DOCUMENT TITLE:

BENCHMARK REPORT

Project: Improving RD and business policy conditions for transnational cooperation in the manufacturing industry

Acronym: Smart Factory Hub

Work package	WP3: Benchmark and RIS3 based Smart factory model definition
Activity	A 3.3: RIS3 benchmarking and trans-regional smart factory model definition
Deliverable	D 3.3.1: Benchmark Report
Date of issue	22.09.2017
Document issued by	PRO
Contributors	All partners
Version	A1.0
Number of Pages	85

Dissemination level		
PU	Public	X
PP	Restricted to other Programme participants	
RE	Restricted to a group specified by the consortium	
CO	Confidential, only for members of the consortium	

Project co-funded by European Union funds (ERDF, IPA)

TARGET GROUP ASSESSMENT

Has this deliverable addressed any of the target group indicated in the application form?

Yes / **No**

If yes, please describe the involvement of each individual target group in the table below.

Target group	Number reached by the deliverable	Description of target group involvement
SME		
Regional public authority		
National public authority		
Higher education and research		
Business support organisation		

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1 Executive summary

Within the SMART FACTORY HUB Project 10 countries: Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Romania, Serbia, Slovakia and Slovenia, are selected to show, how they operationalized their smart specialization strategy and enhance innovation in the context of smart manufacturing. Benchmark activity will identify synergies within 3 identified smart factory topic areas ((i) Applying novel technologies, (ii) Applying effective production processes and (iii) Applying effective human resource management systems).

The benchmark report aims to give common benchmarking overview of strategies, priorities, indicators, implementation schemes, instruments and initiatives in order to highlight cross regional differences, diversities, advantages, shortages, possibilities and other factors relevant for future Smart factory model definition.

This benchmark report is based on a statistical benchmark using EUROSTAT data, survey related to regional critical factor for SME, and regional mapping reports to the smart specialisation strategy from each single country. It shows, how these countries managed to increase SME competitiveness in Europe, which relies heavily on innovation and thus the successful implementation of a National/Regional Strategy for Smart Specialisation (RIS³) and the quality of its design and delivery mechanisms for financial and non-financial support services.

The report summarizes, that the most influential areas for increasing SME's competitiveness in the future are (i) product quality, (ii) manufacturing costs, (iii) speed of production and (iv) coordination with customers.
In general, it can be conducted, that SMEs currently implemented smart manufacturing novel technologies or HR management. Around 40% SMEs are currently not implementing any smart manufacturing solutions/methods related to production processes. SMEs do have plans to become more active in the future, with data analytics, Next-gen manufacturing systems and smart supply network being the top three areas of interest.
Lean manufacturing and 6 Sigma are considered the most favourite production process optimisation systems, while employee motivation systems and knowledge sharing/transfer are the most selected HR management system to be implemented in the future.

Almost 80% of SMEs are willing to cooperate in the future, predominantly acting as ''receivers'' of new technologies and systems. They are mostly interested in the production level (technical view) or company level, education/training level.
The project SMART FACTORY HUB tries to address these needs by improving competences and skills among the participation organisation and transferring knowledge in order to design and set-up cooperation and learning hub for technology alliances, as well as policy hub for policy recommendations.

2 Introduction

To make innovation a priority for all regions

'Europe 2020' requires policy makers to consider how the different aspects of smart, sustainable and inclusive growth are interrelated. Integrated smart specialisation strategies respond to complex development challenges by adapting the policy to the regional context.

Within the SMART FACTORY HUB Project 10 countries: Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Romania, Serbia, Slovakia and Slovenia, are selected to show, how did they operationalize their smart specialization strategy and enhance innovation in the context of smart manufacturing.

Figure 1: The Danube region and 10 survey countries

Benchmark activity will identify synergies within 3 identified smart factory topic ((i) Applying novel technologies, (ii) Applying effective production processes and (iii) Applying effective human resource management systems).

This benchmark report is based on a statistical benchmark, regional critical factor SME diagnosis reports, and regional mapping reports to the smart specialisation strategy from each single country. About 280 SMEs answer the survey.

The report aims to give common benchmarking overview of strategies, priorities, indicators, implementation schemes, instruments and initiatives in order to highlight cross regional differences, diversities, advantages, shortages, possibilities and other factors relevant for future Smart factory model definition. It shows, how these countries managed to increase SME competitiveness in Europe, which relies heavily on innovation and thus the successful implementation of a National/Regional Strategy for Smart Specialisation (RIS³) and the quality of its design and delivery mechanisms for financial and non-financial support services.
In line with the 2014-2020 ERDF thematic priorities, these support services should enhance R&D+I activities or strengthen enterprise competitiveness.[1]

[1]http://s3platform.jrc.ec.europa.eu/smes-and-smart-specialisation

3 Benchmark Analysis

This chapter is divided into

- A statistical overview of current development state of the selected 10 countries. (see chapter 3.1Statistical Benchmark)
- A comparison of the national smart specialisation strategies and useful information about support environment, solution providers, production SME's and other details from the manufacturing sector. (see chapter 3.2Strategy Background; 3.3Support Environment; 3.5Smart Factory support schemes and programmes)
- Benchmark based on the survey carried out to identify the state of development of SMEs in respect to Smart manufacturing and detect challenging areas/skills/knowledge for further development (regional critical factor SME diagnosis reports). (see chapter 3.6Benchmark of critical factor SME in the macro Danube region)

3.1 Statistical Benchmark

A statistical benchmark method allows to make territories comparable among each other with specific context factors. We identified three dimensions: geo-demography, economy indicators including industry specialisation and the level of innovation activities. The next step was to identify variables that reflect the multifaceted nature of those dimensions more appropriately. The selection of these variables is strongly conditioned by data availability, usually quite scarce with regards to some crucial regional issues. Eurostat was used as a main data base.

3.1.1 Geo-demography

This chapter looks at Geo-Demography characteristics of the defined Danube Region (Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Romania, Serbia, Slovakia and Slovenia). The whole region counts with 156 Million inhabitants, whereas 67.3 % are persons considered to be of working age (15 to 64 years old) in 2015 and average population density of 113 persons per km².

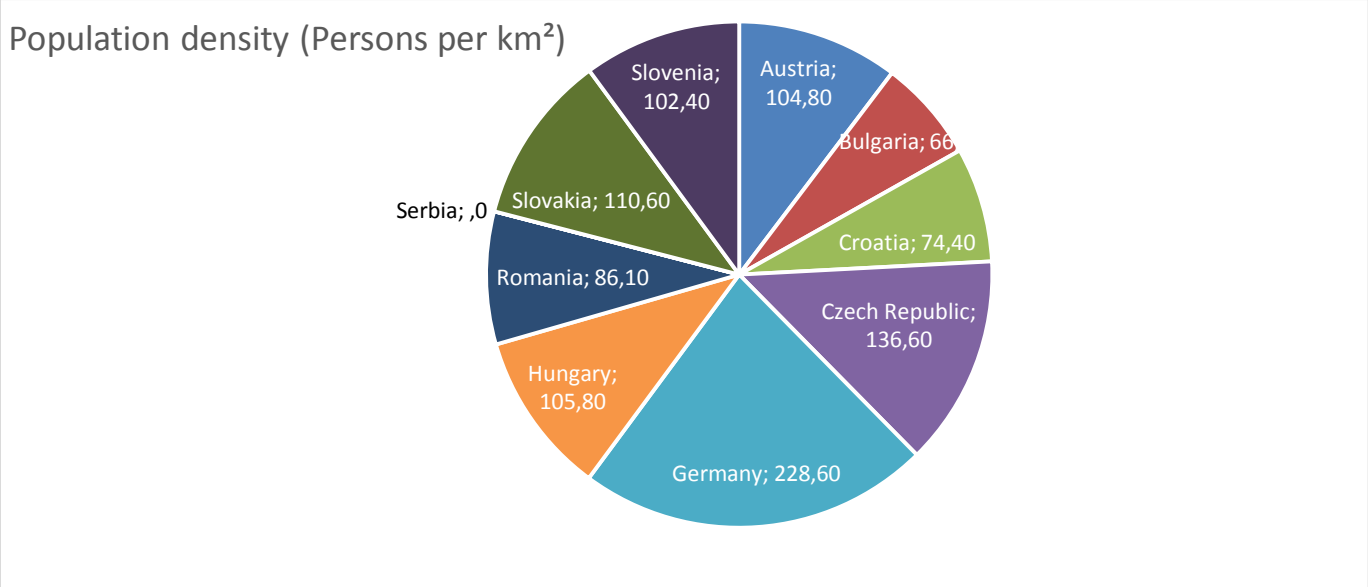


Figure 2: Population density (Person per km²) per country

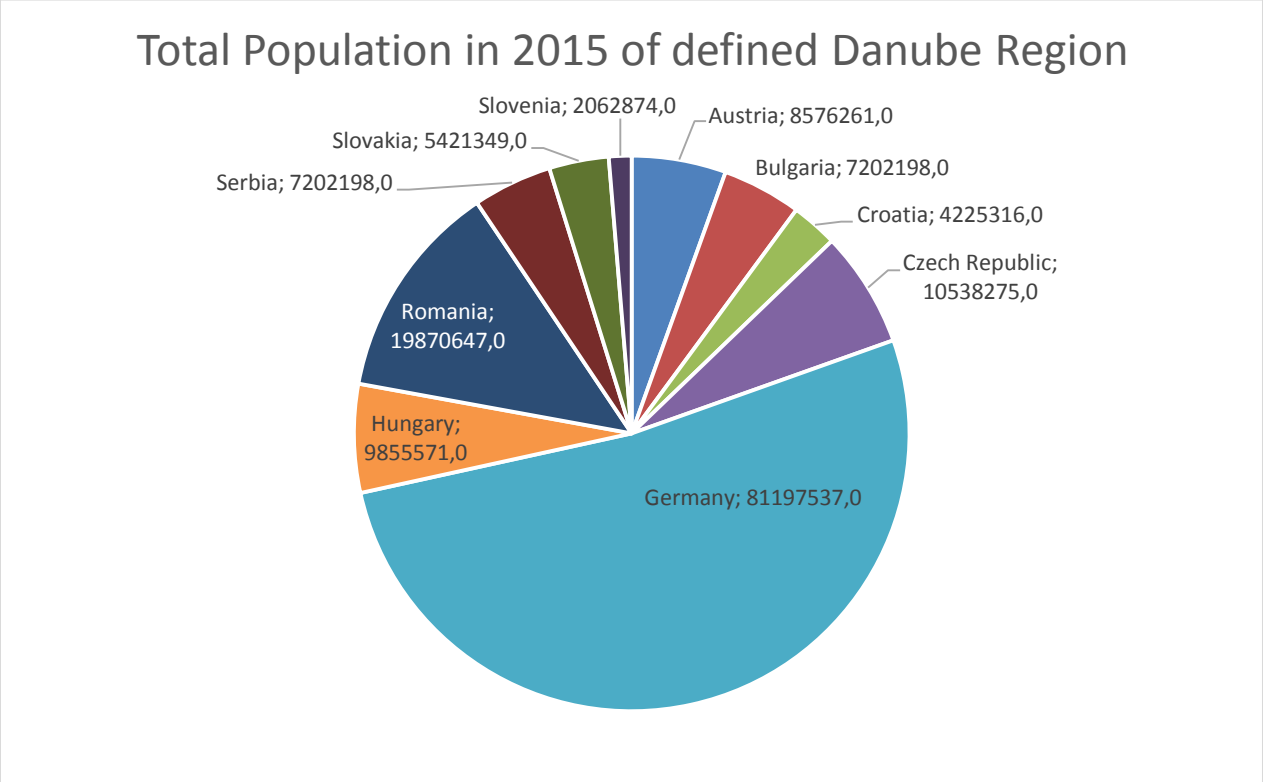


Figure 3: Total Population in 2015 of defined Danube Region[2]

The impact of demographic ageing within the European Union (EU)is likely to be of major significance in the coming decades. Consistently low birth rates and higher life expectancy are transforming the shape of theEU-28'sage pyramid; probably the most important change will be the marked transition towards a much older population structure, a development which is already apparent in several EU Member States.
As a result, the proportion of people of working age in the EU-28 is shrinking while the relative number of those retired is expanding. The share of older persons in the total population will increase significantly in the coming decades, as a greater proportion of the post-war baby-boom generation reaches retirement. This will, in turn, lead to an increased burden on those of working age to provide for the social expenditure required by the ageing population for a range of related services.[3]

Across the Danube region states, the highest share of persons to be of working age in the total population in 2015 was observed in Slovakia (70.7 %), while the lowest share was recorded in Germany (65.8 %). Regarding the share of persons aged 65 or older in the total population, Germany (21 %) and Bulgaria (20 %) had the highest shares, while Slovakia had the lowest share (14 %).

[2]Eurostat
[3]http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing

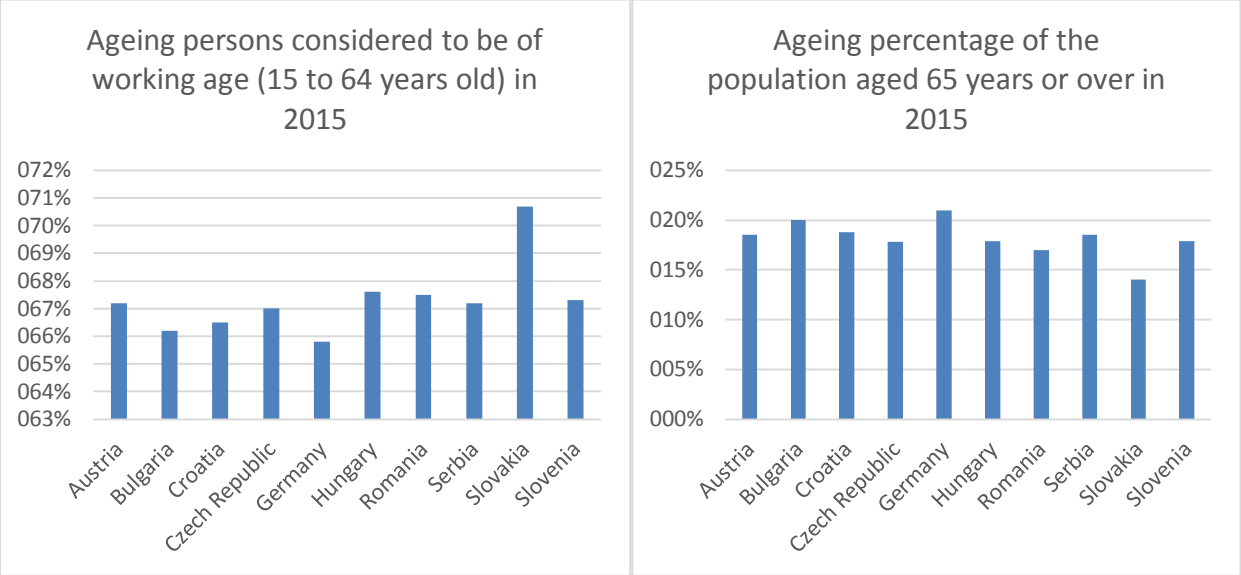


Figure 4a: Ageing persons considered to be of working age (15 to 64 years old) in 2015 and Figure 4b: Ageing percentage of the population aged 65 years or over in 2015[4]

Tertiary education — provided by universities and other higher education institutions — is the level of education following secondary schooling. It is seen to play an essential role in society, by fostering innovation, increasing economic development and growth, and improving more generally the wellbeing of citizens. In the coming years, many commentators predict that there will be increased demand for highly skilled people; indeed, skills gaps already exist in some EU Member States. Driven by digital technology, jobs are becoming more flexible and complex. This has resulted in a growing number of employers seeking staff with the necessary capacities to manage complex information, think autonomously, be creative, use resources in a smart and efficient manner, as well as communicate effectively. Indeed, Europe's future prosperity depends, at least to some degree, on nurturing more dynamic, high-achievers who can develop innovative products and processes.[5]In the below figure shows, that compared to the EU Average Austria and Slovenia have a high ratio of Tertiary educational attainment (age group 30-34) (Figure 5).There was no data available for Serbia. In Figure 6 the map visualize in detail different region of the Danube countries with colouring the ratio of population aged 25-64 by educational attainment level of Tertiary education. It is interesting to see that central European countries and partly Bulgaria and a region of Hungary have a higher ratio than other countries.

[4]EUROSTAT
[5]http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics

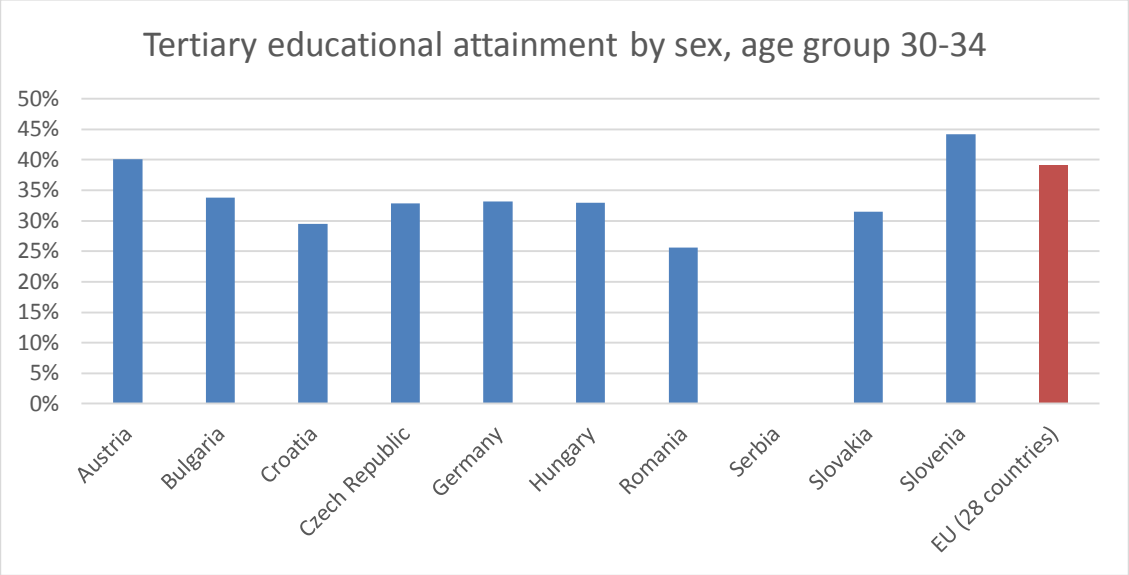


Figure 5a: Tertiary educational attainment by sex, age group 30-34[6]

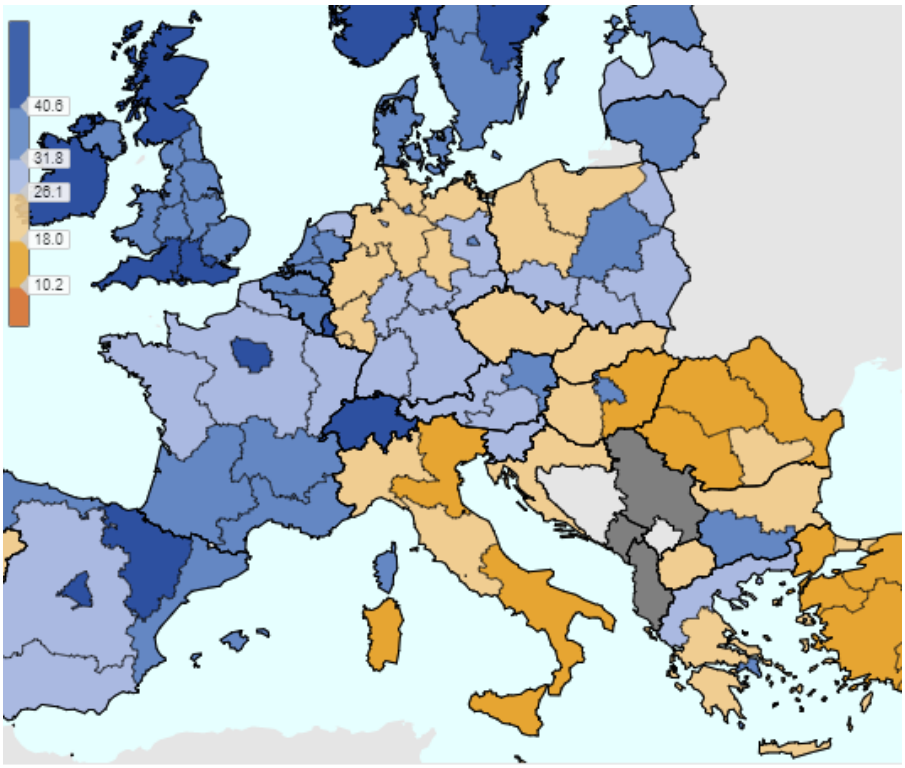


Figure 6: Map of Population aged 25-64 by educational attainment level, sex and Nuts 2 Regions (5), Total Tertiary education (level 5-8[7]

[6] http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdsc480&plugin=1
[7] http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.education&lang=en

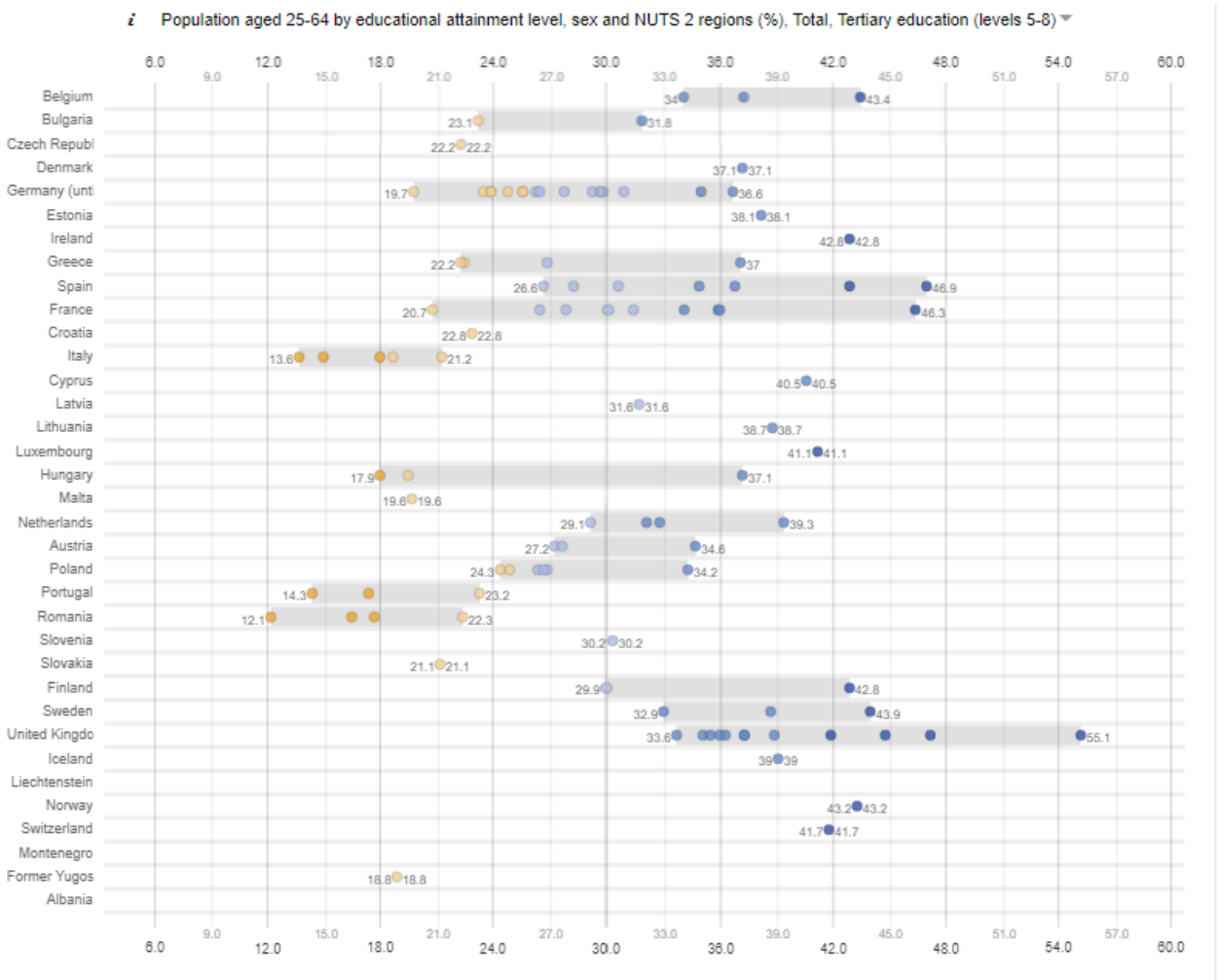


Figure 7: Population aged 25-64 by educational attainment level, sex and Nuts 2 Regions (5), Total Tertiary education (level 5-8[8]

Looking at the population (age group 25-64) having at least upper secondary educational attainment, except of Romania, countries are have a higher ratio as the average of European 28 Countries. Czech Republic and Slovakia and Slovenia having the highest ratio of the Danube region countries.

[8] http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.education&lang=en

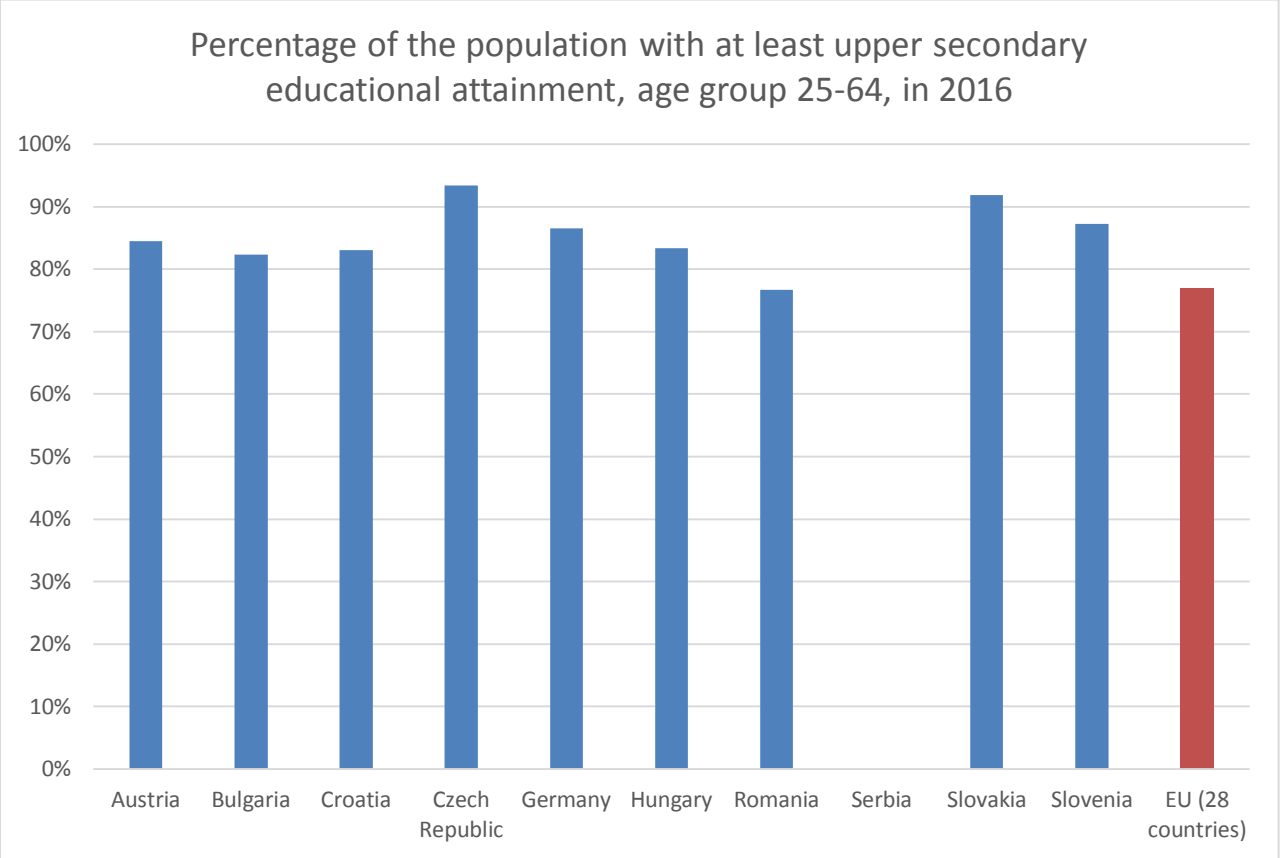


Figure 8: Percentage of the population with at least upper secondary educational attainment, age group 25-64 in % in 2015

3.1.2 Economy indicators and industry specialisation

This article presents some of the main economy indicators for the Danube region as a whole and for each country.

The main aggregates, covering the annual and quarterly gross domestic product (GDP) and its components, are among the most significant indicators of the state of any economy, be it at a national or European level.[9] Data on GDP, production, employment, gross value added, share of manufacturing sector and productivity are used as headline figures and key interest.

As seen, in the next figures the GDP per Capita in Germany and Austria is twice as high compared to the other countries, followed by Slovenia, Czech Republic and Slovakia.

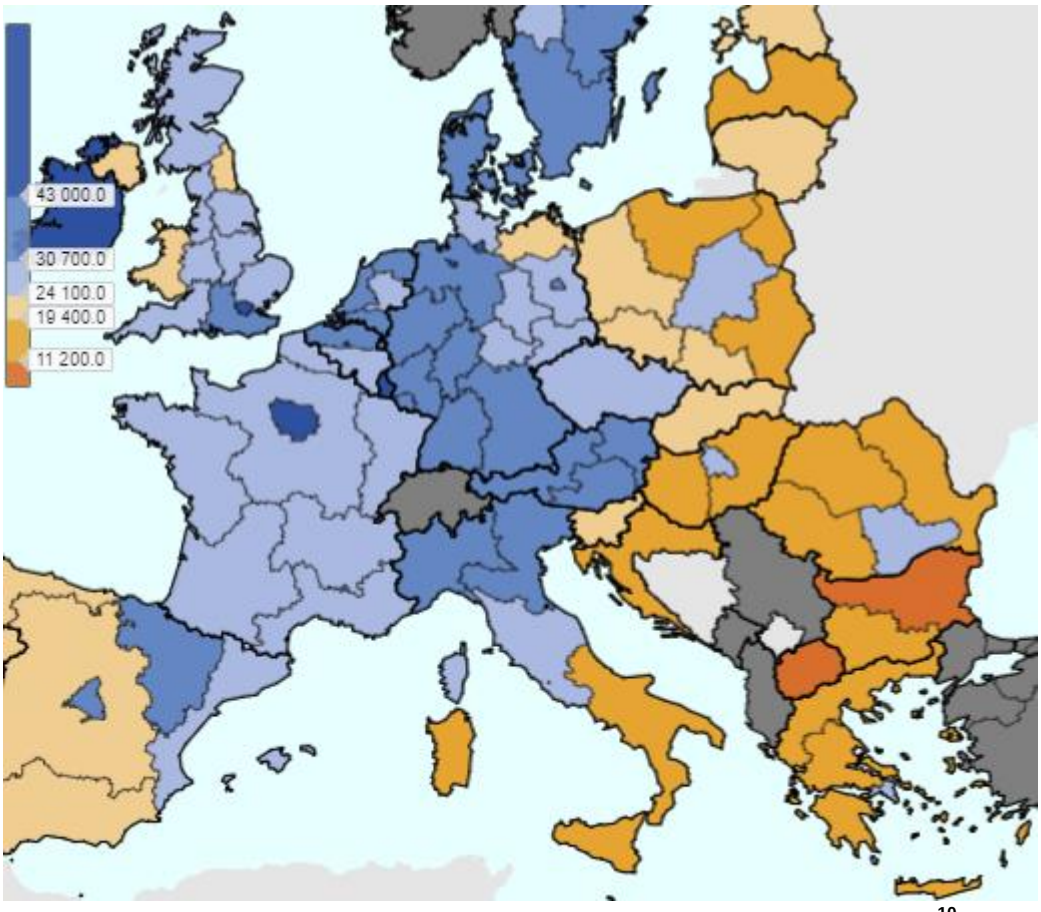


Figure 9: GDP at current market prices by Nuts 2 region (PPS-HAB)[10]

[9] http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_main_GDP_aggregates_and_related_indicators

[10] http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts1.economy&lang=en

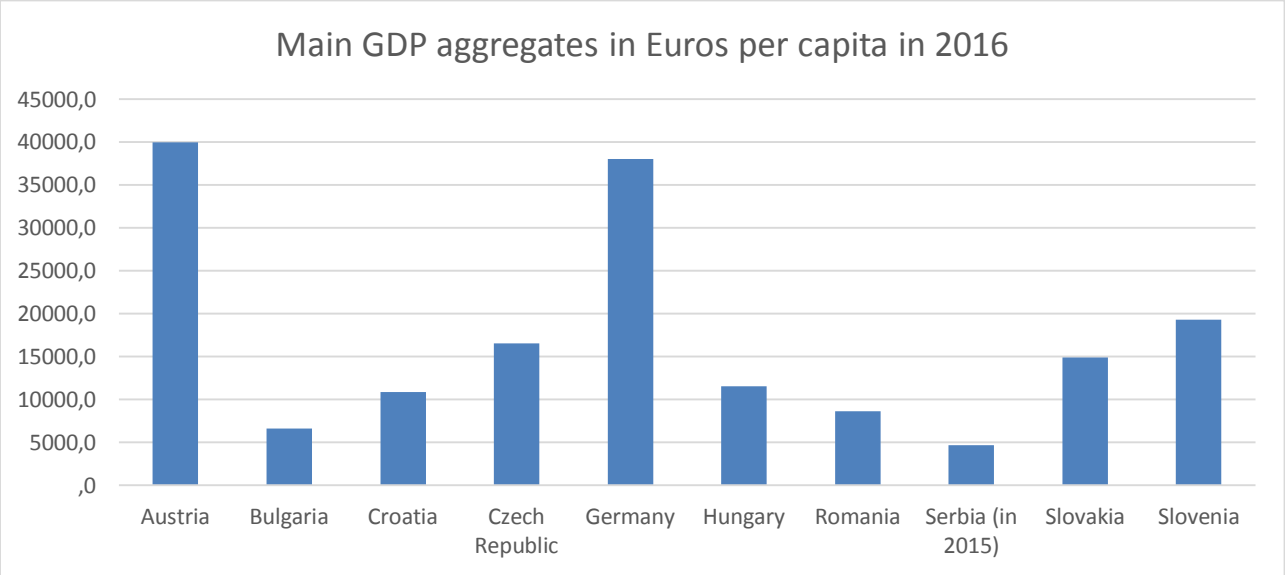


Figure 10: Main GDP aggregates in Euros per capita in 2016[11]

Starting from the production side, Figure 11 presents the breakdowns of EU-27 gross value added by 10 industries according to the revised classification NACE Rev.2.Looking at the evolution of GVA on a longer term perspective, one can see that the weights of industries slightly decreased while the service sector expanded between 2001 and 2011. Manufacturing showed the highest loss of weight among industries as it accounted for 18 % of GDP in 2001 and only to 15.5 % in 2011.[12]In the defined Danube region, the manufacturing sector plays an important role in Czech Republic, Germany, Hungary, Austria, Slovenia and Slovakia, while in Romania and Bulgaria is this sector under represented.

[11]EuroSTAT
[12]http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_main_GDP_aggregates_and_related_indicators#GDP_in_PPS

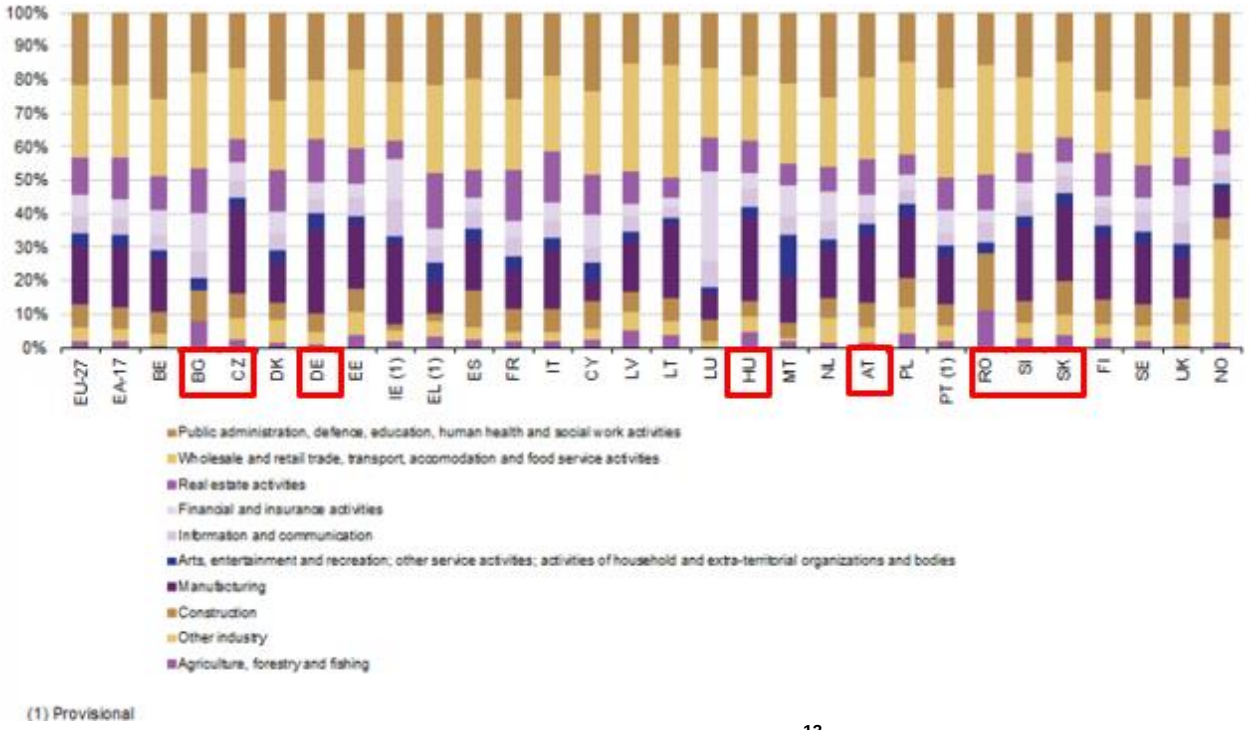
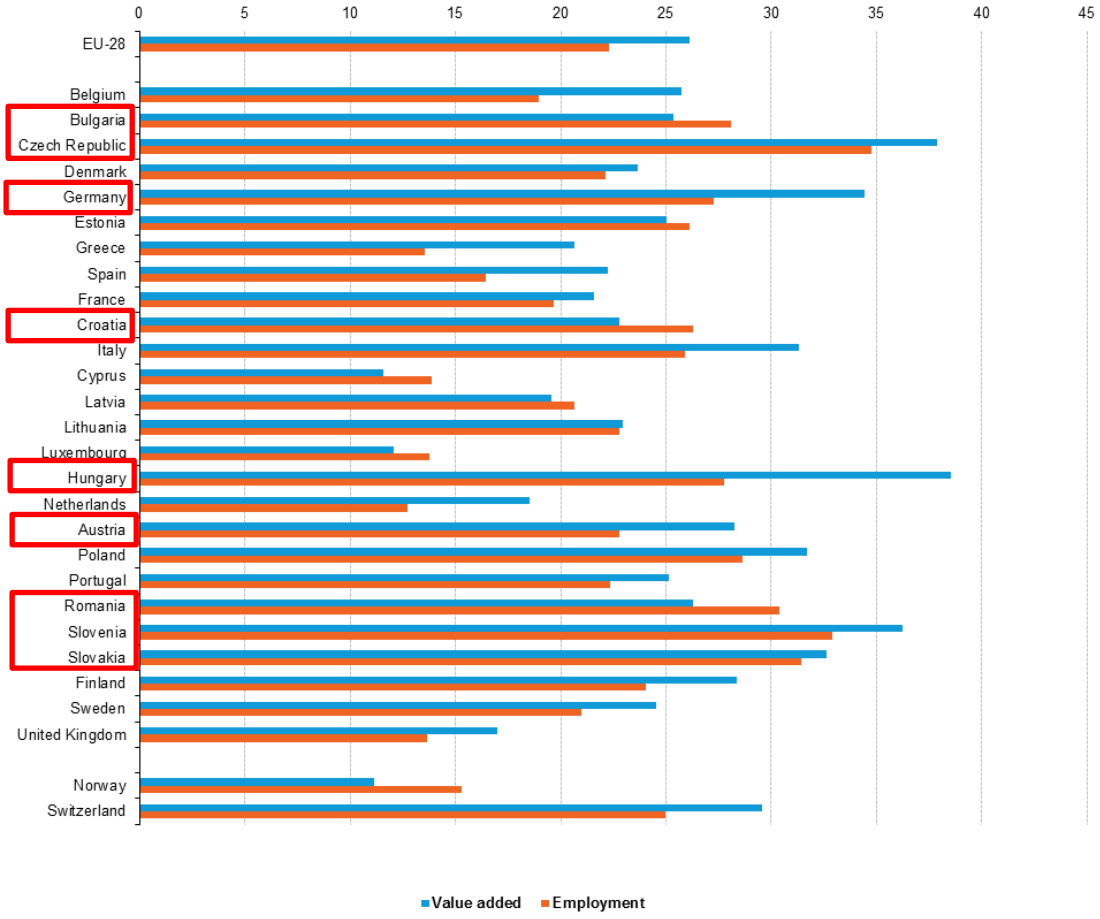


Figure 11: Country comparison of value added by industry, 2011[13]

[13] http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_main_GDP_aggregates_and_related_indicators#GDP_in_PPS

Figure 12 shows that the share of manufacturing within the non-financial business economy's value added varied in 2013 from 23 % in Croatia to more than 35.0 % of the total in Slovenia, the Czech Republic and Hungary, with the latter having the highest share (38.5 %). The range in employment terms was similar, from 23 % in the Austria to 34.8 % in the Czech Republic.



(*) Data for Ireland and Malta not available.
Source: Eurostat (online data code: sbs_na_ind_r2)

Figure 12: Relative importance of manufacturing (NACE Section C), 2013 ([1])
(% share of value added and employment in the non-financial business economy total)[14], [15]

In 2013, the EU-28's manufacturing sector recorded apparent labour productivity and average personnel costs above non-financial business economy averages: the apparent labour

[14] http://ec.europa.eu/eurostat/statistics-explained/index.php/Manufacturing_statistics_-_NACE_Rev._2

[15] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Figure_2_Relative_importance_of_manufacturing_(NACE_Section_C),_2013_(%C2%B9)_(%25_share_of_value_added_and_employment_in_the_non-financial_business_economy_total).png#file

productivity of the manufacturing sector was EUR 55.0 thousand per person employed, some EUR 8.1 thousand more than the non-financial business economy average (EUR 46.9 thousand per person employed), while average personnel costs in the manufacturing sector were EUR 38.3 thousand per employee, some EUR 5.6 thousand above the non-financial business economy average (EUR 32.7 thousand per employee). Combing these two ratios into the wage-adjusted labour productivity ratio shows that value added per person employed in the EU-28's manufacturing sector was equivalent to 143.0 % of average personnel costs per employee, which was slightly above the average for the non-financial business economy (143.1 %). [16] Looking at the Danube region, the highest personnel costs can be found in Austria and Germany and the lowest in Bulgaria. In terms of labour productivity, Germany and Austria are the frontrunners, followed by Slovenia, Hungary and Czech Republic.

	Apparent labour productivity (EUR thousand per head)	Average personnel costs	Wage-adjusted labour productivity	Gross operating rate (%)	Investment rate
EU-28	55.0	38.3	143.0	7.9	:
Belgium	95.7	62.4	153.3	7.2	15.9
Bulgaria	9.1	4.9	185.7	8.4	44.1
Czech Republic	25.9	15.9	163.3	10.1	21.0
Denmark	82.9	50.1	165.5	12.1	10.4
Germany	67.9	51.5	132.0	6.4	12.0
Estonia	23.7	14.6	162.0	8.7	20.7
Ireland	:	:	:	:	:
Greece	35.6	24.3	146.7	9.5	13.5
Spain	53.6	37.5	142.9	7.2	14.0
France	64.2	52.4	122.4	4.6	15.9
Croatia	17.4	11.5	151.1	10.2	15.8
Italy	53.2	40.5	131.4	7.9	12.3
Cyprus	28.0	20.3	137.9	9.0	7.9
Latvia	15.6	8.5	184.3	11.2	21.5
Lithuania	14.5	9.2	158.4	5.7	25.0
Luxembourg	70.8	55.3	127.9	4.0	15.7
Hungary	28.0	13.2	211.7	10.8	24.6
Malta	:	:	:	:	:
Netherlands	84.8	54.2	156.5	7.5	11.8
Austria	76.9	53.8	142.9	8.6	12.6
Poland	23.2	12.0	193.0	10.6	20.3
Portugal	26.2	17.1	153.4	8.0	19.0
Romania	12.0	6.7	179.7	9.5	34.7
Slovenia	33.3	22.7	146.8	9.5	19.0
Slovakia	22.8	15.4	147.5	6.6	27.5
Finland	69.6	50.2	138.8	5.8	11.0
Sweden	82.8	65.4	126.7	7.4	12.7
United Kingdom	72.1	38.2	188.6	14.0	9.4
Norway	105.2	76.5	137.5	7.7	11.0
Switzerland	129.6	:	:	14.2	9.7

: - not available
Source: Eurostat (online data code: sbs_na_ind_r2)

Figure 13: Key indicators, manufacturing (NACE Section C), 2013

The gross operating rate (the relation between the gross operating surplus and turnover) was 7.9 % for the EU-28's manufacturing sector in 2013, below the 9.5 % average for the non-financial business economy, and as such this sector had the second lowest level of profitability

[16] http://ec.europa.eu/eurostat/statistics-explained/index.php/Manufacturing_statistics_-_NACE_Rev._2

(using this measure) among any of the NACE sections within the non-financial business economy, with only distributive trades recording a lower gross operating rate (4.2 %).

Among the EU Member States, the relative importance of large enterprises was at its greatest in Hungary and Germany in 2013, as these enterprises contributed more than two thirds of the total value added generated in the manufacturing sector.
SMEs enterprises made a considerable contribution to manufacturing value added in Bulgaria and Croatia, where the relative weight of SMEs enterprises in manufacturing value added was higher than the contribution made by large enterprises.[17]

Table 1: Value added by enterprise size class, manufacturing (NACE Section C)[18]

	Total	SMEs	Micro	Small	Medium-sized	Large
	(EUR million)			(% of total)		
EU-28	1 630 000.0	44.4	6.8	14.6	23.0	55.5
Belgium	49 191.2	39.5	5.2	13.0	21.3	60.5
Bulgaria	4 778.2	54.8	5.5	15.9	33.4	45.2
Czech Republic	31 457.0	41.6	7.1	9.9	24.6	58.4
Denmark	29 364.8	38.7	4.5	12.3	21.9	61.3
Germany	490 616.9	33.6	3.3	10.3	20.0	66.4
Estonia	2 476.9	70.7	7.0	22.0	41.7	29.3
Ireland	:	:	:	:	:	:
Greece	10 288.3	62.0	24.3	12.6	25.1	38.0
Spain	93 133.7	58.5	10.4	21.9	26.2	41.5
France	192 888.7	44.8	9.0	14.9	20.9	55.2
Croatia	4 541.6	52.0	8.8	17.0	26.2	48.0
Italy	198 678.9	66.6	12.1	26.8	27.7	33.4
Cyprus	806.6	81.9	22.7	32.6	26.7	18.1
Latvia	1 883.1	68.3	5.8	19.7	42.9	31.7
Lithuania	2 875.3	59.7	4.3	16.2	39.2	40.3
Luxembourg	2 375.3	42.5	3.5	12.4	26.6	57.5
Hungary	18 585.0	32.2	4.4	8.6	19.2	67.8
Malta	:	:	:	:	:	:
Netherlands	57 776.9	54.5	7.9	16.8	29.8	45.5
Austria	47 493.2	41.6	4.5	12.3	24.8	58.4
Poland	54 564.3	42.3	6.1	10.6	25.6	57.7
Portugal	16 684.1	66.6	11.0	23.5	32.1	33.4
Romania	13 962.6	41.8	5.2	11.2	25.4	58.2
Slovenia	6 290.7	50.2	9.7	14.2	26.3	49.8
Slovakia	10 037.6	39.5	8.0	9.8	21.8	60.5
Finland	24 507.5	44.5	7.9	14.2	22.3	55.5
Sweden	52 660.2	39.2	6.5	12.8	19.9	60.8
United Kingdom	178 893.6	44.8	7.3	14.3	23.2	55.2
Norway	24 759.0	51.2	6.6	16.8	27.8	48.8
Switzerland	88 859.9	45.3	4.7	13.8	26.8	54.7

: not available
Source: Eurostat (online data code: sbs_sc_ind_r2)

[17] http://ec.europa.eu/eurostat/statistics-explained/index.php/Manufacturing_statistics_-_NACE_Rev._2#Size_class_analysis

[18] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Figure_2_Relative_importance_of_manufacturing_(NACE_Section_C),_2013_(%C2%B9)_(%25_share_of_value_added_and_employment_in_the_non-financial_business_economy_total).png#file

3.1.3 Level of innovation activities

The level of innovation activities of companies and regions is measured by two indicators (Human resources in science and technology) and Enterprises engaged continuously in in-house R&D activities.
Statistics on science and technology personnel are key indicators for measuring the knowledge-based economy and its developments, for example, providing information on the supply of, and demand for, highly qualified science and technology specialists.[19]
Persons in S and T occupations accounted for over one third of the total labour force in Germany (~38 %) in 2015 and Austria (~34.0 %), as well as in Slovenia (~31.0 %) and Czech Republic (~30.0 %).

The lowest share was recorded in Romania, which was the only EU Member State where less than one fifth (19.1 %) of the labour force was employed in an S and T occupation, while Bulgaria and Slovakia each recorded shares that were below one quarter.[20]

[19] http://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_personnel
[20] http://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_personnel

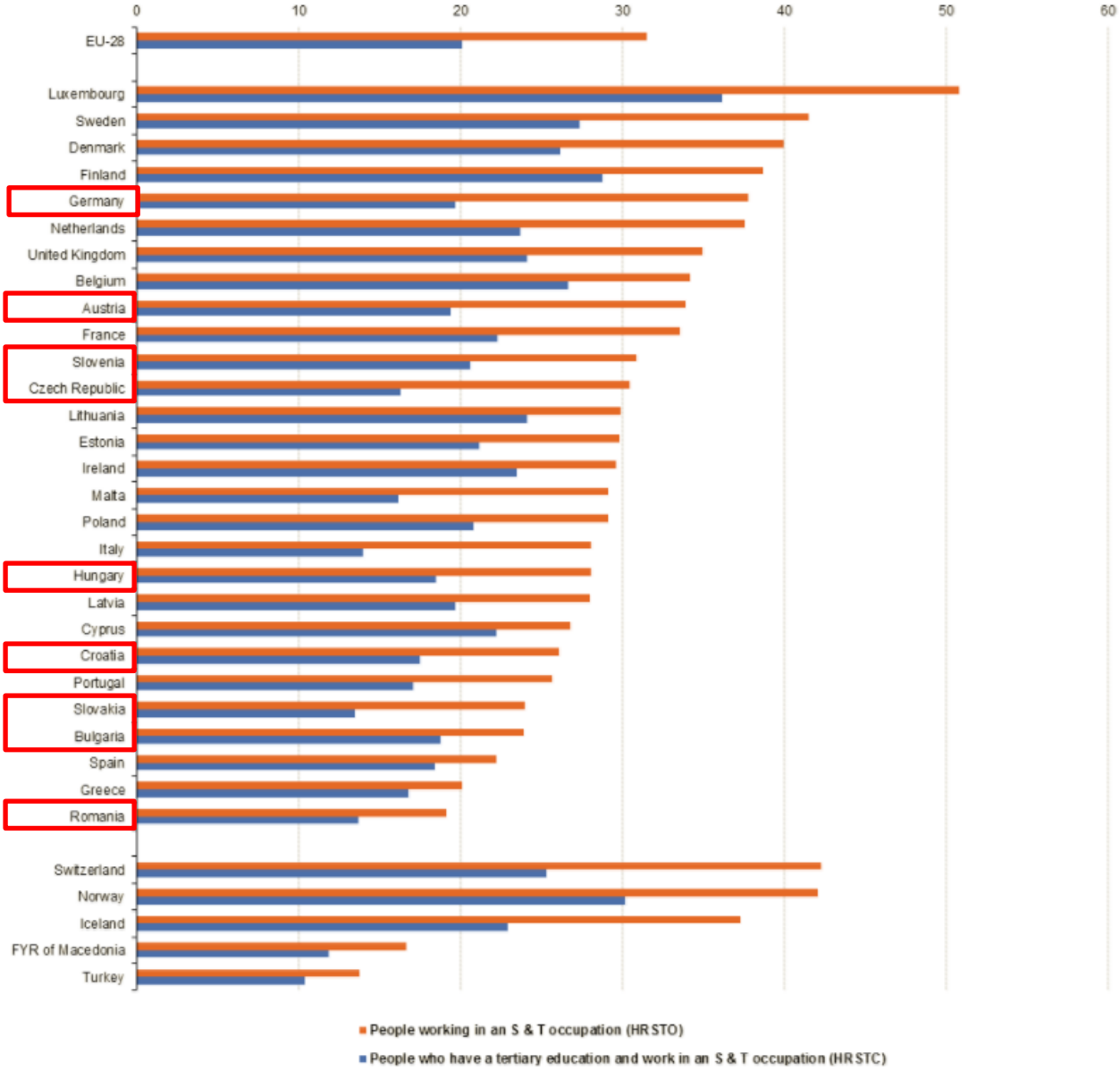


Figure 14: Human resources in science and technology, 2015 (% of labour force)[21]

The figure below shows the human resources in detail by NUTS 2 regions.

[21] http://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_personnelhttp://ec.europa.eu/eurostat/statistics-explained/index.php/File:Human_resources_in_science_and_technology,_2015_(%25_of_labour_force)_YB17.png

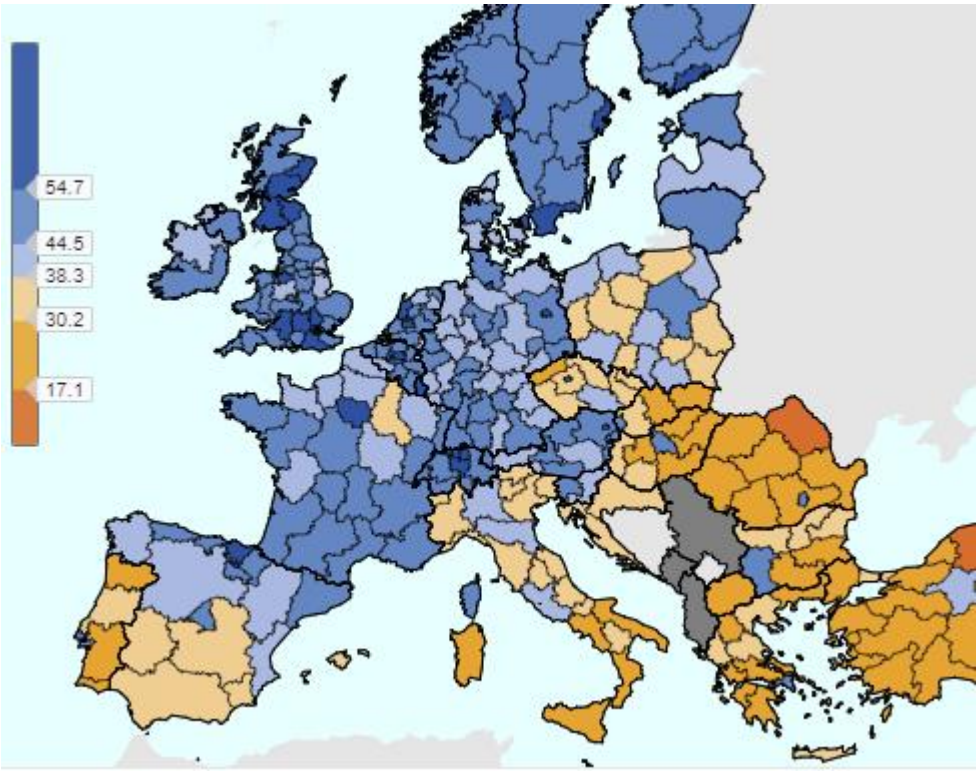


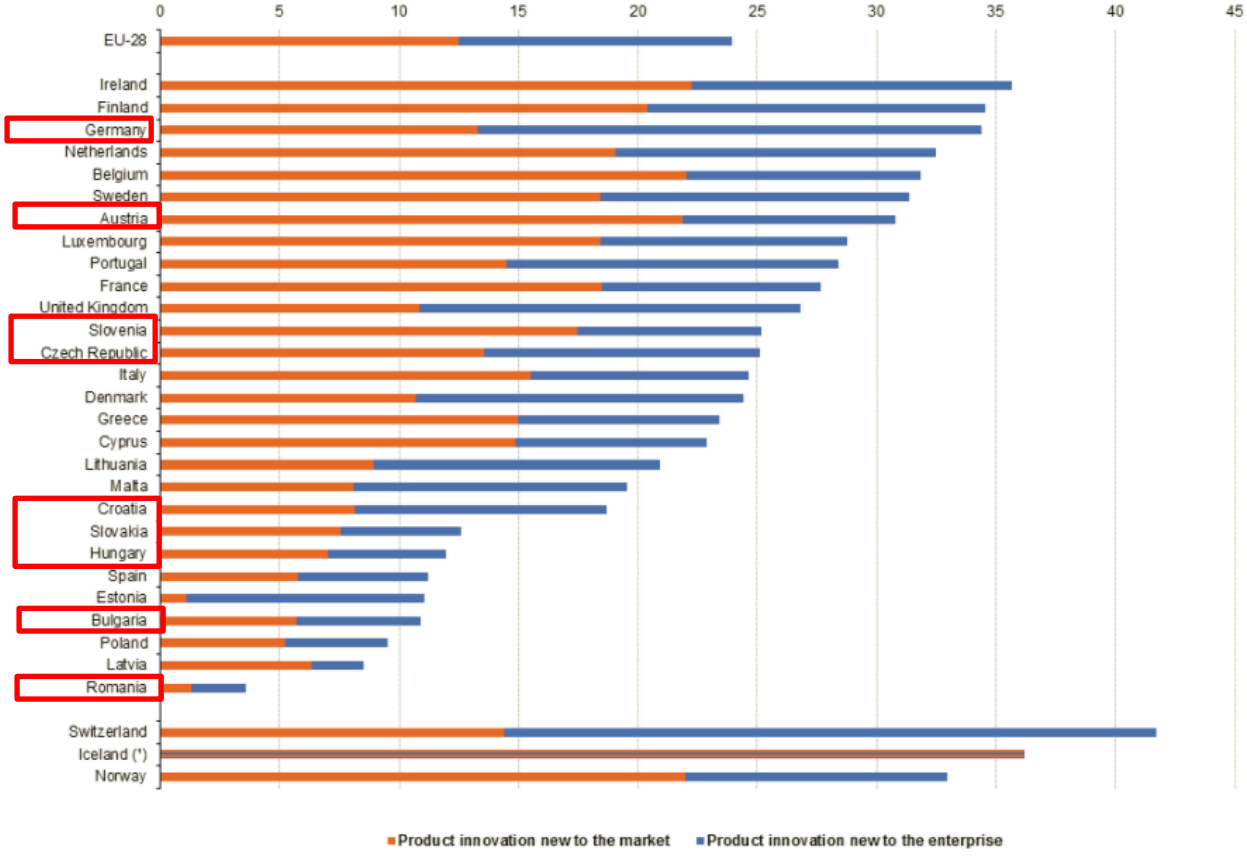
Figure 15: Human Resources in science and technology[22]

Among the EU Member States, the highest proportions of innovative enterprises during the period 2012–2014 were observed in Germany (67.0 % of all enterprises), Luxembourg (65.1 %) and Belgium (64.2 %), while Ireland and the United Kingdom also recorded proportions that were above 60.0 %. The lowest levels of innovative activity were recorded in Poland (21.0 %) and Romania (12.8 %), while just over one quarter of all enterprises in Hungary, Latvia and Bulgaria reported some form of innovative activity.

Within the EU-28, almost one quarter (23.9 %) of enterprises were product innovators during the period 2012–2014 (see Figure 16). The highest shares of product innovators (in the total number of enterprises) were recorded in Ireland (35.7 %), Finland (34.5 %) and Germany (34.4 %), while the Netherlands, Belgium, Sweden and Austria also recorded share that were in excess of 30.0 %. By contrast, share of less than 10.0 % were recorded in Poland (9.5 %), Latvia (8.5 %)

[22] http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.scitech&lang=en

and Romania (3.6 %).[23]



Note: the survey reference period was 2012–2014.
(*) Data are only available for the total.
Source: Eurostat (online data code: inn_cis9_prod)

Figure 16: Share of enterprises that had product innovations, 2012–2014 (%)[23]

3.2 Strategy Background

Regional Mapping reports of each country provided an overview of regional strategic background and supporting ecosystem for production companies. This chapter aims to give an overview of the national strategies, their implementation, key measures and strategic topics.

All national Strategies are in line with the European Strategy and implemented the according support measures, except Serbia is still working on its national strategy. In the following map the implemented national strategy of each country and policy initiatives are identified. These strategies are operationalized in different ways. While Austria's and Romania's governance structure are regional based, in Bulgaria, Czech Republic, Slovenia, Croatia and Hungary follow a central approach. In Germany the strategy implementation is led by Federal Government in cooperation with the Länder.

[23] http://ec.europa.eu/eurostat/statistics-explained/index.php/Innovation_statistics

Figure 17: Overview of national strategies and policy initiatives on smart factory

Each country have different regional characterises and therefore set different specialisation topics. Table 2 shows the Strategy Priorities of each country. Looking at the whole region technology driven topics seems to be the most important once, namely Information and Communication Technologies, Material Sciences and Production (manufacturing) Technologies.

Table 2: Strategy Priorities

Strategy Priorities	Austria (Upper Austria)	Bulgaria	Croatia	Czech Republic	Germany	Hungary	Romania	Serbia	Slovakia	Slovenia	Topic Priority of Danube Region
Information and Communication Technologies	*Yes*	Yes	*Yes (horizontal)*	*Yes*	Yes	*Yes*	*Yes*		Yes	Yes (horizontal)	**9**
Material Sciences	*Yes*	Yes (nanotechnology)		*Yes*	Yes	*Yes*	*Yes*		Yes	Yes	8
Production (manufacturing) Technologies	*Yes*	Yes		*Yes*	Yes	*Yes*	*Yes*		Yes	Yes	**8**
Sustainability, Circular economy, Energy, Climate, Resources	*Yes*		*Yes*	*Yes*	Yes	*Yes*	*Yes*		Yes	Yes	8
Food and Bio-Economy		Yes	*Yes*		Yes	*Yes*	*Yes*		Yes	Yes	7
Life Sciences	*Yes*	Yes (Biotechnology		*Yes*	Yes		*Yes*		Yes		6
Education	*Yes*			*Yes*	Yes		*Yes*		Yes	Yes	6
Creative Industries, Service Innovations		Yes			Yes	*Yes*	*Yes*		Yes	Yes	6
Security			*Yes*	*Yes*	Yes		*Yes*		Yes		5
Transport and Mobility			*Yes*	*Yes*	Yes		*Yes*			Yes	5
Quality of Life and Demography	*Yes*		*Yes*	*Yes*	Yes		*Yes*				5
Smart cities and communities, smart buildings, smart homes				*Yes*	Yes		*Yes*			Yes	4
Humanities, Social and Cultural Services							*Yes*				1
Tourism		Yes					*Yes*			Yes	3
Pharmacy		Yes									1
Mechatronics and clean technologies		Yes									1

3.3 Support Environment

The smart specialisation strategy should not only build on and/or aim at regional scientific excellence but also support practice-based ('non-technological') innovation (6) and include the adoption and diffusion of knowledge and innovation.[24]

The links between RIS³ and SME support services are important and for successful SME support services to be deployed in all regions.[25]

Support environment is defined as the support environment structure, actors responsible for implementation of strategies and other supporting actors like clusters, technology parks, R&D centres, competence centres, University incubators, Business incubators.

Each country rated the above named support environment with 1 most important and 5 less important. It turned out seen in Figure 18 the most important support environment for SME are clusters, research centres and technology parks.

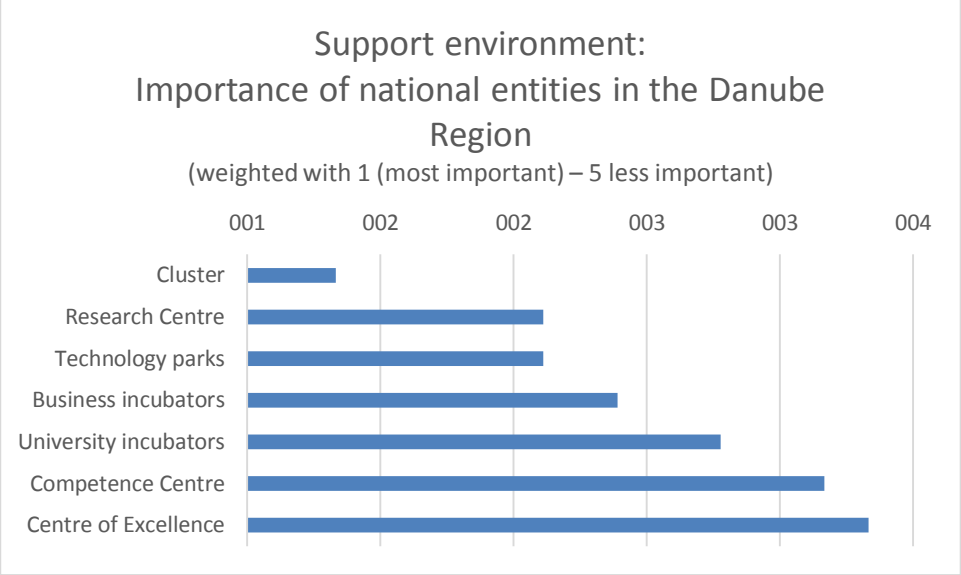


Figure 18: Support environment in the Danube region ranked by 1 most important to 5 less important

Table 3 shows the quantity of national entities of each country. Czech Republic and Romania have the highest number of clusters. In Table 4 the detailed ranking of the support environment by each country can be observed.

[24] http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/smart_specialisation_en.pdf
[25] http://s3platform.jrc.ec.europa.eu/smes-and-smart-specialisation

Table 3: Supporting environment: Number of national entities identified (estimated)

Support environment related to smart factory	**Austria**	**Bulgaria**	**Croatia**	**Czech Republic**	**Germany**	**Hungary**	**Romania**	**Serbia**	**Slovakia**	**Slovenia**
Cluster	*12 (Upper, Lower Austria and Styria*	10	13	51	>20	9	*43*	40	9	13
Centre of Excellence	*2*	2	10	9	5-8	3	*3*	12	9	8
Competence Centre	*6*	0	20	33	20-30	4	*3*		5	7
Research Centre	*12*	1	25	32	>20	20>	*15*	21	5	13
Technology parks	*2*	1	3	9	15-20	20>	*86*	5	4	2
University incubators	*3*	2	1	1	10-15	5	*3*	1	5	3
Business incubators	*11*	3	34	5	10-20	5	*10*	4	10	14

Table 4: Supporting environment: Importance of national entities identified for SMEs (weighted with 1 (most important) – 5 less important)

	Austria	**Bulgaria**	**Croatia**	**Czech Republic**	**Germany**	**Hungary**	**Romania**	**Serbia**	**Slovakia**	**Slovenia**	**Danube Region**
Cluster	*1*	1-2	1-2	2	1	1	*1*	2	1-2	1-2	1,33
Centre of Excellence	*3-4*	2-4	3	3	3-4	3	*3-4*	4	4-5	2-4	3,33
Competence Centre	*3-4*	5	2-3	2-3	2	2	*3-4*	4	3-4	3-5	3,17
Research Centre	*2*	1-2	3-4	1	1-2	3	*1-2*	2	3-4	1-2	2,11
Technology parks	*2*	1-2	2	2	3	2	*2*	1	3	1-2	2,11
University incubators	*1-2*	3-4	3	3	3	2	*3*	2	2	3-5	2,78
Business incubators	*1-2*	3-4	1-2	2	3	3	*2*	1	2	2-4	2,39

3.3.1 Importance of Austrian supporting environment

For Austria the most important support environment for SME are:

- **Clusters:** Most of clusters have special SME related activities and play an important role in connecting SMEs with large industries
- **University incubators** support of research oriented Start Ups and Spin off, normally the are 100% SMEs
- **Business incubators** support of business oriented Start Ups and Spin off, normally the are SMEs
- **Research Centre:** Production oriented research centres have customers from large industry and SMEs. Research centres with solution-oriented approaches are also relevant for SMEs.
- **Technology parks**: Most technology parks provide a mixture of infrastructure, business support and access to research and other partners, so they are also important for SMEs.
- **Centre of Excellence:** The excellence centre IST focuses on high-level research and is dedicated to basic research and graduate education. The research is about 10 years or more from the current market needs. Therefore, it's not interesting for SMEs.
- **Competence Centre:** The funding scheme of competence centre is not really focusing on SMEs, the programme fits more for large companies. Nevertheless, some SMEs are participating. The benefit is a close cooperation with other companies along the value chain.

3.3.2 Importance of Slovenia supporting environment

For Slovenia the most important support environment for SME are:

- **Clusters**: Most of clusters have special SME related activities and play an important role in connecting SMEs with the industry.
- **Research Centre**: Production oriented research centres have customers from industry and SMEs. Research centres with solution-oriented approaches are relevant for SMEs especially in product development phase.
- **Technology parks**: Most technology parks provide a basic infrastructure, business support and access to research and other partners.
- **Centre of Excellence**: A measure aimed at promoting the concentration of knowledge in priority technological areas and horizontal integration throughout the knowledge-based chain, which is implemented on the basis of a strategic partnership between the economy and the academic sphere. It is a comprehensive, interdisciplinary research and development program, with an emphasized horizontal goal of accelerating the transition to an energy efficient economy with low greenhouse gas emissions, Intensive promotion of the transition to a low-carbon society.Limited importance for SMEs outside existing co-financed structures.
- **Business incubators**: support of business oriented Start Ups and Spin offs, important for SME's.
- **University incubators** support of research oriented Start Ups and Spin offs, important for SME's.

- **Competence Centre**: Aimed at strengthening the ability to develop and use new technologies for the development of new competitive products, services and processes in the priority areas of the technological Development. The instrument is complementary to the instrument of centers of excellence and together form a completed whole in the field of R & D. Limited importance for SMEs outside existing co-financed structures.

3.3.3 Importance of German supporting environment

For Germany the most important support environment for SME are:

- **Clusters:** Cluster initiatives often consist of regional networks with cross-disciplinary experts that can help SMEs to implement Smart Manufacturing solutions.
- **Research Centre:** Research organisations can systematically support SME in planning, designing, testing and benchmarking Smart Manufacturing solutions.
- **Competence Centre:** For most SMEs Competence Centre serve as a first contact point when they need to address specific Smart Manufacturing related issues.
- **Technology parks**: Usually these are some kind of testlab facilities that feature demonstrating use cases that allow interested SME for a “touch-and-feel” of practical solutions. The physical devices showcase currently available solutions but they also provide insight into the costs, different levels of complexity, etc.
- **University incubators** support of business oriented Start Ups and Spin offs, they do not play such an important role to SME in Germany.
- **Business incubators** support of research oriented Start Ups and Spin offs, they do not play such an important role to SME in Germany.
- **Centre of Excellence:** So called “Spitzencluster/ Cluster-Exzellenz” are politically motivated high-tech initiatives that aim for state-of-the-art output from the most capable stakeholders within a specific region. The importance of CoE for SMEs is rather limited; however, there might be useful best practices provided

3.3.4 Importance of Croatian supporting environment

For Croatia the most important support environment for SME are:

- **Clusters:** Most of clusters have special SME related activities and play an important role in connecting SMEs with the industry.
- **Research Centre:** Production oriented research centres have customers from large industry and SMEs. Research centres with solution-oriented approaches are also relevant for SMEs.
- **Technology parks:** They connect professionals and entrepreneurs who wish to realize their economic goals, which are based on new technologies. Similar to the business park whose primary objective is to business and production, technology parks, but the focus is on the development and scientific research activities.
- **Centre of Excellence:** gathers and crosslinks the best scientists in a particular field at a national level that are focused on contemporary research topic. They also have to be internationally competitive and recognizable group in terms of quality and scope of scientific production, capable of effective international cooperation and have to give

significant contribution to the development of science, higher education and the economy at the national level.

- **Business incubators:** The primary purpose of the incubators is to increase the potential for growth and survival of young firms by providing modular buildings, common technical infrastructure, managerial support and other support services.
- **University incubators** support of research oriented Start Ups and Spin offs, important for SME's.
- **Competence Centre:** Industry-led individual (networked) entities designed to provide support in raising capacities of business sector (mainly SME that lack in-house capacities for R&D) to enforce R&D projects (especially those focused on development and applied research and commercialization of results) in line with the thematic areas identified in Croatian S3 Strategy

3.3.5 Importance of Slovakia supporting environment

For Slovakia the most important support environment for SME are:

- **Clusters**: Most of the clusters are created by the SMEs and their main activities are focusing on networking and supporting SMEs in the innovation strategies.
- **University incubators** support of research oriented Start Ups and Spin off, normally they are 100% SMEs.
- **Business incubators** support of business oriented Start Ups and Spin off, normally they are SMEs in majority.
- **Technology parks**: Most technology parks provide a mixture of infrastructure, business support and access to research and other partners, so they are also important for SMEs.
- **Research Centre:** Production oriented research centres have customers from large industry and SMEs. Research centres with solution-oriented approaches are also relevant for SMEs.
- **Competence Centre:** The funding scheme of competence centre is not really focusing on SMEs, the programme fits more for large companies. Nevertheless, some medium companies are participating. The benefit is a close cooperation with other companies along the value chain.
- **Centre of Excellence**: The role of the CoE is promoting the concentration of knowledge at priority technological areas and horizontal linking along the entire chain of knowledge development, which is realised on the basis of strategic partnerships between the private sector and academia. This comprehensive inter-disciplinary research and development programme emphasises the horizontal objective of promoting the transition to an energy-efficient economy with low greenhouse gas emissions or strongly promoting the transition to a low-carbon society. Limited importance for SMEs outside existing co-financed structures.

3.3.6 Importance of Czech Republic supporting environment

For Czech Republic the most important support environment for SME are:

- **Research Centre**: These centres are focused on applicational research. Quite often supports SMEs with research activities that can't be carried out by themselves because of lack of personal or equipment.
- **Clusters**: Clusters bring SMEs into networks to ease the transfer of know-how between companies and make the financial subsidies more affordable.
- **Technology parks**: Most technology parks provide a space for the operation, basic infrastructure, business support and access to research and other partners.
- **Business incubators**: Support organizations that assist in the creation, speeding up and long-term performance of the SMEs by providing advisory services and opportunities for networking and collaboration with other companies.
- **Competence Centre**: Aimed at strengthening the ability to develop and use new technologies for the development of new competitive products, services and processes in the priority areas of the technological development. Those centres are usually formed by large companies and research organisation however SMEs are also part of these networks and can benefit from brand new research outcomes in specific areas.
- **Centre of Excellence**: These centres focus on high-level or basic research in areas of medicine, information and communication technologies, new materials and energy. This futuristic research is not interesting for the SMEs current market needs, therefore it's not interesting for SMEs.
- **University incubators:** Support of research oriented Start Ups and Spin offs, they do not play such an important role to SMEs in Czech Republic.

3.3.7 Importance of Romania supporting environment

For Romania the most important support environment for SME are:

- **Clusters:** Cluster are the form of organization through which SMEs can access both funds for the development and deployment of smart factory technologies and knowledge transfer and access to research development activities
- **Research Centre:** Research Centers provide SME support in developing and implementing customized solutions for Smart Manufacturing
- **Technology parks**: Technology parks provide access to technical support and human resource and common access to various SME-enabled production facilities
- **Business incubators**: Business Incubators in Romania are designed exclusively for SMEs and provide support for Start Up and Spin Off
- **University incubators**: They offer support to SMEs based in partnerships with universities and which have as their object research and development and micro production activities
- **Centre of Excellence:** They are dedicated to theoretical research at the highest level, usually they do not provide direct results to SMEs therefore they are not so important for SMEs
- **Competence Centre:** They are generally affiliated with universities and are founded with large and renowned companies, they can be used as examples of good practice in the use of the latest technologies and limited supply of finished products to SMEs

3.3.8 Importance of Bulgarian supporting environment

For Bulgaria the most important support environment for SME are:

- **Clusters**: Most of the clusters have special SME related activities and play an important role for SMEs for cooperation in research and development projects, penetration of foreign markets, learning, networking and the development of competencies
- **Research Centre**: The research centres are aimed at carry out basic and applied research, including using non-traditional techniques. They are established by many universities, with a view to implement specific research and educational activities. Most research centres demonstrates the scientific results of their work.
- **Technology parks**: designed and created to act as a platform for the exchange of knowledge and ideas between academia, business, government and society.
- **Centre of Excellence:** are measures for development of the scientific and research infrastructure of Bulgaria. They are seen as hubs of high – quality research and innovation for priority areas of RIS3 in Bulgaria
- **Business incubators**: assist in the creation, speeding up and long-term performance of the companies in that they provide space for the operation, advisory services, and opportunities for networking and collaboration with other companies.
- **University incubators**: Conduct trainings and prepare students for real business conditions
- **Competence Centre**: are measures for development of the scientific and research infrastructure of Bulgaria

3.3.9 Importance of Hungarian supporting environment

For Hungary the most important support environment for SME are:

- **Clusters:** Clusters help to bring together SMEs, create a Network and share the knowledge, it is easier to get national funds as a member of a cluster
- **University incubators** this sector is growing fast, but in the main time they are not an important support institution in Hungary
- **Business incubators** support of business oriented Start Ups and Spin off, normally the are SMEs
- **Research Centre:** Centres who are focusing on applications, are relevant for SMEs (and also for large enterprises). Research centres with solution-oriented approaches are also relevant for SMEs.
- **Technology parks**: this sector is growing fast, but in the main time they are not an important support institution in Hungary
- **Centre of Excellence:** The excellence centres focus on high-level research and is dedicated to basic research and graduate education.
- **Competence Centre:** It can help SMEs to get to know new technologies but it is much more relevant for large enterprises.

3.3.10 Importance of Serbia supporting environment

For Serbia the most important support environment for SME are:

- **Clusters:** Clusters represent a form of informal networking among businesses and other organizations in the sector in a given geographical area, which offers plenty of benefits of cooperation.
- **University incubators** University incubator provides education to students and young people who wish to start own business, through training programs in entrepreneurship and specialized trainings, permanent consulting and mentoring program.
- **Business incubators** A business incubator is a company whose main activity is making business space, administrative, technical and other services, available to newly established companies, for compensation, for a maximum period of five years from their establishment.
- **Research Centre:** A research and development centre is an innovation organization for conducting applied and developmental research, creating innovations and placing new knowledge and technology, within its own production and services or within the production and services of other business entities.
- **Technology parks**: Technology parks have a special significance as they contribute to: the creation of work places at value added jobs and to high quality employment; to the creation of new jobs/companies based mainly on high technology, i.e. high technology intensive companies/jobs; and the transfer of technology from its source, the knowledge base, into the business sector.
- **Centre of Excellence:** Centre of Excellence is an entity that provides leadership, best practices, research, support and/or training for a focus area.

- **Competence Centre:** The competence centres are defined as development and research centres that are managed by partners from industrial sector and link partners from the industry and public research sector; they focus on the promotion of the development capability and the application of new technologies in manufacturing new competitive products, services and processes at priority areas of technological development.

3.4 Support Measures

In the following chapter, each country summarizes its operational work plan to support production orientated SMEs, how does the strategy support the SME?

3.4.1 How do we get there – S4 concept – the case of Slovenia

S4 addresses in a comprehensive manner a broad range of development policies related to innovation, in particular the policy of promoting research and innovation, industrial policy, entrepreneurship promotion as well as some parts of the education system, rural development policy, international relations, improved regulatory environment (procedures related to the issuing of permits), etc. The state will provide financial support to the identified priority areas as well as non-financial support providing services implemented in close cooperation with strategic partnerships.
S4 identifies priority areas and the areas of application to be addressed as a priority under Slovenia's development policy. S4 also optimizes the supportive business-innovation ecosystem the nature of which should be horizontal with the performance thereof also depending on the competitiveness of priority areas (e.g. in promoting the establishment of new enterprises).
Due to Slovenia's limited critical mass in a given area and due to the strong regional complementarities between stakeholders in all areas, S4 is designed as a nationwide document. Nevertheless, Structural Funds are divided between the two cohesion regions, namely the cohesion region Vzhodna Slovenija and the cohesion region Zahodna Slovenija, which will guarantee Slovenia's harmonious development and enhance overall national competitiveness. In addition to addressing individual cities and the related urban areas, S4 also directly addresses the innovation potential of rural areas.
S4 is based on a model of "open and responsible innovation", including social innovation. A critical contemplation regarding various aspects and consequences of the process of increasing (market) competition and market specialisation for the individual and the society is indeed an integral element of the smart specialisation process. In addition to purely economic parameters and conditions, the introduction and penetration of new technologies depends on a wide range of soft factors. S4 therefore places great emphasis on non-technological and social aspects at various levels (individual, social groups, organisations), e.g. in terms of identifying, defining and evaluating the individual thematic areas and future societal needs, joint co-decision, etc.

Key principles pursued during S4 implementation:
1. Consistency of the policy mix in terms of the degree of technological development, over time and in terms of the size of projects

2. Integrated approach that addresses in a comprehensive manner RDI, infrastructure, human resources, demand-side measures, regulation and internationalisation
3. Strategic approach with clearly defined priorities and tailored governance structure
4. Complementarity in relation to other financial instruments (leverage), and between grants and refundable types of support
5. S4 focuses on technologies and areas which will show results by 2020 and which predominantly pertain to the current economic structure and its potential, by also supporting emerging industries and areas. The share of the latter in the financing structure, by also taking into account the funds used for research and development in the framework of promoting entrepreneurship, will be targeted at approximately 20%.
6. Tailored response in terms of the specificity of individual priority areas.

Policy mix – measures and supported areas can be summarised as follows:

Research, development and innovation:

- Basic science
- Research, development and innovation in value chains and networks
    - Improving international competitiveness and excellence in research to participate in value chains,
    - Support to RDI processes
- Support to investments
- Complementarity with Horizon 2020 and international initiatives
- Better utilisation and development of research infrastructure
- Specific measures
    - Sustainable food production
    - Sustainable tourism

Human resources:

- Research potential of researchers and international mobility
- Strengthening development competences and innovation potentials
- Employee knowledge and competences
- Young and creative Slovenia

Entrepreneurship and innovation:

- Newly established enterprises and knowledge transfer
- Growth and development of SMEs
- Internationalisation and FDI

Slovenia of development:

- Innovative and green public procurement
- Tax relief
- Economic diplomacy and promotion
- Issuing permits and eliminating regulatory barriers
- Efficient justice administration

Activities from the Smart specialization strategy down to 9. SRIPs, which are following:

1. Smart cities and communities
2. Smart buildings and homes, including wood chain
3. Networks for transition into circular economy
4. Sustainable food production
5. Sustainable tourism
6. Factories of the future
7. Health - medicine
8. Mobility
9. Development of materials as end products

3.4.2 How do we get there – RTI concept – the case of Austria

The economic performance of Austria strongly depends on its manufacturing industry. The ability to manufacture internationally competitive products and to increase productivity is key to the economic growth of Austria as a highly industrialised and knowledge based country. And Innovations in the manufacturing sector will continue to be an indispensable basis for added value and employment in the future. [26]

Strategy for research, technology and innovation (RTI) of the Austrian Federal Government is the key strategic document of the Government of the Republic of Austrian in the field of innovation. S3 shall serve as the basis for Austrian development policy.

The Austrian Federal Government launched its Strategy for Research, Technology and Innovation for the next decade on 8 March 2011. According to its motto "Realising Potential, Increasing Dynamics, Creating the Future: Becoming an Innovation Leader", the strategy addresses measures to strengthen national research structures with a focus on excellence, to foster the innovative capacity of companies, allow for thematic priority setting, raise the efficiency of governance, and link research, technology and innovation to the education system. The strategy should also help to mobilise research, technology and innovation for the grand challenges of society and the economy.[27]

Policy mix – measures and supported areas can be summarised as follows:

Education system

- Structural reform of the education system
- Improve educational transitions
- Increase mobility
- Improve conditions for researchers at universities
- Strive for gender equality in research

Basic research and research infrastructure

- Expand third-party financing of university research
- Universities: Develop performance agreements
- Finance non-university institutions with performance agreements
- binding "national roadmap for research infrastructure"
- stimuli for networking infrastructures
- Austrian participation in European and international infrastructures in the context of the ESFRI roadmap

Innovation and Corporate Research

- Expand direct funding and its optimal coordination
- attract additional research-intensive firms
- an innovation-oriented infrastructure policy

[26] http://ostaustria.org/bridges-magazine/item/8312-production-of-the-future-advanced-manufacturing-in-austria
[27] https://era.gv.at/directory/158

- COOPERATION BETWEEN SCIENCE AND BUSINESS
- START-UPS AND VENTURE CAPITAL FINANCING

Governance of the research and innovation system - THE FUNDING SYSTEM

- reducing programme diversity
- modern, standardised body of regulations for research funding
- tax relief
- a distribution of public and private financing
- Complementarity with Horizon 2020 and international initiatives

Financing system

- Develop research funding regulations, e.g.:
  - Establish basic principles and targets of research policy
  - Define output targets
  - Long-term budgetary planning reliability
  - Code of conduct
- Open up alternative private financing sources

The following table presents an overview of the regional thematic priorities and their correspondence with the national thematic priorities. It is clearly seen, that production technologies play a significant roll in all regions. In these report specially the situation in Upper Austria, Lower Austria and Styria is considered.

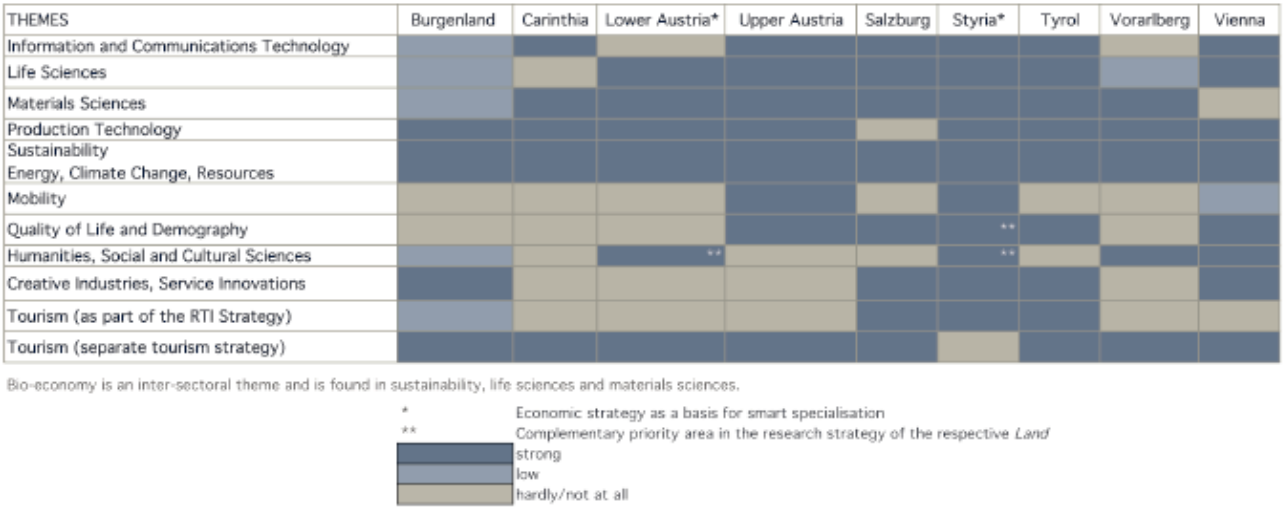


Figure 19: Priorities of the federal states (Länder) of Austria[28]

[28] http://www.oerok.gv.at/fileadmin/Bilder/3.Reiter-Regionalpolitik/2.EU-Kohaesionspolitik_2014_/Nationale_Strategie_STRAT.AT2020/Policy_framework_for_smart_specialisation_in_Austria__OEROK-SR_Nr_199_EN_web_.pdf

3.4.3 How do we get there – High-Tech Strategy concept– the case of Germany

The new High-Tech Strategy[29]

In September 2014, the German Federal Cabinet adopted the New High-Tech Strategy ("Innovations for Germany"). The objective of the New High-Tech Strategy is to move Germany forward on its way to becoming a worldwide innovation leader.

A continuation of the existing High-Tech Strategy and successor activities, the new initiative seeks to consolidate domestic growth and prosperity through a coherent innovation policy founded on knowledge transfer for quicker times from laboratory to market. To this extent, EUR 14 billion in investment funding was set aside in 2014 alone. A further EUR 3 billion in research funding has been set aside for the duration of the current legislative period (2013-2017).

Activities conducted within the framework of the New High-Tech Strategy are conducted in accordance with Germany's five pillars of innovative strength:

1. Prioritizing future challenges relative to prosperity and quality of life.
2. Consolidating resources and promoting transfer.
3. Strengthening the dynamism of innovation in industry.
4. Creating favorable conditions for innovation.
5. Strengthening dialogue and participation.

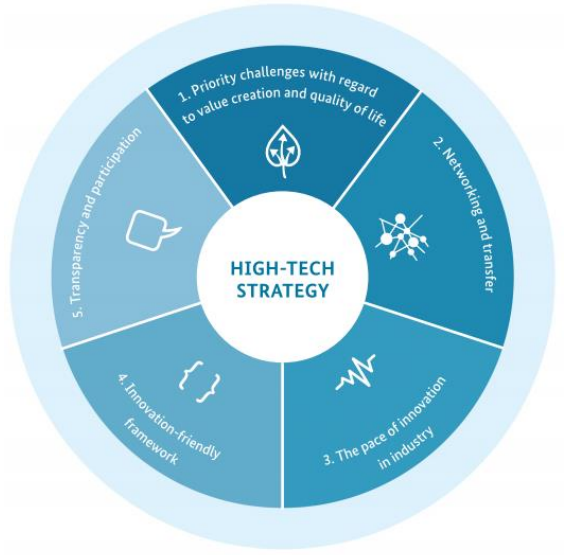


Figure 20: Core elements of the new strategy[30]

[29] http://industrie4.0.gtai.de/INDUSTRIE40/Navigation/EN/Topics/Why-germany/why-germany-policy,t=the-new-hightech-strategy,did=1160434.html
[30] https://www.bmbf.de/pub/HTS_Broschuere_eng.pdf

Central to the New High-Tech Strategy are six priority task areas. These are as listed below.

- **Digital Economy and Society**
  Innovative solutions are being developed to address the challenges inherent in digital technologies, and opportunities for value creation and prosperity in Germany identified.

- **Sustainable Economy and Energy**
  Consumption and production need to become more environmentally sustainable, resource-efficient and socially acceptable.

- **Innovative Workplace**
  Focus on profound changes taking place in the modern workplace with jobs as important basis for creative ideas and economic innovation.

- **Healthy Living**
  Increased research activity aimed at helping people live longer, healthier and more independent lives.

- **Intelligent Mobility**
  Research activity supporting integrated transport policies that optimize modes of transport in terms of efficiency, capability and interaction.

- **Civil Security**
  Addressing security issues inherent in complex systems and infrastructures (e.g. energy supply, communications, mobility, and logistics) in everyday life.

The New-High Tech Strategy will see the German Federal Government provide support to science and industry within the context of collaborative partnerships covering everything from the digital society and digital manufacturing processes (i.e. INDUSTRIE 4.0) to electric mobility and individualized medicine.

Particular support is provided for small and medium-sized enterprises in the form of the technology-neutral programmes initiated by the Federal Ministry for Economic Affairs and Energy (BMWi) including the Central Innovation Programme for SMEs (ZIM) and Cooperative Industrial Research (IGF).

3.4.4 How do we get there – RTI concept – the case of Croatia

The Smart Specialisation Strategy (S3) has been developed by the Croatian government in response to the European Commission's Europe 2020 strategy and as ex-ante conditionality for

usage of ESI Funds intended through thematic objective 1 – Strengthening research, technological development and innovation.

The key objectives of the Croatian S3 are to foster economic growth and jobs through the three mutually reinforcing Europe2020 priorities. By doing so, Croatia will contribute to making Europe a smarter, more sustainable and more inclusive place to live.

Croatian S3 presents a comprehensive assessment of the country's governance structure, innovation facilitating instruments, and key innovation assets –research and human capital. It proposes a strong monitoring and evaluation (M&E) framework and provides a sectoral analysis of five priority sectors of the economy and their innovation potential.

The main purpose of Smart Specialization is to transform the Croatian economy and increase its competitiveness by concentrating knowledge resources and linking them to a limited number of priorities. The identification of the Smart Specialization priorities will allow concentration of research capacities and infrastructure. This will provide advantage to both public and private sector and will bring together the critical mass of researchers who will jointly work on strategic R&D topics with goal of research excellence and its commercialization.

The end result of these processes is the selection of 5 TPAs with relevant technological and production fields as the main focus for the S3 in Croatia: (1) Health and quality of life, (2) Energy and sustainable environment, (3) Transport and mobility, (4) Security and (5) Food and bio-economy. Additionally, Croatia has identified two **cross-cutting** themes able to create the biggest added value and foster the emergence of new economic activities, rising of the productivity of the Croatian economy and the creation of new and sustainable job opportunities. Cross-cutting themes are KETs and ICT.

Policy mix – measures and supported areas can be summarised as follows:

1. Establishment of the more effective National innovation system

i) Establishment of Innovation Network for Industry and development of Thematic Innovation Platforms;
ii) Science and Technology Foresight project;
iii) Development of Technology Transfer Offices and Science-Technology Parks;

2. Developing RDI Infrastructure and enhancing RDI activities

A. Development of RDI Infrastructure

i) Development of new and the improvement of existing RDI infrastructure in Croatia;
ii) Centers of Competence

B. Enhancement of RDI activities

i) Support to business investment in RDI
ii) Support to SMEs capacities to innovate
iii) Support to social innovation

iv) Support to research organizations conducting R&D projects directed towards the needs of economy
v) Strengthening research excellence by supporting national Centers of Research Excellence and enabling synergies with ERC grants

3. **Upgrading in global value chain and promoting internationalization of Croatian economy**
   i) Support to competitiveness cluster initiatives

4. **Development of smart skills**
   i) Establishing infrastructure for smart skills policies
   ii) Medium term tools for skill assessment at the level of competences
   iii) Implementing the Croatian Qualification Framework mechanism for delivering timely and standardized training programmes based on future and medium term skill needs

3.4.5 How do we get there – RIS3 SK concept – the case of Slovakia

The strategy *"Research and Innovation Strategy for Smart Specialisation of the Slovak Republic"* ("RIS3") was approved by Government Resolution No. 665 of 13 November 2013.

The RIS3 document is the national R&I strategy for 2014-2020 and its implementation is a complex process, combining in a complementary way the competences of the different ministries and reaching beyond the competences and interests of regional and municipal self-governments, civil associations and the business sphere. Its effect is based on the integration of science with innovation and of research institutions with the economic practice, especially industry, by creating optimum conditions within the regional and sectoral space.

It sets goals and policy measures are aimed at research, innovation and education:

- Goal 1 tackles challenge of the dual economy and aims at increasing embeddedness of key industries in Slovakia.
- Goal 2 relates to support to economic growth via results of excellent science.
- Goal 3 aims at creating dynamic, open and inclusive innovative society as a condition for improving quality of life contains three policy measures on grand societal challenges.
- Goal 4 aims at improving quality of human resources for innovative Slovakia' contains policy measures aimed at improving system of vocational education and supporting excellent higher education.[31]

Based on the analysis of the development of the Slovak economy there were identified the areas of specialization based on traditional sectors and prospective areas of specialization concerning

[31] https://rio.jrc.ec.europa.eu/en/library/strategy-smart-specialisation-slovak-republic-ris3, https://www.opvai.sk/media/57254/action-plan-for-the-implementation-of-the-research-and-innovation-strategy-for-smart-specialisation-of-the-sr-2014-2020.pdf

the fast growing sectors, which have a high potential for the development of the Slovak economy. The analysis of economic development, infrastructure and R&D capacities and their interconnection are the basis for the specialization. An allocation of the Slovak industry does not correspondent with the R & I capacities. **For using of both potentials it is necessary to create R&I opportunities for existing businesses and to create an environment for the creation of enterprises using already built capacities of R&I.** The priority areas must be consistent with the environment and society to make the best use of the potential and synergies. By this way it would be achieved the national and regional competitiveness of businesses, not only at the local but also the global market, which will help to increase the overall competitiveness of the European Union.

RIS3 through the development of innovations, science and technologies in identified priority areas creates preconditions for sustainable growth of the competitive capability of the Slovak republic while supporting the structural diversification of the Slovak economy.

Slovak Republic´s Priority Areas and Prospective Areas of economic specialisation:

Priority Areas of economic specialisation:

- Automotive and mechanical engineering industries
- Consumer electronics and electrical equipment
- ICT and Services
- Production and processing of iron and steel

Prospective areas of specialisation:

- Automation, Robotics and Digital Technology
- Processing and increasing the value of light metals and their alloys
- Production and processing of polymers and advanced chemical substances (including smart fertilizations
- Creative industry
- Increasing the value of domestic raw material
- Progressive chemical technologies for production of modern fertilizers
- Support of the smart technologies in the field of raw materials processing in regions of their occurrence

Areas of specialisation from the point of view of available scientific and research capacities:

- Research of materials and nanotechnology
- Information and communications technology
- Biomedicine and Biotechnology
- Environment and agriculture
- Sustainable energy

Policy mix – measures and supported areas can be summarised as follows:

Research, development and innovation:
- Fostering excellence of research
- Development of excellent research while ensuring the necessary infrastructure for research and development
- Linking universities, Academy of Sciences, research institutions and partners from the area of industry
- Systematic support and stimulation of international cooperation in science and technology
- Knowledge-oriented services and creative industry
- Supporting research and innovation in environmental areas including adaptation to climate change

Education:
- Improving the quality of secondary education
- Improving the quality of higher education
- Improving business involvement in education
- Improving the quality of life-long education
- Increasing emphasis on education in fields relevant to the RIS3 priority areas
- Supporting the mobility of highly skilled workers

Human resources:
- Research and innovation in addressing major societal challenges in Slovakia
- Supporting an open and inclusive society

Entrepreneurship and innovation:
- Development of innovative capacities through cooperation between enterprises and research institutions in key sectors of the Slovak economy
- Technological upgrade for structural changes in industry
- Support for building research and innovation capacities in Slovak enterprises
- Establishing indirect motivational tools
- Supporting dynamic business environment favourable to innovation
- Protection and utilization of intellectual property

3.4.6 How do we get there – National RIS3 concept – the case of Czech Republic

The National Research and Innovation Strategy for Intelligent Specialization of the Czech Republic (further referred to as the National RIS3 Strategy) is a strategic document that ensures the **effective targeting** of European, national and private funds for activities leading to the enhancement of innovation capacity and to the priority areas with a view to fully exploiting the knowledge potential at both national and regional level, thus supporting the reduction of

unemployment and the strengthening of the competitiveness of the economy in the area of **research, development and innovation**.

Preparations of this document were launched in 2013. The Czech Intelligence Specialization Strategy includes a national RIS3 strategy and 14 regional strategies in the form of so-called regional annexes elaborated for individual regions of the Czech Republic that refine national priorities in relation to the specificities of the region's research and innovation potential. National RIS3 together with regional annexes was approved by the Czech government on 8th December 2014.

Within the conceptual view on RIS3 two priorities are proposed for the Czech Republic:

- horizontal: interventions supporting the creation and / or improvement of the innovation system at national and regional level (eg. interventions regardless of the specialized focus of the supported activities)
- vertical: interventions focused on specific competitive, prospective sector / sub-sectors of R&D&I with strong growth potential, so-called smart specialization domains

The proposing part of RIS3 consists of six key areas in which the Czech Republic needs to make significant changes in order to strengthen the knowledge-based economy, develop the identified domains of specialization and to fulfill the vision of RIS3 "Czech entrepreneurial, creative and attractive for talents and money " in the long run.

The key areas of changes and strategic goals of the National RIS 3 strategy are as follows:

- Higher innovation performance of companies
  - Increase innovation demand in companies (also in the public sector).
  - Increase the rate of corporate business with an emphasis on creating new fast growing businesses.
  - Increase the internationalization of SMEs.

- Improving the quality of public research
  - Improve the quality and problem orientation of research in knowledge domains relevant for intelligent specialization.

- Increasing the economic benefits of public research
  - Increase the relevance of research according to the needs of the application sphere.

- Better accessibility of human resources in the number and quality for innovative entrepreneurship, research and development
  - Improve the quality of school leavers.
  - Identify and use talents.
  - Improve the quality of R&D personnel.

- The development of eGovernment and eBusiness to increase competitiveness
  - Development of eGovernment.
  - Development of eBusiness and ICT in business.
  - Infrastructure Development in ICT.

- Strengthening and better use of social capital and creativity to address complex societal challenges
  - Promote open partnership cooperation in experimental solutions of social challenges and system-based use of proven models.
  - Encourage and make better use of the cooperation of local actors to address needs in the area of employment, economic development and social inclusion in the regions of the Czech Republic.

3.4.7 How do we get there – National Smart Specialization concept – the case of Romania

Smart specialization at regional level is a concept recently promoted by the European Commission (EC) with the adoption of the Europe 2020 strategy to respond to the need to better justify R & D and innovation (R & D) investment through the Cohesion of the EU.
In Romania, the smart specialization strategy was developed at the regional level by the eight regional development agencies and was aimed at capitalizing on the opportunities and potential of each region.
In Romania there are three converging measures that support the country-specific smart specialization strategy:

- National RDI Strategy 2014-2020 coordinate by Executive Board for Financing Higher Education, Research, Development and Innovation
- National Competitiveness Strategy coordinated by Ministry of Economy
- Regional Smart Specialization Policy coordinated by Regional Development Agencies

At national level, the following priority directions have been identified for smart specialization:

- Bio economy
- IT & C, storage and security
- Energy, environment and climate change
- Eco-nano-technologies and advanced materials
- Health care

each developing region will, through its own strategy, identify its own objectives and competitive advantages to finance in the 2014-2020 period.
At regional level, policies have been set differently, as can be seen in the two examples below: the Center region and the North West region.
Smart specialization Center region :

- Building an economic culture of innovation
  - Supporting innovation and enterprise modernization activities
  - Supporting innovative business to use European funding instruments
  - Supporting research-based economic entities

  - Support the activities of innovative clusters and other structures of economic cooperation
  - Supporting ,,smart" cities (urban transport,energy, etc)
- Research to the support regional business
  - Supporting innovation and enterprise modernization activities
  - Supporting innovative business to use European funding instruments
  - Supporting research-based economic entities
  - Support the activities of innovative clusters and other structures of economic cooperation
  - Supporting ,,smart" cities (urban transport,energy, etc)
- Domains of excellency for an intelligent development
  - Creating and developing poles of excellence and networks of centers of excellence in the priority economic sectors
  - Supporting innovative companies operating in the areas of excellence
  - Supporting C-D in areas of excellence
  - Developing regional brands
- Professional skills for a knowledge-base economy
  - Modernizing the Education and Training Infrastructure in the areas of excellence
  - Improving vocational training in regional areas of excellence
  - Increasing entrepreneurial skills in regional ares of excellence
  - Improving the skills of using IT technologies in areas of excellence
- Interregional cooperation at European level
  - Supporting the participation of innovative enterprises in various international econmic cooperation networks
  - Expanding the active partcipation of research institutions in the Central Region in international research networks

Smart specialization North-West region:

- Health and welfare
  - Agro-food industry
  - Cosmetics and food supplements
  - Health
- New materials and products
  - Furniture
  - Plastic, paper, packaging
  - Production technologies, machinery
  - Equipment and machinery
  - Metal processing technologies
- Towards a digital transformation
  - Information and communication technology
- Policy mix - EFERVESCENT INNOVATION ECOSISTEM

For Romania, over 22 billion euros are available in the 2014-2020[32] period, some of this funding can be accessed for smart manufacturing development. This accessible funding are distributed as follows:

- Strengthening research, technological development and innovation (ERDF 973 million Euros + 93 million Euros from the European Agricultural Fund for Rural Development (EAFRD)
- Improving access, use and increase the quality of ICT (Information and Communication Technology) (101 million Euros)
- Improving the competitiveness of SMEs
- Promoting job sustainability, job quality and supporting labour mobility
- Investments in education, training, skills training and lifelong learning (1.6 billion Euros (EAFRD- 35,270,500 Euros , ESF - 1,257,101,071 Euros andERDF 361,702,128 Euros)

3.4.8 How do we get there – National RIS3 concept – the case of Hungary

In Hungary the RIS3 strategy was developed on national level based on the recommendations of the 19 counties of Hungary.

As a result of the two-round EDP ("Entrepreneurial Discovery Process") process, the participants of the county workgroups, organized along the 'quadruple helix', identified the sectors and the technologies and research directions, along which they develop their research, development and innovation strategy and specialization.

Three national smart specializations were formulated in the course of the strategy building:

Systems science	It places the emphasis on systematic approaches in the research. It implements new scientific results on the frontiers of the areas of sciences by using the leading research results of the neighbouring disciplines and renewing the area of research, from or on the basis of which possibilities are provided directly to the economy or the society to use significant applications.
Sustainable society	It provides innovative answers to societal challenges. It promotes the sectors with the instruments of follow-up innovation sectors, making the environment liveable and increasing the retention force of the region through the utilization of the latest research results, the use of modern technologies, equipment, and materials and social innovation.
Smart production	It focuses on product development. It is capable of manufacturing own products or improve existing products through technological renewal in the innovation value chain, which provides a competitive advantage, in particular, by using smart technologies and/or advanced materials.

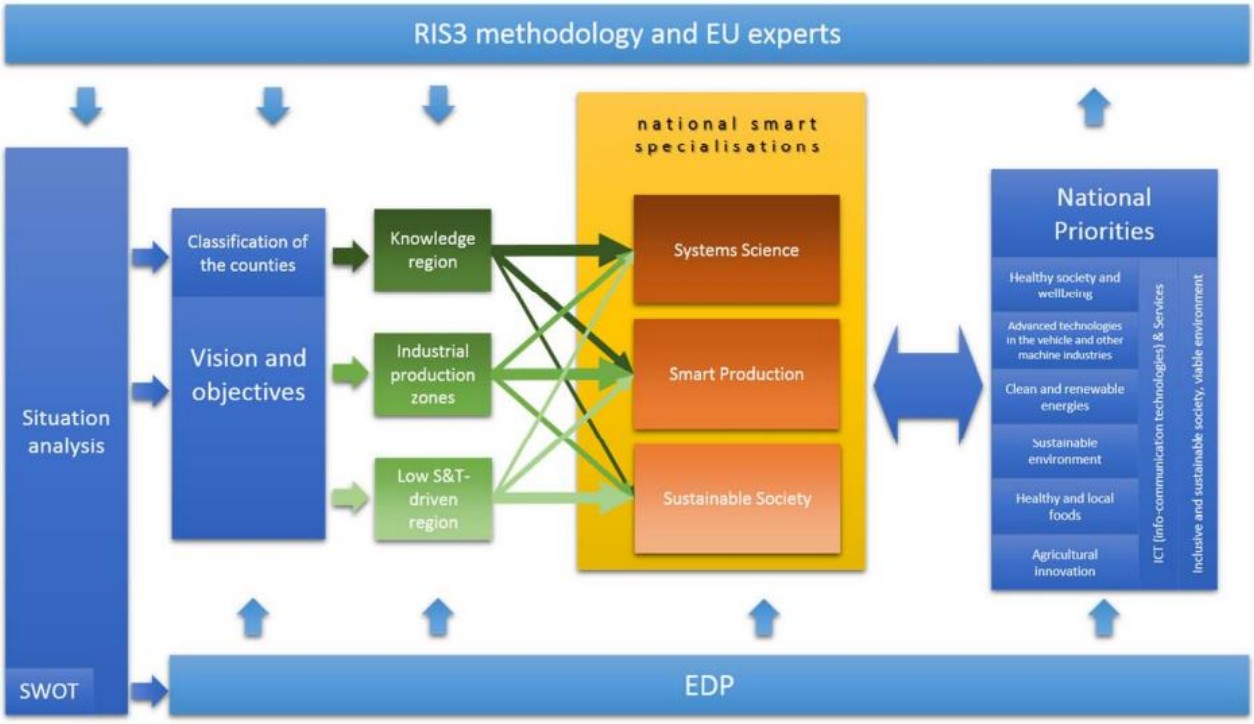
[32] http://ec.europa.eu/regional_policy/ro/funding/available-budget/

Six sectoral and two horizontal national research priorities and a limited number of local specialization sectors/technologies were created in order to achieve the vision and objectives to be implemented along smart specialization.

Within the national research priorities, the sectoral priorities and two horizontal priorities are particularly important for all counties:

- Each of the national priorities, even if they have different weights, were determined by all counties when they determined their directions of specialization.
- These national priorities represent directions for specialization which can be formulated by all counties and at the national level.
- Therefore, the individual counties cannot be differentiated.

Alignment of the national smart specializations to the S3 strategy



3.4.9 How do we get there – IS3 and concept for introduction of Industry 4.0 – the case of Bulgaria

Bulgaria's Innovation Strategy for Smart Specialization goal is Bulgaria to move from the group of "modest innovators" into the group of "moderate innovators".
In practice, this change in the indicators will be implemented through an effective policy for promoting:

• Innovation, research and development of human capital;
• Investment in high-tech areas in which Bulgaria has traditions, has created professionals and successfully competes on the international market;
• Export-oriented industries;

The Concept for introduction of Industry 4.0 in Bulgaria was elaborated and approved by the Bulgarian Parliament in April 2017. It is the prerequisites for the modernization, automation and competitive positioning of the Bulgarian economy in the medium to long term period 2017 – 2030. The concept is in support of the ISIS and the priority area "Stimulating the wide use of ICT by enterprises, especially SMEs, citizens and the public sector, to address the major economic and social challenges.
In general, the results from the implementation of Industry 4.0 are in line with those of IS3 - by supporting competitiveness and attracting attractive foreign direct investment.
The vision of the concept is by 2030 Bulgaria to be recognized as a regional centre of the digital economy through the deployment of technologies, business models and processes from Industry 4.0 and the ubiquitous use of digital technologies in manufacturing processes.
The main area of intervention is the Digitalization of business, export orientation and competitiveness (in order to reach the average European level of the DESI index).

- Intervention 1 Accelerated integration of Bulgaria in European and international programs, initiatives and networks related to the development and implementation of Industry 4.0.
- Intervention 2 Technological upgrading of the Bulgarian economy through introduction of standards, construction of infrastructure, development of specific mechanisms to stimulate the development and market introduction of technological innovations (new products, services and production processes) through the technologies of Industry 4.0.
- Intervention 3 Building human, scientific, organizational and institutional capacity for development of Industry 4.0 in Bulgaria.

Policy mix – measures and supported areas can be summarised as follows:

The RIS3 supporting measures are connected with the several operational programs and funds supporting the development of innovation, science and research.

Operational Programme Science and Education for Smart Growth 2017-2020

- Creating and developing Centres of Excellence (CoE) and Centres of Competence (CoC) in the RIS3 areas.
- Improving the territorial and thematic distribution of research infrastructures, with a view to regional smart specialization.
- Increasing the participation of Bulgarian researchers in international cooperation.

National Innovation Fund

- Scientific applied research project
- Feasibility studies

The National Science and Research Fund

- improvement of the scientific research infrastructures in the universities and research institutes;

- modernization of the scientific research equipment in the universities, specialized laboratories and research institutes
- financial support to the scientific organizations and the higher educational institutions

based on project-programme financing;

- financing of projects, developments and demonstration projects in scientific directions,determined by the Fund;
- financing of projects, developments and demonstration projects of young scientists

Development of research infrastructure

- biology and medicine:
- material science:
- natural and engineering sciences:
- social sciences:

Human resources

- Strengthening the link between higher education and the requirements of the labour market; stimulating the training in technical and engineering specialties; enhancing the practical application of higher education;
- Reforming vocational education and promoting lifelong learning.
- Internationalisation of innovation to further improve the quality of research and management of the phenomenon of “brain drain“

Activities leading to an effective research and business partnership

- Promotion of partnerships on the demand side and on the supply side
- Entrepreneurship and innovation
  - Newly established enterprises and knowledge transfer
  - Growth and development of SMEs
  - Internationalisation and FDI

3.4.10 How do we get there – Serbia

At this moment the Smart Specialization Strategy in Serbia doesn’t exist, but the concept is recognized and the Interdepartmental Working Body for the Preparation of Research and Innovation Strategy for Smart Specialization of the Republic of Serbia was established under the Decision of the Government of the Republic of Serbia of 29 November 2016. One of the strategic documents important for preparing the RIS 3 Strategy is Strategy for the Support to Development of Small and Medium-Sized Enterprises, Entrepreneurship and Competitiveness for the period 2015-2020.

The Strategy establishes guidelines for the development of entrepreneurship and competitiveness based on private entrepreneurial initiative, knowledge and innovation. One of the dominant challenges of this Strategy is the poor link between research institutions and SMEs. This Strategy continues the policy of fully recognizing and applying of all documents that define

EU policies in the field of entrepreneurship and competitiveness, primarily, the Europe 2020 Strategy and the Small Business Act. Particular attention has been paid to alignment with regional strategies related to this area, primarily with the South East Europe 2020 Strategy, and the EU Strategy for the Danube Region, as well.

The precondition for achieving sustainable socio-economic development and successful completion of the European integration process of the Republic of Serbia is the development of the economy, which builds its long-term competitiveness on private entrepreneurial initiative, knowledge, application of new technologies and innovativeness.
The Strategy for the Support to Development of Small and Medium-Sized Enterprises, Entrepreneurship and Competitiveness for the period 2015-2020 defines the framework, goals, priorities and measures to improve the development of micro, small and medium sized enterprises and entrepreneurship in the coming medium-term period.

The previous Strategy for the Development of Competitive and Innovative Small and Medium Enterprises for the period 2008-2013 improved the support for funding innovation projects of SMEs in the area of support to innovations. The Ministry of Education, Science and Technological Development encouraged innovative projects through the program of support to innovation activities. Fund for Innovative Activity was founded, establishing two new support programs through the Project of support to innovations in Serbia which is funded from the National program of the EU Instrument for Pre-accession Assistance (hereinafter referred to as IPA) for the year 2011. Within the Program of early development, 21 projects were supported in 2013, amounting to EUR 723,753.91, and through the Program of co-funding innovations, 10 projects were supported in the amount of EUR 640,421.67. Activities regarding the promotion of innovativeness through events organized by CCIS, Fund for Innovative Activity, NARD, etc. were continued. With the objective to support innovations, within action plans, activities to encourage participation of SMEs in international innovative and research and business programs/ networks were envisaged, such as: Competitiveness and Innovation Framework Program (CIP), EU Program “Eureka” and the 7th Framework Programme (FP7).

Within the activities of cluster support, the Ministry of Economy, and later the NARD, implemented the Program of support to development of innovation clusters in the total amount of RSD 113.6 million for the given five-year period.

Concentration of SMEs by sector has not changed significantly over the years: the concentration in non-trade sectors is dominant and one in three enterprises or entrepreneurs from SMEs operates in the field of retail and wholesale trade, followed by services and manufacturing. The structure of SMEs in the manufacturing industry is dominated by economic entities operating in low-tech fields, with products of low added value and differentiation resulting in their weaker position on the market and low price and profit margins

3.5 Smart Factory support schemes and programmes

Favourable financial environment is very important for development of each company. The importance is also reflected by the fact that the financing of SMEs one of the main topics of the discussions, documents and programs on entrepreneurship at EU level.

Figure 21 and Table 5 in the appendix show important key indicators to the financial environment of the defined countries. The maximum grants given per project is an important indicator. The highest max. grant can be observed in Slovakia (up to 5 Mio. EUR) and Czech Republic (up to 3,7 Mio. EUR). Germany, Austria and Romania support with max. two Mio. EUR cooperative research projects, followed by Bulgaria with 1,4 Mio EUR for scientific projects. Croatia and Slovenia provide up to 0,5 Mio EUR funding per project.

National funding schemes - Overview

NFB: Federal Ministry of Economic Affairs and Energy (BMWi)
Max. grants*: **2 Mio. EUR** per project
Topic: Supporting research & innovation Enhancing the competitiveness of SMEs Reducing CO2 emissions

NFB: Ministry of Industry and Trade (MPO)
Max. grants*: Industrial projects max. **3.7 Mio** per project
Topic: Nanotechnology; Advanced materials; Advanced manufacturing technologies

NFB: Ministry of Economy and Ministry of Education, Science, Research and Sport
Max. grants*: within range **2 Mio. EUR to 5 Mio. EUR**
Topic: Operational Programme for Research and Innovation; Financial vouchers for legal, technological or business

NFB: Austrian Research Promotion Agency (FFG)
Max. grants*: **2 Mio. EUR** per project
Topics: Smart manufacturing; Information and communication technology (ICT)

NFB: National Ministry for Economic Development and National Office for Innovation
Max. grants: 2 million euros per project
Topic: development of products and services. Manufacturing industries - priotities defined in National Irinvi Plan

NFB: Ministry of Economic Development and TechnologyMax. grants*: **0,5 Mio.** EUR per project
Topic: Lean production, business process management, design management, solutions for direct practical application and demonstration of the use in accordance with Slovene Strategy for smart specialization

NFB: Executive Board for Financing Higher Education, Research, Development and Innovation, Ministry of Economy
Max. grants*: **2 Mio EUR** per project for all type of companies for activity improvement
Topic: Creative industries; Auto and parts industry; Information technology and communications

NFB: Ministry of Regional Development and EU funds Economy, Entrepreneurship and Crafts
Max. grants*: New products and services as result of research, development and innovations: maximum grant **0,5 MIO EUR** per project
Topic: R&D of new products, processes and technologies for SMEs according to S3.

NFB: The Innovation Fund
Max. grants*: 0,3 Mio. EUR per project
Topic: Innovation Co-financing Programme

NFB: Ministry of Economy, Ministry of science and education, Bulgarian Small and Medium Enterprise Promotion Support Agency
Max. grants*: Development of product and production innovations: **0,5 Mio EUR**
Scientific research: **1.4 Mio EUR**
Topic: Operational Program "Science and Education for Smart Growth"

***Max. grants:** Max grants for cooperative research projects related to smart factory (Call Year 2017)
NFB: National Funding Body
Further details see annex table: Key indicators of national funding schemes related to (max grants, Infrastructure funding, national funding schemes for companies, Topics …)

Figure 21: Key indicators of national funding schemes related to max grants and topics related to smart factory

3.6 Benchmark of critical factor SME in the macro Danube region

EU S3 actors play a crucial role in regional and national smart specialisation strategies. They specifically:

- participate in entrepreneurial discovery process,
- contribute to the development of S3 strategies and their implementation,
- provide advice on how to match regional development needs with R&I and vice versa,
- support particular technologies, industries or clusters,
- provide an adequate innovation ecosystem,
- form the quadruple helix of innovation actors,
- are involved in international networks and thus they add the needed external and outward-looking dimension to smart specialisation strategies.[33]

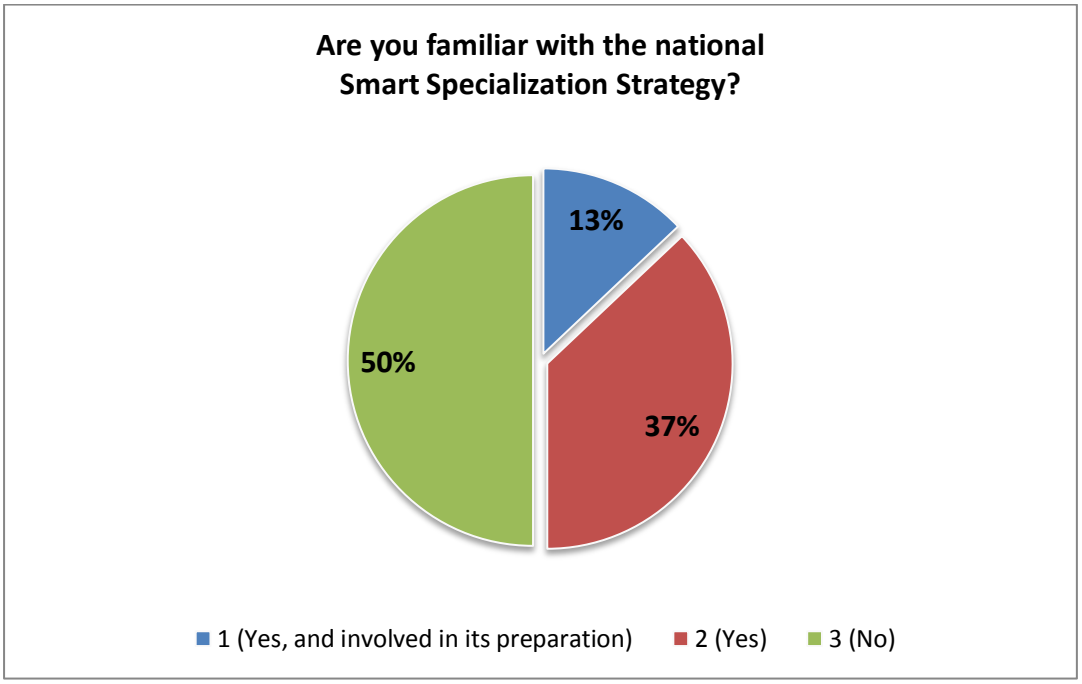
While larger companies have easier access to consultants assisting them with such issues, SMEs typically do not have financial means and necessary human resources to do the same. Based on a questionnaire we assessed if and how well are manufacturing oriented SME's in the Danube region aware of challenges and possibilities related to smart manufacturing, and are ready to incorporate emerging technologies and other solutions to become a Smart Factory.

3.6.1 Survey results for the Danube region

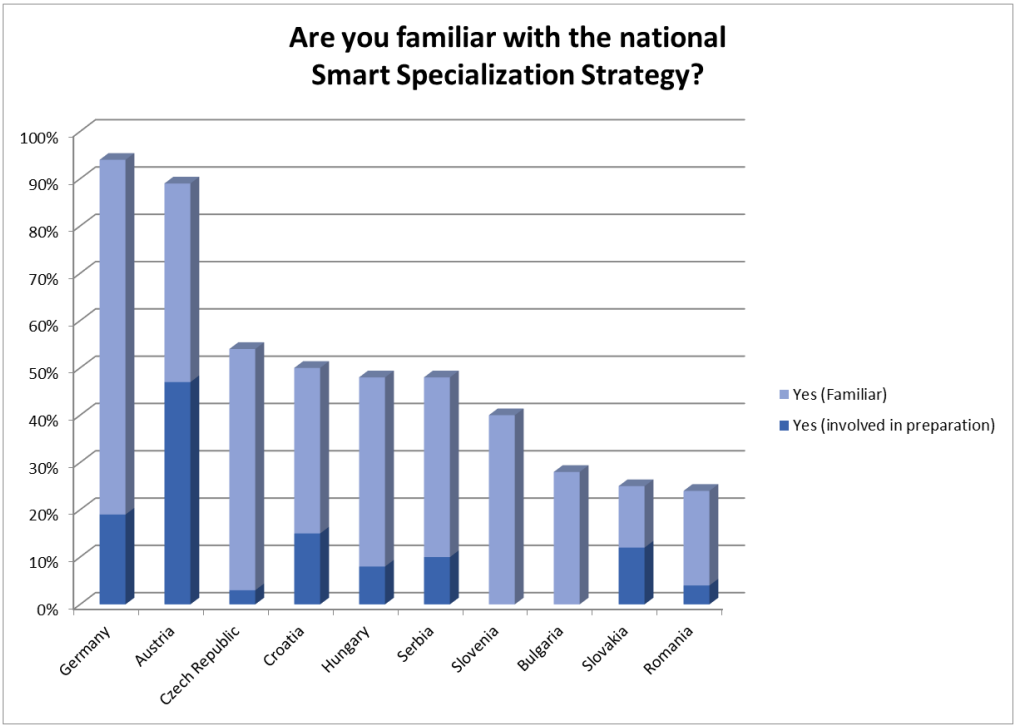
The survey was conducted among production oriented SMEs in the Danube region, with the goal to identify the state and position of these companies related to the challenges of smart manufacturing.

KEY QUESTION 1: How well are SMEs familiar with the Smart Specialization strategy or related policy, what was their involvement in creating it and how do they perceive its benefits?

[33] http://s3platform.jrc.ec.europa.eu/s3-actors



In the Danube region, half of the SMEs are not familiar with the Smart Specialization Strategies of their countries, while the other half is familiar with them. The fact is that different national authorities choose very different approach in involving the SMEs in preparing or influencing national strategies. It is interesting to see however, that only 13% of them have been involved in its preparation at different stages and levels. The information about exact level of involvement was not deemed crucial since we consider the fact that once SME is ''involved'', it is sufficiently familiar with the strategy, so it can understand and take advantage of all the benefits of the respective strategy.



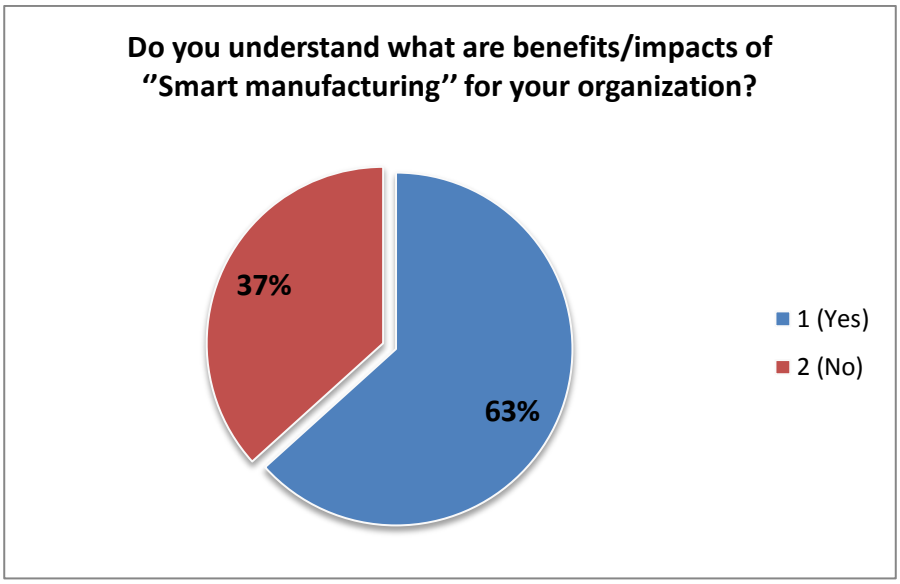
If we take a deeper look at those familiar with the strategy, it is interesting to compare the results at a country by country level. The SMEs in Germany and Austria are much more familiar with their national strategies then others. Around 90% of all SMEs responded positively about being familiar with the strategy, which means that the information campaigns around the strategy, their preparation strategy and the way of work resulted in the very high level of awareness. On the other hand, there is a group of countries (Czech Republic, Croatia, Hungary, Serbia and Slovenia) that are lagging behind, with app. 50% of familiarity with the strategy. The group of countries with the least awareness among SMEs (around 25%) consist of Bulgaria, Slovakia and Romania.

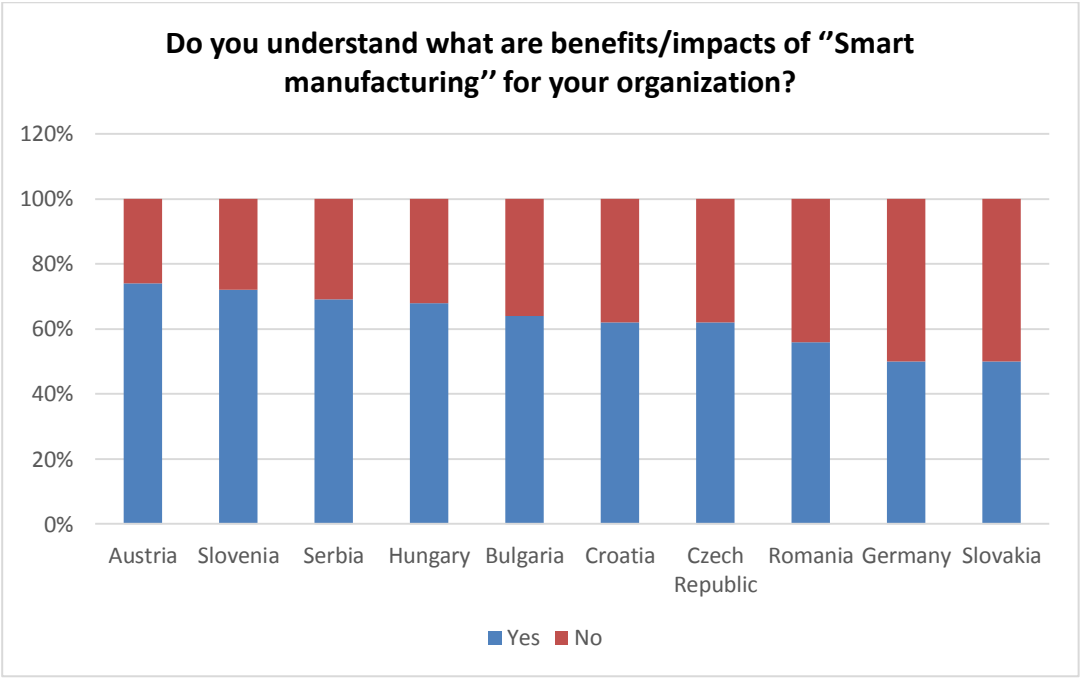
The same graph also gives indication of the involvement of SME in the preparation of the national strategy, which ranges from 3 – 10 % in most of the countries. Only in Slovenia and in Bulgaria none of the respondents were involved in its preparation, while in Austria more than 40 % and in Germany almost 20 % were actively involved.

KEY MESSAGE:

In the Danube region, the SMEs awareness about the Smart Specialization Strategies and their involvement in preparation is not sufficient, while there are big differences in their awareness and involvement on a country by country level. This can have negative effect on the overall competitiveness of the Danube based SMEs and on the other hand result in increasing the gap between more developed and less developed countries (from the Smart manufacturing viewpoint) in the Danube region.

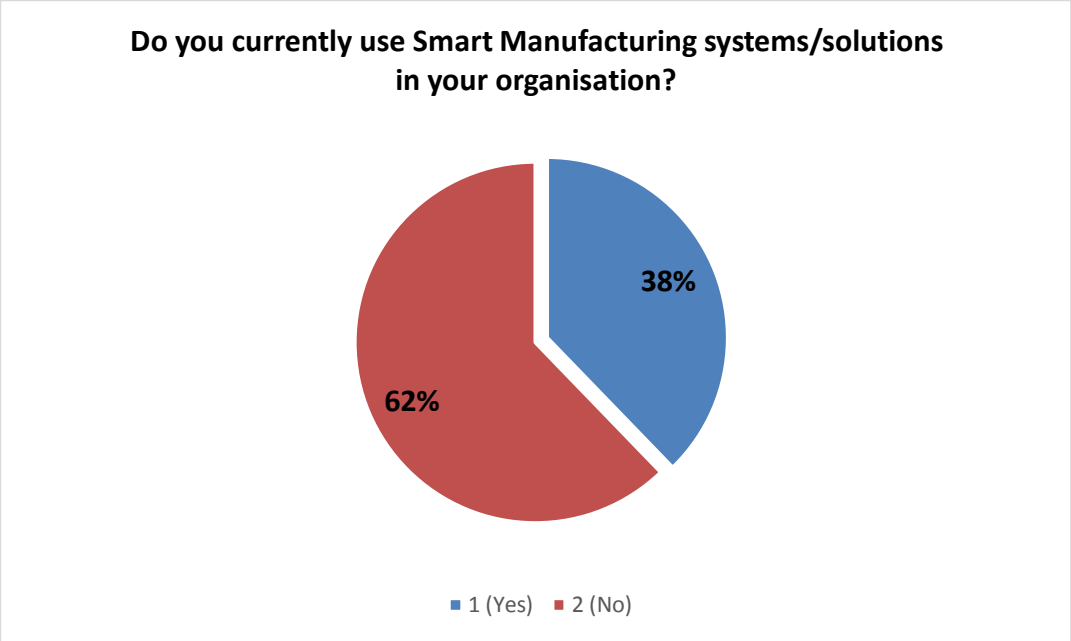
KEY QUESTION 2: How well is Smart Manufacturing perceived at strategic and spread at operational level (maturity of Smart Manufacturing in the SMEs)?

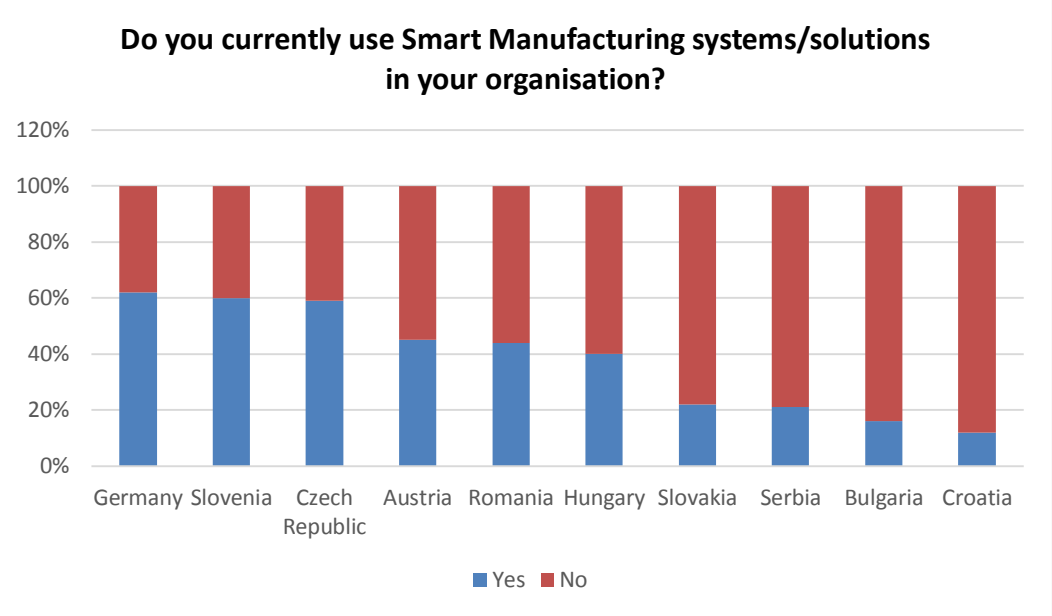




Based on collected answers about ''understanding the benefits'', we are able see that 63% of SMEs in the Danube region do understand the benefits and impact of Smart manufacturing for their organization, while 33% have difficulties understanding the benefits brought by the Smart manufacturing systems/solutions. By conducting the questionnaires in person, we could witness the fact that SMEs did hear about Smart manufacturing topic and would be able to anticipate that it is something which will influence their businesses and production facilities however there is a very high discrepancy on the level of understanding the benefits.

In addition, we can witness rather small discrepancies between countries, when it comes to the question of understanding the benefits. We could argue about what does it mean for the German SME (already using some Smart manufacturing solutions) to really understand the benefit of the Smart manufacturing in comparison to the SME in less production technology developed country where the SME only knows that Smart manufacturing will yet be a topic he will eventually have to embrace.





Without going to analyse and determine the exact frame of Smart manufacturing solutions (clarifying the question with the respondent of what is and what is not the Smart manufacturing solution was exceeding the scope of this survey), we were interested to know how many SMEs

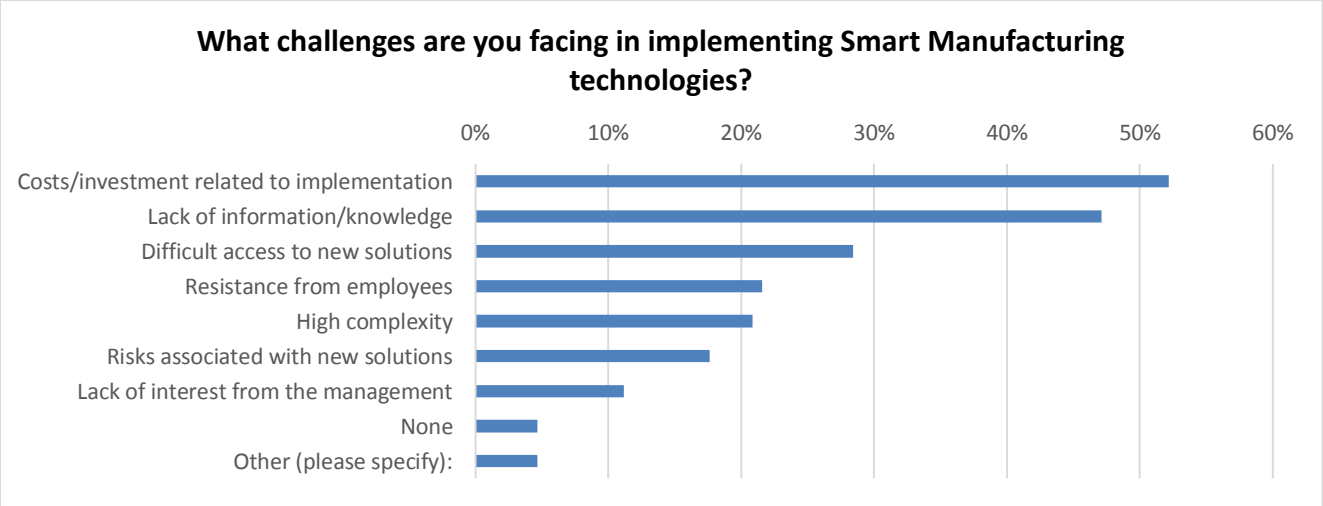
currently use Smart manufacturing systems or solutions. This answer would namely very well complement with the previous question of understanding the benefits.

The results show that only 38% of SMEs state that they are currently using the Smart manufacturing systems/solutions in their organizations. It is even more interesting to see (expectedly) that there is a difference in country by country comparison, which shows that SMEs from the western part or Danube region already use Smart manufacturing system and solutions more often than SMEs from the eastern part.

KEY MESSAGE:

The Smart manufacturing as a topic could be perceived much better among SMEs in the Danube region, therefore this area needs to be promoted and supported by information campaigns, knowledge transfer, technology transfer and other supporting actions. Common regional approach would be added value in order to minimize the gap between more and less developed production oriented SMEs from different countries. The Smart Specialization Strategies need to be operationalized efficiently and effectively, in order to increase investments and implementation of the Smart manufacturing technologies and systems.

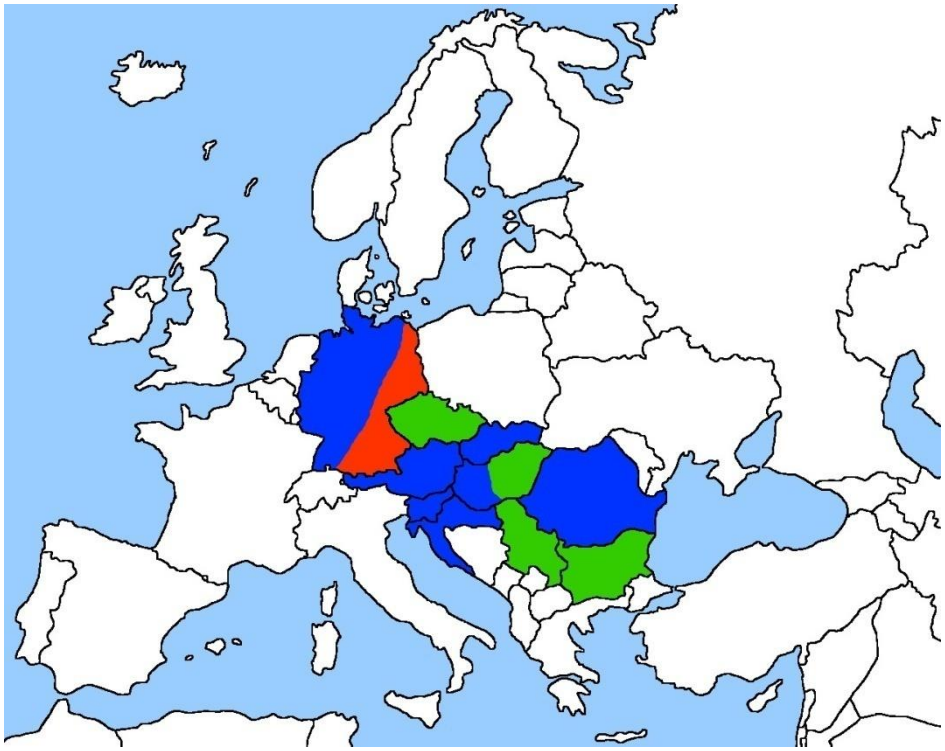
KEY QUESTION 3: What kind of challenges are SMEs facing in implementing Smart Manufacturing technologies and solutions?



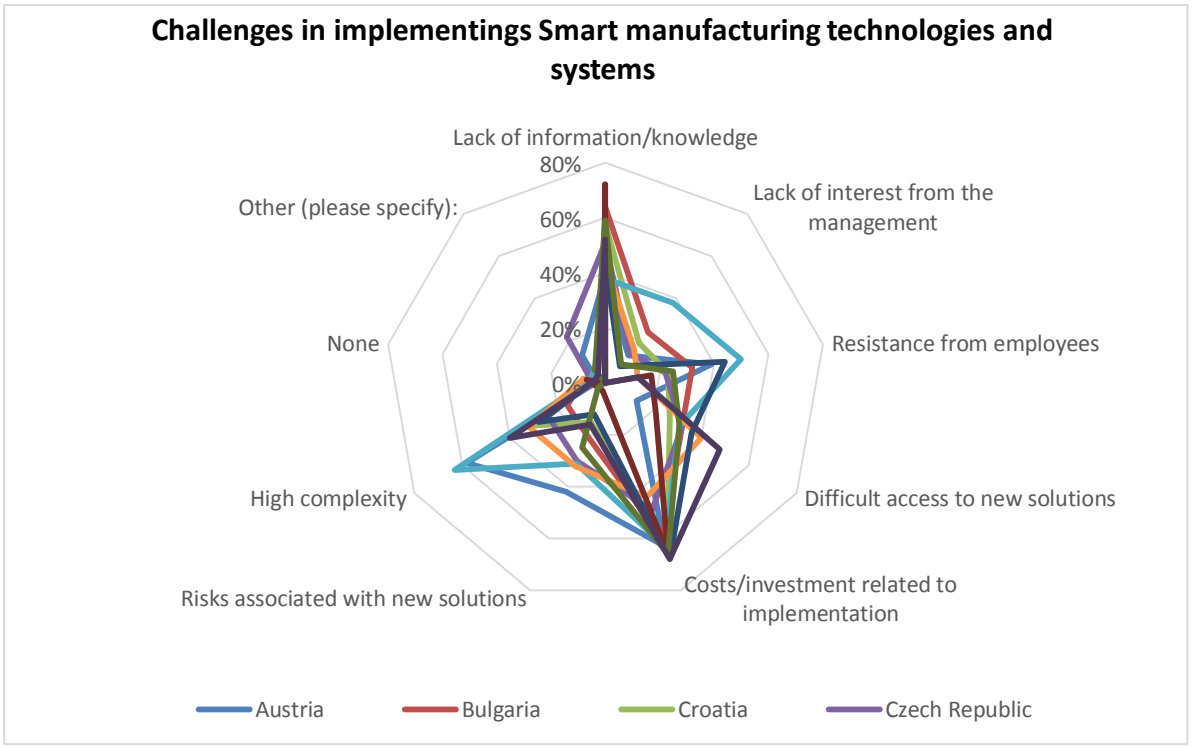
Based upon previous conclusions, we could ask ourselves, what might be the reasons for SMEs not being able to implement Smart manufacturing solutions and technologies at a higher pace. In order to be able to support them in doing so, we shall know and understand what are their challenges, limitations and obstacles in this respect. This is therefore the most important research question, which also determines what kind measures shall be developed and introduced in the future in order to mitigate risks and remove obstacles identified above.

The results show that the biggest challenge for implementing Smart manufacturing technologies and solutions is in the Costs/investments related to implementation (52%), while Lack of information/knowledge (47%) follows closely. These two challenges are standing out, which means that the most effort shall be directed into establishing framework in the direction of financial support and assuring/transferring information, knowledge best practices, concrete solutions, etc.

Other challenges that are following the two most important ones are: Difficult access to new solutions linked to Smart manufacturing (28%), Resistance from employees (22%), Risks associated with new solutions (18%) and lack of interest at the management level (11 %).



●Costs/investment related to implementation ● Lack of information/knowledge ● High complexity



If we look at the country comparison perspective and analyse the most common answers more closely, we can conclude that where the biggest challenges are Costs/investments related to implementation, the information and solutions already exist to some extent, however the reason

for not implementing is the investment attached to them. In a contrary, in countries that still lack information, the biggest challenge is linked to awareness about all the possibilities and benefits these technologies and systems will bring to the SMEs and how to implement them accordingly.

It is interesting to see also that in Germany (and also in Austria), the High complexity is equally (or highly) important as Investment related challenge, from which we would suspect that the more SMEs get advanced and complex, the complexity alone becomes the challenge. A possible explanation is that in these two countries there are still very complex production systems with existing smart manufacturing systems . So some more complex “on top” is almost hard to handle. Additional high complexity also means high costs.

KEY MESSAGE:

SMEs in the Danube region are facing challenges in implementation of Smart manufacturing solutions and systems. These most common challenges are linked with the need for investments and lack of information/knowledge, which means that the supporting environment shall focus into developing funding support measures and assuring/transferring information, knowledge best practices, concrete solutions, etc.

KEY QUESTION 4: Which areas influenced by the Smart Manufacturing are most important for increasing the competitiveness of SMEs?

In order to try to determine which are the Smart manufacturing technologies and systems that are most likely to be implemented, we would need to understand what do SMEs see as the competitiveness area which they would have to prioritize. It is very likely that if the SME believes that the competitiveness will have to be built on the improved coordination with suppliers, then it is more likely that this SME will implement certain technological and organisational advances on this particular field in order to keep and increase their overall competitiveness. Moreover, it is inevitably, that these advances will rely on Smart manufacturing technologies.

From the answers received, we are able outline that SMEs will be focused into the **Improved product quality**, followed by **Decreased manufacturing costs**. In the second group of answers, SMEs will build their competitiveness on **Increased speed of production operations**, **improved coordination with customers** and **Improved agility and responsiveness** in the production process.

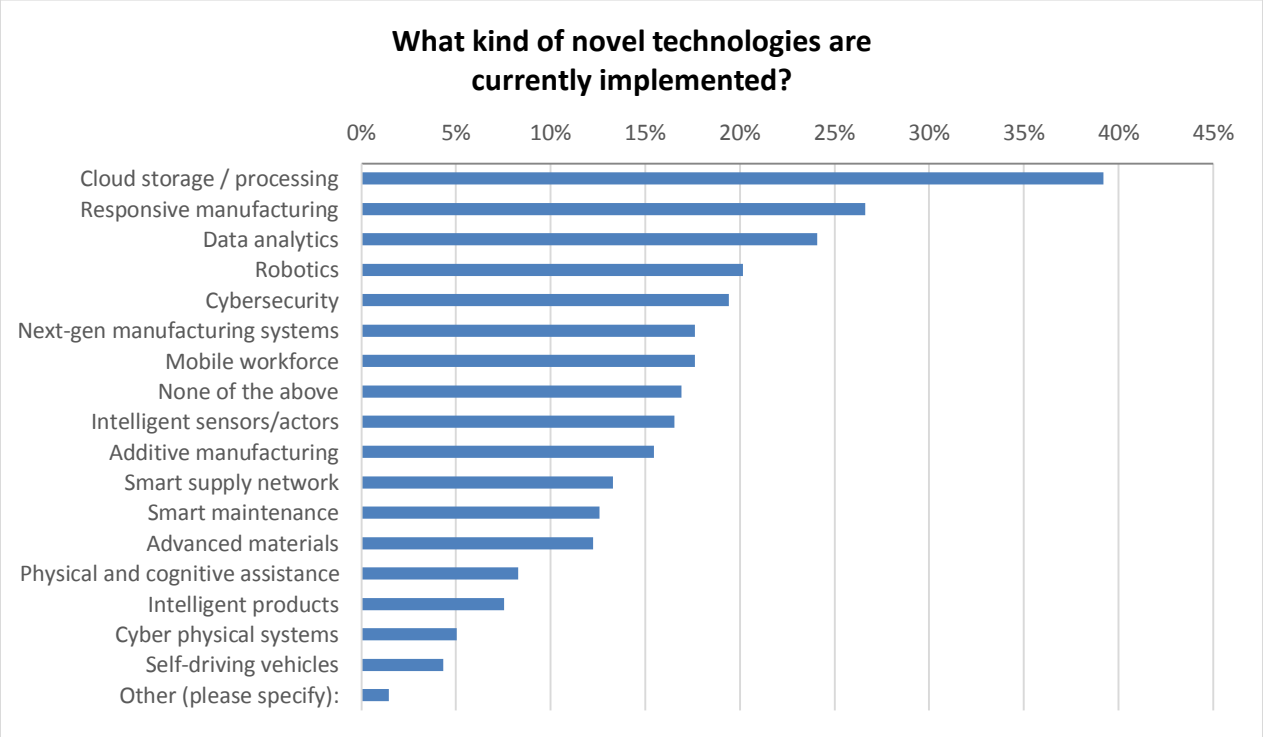
In summary, these results show that the most important focus for SME's competitiveness will be: product quality, production costs and speed, customer satisfaction, while areas like suppliers, maintenance, safety, energy, and business analytics are of less importance. Areas like monitoring and visualization are least important.

KEY MESSAGE:
The most influential areas for increasing SME's competitiveness in the future are (i) product quality, (ii) manufacturing costs, (iii) speed of production and (iv) coordination with customers.

KEY QUESTION 5: What is the current state-of-art and future plans/strategic orientation for implementation of SMEs in relation to all three areas of intervention?

The following three areas of intervention are identified as important for the Smart manufacturing implementation and further development of production oriented SMEs:

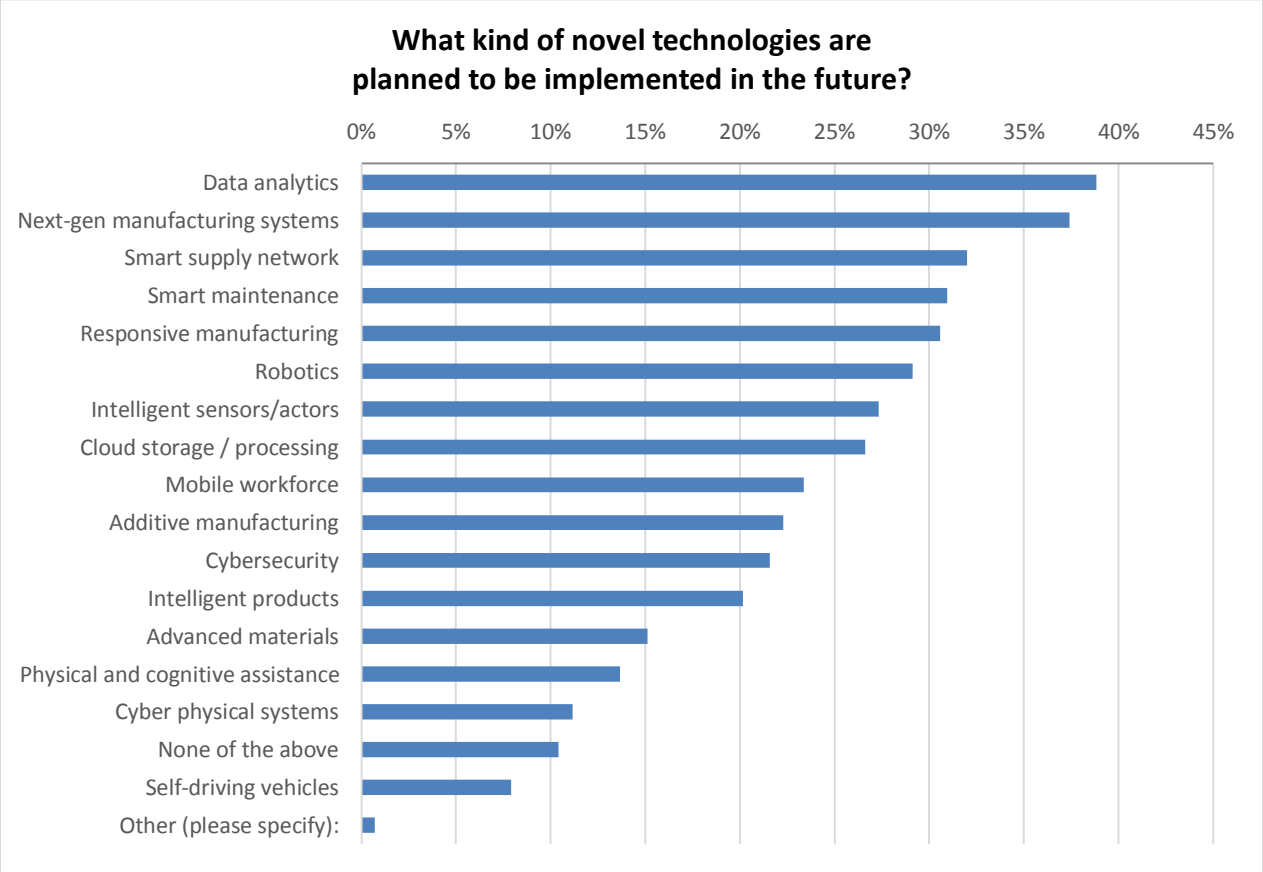
- Novel technologies
- Production processes
- Human Resource Management (HRM)



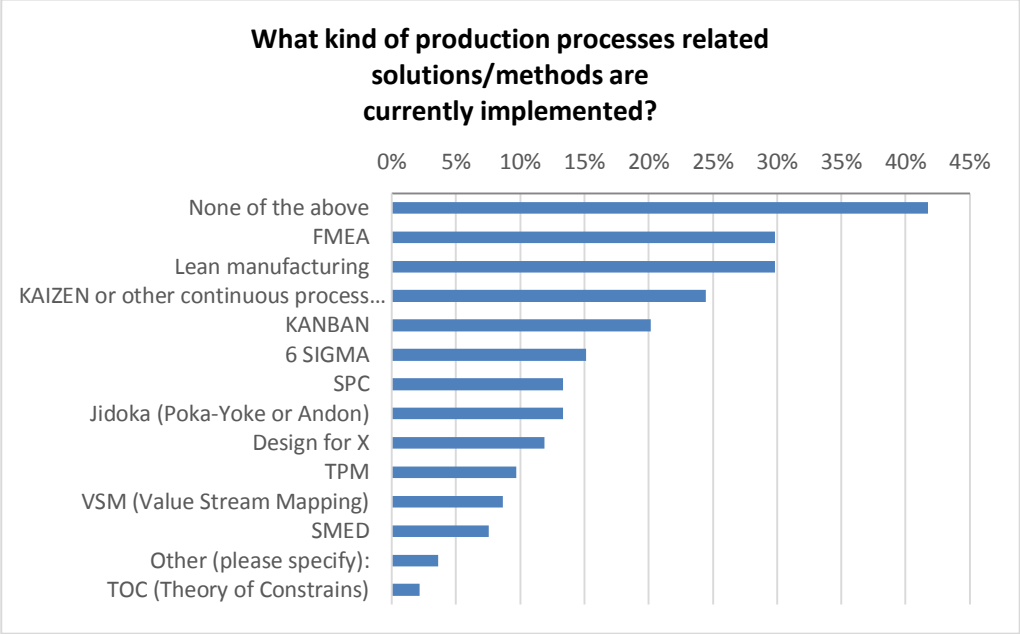
As seen above, almost 40% of SMEs in the Danube region are currently using cloud storage / Processing. Additionally they implemented responsive manufacturing (27 %), data analytics (24 %) and robotics (20 %), which shows that SMEs already invested in implementation of these novel technologies. Solutions such as mobile workforce and next-gen manufacturing systems are used by almost by 20% of organizations while others are used less.

It is interesting to see however that 17 % are currently not using any of smart manufacturing systems/solutions in their production. Under the Key question 2, the SMEs answered that 62% of

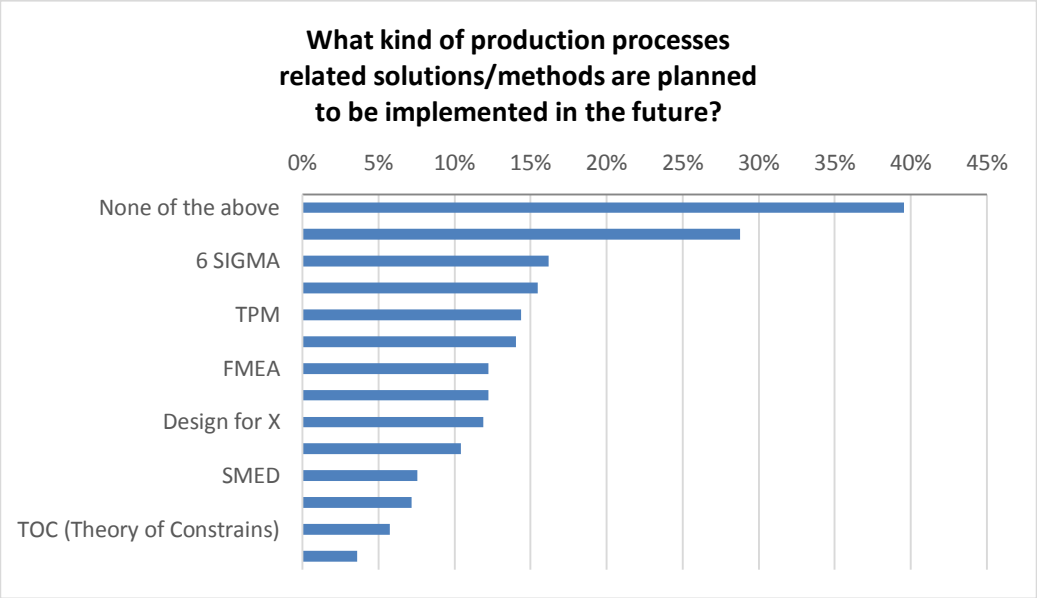
them are not using any Smart manufacturing solutions and systems, which is a slight discrepancy, however this is expected due to the fact that the exact framework of what falls into Smart manufacturing solution is vague and rather complex. Therefore, when asking for explicit technology, the respondent may recognise the technology and gives a positive answer to that particular implementation area.



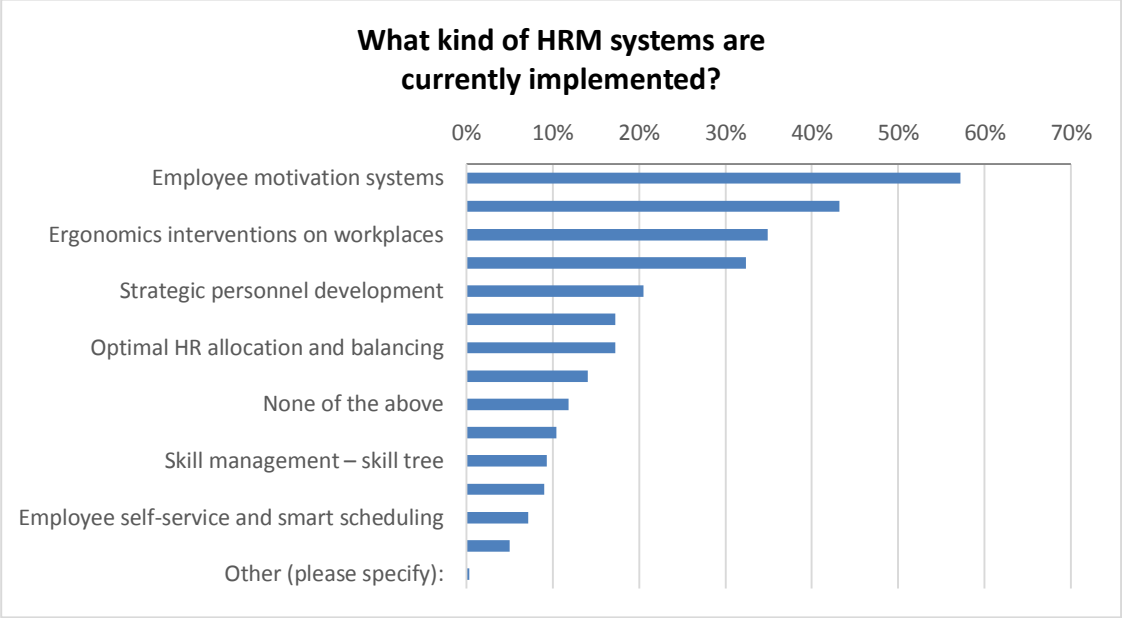
Almost all organizations answered that they are willing to implement at least some new technologies in the future. The most organizations (39%) are planning to implement technologies related to data analytics, which is followed by the Next-gen manufacturing systems (37 %) and smart supply network (32%). Those three areas are in the upfront of all the answers from the organizations and should be the main orientation for the mapping possibilities in the future.



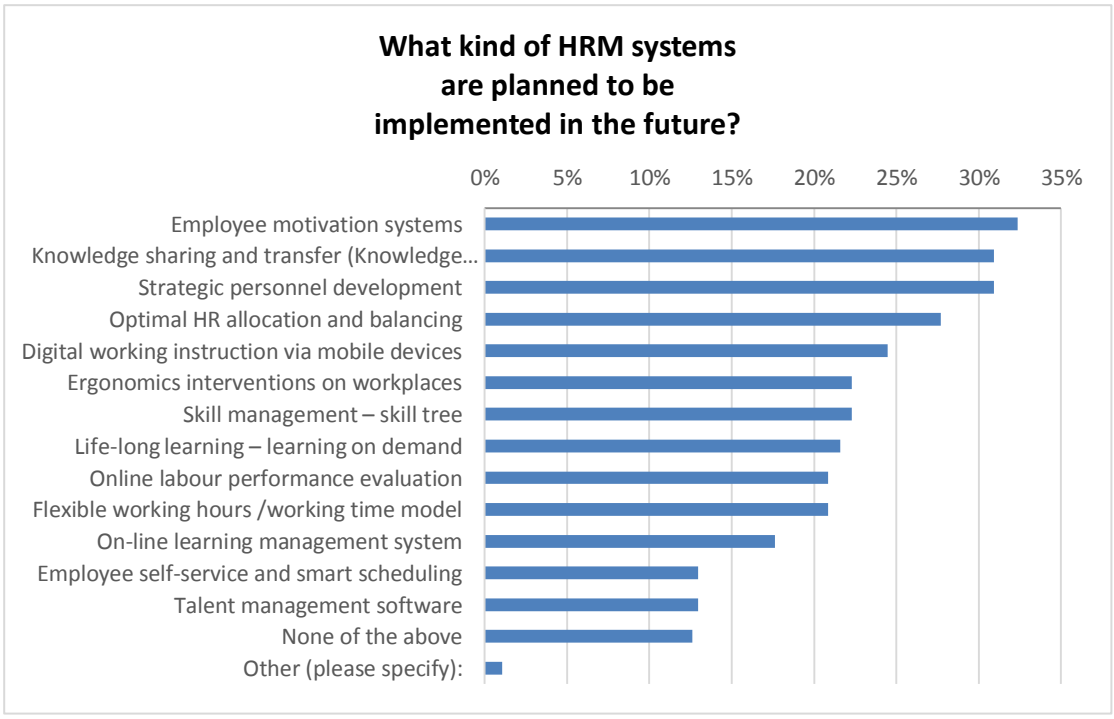
As seen above, also solutions/methods related to the production process are currently not implemented in around 40% of SMEs. The ones who have implemented new methods choose the FMEA (30%), followed by lean manufacturing (30%). Less than 25% have implemented KAIZEN, KANBAN and 6 SIGMA, while others were chosen by less than 10% of organizations.



The future plans from organizations are very modest, as majority of them answered that they won't be implementing new solutions/methods for the production process (40%). The ones, who will implement new methods, have chosen the answer Lean manufacturing (28%), 6 Sigma and KAIZEN (15%).



Unlike production processes, human resource management is already implemented in many SMEs. The most used is employee motivation system (57%), followed by flexible working hours (43%) and ergonomic intervention on workplaces (35%). There are still around 12% of SMEs who do not use any of the solutions/methods related to the human resource management.

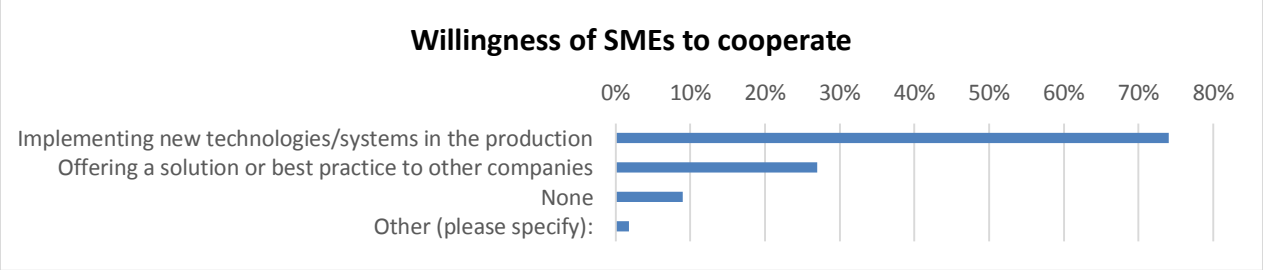


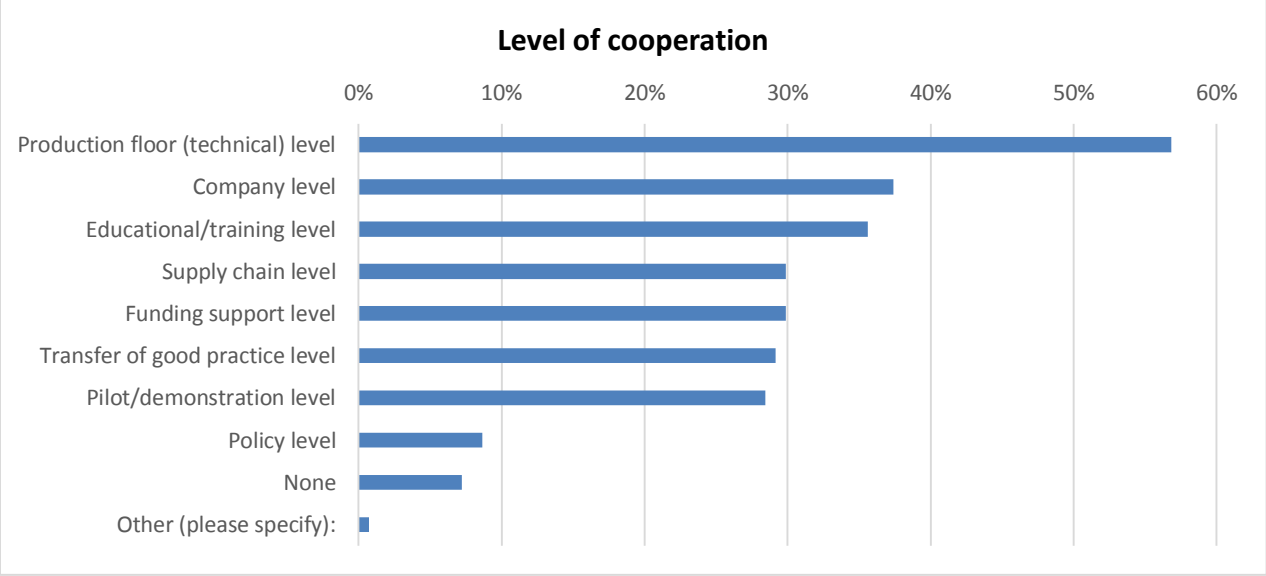
In the future, SMEs will be mostly looking to implement Employee motivation system (32%), Knowledge sharing and transfer (31%) and strategic personnel development (31%).

KEY MESSAGE:

SMEs in the Danube region have been mostly implementing Smart manufacturing novel technologies or HR management, while around 40% SMEscurrently not implementing any smart manufacturing solutions/methods related to production processes. SMEs do have plans to become more active in the future, with data analytics, Next-gen manufacturing systems and smart supply network being the top three areas of interest.
Lean manufacturing and 6 Sigma are considered the most favourite production process optimisation systems, while employee motivation systems and knowledge sharing/transfer are the most selected HR management system to be implemented in the future.

KEY QUESTION 6: Would SMEs be willing to cooperate, in which areas and at what levels?



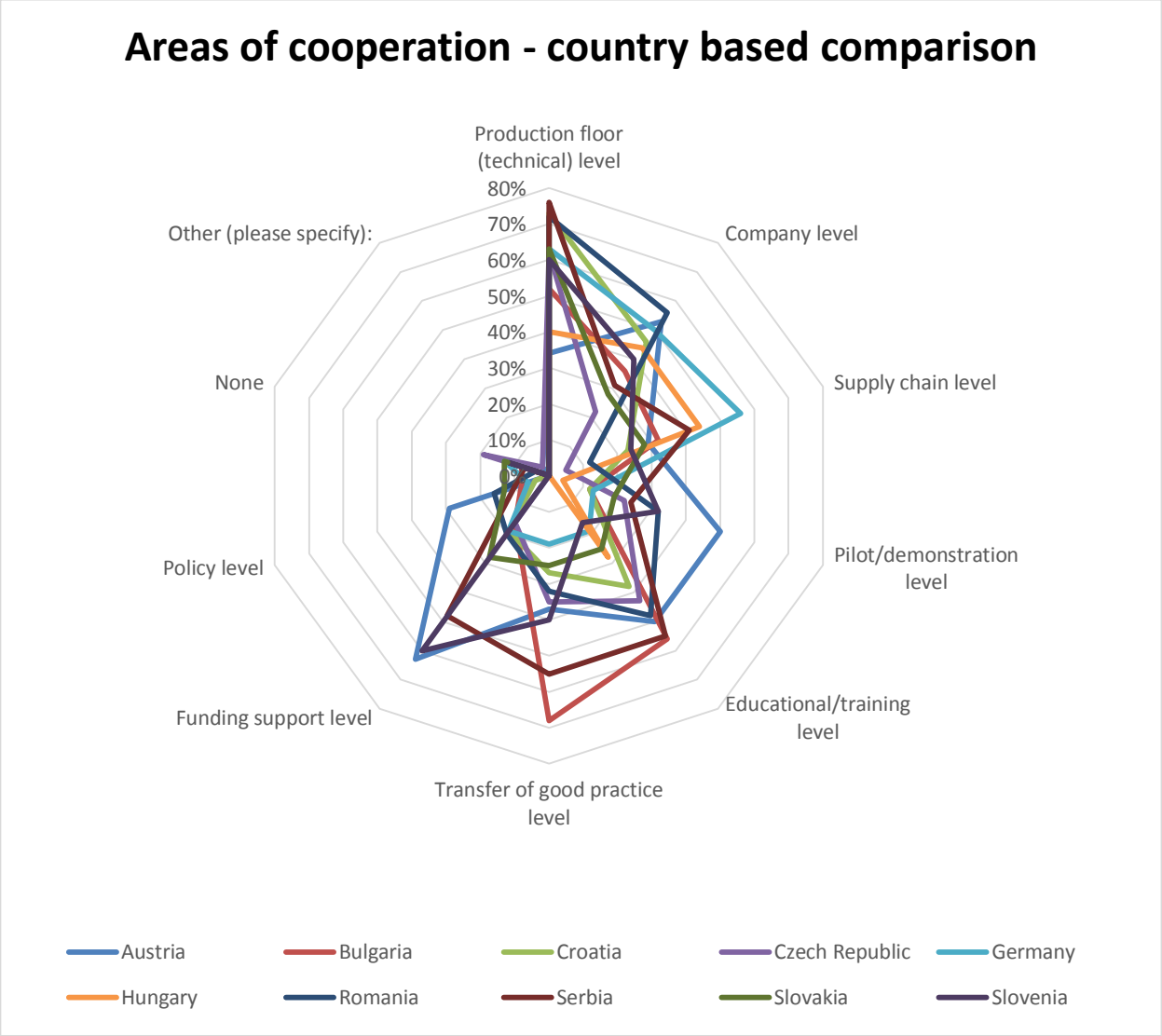


The graphs above show that most of the surveyed SMEs in the Danube region are production oriented companies who would be willing to cooperate on the implementation of new technologies/systems in the production (74%), while only close to 10% answered that they are not interested in such cooperation. Almost 30 % answered that they would like to become the solution provider or best practice showcase to other companies, which is surprisingly high

percentage considering the fact that majority of respondents do not develop their own solutions for further sale and exploitation. In addition, SMEs might treat these kind of solutions as competitive advantage and would not be willing to share. In the future, it might be interesting also to work closely with this particular challenge, since those showcases would be ideally used for sharing information, knowledge, technologies and best practices (being that this is the No. 2 most common challenge).

The other possible level of cooperation was proposed to SMEs, who responded very positively, with less than 7% answering negatively. One particular answer is standing out. A very high portion of SMEs (57%) answered that they would be willing to cooperate at the production level (technical level). This is very encouraging since this corresponds to the other answers – SMEs are namely willing to implement Smart manufacturing technologies and systems and are willing to accept all the help they could need for doing so. The company level and educational/training level are also preferred ways of cooperation, which again shows the need for more information and knowledge. This relates with the answers to the biggest challenges, where lack of information was pointed out very often.

In contrary however, it is interesting to see that funding support level of cooperation is not so dominant at this point anymore, while investments/costs related to implementing Smart manufacturing solutions was identified as a very high challenge.



The graph above is highly interesting since the spread of most common answers between different countries is rather high. It seems like every country SMEs are having different expectations from such cooperation.

In particular, cooperation on a production floor (technical level) was most interested for SMEs of Croatia, Czech Republic, Germany, Romania, Serbia, Slovakia while Austrian, Slovenian and Serbian SMEs showed more interest for funding support. SME's of Bulgaria are willing to cooperate with sharing best practice examples, in Hungary SME prefer a cooperation on company level, and as Germany on supply chain level.

SMEs in Bulgaria (56 %), Czech Republic (43%), Austria (50 %), Romania (48 %) and Serbia (55 %) would like to cooperate at an educational level, which is again aligned with SME need assessment above. In particular, in Bulgaria, SMEs would like to participate in transferring good practice examples which is very practical and straight forward way of cooperation.

These levels of interest for cooperation clearly reflect that SMEs in the Danube region do want to improve knowledge, competences and skills related Smart manufacturing.

KEY MESSAGE:
Almost 80% of SMEs are willing to cooperate in the future, predominantly acting as ''receivers'' of new technologies and systems. They are mostly interested in the production level (technical view) or company level, education/training level.

4 Conclusions

This benchmark report is based on a statistical benchmark, regional critical factor SME diagnosis reports, and regional mapping reports to the smart specialisation strategy form each single country.

It showed that the defined Danube region is not a homogeneous region. There is a big difference in the economic state of each country. The region consists of economical strong countries and some of them lagging behind in innovation and education. However, in the region, the manufacturing sector plays an important role in Czech Republic, Germany, Hungary, Austria, Slovenia and Slovakia, while in Romania and Bulgaria is this sector under represented.

It can be seen that all countries have a national strategy for smart specialization which are in line with the European Union, except in Serbia the strategy development is in progress. The strategies were operationalized with support measures, whereas support environment plays a crucial role to translate the strategy for SMEs. However SMEs have mainly not been involved in development of the Smart Specialization strategy in the Danube region, while also the Strategy is not well recognised by the SMEs.

Furthermore, SMEs are facing variety of challenges when it comes to the implementation of Smart manufacturing technologies, but the most important two are related to investments and lack of information/knowledge. It is likely that there is a correlation between lack of information and cost/investment related to implementation. In eight from ten countries, SMEs stated lack of information as the main obstacle, followed by cost/investment related to implementation, or vice versa.
This show, that more qualified workers are need to apply Smart Manufacturing technologies. On the other hand, attendants have marked that they cannot afford devices related to Smart Technologies, so the lack of budget plays an important role in the non-usage of these technologies.

The most influential areas for increasing SME's competitiveness in the future are (i) product quality, (ii) manufacturing costs, (iii) speed of production and (iv) coordination with customers.
In general, it can be conducted, that SMEs currently implemented smart manufacturing novel technologies or HR management. Around 40% SMEs are currently not implementing any smart

manufacturing solutions/methods related to production processes. SMEs do have plans to become more active in the future, with data analytics, Next-gen manufacturing systems and smart supply network being the top three areas of interest.
Lean manufacturing and 6 Sigma are considered the most favourite production process optimisation systems, while employee motivation systems and knowledge sharing/transfer are the most selected HR management system to be implemented in the future.

Almost 80% of SMEs are willing to cooperate in the future, predominantly acting as ‘’receivers’’ of new technologies and systems. They are mostly interested in the production level (technical view) or company level, education/training level. Financial tools and cooperating on funding level are requested by SMEs to overcome high costs/investments.
The project SMART FACTORY HUB tries to address these needs by improving competences and skills among the participation organisation and transferring knowledge in order to design and set-up cooperation and learning hub for technology alliances, as well as policy hub for policy recommendations.

5 References

Internet sources were accessed in June and July 2017

1. http://s3platform.jrc.ec.europa.eu/smes-and-smart-specialisation
2. Eurostat
3. http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing
4. EUROSTAT
5. http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics
6. http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdsc480&plugin=1
7. http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.education&lang=en
8. http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_main_GDP_aggregates_and_related_indicators
9. http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts1.economy&lang=en
10. EuroSTAT
11. http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_main_GDP_aggregates_and_related_indicators#GDP_in_PPS
12. http://ec.europa.eu/eurostat/statistics-explained/index.php/Manufacturing_statistics_-_NACE_Rev._2
13. http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Figure_2_Relative_importance_of_manufacturing_(NACE_Section_C),_2013_(%C2%B9)_(%25_share_of_value_added_and_employment_in_the_non-financial_business_economy_total).png#file
14. http://ec.europa.eu/eurostat/statistics-explained/index.php/Manufacturing_statistics_-_NACE_Rev._2#Size_class_analysis
15. http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Figure_2_Relative_importance_of_manufacturing_(NACE_Section_C),_2013_(%C2%B9)_(%25_share_of_value_added_and_employment_in_the_non-financial_business_economy_total).png#file
16. http://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_personnel
17. http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Human_resources_in_science_and_technology,_2015_(%25_of_labour_force)_YB17.png
18. http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.scitech&lang=en
19. http://ec.europa.eu/eurostat/statistics-explained/index.php/Innovation_statistics
20. http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/smart_specialisation_en.pdf
21. http://s3platform.jrc.ec.europa.eu/smes-and-smart-specialisation
22. http://ostaustria.org/bridges-magazine/item/8312-production-of-the-future-advanced-manufacturing-in-austria
23. https://era.gv.at/directory/158

24. http://www.oerok.gv.at/fileadmin/Bilder/3.Reiter-Regionalpolitik/2.EU-Kohaesionspolitik_2014_/Nationale_Strategie_STRAT.AT2020/Policy_framework_for_smart_specialisation_in_Austria__OEROK-SR_Nr_199_EN_web_.pdf
25. http://industrie4.0.gtai.de/INDUSTRIE40/Navigation/EN/Topics/Why-germany/why-germany-policy,t=the-new-hightech-strategy,did=1160434.html
26. https://www.bmbf.de/pub/HTS_Broschuere_eng.pdf
27. https://rio.jrc.ec.europa.eu/en/library/strategy-smart-specialisation-slovak-republic-ris3, https://www.opvai.sk/media/57254/action-plan-for-the-implementation-of-the-research-and-innovation-strategy-for-smart-specialisation-of-the-sr-2014-2020.pdf
28. http://ec.europa.eu/regional_policy/ro/funding/available-budget/
29. http://s3platform.jrc.ec.europa.eu/s3-actors

6 Appendix

Table 5: Key indicators of national funding schemes related to (max grants, Infrastructure funding, national funding schemes for companies, Topics …)

	Austria	Bulgaria	Croatia	Czech Republic	Germany	Hungary	Romania	Serbia	Slovakia	Slovenia
EU structural funds and investment funds in amount in EURs	536,262,079	934,763,626	692,000,000	4 581 Mio EUR	10,773,7 Mio. EUR		1167 Mio EUR	-	2.266 mil € (from this amount approx. 566 mil € to SMEs and 1.700 mil. € to R&D)	133,000,000
National funding body	Austrian Research Promotion Agency (FFG)	Ministry of Economy Ministry of science and education Bulgarian Small and Medium Enterprise Promotion Support Agency	Ministry of Regional Development and EU funds Economy, Labour and Entrepreneurship	Ministry of Industry and Trade (MPO)	Federal Ministry of Economic Affairs and Energy (BMWi)		Executive Board for Financing Higher Education, Research, Development and Innovation Ministry of Economy	Ministry of education, science and technological development Ministry of economy Ministry of Public Administration and Local Self-Government	Ministry of Economy and Ministry of Education, Science, Research and Sport	Ministry of Economic Development and Technology
National support schemes designed for companies	SME's are eligible in all programmes/ support schemes **Specific SME programmes are:**, Basisprogram, funded with € 100 Mio. / Year for	Operational program Innovation and Competitiveness Operational Program "Science and Education for Smart Growth" National Innovation Fund	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.		SME's are eligible in all programmes/ support schemes. Co-financing rate is lower for SME's in most schemes.	Innovation Fund Development Agency of Serbia Development Fund	SME's are eligible in all programmes/ support schemes **Specific SME programmes are:**, Operational Programme for	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.

	single projects SME Package (Innovation Vouchers, Project.Start, Market.Start …)								Research and Innovation (2.266 mil €) Financial vouchers for legal, technological or business partnerships (50 mil €)	
Topics of programmes	**<u>Smart manufacturing</u>** - High-tech materials and surfaces - High-capacity, resource-efficient and robust manufacturing processes - Flexible and versatile production systems - Innovation, optimisation, miniaturisation and sensor/actuator integration for products - Bio-based	**Operational program Innovation and Competitiveness** - Technological development and innovation - Entrepreneurship and Capacity for growth - Capacity for SMEs growth– interventions **Operational Program "Science and Education for Smart Growth"** • Creating and developing Centres of Excellence (CoE) and Centres of Competence (CoC) in the RIS3 areas. • Improving the territorial and		- product innovations - photonics - micro and nanoelectronics, -nanotechnology - advanced materials - advanced manufacturing technologies -electromobility, - renewable energy - use of secondary raw materials - high-speed internet	Supporting research & innovation Enhancing the competitiveness of SMEs Reducing CO2 emissions		- Tourism and ecotourism - Textiles and leather goods - Wood and furniture - Creative industries - Auto and parts industry - Information technology and communications - Food and drink processing - Healthcare and pharmaceutical products - Energy and environmental management	**Innovation Fund:** - Early development programme - Innovation Co-financing Programme **Development Agency of Serbia:** - Start up support - Competitiveness development support - Economic growth support - Innovative SME support - Exporters support - Mentoring	**<u>Operational Programme for Research and Innovation:</u>** Technological development and innovation, technological transfer to overall strengthen the research and innovation activities in Slovakia. Research, education, innovation and entrepreneurship support. **<u>Financial vouchers for</u>**	Lean production, business process management, design management, solutions for direct practical application and demonstration of the use in accordance with Slovene Strategy for smart specialization

	industry/biorefinery - Substitution and recycling of raw materials **Information and communication technology (ICT):** - Semantic systems - Embedded systems - Visual computing, the visualisation of data and applications - Systems-on-chips - Trust in IT systems - ICT and demographic change	thematic distribution of research infrastructures, with a view to regional smart specialization. • Increasing the participation of Bulgarian researchers in international cooperation **National Innovation Fund** o Scientific applied research project o Feasibility studies **The National Science and Research Fund** • improvement of the scientific research infrastructures in the universities and research institutes; • modernization of the scientific research equipment in the universities, specialized laboratories and research institutes • financial support to the scientific organizations and the higher educational institutionsbased on project-programme financing; o financing of projects, developments and demonstration projects in scientific directions, determined					Bioeconomy (agriculture, forestry, fishing and aquaculture), biopharmaceutics and biotechnologies	programme support - New jobs support **Development Fund** - Financial support to start ups - Financial support to investments Affordable loans	**legal, technological or business partnerships:** Support start-ups by issuing financial vouchers for legal, technological and business consulting services. Improving the conditions for young innovative entrepreneurs, enhance knowledge transfer and ease the access to finance, etc.	

		by the Fund; • financing of projects, developments and demonstration projects of young scientists								
Max grants for cooperative research projects related to smart factory (incl. Call year)	**Call 2017:** Production of the future: max. 2 million euros per project ICT of the future: max. 2 million euros per project	Call 2017 - Development of product and production innovations max 500 000 euro per project - Entrepreneurship support - max 200 000 euro per project - Energy Efficiency in enterprises – max 1 250 000 per project - Scientific research – max 1400000 euro per project	Call 2017: New products and services as result of research, development and innovations: maximum grant 0,5 MIO € per project	Calls in 2017: Industrial projects usually max. 3.7 Mio per project, environmental projects usually 7.4 Mio €, project of Technology Agency usually 0.7 Mio €	Maximum grant 2 MIO € per project		Micro industrialisation program 55,000EUR /project Start-up Nation Romania 50,000EUR /project 2 million euros / project for all type of companies for activity improvement	-	**Call 2017:** The support within range 2 mil € to 5 mil €	Call 2017: Total grant 30 MIO € for all 8 areas of Smart Specialisation, maximum grant 0,5 MIO € per project consisting of up to 3 companies..
Infrastructure funding	**Yes** **Call:** - Coin capacity building - R&D infrastructure funding	Yes Calls 2017 - ○ Creation and development of thematically focused laboratories ○ Creating and developing Centres of Excellence and Centres of Competence in the RIS3 areas.	Yes Call: Development of new and the improvement of existing RDI infrastructure in Croatia	No specific funding. Smaller parts of equipment included to existing calls.	No specific funding. Smaller parts of equipment included to existing calls.		No specific funding. All type of equipment are eligible in existing call	No specific funding.	No specific funding. Smaller parts of equipment included to existing calls.	No specific funding. Smaller parts of equipment included to existing calls.

Table 5: Key indicators of national funding schemes related to (max grants, Infrastructure funding, national funding schemes for companies, Topics …)

	Austria	Bulgaria	Croatia	Czech Republic	Germany	Hungary	Romania	Serbia	Slovakia	Slovenia
EU structural funds and investment funds in amount in EURs	*536,262,079*	934,763,626	692,000,000	4 581 Mio EUR	10,773,7 Mio. EUR		*1167 Mio EUR*	-	2.266 mil € (from this amount approx. 566 mil € to SMEs and 1.700 mil. € to R&D)	*133,000,000*
National funding body	*Austrian Research Promotion Agency (FFG)*	Ministry of Economy Ministry of science and education Bulgarian Small and Medium Enterprise Promotion Support Agency	Ministry of Regional Development and EU funds Economy, Labour and Entrepreneurship	Ministry of Industry and Trade (MPO)	Federal Ministry of Economic Affairs and Energy (BMWi)		*Executive Board for Financing Higher Education, Research, Development and Innovation Ministry of Economy*	Ministry of education, science and technological development Ministry of economy Ministry of Public Administration and Local Self-Government	Ministry of Economy and Ministry of Education, Science, Research and Sport	*Ministry of Economic Development and Technology*
National support schemes designed for companies	SME's are eligible in all programmes/ support schemes **Specific SME programmes are:**, *Basisprogram, funded with € 100 Mio. / Year for single projects*	Operational program Innovation and Competitiveness Operational Program "Science and Education for Smart Growth" National Innovation Fund	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.		*SME's are eligible in all programmes/ support schemes. Co-financing rate is lower for SME's in most schemes.*	Innovation Fund Development Agency of Serbia Development Fund	SME's are eligible in all programmes/ support schemes **Specific SME programmes are:**, *Operational Programme for Research and Innovation*	SME's are eligible in all programmes/ support schemes. Co-financing rate is higher for SME's in most schemes.

	SME Package (Innovation Vouchers, Project.Start, Market.Start …)								*(2.266 mil €)* *Financial vouchers for legal, technological or business partnerships (50 mil €)*	
Topics of programmes	**<u>Smart manufacturing</u>** - *High-tech materials and surfaces* - *High-capacity, resource-efficient and robust manufacturing processes* - *Flexible and versatile production systems* - *Innovation, optimisation, miniaturisation and sensor/actuator integration for products* - *Bio-based industry/biorefinery*	**Operational program Innovation and Competitiveness** - Technological development and innovation - Entrepreneurship and Capacity for growth - Capacity for SMEs growth– interventions **Operational Program "Science and Education for Smart Growth"** • Creating and developing Centres of Excellence (CoE) and Centres of Competence (CoC) in the RIS3 areas. • Improving the territorial and thematic distribution of research		- product innovations - photonics - micro and nanoelectronics, - nanotechnology - advanced materials - advanced manufacturing technologies -electromobility, - renewable energy - use of secondary raw materials - high-speed internet	Supporting research & innovation Enhancing the competitiveness of SMEs Reducing CO2 emissions		- Tourism and ecotourism - Textiles and leather goods - Wood and furniture - Creative industries - Auto and parts industry - Information technology and communications - Food and drink processing - Healthcare and pharmaceutical products - Energy and environmental management Bioeconomy (agriculture,	**Innovation Fund:** - Early development programme - Innovation Co-financing Programme **Development Agency of Serbia:** - Start up support - Competitiveness development support - Economic growth support - Innovative SME support - Exporters support - Mentoring programme support	**<u>Operational Programme for Research and Innovation:</u>** Technological development and innovation, technological transfer to overall strengthen the research and innovation activities in Slovakia. Research, education, innovation and entrepreneurship support. **<u>Financial vouchers for legal, technological</u>**	Lean production, business process management, design management, solutions for direct practical application and demonstration of the use in accordance with Slovene Strategy for smart specialization

	- *Substitution and recycling of raw materials* **Information and communication technology (ICT):** - *Semantic systems* - *Embedded systems* - *Visual computing, the visualisation of data and applications* - *Systems-on-chips* - *Trust in IT systems* - *ICT and demographic change*	infrastructures, with a view to regional smart specialization. • Increasing the participation of Bulgarian researchers in international cooperation **National Innovation Fund** o Scientific applied research project o Feasibility studies **The National Science and Research Fund** • improvement of the scientific research infrastructures in the universities and research institutes; • modernization of the scientific research equipment in the universities, specialized laboratories and research institutes • financial support to the scientific organizations and the higher educational institutionsbased on project-programme financing; o financing of projects, developments and demonstration projects in scientific directions, determined by the Fund; • financing of projects,					forestry, fishing and aquaculture), biopharmaceutics and biotechnologies	- New jobs support **Development Fund** - Financial support to start ups - Financial support to investments Affordable loans	**or business partnerships:** Support start-ups by issuing financial vouchers for legal, technological and business consulting services. Improving the conditions for young innovative entrepreneurs, enhance knowledge transfer and ease the access to finance, etc.	

		developments and demonstration projects of young scientists								
Max grants for cooperative research projects related to smart factory (incl. Call year)	**Call 2017:** Production of the future: max. 2 million euros per project ICT of the future: max. 2 million euros per project	Call 2017 - Development of product and production innovations max 500 000 euro per project - Entrepreneurship support - max 200 000 euro per project - Energy Efficiency in enterprises – max 1 250 000 per project - Scientific research – max 1400000 euro per project	Call 2017: New products and services as result of research, development and innovations: maximum grant 0,5 MIO € per project	Calls in 2017: Industrial projects usually max. 3.7 Mio per project, environmental projects usually 7.4 Mio €, project of Technology Agency usually 0.7 Mio €	Maximum grant 2 MIO € per project		Micro industrialisation program 55,000EUR /project Start-up Nation Romania 50,000EUR /project 2 million euros / project for all type of companies for activity improvement	-	**Call 2017:** The support within range 2 mil € to 5 mil €	Call 2017: Total grant 30 MIO € for all 8 areas of Smart Specialisation, maximum grant 0,5 MIO € per project consisting of up to 3 companies..
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