technical solutions, human resource development (Masters of Science, PhD students).

Cooperation with various associations such as Cluster AT+R, representing companies, universities and local governments (Prešov and Košice self-governing regions).

- **Has the implementation of policies pushed for the build-up of new infrastructure for research and innovation?**

The implementation is based on creation of long-term and specific links between industry and academia using the infrastructure built during the past several years. In case of need certain parts of infrastructure are constructed, completed and bought.

- **Has the implementation of policies pushed for the creation of new clusters, technology platforms or networks fostering open innovation?**

There arise opportunities for new direction of the existing clusters, eg. for the implementation of S3 and Industry 4.0 policies (digitalization, automation).

Involvement in the EU initiatives, such as eg. EIT Manufacturing, Manufuture, EFFRA, etc.

- **Regulation scenario: is there any new framework condition or emerging need in term of standardization or certification?**

There arises real demand for up-to-date interpretation and implementation of the Industry 4.0 (digitalization, automation) in the companies, especially in SMEs at the regional and national levels.

FOLLOW UP

Cluster AT+R cooperates as a partner with the Prešov and Košice self-governing regions in preparing regional development and action plans. At the moment we are working together to prepare the action plan for the European Commission and the World Bank initiative Slovakia Catching-Up Regions with Prešov self-governing regions.

Moreover as a result of the business continuity and collaborative workshop with the regional S3 manager in Prešov self-governing region, some areas of future collaboration and possible synergies have been analyzed and specific actions were proposed. Cluster



AT+R offered to serve as a point of contact between the Prešov region and other NUCLEI CE regions in the relevant fields of mechatronics and advanced manufacturing, facilitate transnational collaboration, and assist in enhancing the innovation transfer by involving local stakeholders (companies, academic institutions, and regional authorities) in events focusing on best practice transfer, matchmaking and exchange of experience. Also links between schools and academic institutions would be supported through participation in educational activities and promotion of R&D cooperation.

It was agreed the first joint event would be organized in September 2019 with the participation of NUCLEI network stakeholders. It would be focused on Industry 4.0 innovation management practices and their application in the context of local companies and partners. Further activities would be planned during subsequent meetings.



DT4.2.1_REGIONAL ACTION PLAN VENETO (IT)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
Veneto

Responsible partner: T2i



Analysis of S3 performances using BSC model

Actions for supporting innovation in Veneto Region:

With an estimated total amount of € 114,000,000.00, the Region contributes to the Regional research system and to the targets set by the Europe 2020 Strategy:

Action 1.1.1 "Support for research projects of companies for the employment of researchers" (PhDs and postgraduates with technical-scientific profiles) -

Expected provision: € 18,000,000.00

Action 1.1.2 "Support for the purchase of services for technological, strategic, organizational and commercial innovation of companies"

Expected provision: € 7,000,000.00

Action 1.1.4 "Support for collaborative R & D activities for the development of new sustainable technologies, new products and services".- Expected provision: € 70,000,000.00

Action 1.4.1 "Support for the creation and consolidation of innovative, high-intensity knowledge application start-ups and research spin-off initiatives".

Expected provision: € 19,000,000.00

Action 1.1.1 "Support for research projects of companies for the employment of researchers"

137 projects presented

75 projects approved

Action 1.1.2 "Support for the purchase of services for technological, strategic, organizational and commercial innovation of companies"

75 projects presented

67 projects approved

Action 1.4.1 "Support for the creation and consolidation of innovative, high-intensity knowledge application start-ups and research spin-off initiatives".

75 projects presented - 2nd round 53 projects presented

All projects approved - 2nd round 41 projects approved

FOCUS ON ACTION 1.1 Main goal of the policy instrument: To promote the research activity through the employment of researchers hired directly by the company or by an agreement with a qualified research structure

Action 1.1.1 "Supporting for research projects to the companies in order to employ researchers (PhDs and postgraduates with technical-scientific profiles) within the companies".



Total provision: € 18,000,000.00

Main figures Call for researchers

1st Call

75 projects admitted and financed

51 not approved

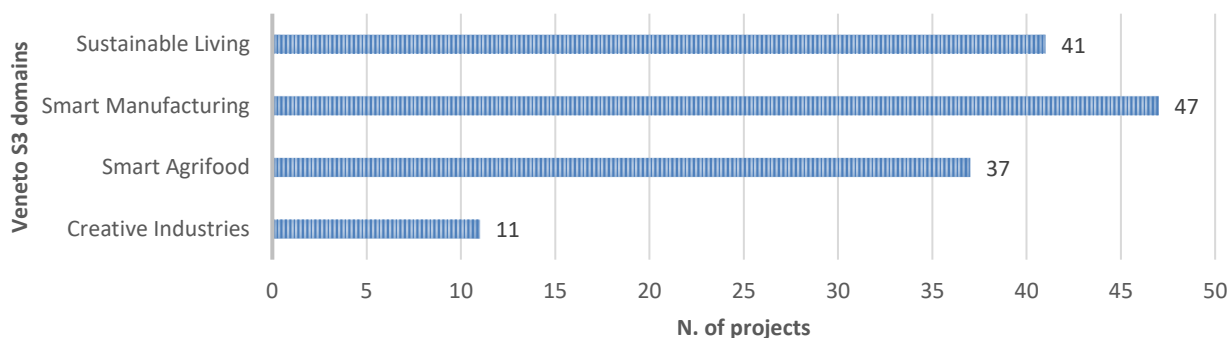
Total financial resources: 4,4 ml Euro

2nd call

61 projects admitted

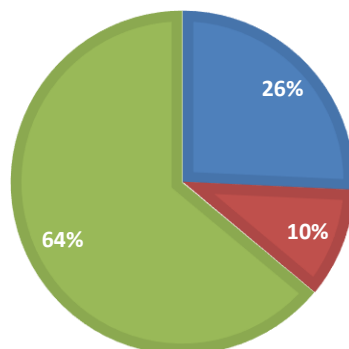
Total financial resources 3 ml Euro

S3 DOMAINS: CALL OF RESEARCHERS



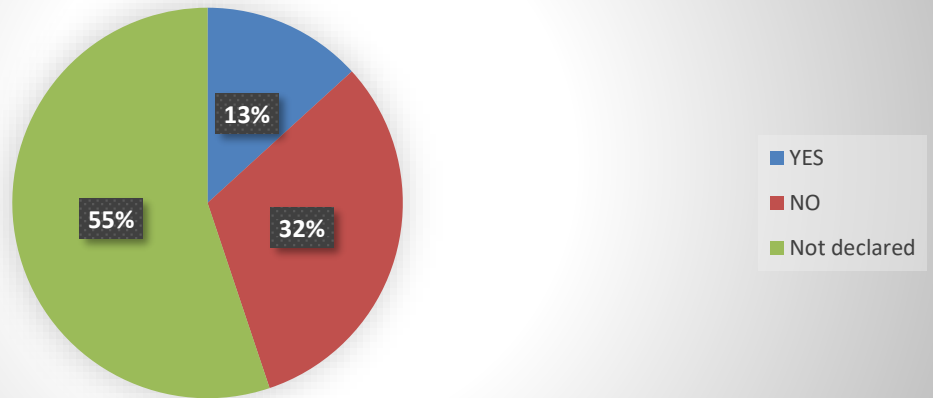
APPROVED PROJECTS FOR ENTERPRISES DIMENSION

■ MICRO ■ MEDIUM ■ SMALL

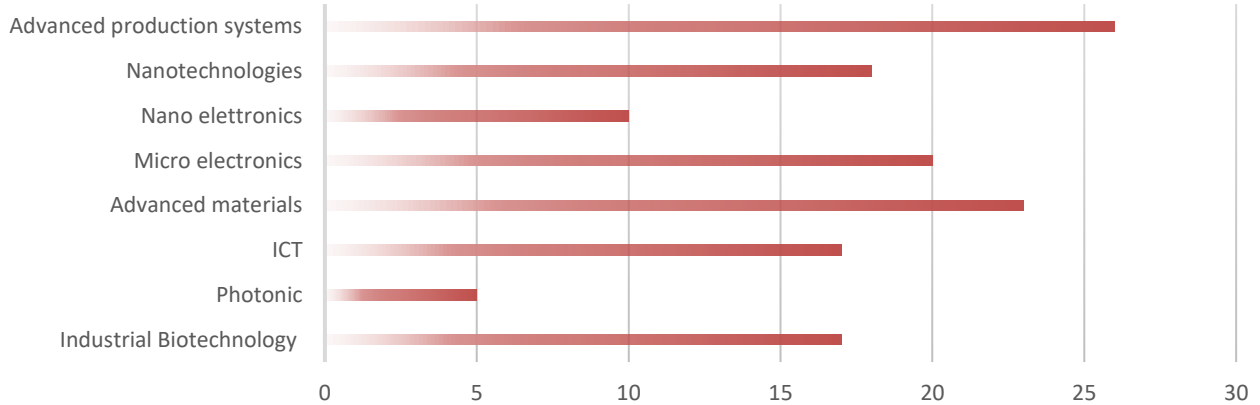




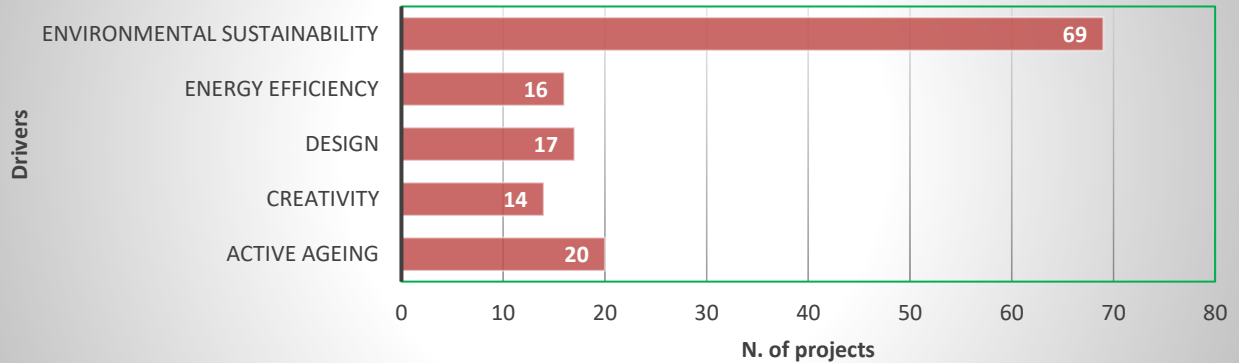
Collaboration with research centers

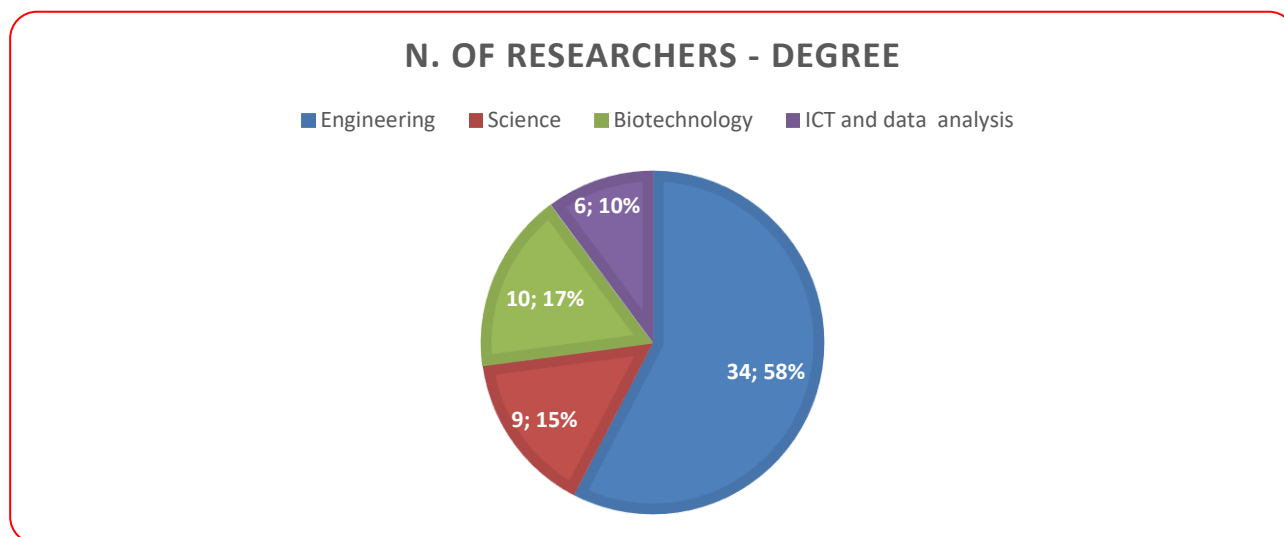
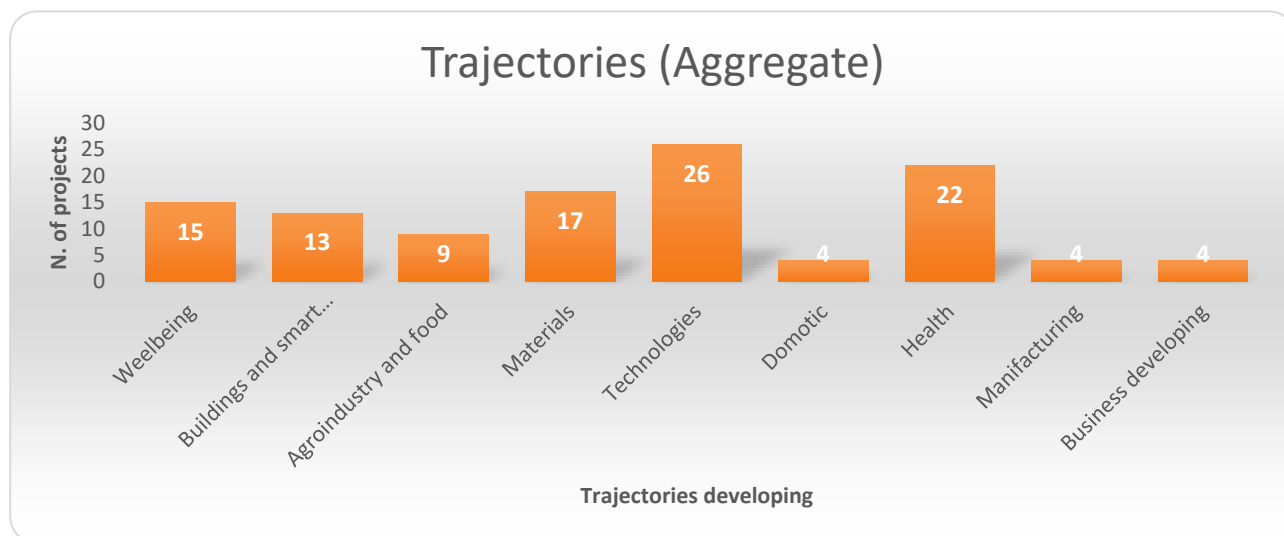


ENABLING TECHNOLOGIES



Innovation drivers





Data and figures

Main financial data of the call

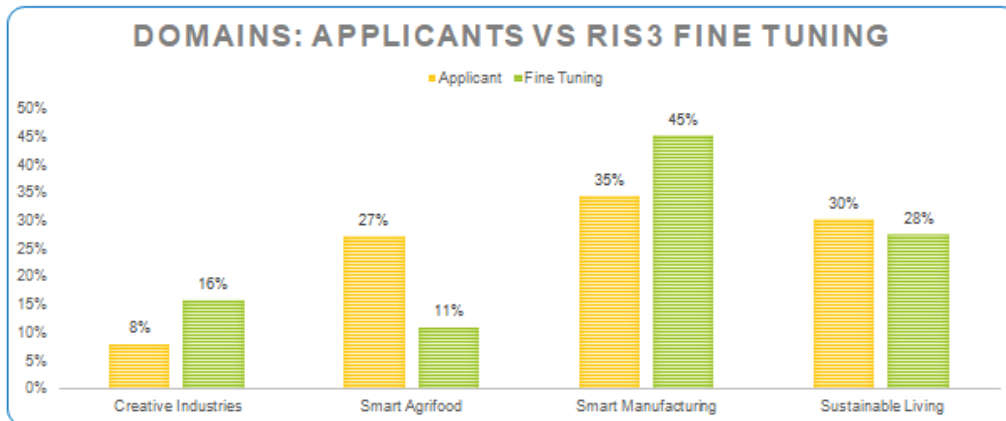
Average financial size of the approved projects: € 83,250.76

Maximun financial size of the projects € 200,000.00

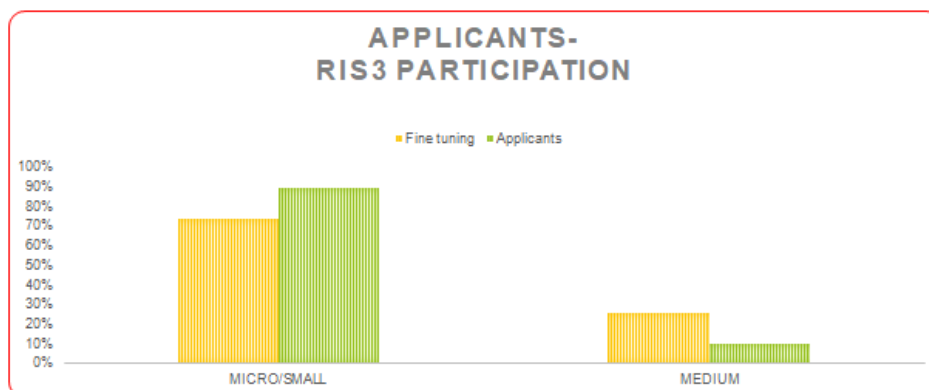
Minimun financial size of the projects € 13,176.94



Comparison: ERDF research call and RIS consultation

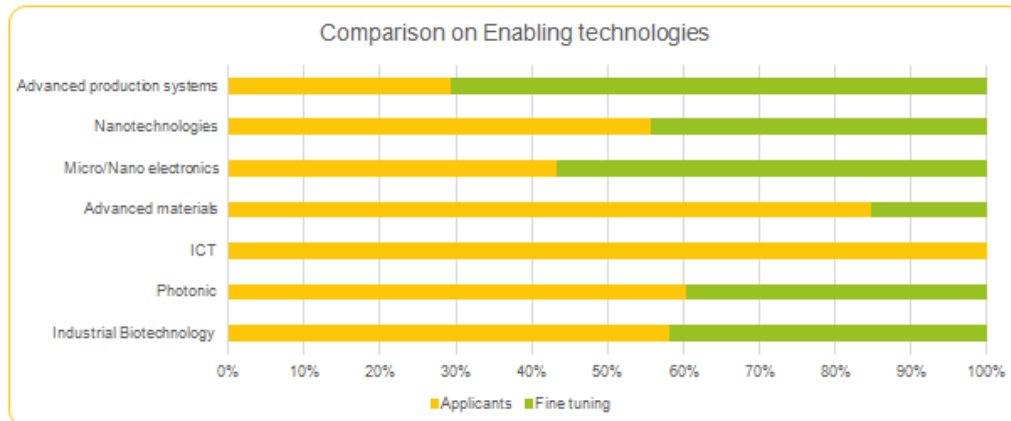


Comparison: ERDF research call and RIS consultation





Comparison: ERDF research call and RIS consultation



Total support granted per field of activity

	Creative Industries	Smart Agrifood	Smart Manufacturing	Sustainable Living	Totale:
Active ageing	205.200,00	3.377.868,04	1.914.594,50	2.238.945,34	7.736.607,88
Creativita'	5.411.571,96	322.990,20	2.277.831,74	603.790,00	8.616.183,90
Design	2.094.007,18	2.045.861,79	5.185.882,54	167.026,25	9.492.777,76
Efficienza energetica	185.656,76	291.300,00	8.024.520,48	2.843.996,21	11.345.473,45
Sostenibilita' ambientale	729.528,64	11.418.908,91	10.298.082,75	11.807.972,41	34.254.492,71
Totale	8.625.964,54	17.456.928,94	27.700.912,01	17.661.730,21	71.445.535,70

	Creative Industries		Smart Agrifood		Smart Manufacturing		Sustainable Living		Totale
	Valore in €	%	Valore in €	%	Valore in €	%	Valore in €	%	
Active ageing	205.200,00	2,38%	3.377.868,04	19,35%	1.914.594,50	6,91%	2.238.945,34	12,68%	7.736.607,88
Creativita'	5.411.571,96	62,74%	322.990,20	1,85%	2.277.831,74	8,22%	603.790,00	3,42%	8.616.183,90
Design	2.094.007,18	24,28%	2.045.861,79	11,72%	5.185.882,54	18,72%	167.026,25	0,95%	9.492.777,76
Efficienza energetica	185.656,76	2,15%	291.300,00	1,67%	8.024.520,48	28,97%	2.843.996,21	16,10%	11.345.473,45
Sostenibilita' ambientale	729.528,64	8,46%	11.418.908,91	65,41%	10.298.082,75	37,18%	11.807.972,41	66,86%	34.254.492,71
Totale	8.625.964,54	100,00%	17.456.928,94	100,00%	27.700.912,01	100,00%	17.661.730,21	100,00%	71.445.535,70

The monitoring system is continuing to measure the effects of policies; at this date these are the available data.



Matching with NUCLEI outcomes

At the level of the Veneto Region from the follow-up of the Open Seminars and Working Tables of the Nuclei project we can substantially derive the following points of interest:

- Percentage growth rates for the selected indicators stand, for SMEs: all around the percentage values between 0% and 10%. Only large companies have growth of more than 25%.
- The budget spent on research contracts is a point to work on; the values found and the willingness to invest are not well rooted in the corporate culture of SMEs, both for budget problems and also, above all, for problems of knowledge.
- For large companies innovation takes place through well-defined processes and company roles; for small and medium-sized enterprises more through sporadic initiatives.
- For many SMEs, participating in business networks and in initiatives (such as the Open Seminars in Nuclei project) is one of the few clear way to deal with practices and significant examples of open innovation.
- For SMEs, the example of Nuclei seminars, the motivation produced, the links created, the interesting expressions of interest, become objective value for the company's innovation spirit.
- SMEs do not know how to meet easily research centers and developers of new technologies; Nuclei project format can be of support in this direction.
- Companies perceive the role of innovation as fundamental, invest in innovation, and have indicators capable of defining that there have been significant results deriving from practices related to innovation.
- Companies invest in innovation specially if guided by experts, who introduce them into networks and appropriate opportunities. The Nuclei format works and creates relationships between companies and research centers.
- Cluster management required to build “bridges” to clusters and similar networks in EU and other target regions.
- Participants urged to enhance further internationalization activities with extra-CE regions.

Topics of greater relevance:

- Engineering (prototyping, systems engineering, product development, digital twins, vocational training);
- Production (additive manufacturing, artificial intelligence, robotics, IoT, Industry4.0, sensors/actuators, smart mobility);
- Management/Support (focus on: digital company, big data, new business models, self optimization, sales/services);



It is clear how many ideas can be useful for influencing future regional S3 policies, particularly in relation to the aspects closely related to the SMEs. These are in fact the main realities of which the Veneto regional productive territory is composed, and consequently the objective towards which S3 policies should mainly focus.

In particular, there is a need to focus on defining tools, procedures and practices that guide companies towards innovation processes, enhancing the role of bodies with specific skills in this direction and promoting formats and initiatives such as the Nuclei project, which clearly have this intent.

Another great indication that strongly correlates the results of the Nuclei project with the regional policies is the strong need to strengthen the aspects related to the presence of researchers in the company. Research is also reconciled by S3 policies as a key to innovation. The results of Nuclei show that it is absolutely a field to be strengthened to develop processes of true innovation that arise directly from within companies.

Once again, only large companies have departments and properly defined staff to carry out internal research; specific policies must include, and in part have already foreseen, calls for these ambitions, including those extended to SMEs.

Finally, the survey carried out with respect to the sectors considered to be pivotal will be fundamental. The manufacturing industries involved in Nuclei delineates as fundamental of specific sectors on which to invest: Engineering (prototyping, systems engineering, product development, digital twins, vocational training), Production (additive manufacturing, artificial intelligence, robotics, IoT, Industry4.0, sensors / actuators, smart mobility), Management / Support (digital company, big data, new business models, self-optimization, sales / services).

S3 regional policies partly converge towards the key role played by engineering; the trend of interests must be confirmed and further enhanced.



Conclusions and possible indications for policy makers

In light of the project results and the comparison with regional data, it emerges that the activities of reality such as those represented by the project partners, clusters and companies capable of achieving integration and networking between companies and carrying out events and workshops on the subject of innovation, become key and should be promoted by regional policies. Only thanks to specific actions undertaken by companies capable of bringing together small and medium-sized enterprises, uniting them and making them participate in shared realities will represent a turning point for them and a clear access to open innovation practices.

The experience of the Nuclei project should focus investments and political choices towards specific actions capable of promoting synergies and networking.

To achieve these goals, we need to push for actions such as:

Transnational working tables

Transnational open seminars

Technological tours

Innovation weeks

Makeathons and hackathons

Seasonal schools

Exchanges of experts and / or students

Sharing new technology results (for NUCLEI resources like pools of excellence, web-atlas, digital periscope, results repository).

Nuclei's experience is leading to the creation of an "alliance" with the following specific objectives.

Promote and support the work and activities of each partner through the involvement of other partners;

Continue to involve S3 regional development and initiatives;

Organize common activities;

Cooperate with other clusters in the fields of mechatronics and advanced production (eg European Mechatronic Alliance, EUREKA);

Participate in new project proposals (Interreg or other programs);

Provide a catalog of the competencies and offers of each partner to easily match the exchange needs and solutions;

Support the innovation process and technology transfer.



Thanks to the experience of the Nuclei project we can outline many key points in support of possible choices for regional policies regarding the theme of open innovation and above all experience practices that promote its diffusion at company level.

1. It is necessary to promote and encourage actions that become tangible and concrete "Face to face marketing": only through direct contact between companies, industrial realities and innovation excellence can the practice and access to excellence be disseminated, especially as far as concerns small and medium-sized enterprises;
2. The project meetings have highlighted two important and distinct trends, such as SMEs looking for best practices and business opportunities. Big companies are looking for technological benchmark. Two different flows of actions that can be reunited through common events, in which experiences are mixed.
3. What can really make the difference for all companies is the meeting with Practical Demonstration of technologies from which to learn and eventually derive new lines of market / product / technology.
4. An Active role of cluster manager in establishing transnational initiative (for involving companies, ...) needs to be institutionalized. Companies, especially SMEs, can only access established paths of innovation if they are guided.
5. The role of the cluster managers becomes fundamental to promote also and above all at the transnational high specialized contact points level.
6. Promotion of research activities by cluster manager. Cluster manager has built in bridges for SME and research center. As already highlighted by the choices of the Veneto Region, the policy of promotion of employment and research is a key to social success for the future. This choice also becomes fundamental in a startup perspective; often these realities become promoters of innovation and research for their easily malleable and very dynamic nature. Joint startup development actions and contacts between these and the most established companies could find in the same startup research centers "on site" ready to support the development of open innovation practices in the companies themselves, without having to look elsewhere.
7. At the level of information and transactional diffusion it is necessary to define common and univocal instruments and platforms, accessible in a way shared by the different realities.
8. We need policies and actions that can promote activities capable of Involving young people (makeathon, thematic schools, and other activities)
9. A fundamental aspect of organized meetings is that meetings alone are not abstinence. Care must be taken and importance given to follow-up and surveys collected following the meetings. This is the only way to produce meetings between companies, involved speakers and produce mutually beneficial interactions.
10. It takes time and resources to organize profitable meetings; it is necessary to aim at examples, experts and high-level experiences. Competitiveness is strong and alone
11. The role and presence of S3 managers is fundamental; the supervision of an institution such as the Region is key to success. We need constant supervision and comparison regarding topics, activities, international dimension to S3 priorities.



DT4.2.1_REGIONAL ACTION PLAN CZECH REPUBLIC (CZ)

Regional action plan for the expansion of the
NUCLEI approach as S3 & ESIF driving force
Czech Republic

Responsible partner: RCMT



Analysis of S3 performances using BSC model

Region and cluster definition

In terms of the NUCLEI project, the S3 strategy is the entire Czech Republic. The professional field of mechatronics, robotics and advanced manufacturing systems is represented in the Czech Republic by the association of companies and research organizations “Association of Engineering Technology - SST”. The Association is also the leading partner of the national technology platform focused on the field of advanced production technology - The Technology Platform of Engineering Production Technology - TPSVT. Together, SST and TPSVT promote the interests of businesses and research organizations towards the government, ministries and national strategy papers. RCMT is a strategic partner of SST and TPSVT for research and development. A representative of the RCMT is in charge of representing the interests of SST and TPSVT in the national strategy of smart specialization S3. SST and TPSVT are a national cluster for advanced manufacturing in mechanical engineering, automation, manufacturing machinery and mechatronics. RCMT represents this cluster in the NUCLEI project also towards the Office of the Government of the Czech Republic and the Ministry of Industry and Trade of the Czech Republic on the S3 strategy area.

The Technology Platform TPSVT consists of manufacturing companies, research institutes and associations that have been operating in the advanced manufacturing field in the Czech Republic. The main objective of the platform is to contribute and share to the development and competitiveness of the machine tool sector through the support of specialized applied research. Platform is the only and ultimate cluster in the field that formulates and defines a long-term research strategy that builds on subsequent implementation into specific R & D projects. The main objectives of the Technology Platform for the period up to 2030 are: Objective No.1. to maintain and strengthen the competitiveness of industrial production in the European and world scale through research, development and innovation; Objective No.2. increasing the intensity of joint research, development and innovation activities between industry companies and research organizations that lead to a new successful production.

The strategic objectives of TPSVT as a national cluster of advanced manufacturing technology and mechatronics are in line with the objectives of the NUCLEI project. The NUCLEI project thus directly supports the interests of the national cluster and influences the strategic plans and strategic materials of the TPSVT. Through the RCMT and TPSVT it is possible to positively influence the national S3 strategy at the national level and to promote the ideas and results of the NUCLEI project.

At the beginning of the NUCLEI project, the government authority was the responsible authority for the national RIS3 strategy in the Czech Republic. During the project, the national authority managing the RIS3 strategy was changed. Since 1 April 2018, the Ministry of Industry and Trade of the Czech Republic has been the national authority for the RIS3 strategy. Both the Office of the Government of the Czech Republic and the Ministry of Industry and Trade of the Czech Republic are affiliated partners of the NUCLEI project and cooperate closely with representatives of the RCMT. The following BSC analysis is based on



materials and information provided by the Ministry of Industry and Trade, in particular on the basis for mid-term evaluation of the national RIS3 strategy.

In accordance with the proposed methodology of the NUCLEI project for BSC analysis, the national RIS3 strategy was analyzed from 4 aspects:

- Financial perspective
- Beneficiaries and key stakeholders perspective
- Internal processes perspective
- Learning and growth perspective



For the NUCLEI project, the S3 strategy region is the whole of the Czech Republic and is directly influenced by the national S3 strategy.

Analysis of the national S3 strategy from Financial perspective

In order to assess the progress of any strategy, it is essential to have specific data. National RIS3 strategy is implemented through operational programs and national support programs: monitoring of financial and material indicators is primarily the responsibility of the control authorities, respectively -the specific bearers of these programs. As a result, a consistent approach to monitoring is not ensured in relation to the National RIS3 Strategy. The unification of the monitoring data into one source takes place within the S3 Strategy Department (MIT) and is subject to long-term work on a suitable methodological approach that would enable effective ongoing evaluation and evaluation of the National RIS3 Strategy.

With regard to the fact that all the programs are based on the support of public funds is relatively good overview of financial flows and since support from these programs is conditional on their compliance with the National RIS3 Strategy, this means that there is adequate information on targeting funds to defined key areas of change.

On the other hand, the factual parameters of the aid are not sufficiently monitored. The structural level of the National RIS3 strategy (horizontal objectives) defined by the hierarchy of "vision - key areas of change - strategic objectives - specific objectives" is covered by the indicator system, but apart from the contextual indicators of vision and key



changes in individual operational programs and national support programs can be realistically evaluated only a small part of indicators National RIS3 strategy. Although OPs contain a large number of indicators, only a limited part can be used for evaluating the National RIS3 Strategy. The analysis of material fulfilment of horizontal objectives of the strategy based on monitored indicators of strategic and specific objectives is thus very deprived of input data.

Vertical Objectives National RIS3 strategies are based on a rather complicated format linking research and development (NRIS3 research specialization) with the production base of products and services (NRIS3 economic specialization). So far, none of the Managing Authorities has been obliged to systematically monitor the intersection of research and economic specialization in supported projects. Analysis of the material fulfilment of the vertical objectives of the strategy based on the parameters of supported projects is possible only on the basis of limited data from the sample of projects and the resulting evaluation is therefore based largely on a qualified estimate.

OPERATIONAL PROGRAMS

The most important sources of funding for the National RIS3 Strategy are operational programs (OP) financed by ESIF, especially those with ex-ante conditionality. The total volume of the financial plan of the National RIS3 Strategy is CZK 212.7 billion, the largest share being OP Enterprise and Innovation for Competitiveness (OP EIC).

Planned aid for National RIS3 strategy from operational programs

Provider	Program	NRIS3 plan (CZK billions)
MIT	OP PIK	137.9 0
MŠMT	OP RDE	59.18
Hl. m. Prague	OP PPR	3.37
MMR	IROP	11.03
MLSA	OP Z	1,22
Total	RIS3	212.7 0

Source: MIT monitoring

The sum of the drawdown of funds for all operational programs cumulatively as of 10/2018 reaches less than half of the planned financial volume (48.6%).

The greatest slippage in the drawdown of funds is apparent in the OP EIC and as of 10/2018 only 41.7% of the planned amount was used. Although the drawdown dynamics increase year on year, there is a real risk, this largest source of funding for the National RIS3 strategy will not be exhausted. It can be assumed that the slower drawdown is largely due to, inter alia, the suspension of the EC OP EIC funding, the low absorption capacity in some areas and the procedural problems in the OP EIC administration that occurred during 2018.



Although an even lower drawdown rate can be seen in the OP Employment (36.9%), compared to the OP EIC, the volume of funds allocated from OP Z is marginal and therefore does not pose a serious risk to the overall drawdown of the National RIS3 Strategy.

The analysis of sources of project financing shows that state support (i.e. EU funds and public sources of the Czech Republic) represents 2/3 of resources for operational programs, non-public sources from the Czech Republic and abroad account for 1/3. The main share of state aid is EU funds, which as of 10/2018 amounted to CZK 61.5 billion. The structure of financing is evident from the following chart.

A total of 10,659 projects were supported during the period of implementation of the National RIS3 Strategy (from 2014) to 10/2018. Of this, two thirds of the OP RDE is accounted for. This is a large number of relatively smaller projects, on average not exceeding CZK 5 million. On the other hand, relatively larger projects with an average size of CZK 33 million were supported from the OP PPR and IROP.

Number and average size of projects in operational programs

Program	Balance at 10/2018 (CZK billions)	Number of projects	Project average (CZK million)
OP PIK	57.51	3 323	17.31
OP RDE	33.80	6 932	4.88
OP PPR	2.01	61	32.95
IROP	10.12	305	33.18
OP Z	0.45	38	11.84
RIS3	103.89	10 659	9.75

Source: MIT monitoring

Contribution of operational programs to the implementation of the National RIS3 Strategy

The highest fulfilment rate of the planned funds was achieved in the key area of change C - Economic benefits of R & D & I (over 120%) and lowest in the key area of change F - Social / social challenges (22%). However, both these areas are marginal in terms of planned financial volumes compared to other key areas of change. The funding for the remaining key areas of change is in the range of 40-70% of the planned financial volumes.

With regard to the advanced stage of implementation of the National RIS3 Strategy, it can be expressed that the financial plan will be met for key changes not reaching 10/2018 or 50% of the drawdown.

NATIONAL SUPPORT PROGRAMS

National support programs managed by TA ČR (Centres of Competence, Epsilon, Gamma) and MIT (TRIO) also participate in financing the National RIS3 Strategy. The total planned



volume of these programs is CZK 9.85 billion, of which CZK 7.08 billion in TA CR programs and CZK 2.77 billion in the MIT program.

Planned support of National RIS3 strategy from national support programs

Provider	Program	Plan according to N RIS3 (in billion CZK)
TA ČR	Centers of competence	2.04
TA ČR	EPSILON	4.19
TA ČR	GAMA	0.85
MIT	TRIO	2.77
Total	NRIS3	9.85

Source: MIT monitoring

In total, the drawdown of funds in national support programs has already exceeded the planned amount and is at 116% of the planned financial volume. The planned amount of funding has not yet been used up by the Gamma and Epsilon program. In terms of their share in the total financing of the National RIS3 Strategy, however, their share is negligible and the assumption of the planned limit being reached is realistic.

Analysis of the national S3 strategy from Beneficiaries and key stakeholders perspective

Entrepreneurial discovery process EDP

The EDP process is a fundamental conceptual approach to the design and implementation of European RIS3 strategies. The key features of this process are characterized as follows:

- participants from different backgrounds (triple / quadruple helix) discover and discuss information about possible new business opportunities;
- integrates business knowledge, fragmented across multiple locations and across many organizations, businesses, universities, clients, and users;
- exploring and opening up new areas of technology and market opportunities, potentially rich in innovation.

In the Czech Republic, the stakeholders of the EDP process are mainly stakeholders involved in the activities of national and regional innovation platforms, as described in the previous sections of the document. Their role is essential not only in the identification of vertical objectives in the process of preparing the RIS3 strategy, but also in its implementation, resp. when translating vertical objectives into grant programs and calls.

EDP process in identification of specialization (in preparation of strategy)

Setting of EDP process, resp. The introduction of entrepreneurs, researchers and other entities triple helix began in 2013, when the preparation of the National RIS3 Strategy and



its regional annexes began. At that time, innovation platforms (sectoral or thematic) were established in individual regions; national innovation platforms started to be established during 2014.

As has been shown in the previous analyzes, all implicit objectives of the National RIS3 strategy focused on smart specialization are not sufficiently accentuated and do not have a clear reflection in the definition of objectives and limits of the EDP process. As a result, this process is relaxed and does not reflect the key features of the process as mentioned above.

The evaluator believes that the implementation of EDP in this context focused more on the formal aspect of the process and not on the applicability of the outputs resulting from this process. The real state of "application card cards", respectively the summary of R & D & I priorities identified through EDP within NIP is unsustainably broad and in some cases directly declares that it is a copy of the concept of research, development and innovation of the relevant department.

As already mentioned in the previous chapters, the specific outcome of the EDP process should be the definition of (selected) topics for applied research in the (key) sectors of the Czech economic specialization, so that efforts and available funds (long list) can be effectively targeted.

However, identifying topics for applied research that could be used in key sectors of economic specialization in the Czech Republic is only one side of the problem of finding innovative opportunities.

The EDP process is all about finding and finding business opportunities based on innovation. The research activities of applied research in the Czech Republic cover to a certain extent all key knowledge domains of the National RIS3 Strategy and through the EDP process those areas where the research base is already producing attractive results that can inspire the application sphere in search of new business opportunities built on innovation.

The second concrete outcome of the EDP process should be new business opportunities based on really completed or in progress high technology processes and other results of applied research, which, when interconnected with the implementation base, will enable the emergence of competitive and innovative processes in production and services (short list).

EDP process in strategy implementation

EDP is a continuous process and its importance is evident not only in discovering business opportunities, but also in the projection period and in projecting its outputs into grant programs and calls.

In announcing calls, the MA should take into account the output of NIP in terms of the relevance of the knowledge domains for a specific application sector. While announcing the calls at the beginning of the programming period, the intention was to cooperate with the NIP in this respect (e.g. the OP RDE MA was trying to include the intersections of knowledge domains and application sectors in the calls), but these efforts were not fulfilled for various reasons.



The EDP process was not sufficiently managed by the holder of the National RIS3 Strategy, which negatively contributed to the loss of stakeholder confidence in the meaningfulness of the National RIS3 Strategy, as revealed by the findings of the field survey.

PERCEPTION OF EDP PROCESS BY INVOLVED STAKEHOLDERS (based on mid-term evaluation of S3)

Only less than half of respondents perceive the functioning of coordination between actors in this process. The process of planning and developing EDP positively evaluates less than 40%, while some ambivalence can be observed in this area, with almost the same percentage perceived as insufficiently planned and developed (the rest cannot assess it).

A significant finding is that only a quarter of respondents believe that the results of the EDP process are transmitted to policy makers at national level. This clearly reflects the already mentioned problematic attitude towards the meaningfulness of the National RIS3 strategy as such, where most of the key stakeholders of EDP do not have sufficient motivation to actively participate in this process.

Negative tendencies prevailed when evaluating the support received by respondents in their activities in NIP. Only a third of respondents believe that they are supported by relevant socio-economic data (33%) and are sufficiently informed about current trends in the application sectors (36%). Only 27% of respondents consider the outputs of the RIS3 analysis team to support their activities at a good level. The situation is different in the area of acquainting NIP members with monitoring the fulfilment of the National RIS Strategy, when over 60% of respondents expressed a positive opinion.

Application sector cards represent the main output of NIP activity. The overwhelming majority of respondents agreed that it is necessary to balance and publish the situation in the core industries and the cards are a suitable tool for formulating development measures and interventions to respond to the situation in the core industries.

However, almost 2/3 of the respondents (66%) believe that the R & D & I themes identified through EDP are formulated broadly and broadly, and nearly 60% of respondents consider the resulting cards to be insufficiently opposed and therefore see the risk that cards may not accurately reflect reality. Only less than half of the respondents believe that the card provides feedback on the effectiveness and design of policies and strategies with an impact on the sector.

Most respondents (almost 90%) believe that the inventiveness of the team that makes up the card plays a key role in card processing, and this is reflected in the quality and predicative ability of the card. However, almost half of the respondents believe that the creation of cards is mainly based on the views of the NIP creative team at the expense of objectivity, which corresponds to the already mentioned view of insufficient opposition of cards and inconsistent methodological guidance.

The low link with the regional dimension is also confirmed, as 45% of the respondents are unable to assess at all whether the regional distribution reflects regionally specific application sectors. Only a quarter of respondents believe that regional distribution is not merely formal and perceives compliance with regional application sectors.



Analysis of the national S3 strategy from Internal processes perspective

The implementation system of the National RIS3 Strategy comprises two basic levels: national and regional. The national (top) level is made up of the RIS3 Steering Committee, the National RIS3 Manager, the Interdepartmental Analysis Working Group and the National Innovation Platforms (NIPs). The regional level is made up of Regional Innovation Councils (RIS3 Strategy Managing Authorities), Regional RIS3 Coordinators and Regional RIS Managers and Regional Innovation Platforms.

Organizing the implementation of the National RIS3 Strategy

The preparation of the National RIS3 Strategy was originally entrusted to the Ministry of Education, Youth and Sports (MEYS), which was responsible for the first version of the Strategy approved by the Government on 8 December 2014. Subsequently, the management of the National RIS3 Strategy are in charge of the Deputy Prime Minister's Section for Science, Research and Innovation. Under the responsibility of the Office of the Government, specific parts of the National RIS3 strategy related mainly to management, implementation and budgetary outlook were completed in 2015 and the first half of 2016, based on the requirements of the European Commission. Subsequently, on 1 April 2018, the agenda of the National RIS3 Strategy was transferred to the Ministry of Industry and Trade (MIT) - Section for Digitization and Innovation.

RIS Steering Committee

The RIS3 Steering Committee represents the highest level of management and coordination of the National RIS3 Strategy, which is also reflected in its composition. The Chairman of the Management Committee of RIS3 is the Deputy Director for the Management of the Digitization and Innovation Section, under the responsibility of the National RIS3 Strategy. They are also members of the Deputy Ministers responsible for the Managing Authorities of Operational Programs with ex-ante conditionality, Deputy Ministry of Regional Development (MRD) with an overarching role in the ESIF area, representative of the City of Prague, Chairman of the Technology Agency of the Czech Republic, representative of the Research, Development and Innovation Council. As permanent guests, representatives of the Ministry of Finance, the Ministry of Labour and Social Affairs, selected representatives of regions and other important actors participate in the meetings of the RIS3 Steering Committee.

Although the official composition of the RIS3 Steering Committee is highly representative, it should be noted that the actual participation in individual meetings does not always correspond to this. The representation of the appointed members of the RIS3 Steering Committee by senior officials greatly reduces the importance of the Steering Committee, its ability to take action and make decisions. Representing lower officials may, in the long run, result in negotiations becoming formal, which may have a secondary negative impact on the perception of the importance of the National RIS3 strategy as such.



National RIS3 Manager

The constant shifting of the agenda of the National RIS3 Strategy, which is crucial for the development of the innovation potential of the Czech Republic, is logically accompanied by negative phenomena that do not contribute to building a positive image of this issue. One of the negative consequences is the high turnover in the position of the National RIS3 Manager as the key person in the management of the whole process of the National RIS3 Strategy, which is sensitively perceived by stakeholders.

Anchoring this issue in the structure of state administration bodies is another problematic level. It is characterized by a high degree of hierarchy (the model of hierarchical management is typical of public administration institutions), both in the mutual relationship of these institutions and within individual institutions. Although the issue of National RIS3 strategy has a supra-departmental character, i.e. that it requires management and coordination across ministries, it has been transferred from the Office of the Government, as a sub-departmental institution, to the competence of the MIT.

The role of the National RIS3 Manager is thus ensured only from the position of Head of Unit. This represents a very difficult situation for the National RIS3 Manager in fulfilling his role of complex management and coordination of all actors involved in the implementation of the National RIS3 Strategy. In practice, this means that the National RIS3 manager very often negotiates with the management of OP managing bodies - holders of national support programs (top management of TA CR), regional representations, NIP members (often from the high management level of scientific research institutions and the business sphere)-without being in an equivalent position. Last but not least, the National RIS3 Manager ensures communication with the European Commission regarding the RIS3 issue and its position thus sends out signals outside the Czech Republic, what importance is given to this issue at the national level.

Analytical team

The task of the analysis team is to support the activities of the National RIS3 Manager. In fact, the S3 Strategy Department fulfils the role of the analytical team in the staffing of 3 + 1 (National RIS3 Manager). The role of the analytical team is not only of an “analytical” nature, but their activity is largely focused on the organization and coordination of the whole process of implementation of the National RIS3 Strategy.

The main activities of an “analytical” nature include: monitoring of OP and IPA interventions at the 5th and 10th month of the given year; data analysis and processing of the Report on the implementation of the National RIS3 Strategy in the given year; preparation of the National RIS3 Strategy Implementation Plan for the next year; elaboration of National RIS3 Strategy Update (every two years); analysis and evaluation of regional documents (Semi-annual reports sent twice a year), preparation of the National RIS3 strategy 2021+ (using outputs from an external supplier), preparation of documents for the EC and MRD in connection with the preparation of the new programming period and others.



The main activities of an “organizational” nature include: organizational arrangements for the meetings of the MC RIS3, including the content preparation of background materials (approx. 4x a year); organization of meetings of all NIPs, including the content preparation of background materials (approx. 14 times a year); organization of MAPS meetings, including content preparation of background materials (approx. 6 times a year); organization of regular meetings with regions, including content preparation of background materials (approx. twice a year) and others.

Although the S3 Strategy Department operates in a very limited personnel composition, the above-mentioned basic tasks related to the implementation of the National RIS3 Strategy have been adequately accomplished.

However, the evaluator believes that the scope of the RIS3 agenda as compared to the available personnel capacities no longer allows the team (and the national RIS3 manager) to perform an absolutely crucial role, namely systematic conceptual and methodological guidance. The absence of systematic methodological guidance and coordination was very often mentioned in the field survey, both by the regions and by players at the national level. Although, according to stakeholders’ comments, the situation has improved significantly over the last period (mostly mentioned last year) and considerable progress has been made both in relation to the regional level and in relation to NIP, the emphasis will be on a coordinated approach next programming period, respectively. National RIS3 2021+ has grown enormously.

Interdepartmental Analytical Working Group

An interdepartmental analytical working group has been set up to smoothly coordinate activities between the National RIS3 Strategy team and individual Managing Authorities and Support Providers from the National Support Programs. As the field survey showed, although MAPS was established in 2016, the coordination mechanisms have not been established until recently.

The lack of coordination was particularly apparent at the beginning of the programming period, as this was a key moment when most calls were announced. As a result of poor coordination, individual grant providers (both from ESIF and national funds) grasped the RIS3 issue “on their own” and this was manifested, for example, by inconsistencies in the form of selection criteria and the manner of evaluating compliance of project applications with the National RIS3 strategy. This resulted in wider support for projects with limited targeting to national domains of smart specialization.

It should be noted that in the current programming period, most of the calls have been announced and funds have been allocated without any “central supervision”. For the next programming period, however, it is essential that the National RIS3 Coordinator applies a strong degree of coordination to the grant providers and it can be assumed that MAPS is an appropriate working platform where the transcription of the National RIS3 Strategy into specific interventions and how they can be effectively coordinated.



National Innovation Platforms

NIPs are a key link in the business discovery process (EDP), which is the basic concept of S3 strategies (the course of EDP is analyzed in more detail in the next chapter). Currently, the NIP Strategy 7 operates within the framework of the National RIS3 Strategy.

- I. Engineering, energetics, metallurgy and industrial chemistry
- II. Electronics, electrical engineering and ICT
- III. Manufacture of transport equipment
- IV. Drugs, biotechnology, medical technology, life science
- V. Cultural and creative industries
- VI. Sustainable agriculture and environmental application industries
- VII. Social challenges

The composition of NIP corresponds to the triple helix concept, where there are important representatives of the application sphere (business entities), representatives of leading research organizations, representatives of public administration and regions. Relatively even representation of triple helix representatives was confirmed by field research among NIP members.

The actual functioning of NIP is accompanied by many pitfalls, which were identified by field research directly at NIP members. The fundamental problem, especially on the part of the business sector, is the loss of confidence in the meaningfulness of these structures and their participation in them.

Almost a quarter of respondents from NIP members do not consider the implementation structure to be optimally set up, with the most frequent reservations pointing to underutilisation of NIP potential, limited transmission of impulses arising from NIP activity to the management level and non-systematic NIP activities.

In particular, in the previous years of the operation of the platforms, the absence of a "clear task and assignment" for the NIP can be identified. Platform behaviour has often been reduced to the information flow from the National RIS3 strategy bearer towards NIP members, which completely contradicts the basic principles of the EDP process (the opposite flow of information).

An important problem is also the expertise of the teams of individual NIPs. NIP members themselves rate this as a weakness in the functioning of NIP. Expert teams must be equipped with knowledge of global and European trends, be able to use a participatory approach and effectively organize stakeholders.

It is not a good practice where the National RIS3 Manager presides and effectively directs the meetings of national innovation platforms. Facilitation of expert discussions NIP should be left to knowledgeable experts in the given research sector (priority field), who will be able to conduct a discussion at a high professional level and will be considered by other



stakeholders as expert authorities. The role of the National RIS3 Manager should remain only at the level of transmission of information on EDP results and coordination.

Analysis of the national S3 strategy from Learning and growth perspective

The national RIS3 strategy is implemented through specific projects that are supported within the relevant interventions of operational programs and national support programs. Projects implemented within these interventions should be consistent with the objectives of the National RIS3 Strategy. The approaches of individual managing authorities to reporting this compliance differ dramatically.

In the case of national support programs (Gamma, Epsilon, Competence Centers), applicants for support are not obliged to report compliance of their project with the National RIS3 strategy. For this reason, the knowledge of the National RIS3 strategy of beneficiaries from these programs is also significantly lower than that of beneficiaries from the OP. Beneficiaries from these national support programs are also not obliged to identify in the aid application to which domain of smart specialization their project belongs, which is later reflected in the impossibility to evaluate the actual targeting of the National RIS3 strategy, respectively meeting horizontal and vertical goals.

In the case of the national TRIO support program, applicants for support determined compliance with the National RIS3 Strategy, based on the methodological material “Vertical Priorities of the National RIS3 Strategy”.

Applicants for support from OPs proceeded in a similar way for calls with ex-ante conditionality. In the case of OP EIC applicants, the applicants had at their disposal “Background material for the implementation of the RIS3 strategy in the Operational Program Enterprise and Innovation for Competitiveness 2014-2020”. In the case of applicants from the OP RDE, the applicants followed the instructions in the “Conceptual Approach of the OP RDE MA to the Implementation of the RIS3 Strategy”, resp. according to the “Background Material for Implementing the RIS3 Strategy”. Applicants from the OP PPR program had the material “Assessment of project compliance with the National RIS3 Strategy and the Regional Innovation Strategy of the City of Prague”.

The actual compliance methodology differs from material to material. In the case of the OP EIC, the applicants identified the application domain to which the project is linked as a binary criterion and listed it in a feasibility study. If the applicant was a large enterprise, then he had to meet another binary criterion concerning the knowledge domain. The bonus criterion was to indicate the strength of the link to the relevant knowledge domains, which was mandatory for both small and large companies.

In the case of OP RDE, the applicant is obliged to submit an annex in the project application submitted to the vertical call, the purpose of which is to describe the compliance of the project with the RIS3 strategy, always in the regime relevant to the given call. The compliance of the project application with the RIS3 strategy is assessed at the stage of substantive evaluation by expert evaluators through the exclusion (binary) criterion



“Compliance with RIS3”. Failure to meet this criterion is a reason for rejecting a project application.

In the case of the OP PPR, the applicant must describe the compliance of the project with the priorities of the RIS3 strategies (national and regional) and the domains of specialization that these strategies contain. In order to meet the acceptability criterion, it is necessary that the project falls into one of the application sectors of the National RIS3 Strategy or into the domains of the Regional Innovation Strategy of the Capital City of Prague specialization, where the project must correspond to at least one item.

The lack of a uniform methodology for both beneficiaries and project evaluators and the use of a binary evaluation criterion proved to be not very happy, as confirmed by the field survey with project evaluators.

A serious finding from the questionnaire survey with project evaluators is that although they should be able to assess the compliance of projects with the National RIS3 strategy, their knowledge of this strategy is in many cases poor.

A total of 60% of the evaluators of the national Gamma, Epsilon and Competence Center support programs are unaware of the existence of the National RIS3 strategy or do not know what the strategy is about. The situation of the evaluators of the OP EIC, OP RDE, OP PPR and TRIO programs is much better, as these evaluators must comment on the compliance of the projects with the National RIS3 strategy (compared to TA CR projects where compliance is not a condition). Despite this, almost 7% of the evaluators stated that they did not know the content of the National RIS3 strategy at all and 23% knew its content not quite well.

The evaluators had the opportunity to express their experience with the degree of understanding of the National RIS3 strategy among project promoters. Half of the evaluator’s report that the proportion of project promoters who justify their project’s compliance with the National RIS3 strategy at a high level is between 10 and 30% (average 24.21%). The justification is between 30 and 58.75% (average 43.48%) and 20 to 50% of the submitted projects (32.31% average) show insufficient justification. The evaluators were overwhelmingly in favour of the view that project promoters did not appreciate the importance of the National RIS3 strategy and understood the emphasis on innovation as a necessary condition for receiving support.

It does not make sense to deduce intelligent specialization separately from knowledge specialization domains or separately from economic specialization domains. Only the effective interconnection of both domains of the vertical goals of the National RIS3 strategy makes sense.

On the one hand, the outcome of the EDP process must be the identification of national domains of knowledge specialization, that is, where the scientific research base gives attractive results with high potential for innovation and usable in practice.

On the other hand, it is necessary to identify national domains of economic specialization by the same process, i.e. the area where the application sphere achieves high production parameters, both in terms of volume applied on the domestic and foreign market and in terms of its competitiveness.



In the section on EDP process and the role of NIP it was stated that the role of NIP is not negligible also in setting the evaluation criteria for project evaluation. With regard to the above, it is then possible to build the bonus just on the degree of targeting of the respective project into the intersection of both domains of national specialization - knowledge and economic.

Recommendations for improving RIS3 and the process of developing and implementing the RIS3 strategy resulting from the analysis

- set specific, clear and measurable objectives;
- Introduce consistent prioritization of vertical goals (verticalization) - specialize in key innovative fields and sectors of the national economy with a competitive advantage, clearly define links between knowledge domains and domains of economic specialization;
- simplify the document of the National RIS3 Strategy - its simplification and clarification (including related supporting materials);
- Use clear and unambiguous wording that is understandable to the wider professional public;
- modify terminology and eliminate ambiguous interpretations - give clear definitions and unify research and technical terms;
- create a user-friendly document intended for beneficiaries, evaluators and the wider public, e.g. brief brochures, handbooks, etc. (brief summary material for the first basic orientation) concrete and practical examples;
- continue effective communication and information transfer both in the horizontal (sectoral approach) and in the vertical (towards the regions);
- consider adjusting the NIP structure in relation to prioritization and specialization (consider adjusting the NIP structure according to knowledge domains);
- appoint a professional guarantor (professional authority) to lead the NIP and evaluate its activities financially;
- focus efforts on methodological guidance of important stakeholders in implementing the National RIS3 strategy (e.g. methodological support of regions in the preparation of regional annexes 2021+, methodological “instruction” concerning the compliance of projects with the National RIS3 strategy, etc.);
- enable representatives of the National RIS3 Strategy Analysis Team to actively participate in the preparation of the indicator system for the new programming period under the coordination of the MRD-NCA in order to achieve effective monitoring of the strategy;
- requirements for modifying MS2021 + should be heard by ESIF (MMR-NOK) to enable the system to aggregate data according to national domains of smart specialization (application industries, generic knowledge domains (KETs));
- introduce project bonuses in a coordinated way by all managing authorities of grant programs - introduce a strong point preference for projects aimed at the intersection of



identified domains of national knowledge specialization and national economic specialization and replacing the binary criterion with a point criterion;

- continuously express political support for the RIS3 strategy, both at the level of the national political representation and at the level of the regional political representation;
- promotion and popularization of the RIS3 strategy - to set the “communication plan” of the RIS3 strategy and bring it to the fore, disseminate information on the importance of the RIS3 strategy in public space, PR activities, media campaign, wide education, both national and regional level.

Matching with NUCLEI outcomes

NUCLEI project has built and practically tested the vision of a new model of transnational collaborative environment in the area of advanced manufacturing, mechatronics, robotics, technology transfer, and innovation in the Central European area. This model is based on sustainable links between regions and countries, and between industry, research and local authorities in charge of regional development, and it uses several tools to help collaboration and its meaningful output. The common work of the project partners on the project deliverables resulted, in addition to the specific deliverable outputs, in the 10 NUCLEI “Golden Rules”: key factors for strengthening and extending the collaboration among the participating partners and their regions.

The Czech Republic’s national RIS3 strategy must be further improved in the future. The following overview formulates and recommends to improve the national RIS3 strategy from the perspective of the 10 NUCLEI “Golden Rules”:

1. Common technological background, common understanding, common language

The collaboration is most effective when it takes place within the platform of stakeholders who can easily find shared background in terms of the technology areas they operate in as well as the challenges they face and who understand one another as they speak the same language regarding their needs and expectations.

NUCLEI project measures and recommendations to be incorporated in S3:

There is a need to harmonize the concepts that apply in the technical parts of the RIS3 strategy. Many technical terms and terms overlap and sometimes there is an ambiguity in the prioritization. It is appropriate that the national RIS3 strategy of the Czech Republic should use terms that are commonly used abroad.

2. Meeting together

It is impossible to maintain successful relationships without communication and in the present digital age it is natural to meet virtually. However, we can confirm that meeting face



to face brings also business relationships to the next level helping them thrive. We have also discovered that meetings in small groups provide most benefits to all participants.

NUCLEI project measures and recommendations to be incorporated in S3:

Personal negotiation between stakeholders is to be significantly strengthened in the preparation and updating of the RIS3 strategy. At present, members of national innovation platforms meet approximately once a year and contact is very weak. The NUCLEI project clearly identified the importance of personal meetings, even in small groups. As part of the preparation of the national RIS3 strategy, it is also appropriate to newly apply additional negotiations in small professional groups.

3. Taking the meetings further transnational

Nevertheless, just meeting is not enough: it is important to follow the meetings up in order to generate deals. The development of the full potential of the business contacts created in meetings is supported by involving the stakeholders in common transnational activities.

NUCLEI project measures and recommendations to be incorporated in S3:

Stakeholders involved in the development and updating of a national RIS3 strategy should not only represent the national perspective, but should also be familiar with the international context. Appropriate members of the EDP process should also be members of an international platform or industry group they represent.

4. Key role of cluster managers

Cluster managers have proved to be vital highly specialized transnational contact points in NUCLEI technological fields. Their active role in establishing and maintaining transnational initiatives to involve stakeholders is irreplaceable as they are in the best position to foster the exchange of contacts to initiate and develop business relationships.

NUCLEI project measures and recommendations to be incorporated in S3:

Managers of national clusters and technology platforms are already involved in the preparation and updating of the national RIS3 strategy of the Czech Republic. In the EDP process, the role of cluster managers and technology platforms having their own sectoral R&D strategies and having proven international cooperation should be strengthened.

5. Bridges between industry, research and regions

Another crucial task of clusters and their managers is serving as a point of connection between-en the partners from industry, research institutions and local authorities to facilitate synergies promoting and accelerating technological transfer, innovation, time-to-market and R&D expenditure in the NUCLEI areas.

NUCLEI project measures and recommendations to be incorporated in S3:



In order to implement and promote the concept of Open Innovation at the level of the national TRIS3 strategy, not only representatives of large companies, associations and research organizations, but also representatives of SMEs and start-ups need to participate in the EDP process. At present, the representation of SME partners and start-ups is small and very lacking. This may lead to some prospective themes for the RIS3 strategy being completely omitted.

6. Customized offer

In the NUCLEI activities we have observed that to keep the network productive, it is necessary to cater to various needs of different stakeholders. For example, SMEs tend to look for exchange of best practices and business opportunities whereas large companies to technological benchmarking, therefore they all need adequate opportunities to fulfil their demands.

NUCLEI project measures and recommendations to be incorporated in S3:

As in the area of technology transfer, the needs of large enterprises and SMEs have to be addressed, so the differences in stakeholder needs should be taken into account when developing and updating the RIS3 strategy. Each stakeholder should identify his role and his different view and approach to the RIS3 strategy.

7. Practical demonstration of technologies

A picture paints a thousand words and similarly being able to see the cutting-edge technologies and their development in real life is invaluable for shared technological transfer and transnational cooperation. Technological tours and demonstrations are one of the most popular ways to promote practical understanding and share concepts among the stakeholders.

NUCLEI project measures and recommendations to be incorporated in S3:

The national RIS3 strategy of the Czech Republic is currently not very clear and understandable. It is not possible to directly link the RIS3 strategy to the possibilities of technology demonstrations, but the accompanying documents need to strengthen the visibility of the preferred and promoted themes and technologies.

8. Digital platform

With current fusion of virtual and physical life it would be unthinkable to function without a supporting digital platform used to inform the stakeholders and the public about the transnational activities organized and to foster communication and contacts.

NUCLEI project measures and recommendations to be incorporated in S3:

The theme of the Digital Single Platform is of great importance in developing and updating the national RIS3 strategy. There is currently no common digital platform for stakeholder work under EDP. This topic is promoted at the level of the Ministry of Industry and Trade.



9. Incorporation of S3 priorities

To strengthen the relevance of NUCLEI approach and environment it is inevitable to make it work with respect to S3 priorities of each region and thus organically link its topics, activities and transnational collaboration to the individual S3 regional strategies through building relationships with local S3 managers.

NUCLEI project measures and recommendations to be incorporated in S3:

The NUCLEI project has shown how positive is the cooperation of RIS3 managers from various regions of Central Europe. The National Manager of RIS3 Strategy of the Czech Republic participated in S3 meetings of the NUCLEI project, was in contact with RCMT representatives and evaluated this cooperation very positively. We will continue to cooperate in this national cooperation of the Ministry of Industry and Trade and RCMT as representative of the national cluster of advanced manufacturing techniques. It will also seek to continue international cooperation within the NUCLEI project.

10. Young people

To ensure the continuation and further development of NUCLEI transnational network it is necessary to focus on current stakeholders but also to plan ahead involving new rising generation of innovators, researchers and technology experts, who would continue the good work started, through events like makeathon, hackathons and other activities targeted especially at students and young people.

NUCLEI project measures and recommendations to be incorporated in S3:

The systematic involvement of young people and young promising researchers and inventors in the EDP process of the national RIS3 strategy is completely lacking. Although it is a strategic and conceptual document, it is appropriate that young prospective experts and researchers are also involved in the preparation and updating process.

Conclusions and recommendations

Based on the BSC analysis, the following measures and recommendations, which respect the ideas of the NUCLEI project, are enforced:

- set specific, clear and measurable objectives;
- introduce consistent prioritization of vertical goals (verticalization) - specialize in key innovative fields and sectors of the national economy with a competitive advantage, clearly define links between knowledge domains and domains of economic specialization;
- simplify the document of the National RIS3 Strategy - its simplification and clarification (including related supporting materials);



- use clear and unambiguous wording that is understandable to the wider professional public;
- modify terminology and eliminate ambiguous interpretations - give clear definitions and unify research and technical terms;
- create a user-friendly document intended for beneficiaries, evaluators and the wider public;
- continue effective communication and information transfer both in the horizontal (sectoral approach) and in the vertical (towards the regions);
- appoint a professional guarantor (professional authority) to lead the NIP and evaluate its activities financially;
- focus efforts on methodological guidance of important stakeholders in implementing the National RIS3 strategy;
- introduce project bonuses in a coordinated way by all managing authorities of grant programs;
- continuously express political support for the RIS3 strategy;
- promotion and popularization of the RIS3 strategy.

Based on the NUCLEI project “Golden Rules”, the following measures and recommendations, which respect the ideas of the NUCLEI project, are enforced:

- There is a need to harmonize the concepts that apply in the technical parts of the RIS3 strategy. Many technical terms and terms overlap and sometimes there is an ambiguity in the prioritization. It is appropriate that the national RIS3 strategy of the Czech Republic should use terms that are commonly used abroad.
- Personal negotiation between stakeholders is to be significantly strengthened in the preparation and updating of the RIS3 strategy. At present, members of national innovation platforms meet approximately once a year and contact is very weak. The NUCLEI project clearly identified the importance of personal meetings, even in small groups. As part of the preparation of the national RIS3 strategy, it is also appropriate to newly apply additional negotiations in small professional groups.
- Stakeholders involved in the development and updating of a national RIS3 strategy should not only represent the national perspective, but should also be familiar with the international context. Appropriate members of the EDP process should also be members of an international platform or industry group they represent.
- Managers of national clusters and technology platforms are already involved in the preparation and updating of the national RIS3 strategy of the Czech Republic. In the EDP process, the role of cluster managers and technology platforms having their own sectoral R&D strategies and having proven international cooperation should be strengthened.
- In order to implement and promote the concept of Open Innovation at the level of the national TRIS3 strategy, not only representatives of large companies, associations and research organizations, but also representatives of SMEs and start-ups need to participate in the EDP process. At present, the representation of SME partners and start-ups is small and very lacking. This may lead to some prospective themes for the RIS3 strategy being completely omitted.



- As in the area of technology transfer, the needs of large enterprises and SMEs need to be addressed, so the differences in stakeholder need to be taken into account when developing and updating the RIS3 strategy. Each stakeholder should identify their role and their different view and approach to the RIS3 strategy.
- The national RIS3 strategy of the Czech Republic is currently not very clear and understandable. It is not possible to directly link the RIS3 strategy to the possibilities of technology demonstrations, but the accompanying documents need to strengthen the visibility of the preferred and promoted themes and technologies.
- The theme of the Digital Single Platform is of great importance in developing and updating the national RIS3 strategy. There is currently no common digital platform for stakeholder work under EDP. This topic is promoted at the level of the Ministry of Industry and Trade.
- The NUCLEI project has shown how positive is the cooperation of RIS3 managers from various regions of Central Europe. The National Manager of RIS3 Strategy of the Czech Republic participated in S3 meetings of the NUCLEI project, was in contact with RCMT representatives and evaluated this cooperation very positively. We will continue to cooperate in this national cooperation of the Ministry of Industry and Trade and RCMT as representative of the national cluster of advanced manufacturing techniques. It will also seek to continue international cooperation within the NUCLEI project.
- The systematic involvement of young people and young promising researchers and inventors in the EDP process of the national RIS3 strategy is completely lacking. Although it is a strategic and conceptual document, it is appropriate that young prospective experts and researchers are also involved in the preparation and updating process.

Events and working groups in which the NUCLEI Regional Action Plan is promoted towards the national RIS3 strategy:

- The RCMT representative represents the National Advanced Manufacturing Technology Cluster (TPSVT and SST) as a member of the National Innovation Platform (NIP) for mechanical engineering and mechatronics. The representative participates in all NIP meetings and prepares documents for work on NIP updates. Further NIP meetings will take place in the first half of 2020.
- The RCMT representative is a member of the Expert Working Group for the preparation of materials for updating the National RIS3 Strategy 2021+. The Group held two meetings in 2019 and further negotiations are planned for December 2019.
- The RCMT representative is a member of an expert team for science, research and innovation working under the Confederation of Industry of the Czech Republic. This expert team addresses the topics of updating the national RIS3 strategy. In 2019, one meeting was held focusing on RIS3 and another is planned for the end of 2019.
- The RCMT representative is in direct contact with the national RIS3 manager Daniel Všeťečka. The RCMT representative is also in contact with the entire RIS3 team at the Ministry of Industry and Trade and is collaborating on planning for the preparation of an updated RIS3 strategy.