D.T1.2.1: MAPPING REPORT THE 9 ELEMENTS OF INDUSTRY 4.0 COMPARED TO SMES NEED IN EACH RIS3 REGION

D.T1.2.1 Mapping Report the 9 elements of Industry 4.0 compared to SMEs need in each RIS3 region

FINAL VERSION 03/2020

VDC- PP8 -Germany

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Table of contents

1.Introduction of the 4STEPS project

Common in all PPs' mapping report input provided by PBN

Objectives & Activities:

4STEPS project is addressing the main challenge of Industry 4.0 (I4.0) as tool towards a new, digital industrial revolution holding the promise of increased flexibility in manufacturing, mass customisation, increased speed, better quality and improved productivity and its development is supporting the RIS3 in the target regions in the different sectors. SMEs in the target regions are lagging behind in the adoption of innovative tools and solutions proposed byI4.0 revolution and need to increase transnational collaboration in facing this challenge.

The main project objective isto support the successful RIS3 implementation applying the I4.0 to all the industrial sectors identified by each region.The innovative elements of 4STEPS will be the methodology applied based on the involvement of all the actors of thequadruple helix, thanks to a bottom up approach. SMEs will be the main target and they will be involved via the CEnetwork of the Digital Innovation Hubs (DIH)- including also the relevant stakeholders of the R&D sector, governanceactors, society thanks to a holistic approach. 4STEPS will lead to an improved level of innovative productive methodsand application of I4.0 thanks to a Catalogue development of main possible services offered, a Technology MaturityLevel Index development, Transnational Action plan and the creation of the Digital Innovation Hubs, tested during thepilot actions. Within this approach of networking 4STEPS will include also a solution preparing the CE citizen towardsthe digital future during targeted workshop for digital skills improvement. The project approach developed within the4STEPS project will consider the Industry 4.0 plans applied in CE countries which is are linked to the digitalisedproduction system that will result in a wide range of changes to manufacturing processes, outcomes and businessmodels.

The current Mapping Report (D.T1.2.1) is prepared in the framework of the first thematic work package (abbreviated as WPT1) of the project. WPT1, which is led by PP6 Pannon Business Network Association, includes identifying the different methodologies oriented to enable the approach of RIS3 small companies to the issues

of Industry 4.0. These methodologies include mapping the contents of Industry 4.0, focusing in particular on the priorities of the national and regional plans, as regards the needs of SMEs, i.e. a correlation among the **9 technologies of Industry 4.0** (**Big Data, Augmented Reality, Simulation, Internet of Things, Cloud Computing, Cyber Security, System Integration, Additive Manufacturing, Autonomous Systems**) and their redefinition as regards needs, prospects and scenarios of RIS3 business sectors.

1.1 Objective of this report

This current report **shall map and compare the SMEs needs** focusing in particular the priorities of the national plans, i.e. a correlation **among the 9 Industry 4.0 technologies** and their redefinition as regards needs, prospects and scenarios of SMEs.

The Lead Partner, PP2 and PP6-as WPT1 leader- preliminary developed a common structure to the current report, and this proposal was distributed among the partnership. Following that the partners provided some valuable feedbacks how to modify the report, and these inputs were integrated to the proposal, and then the **common structure of the mapping report could be finalised**.

Every partner (LP+PP2 are working together) will prepare a separate mapping report based on the results of their own SME involvement in their regions.

Since the quantification target of the Mapping Report according to the project requirement (D.T1.2.1) is 8, partners will be working in their own report document following the common structure, and the 8th document will be atransnational summary/comparison, which will present a comprehensive picture about all results in the partnership. This transnational summary will be prepared by the WPT1 Lead Pannon Business Network based on the separate results provided by the partners.

2.Introduction to the regional context

- 2.1.General context

Baden-Württemberg has been one of the leading innovation regions in Europe for decades. Groundbreaking Inventions like the automobile have their origin in today's Baden-Württemberg. In no one other region of Europe is the share of research and development expenditure in the gross domestic product as high as here, with around 80 percent of this R&D spending on the economy and 20 Percent in the public sector. The Stuttgart region is a global leader in the areas of virtual reality, simulation and visualization. Unique know-how has been concentrated here since the 1990s. Supported by cutting-edge research at Fraunhofer IAO, Fraunhofer IPA and HLRS, demanded from the automotive industry as early adopters, the region now has the highest density of VR installations in Europe. Numerous technology spin-offs, many of them among VDC members, show the labor market potential.

- 2.2.National and regional priorities regarding I4.0

The regional priorities in Baden-Württemberg are Sustainable mobility concepts, ICT, green IT and intelligent products, Health, Environmental technologies, renewable energies & resource efficiency.

Regarding the 9 pillars of Industry 4.0 the national priorities include autonomous robots, internet of things, cybersecurity, cloud technologies and big data.

- 2.3. S3 Strategy in the next programming period (regional or national level according to the partner)

The following areas will be additionally promoted in Baden-Württemberg in the next programming period: Artificial Intelligence, IT-Security, Robotics, Quantum Computing, Energy Storage Technologies, Nanotechnology, Construction, Biotechnology and Service Innovations.

3. Description of the sample

-3.1Criteria for the sample‘s selection

Criteria for the sample’s selection was to represent the structure of the local economy including different relevant economic sectors, both supplier and user of industry 4.0 technologies and focusing mainly on small and middle-sized enterprises.

- 3.2Economic sectors represented

The economic sector from I4.0 supplier side is mainly located in the NACE sectors Computer programming, consultancy and related activities, and Computer, electronic and optical products.

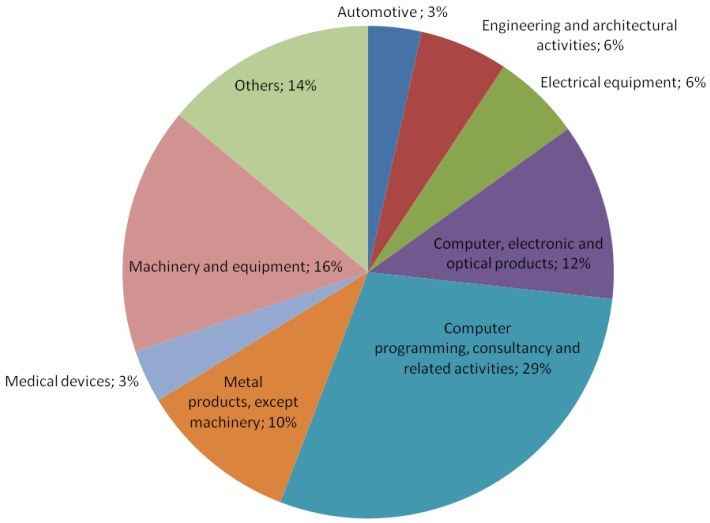

Figure 1: Economic sectors of interviewed organizations

The majority of users of I4.0 technology represented are in line with the local economy mainly from the fields Machinery and equipment, including Metal products, but also from fields like Medical Devices, Engineering or Electrical equipment.

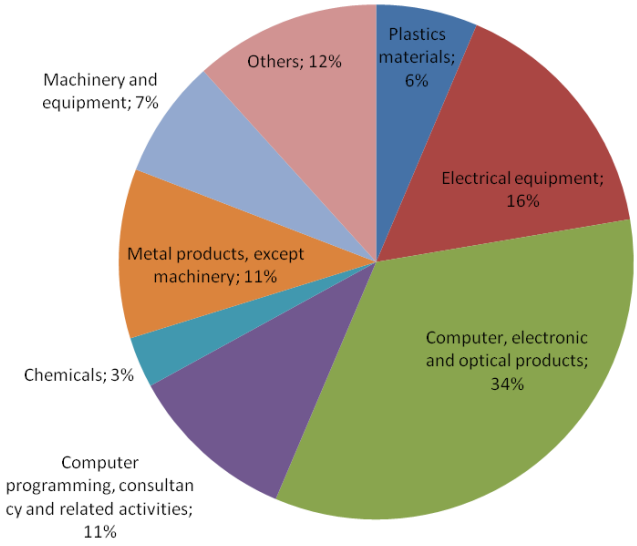

Figure 2: Economic sectors of organizations' suppliers

Regarding the customers of the interviewed companies, were many in the automotive sector. High mentions were also in the Machinery and equipment as well as the Aerospace sector.

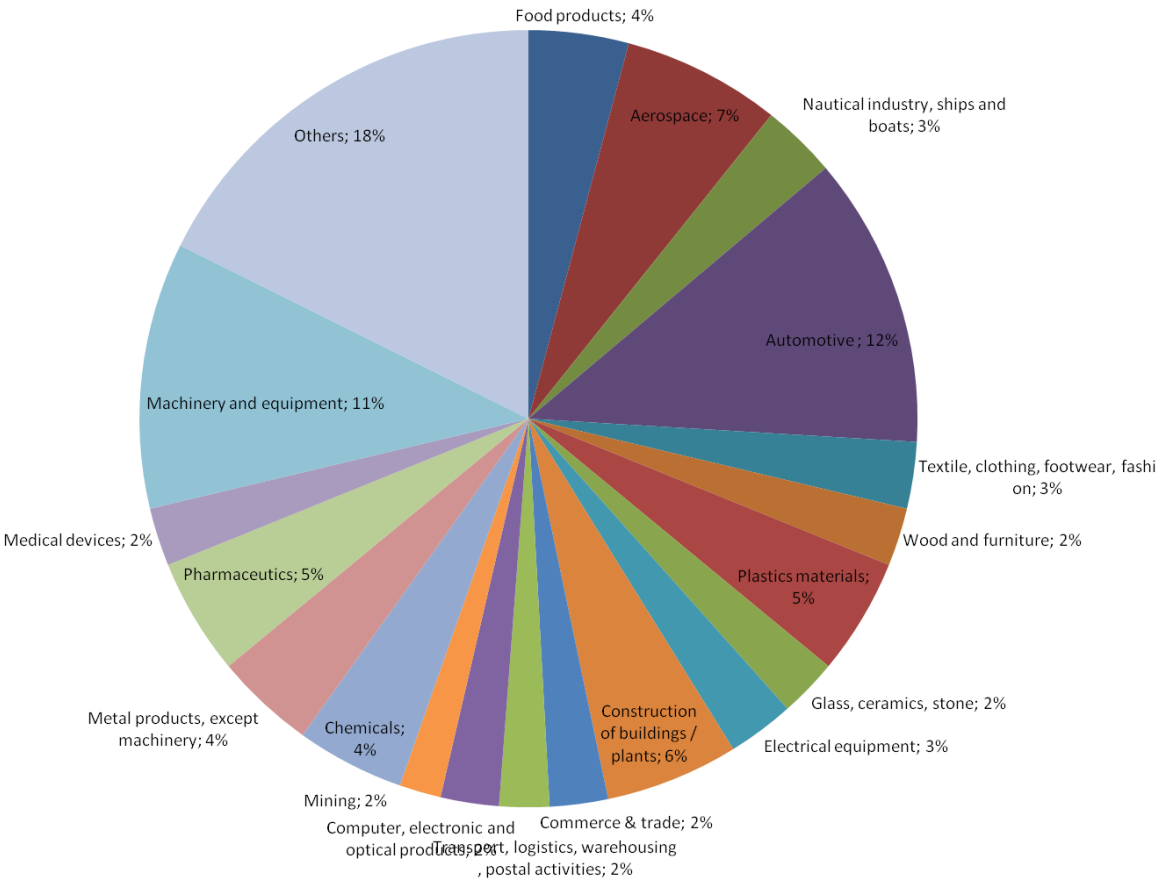

Figure 3: Economic sectors of organizations' customers

- 3.3.Size

Almost half of the interviewed companies reported that they have from 10 up to 49 employees, 17 % have up to 9 employees whereas 25 % have up to 249 and 10% more than 249 employees. Regarding the annual turnover 25% of the answers related to an annual turnover of up to 2 million Euro 38% up to 10 million, 24% up to 50 million and 13% more than 50 million Euro. 11 companies didn't answer teh question regarding their annual turnover.

- 3.4 Geographic distribution

Most of the represented companies are located in Baden-Württemberg with the majority of them residing in the region of Stuttgart.

4.The SMEs and the 9 pillars

Specific to each region

Mapping of the

attitude of the interviewed SMEs towards the 9 enabling technologies

4.1.In case of end users:

- level of adaptation Q 13
- Motivation Q14
- Strategy Q 15
- Needs Q 16
- In what extent are SMEs prepared for digital transformation Q17

Figure 4 summarizes the responses of managers towards the question of the level of adaption of end users of Industry 4.0 technologies. Based on a rating, whereas response option “no usage at all” is ranked with 0, response option “few usage” is ranked with 1, response option “good extend” is ranked with 2 and response option “very intense use” is ranked with 3, Industry 4.0 technology “Cybersecurity” seems to be the most mature technology of selected sample size. Based on applied ranking, it gained 26 points. Following Industry 4.0 technologies are “Cloud Technologies” (25 points), “Systems integration” (23) and “Industrial internet of Things” (23). Far behind is Industry 4.0 technology “Augmented reality”. This technology gained 6 points.

	Answers									
	No usage at all		Few usage		Good extent		Very intense use		Total	
Technology	Abs	No	Abs	Few	Abs	Good	Abs	Intense	Abs	Rel
autonomous robots	12	60%	6	30%	2	10%	0	0%	20	100%
simulation	7	35%	7	35%	5	25%	1	5%	20	100%
systems integration	6	30%	6	30%	7	35%	1	5%	20	100%
industrial internet of things	5	25%	9	45%	4	20%	2	10%	20	100%
cybersecurity	6	30%	4	20%	8	40%	2	10%	20	100%
cloud technologies	6	30%	5	25%	7	35%	2	10%	20	100%
additive manufacturing	12	60%	6	30%	1	5%	1	5%	20	100%
augmented reality	15	75%	4	20%	1	5%	0	0%	20	100%
big data and analytics	9	45%	6	30%	5	25%	0	0%	20	100%

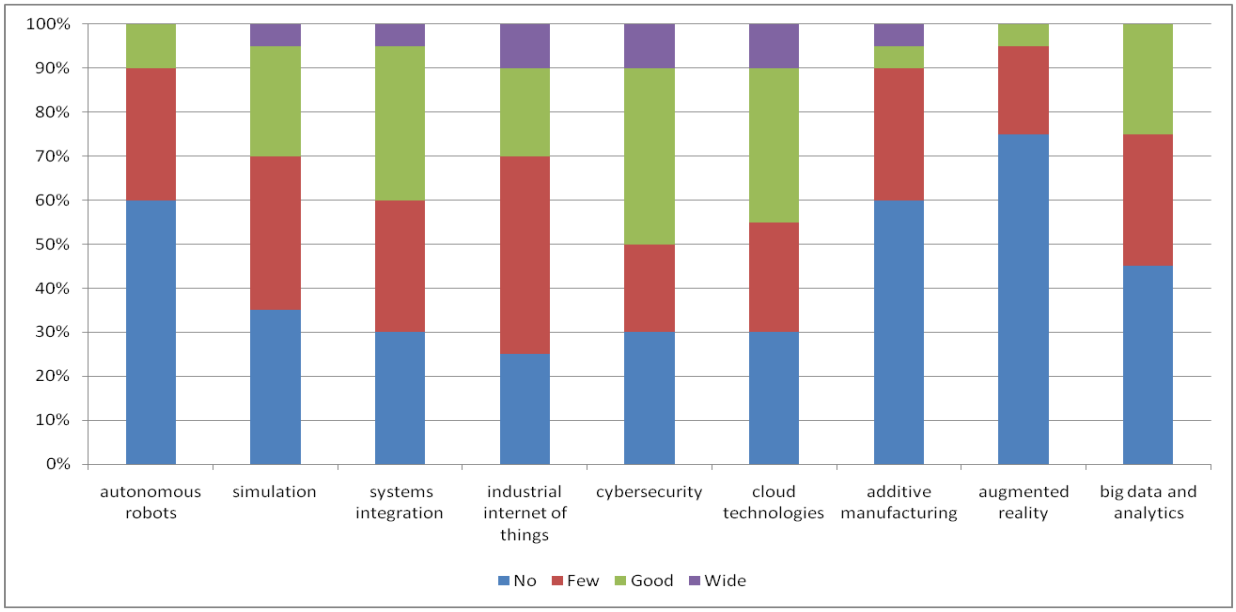

Figure 4: Level of Adaptation of Industry 4.0 technology

Some companies had a higher need compared to their current level of adaptation, mainly in the fields augmented reality, simulation and big data & analytics. Regarding autonomous robots there was no difference to the current level of adaptation.

The main motivation for the digital transformation is according to the respondents, the offer of new products and services. 30% agreed fully to this statement, 50 % agreed mostly. Also relevant were new customers (20% fully, 60% mostly) and internal innovation /15% fully, 65% mostly), as well as new markets, business areas (20% fully, 45% mostly) and the adaptation of existing products and services (15% fully, 55% mostly).

	Answers									
	I don't agree		I partly agree		I mostly agree		I fully agree		Total	
Option	Abs	Don't	Abs	Partly	Abs	Mostly	Abs	Fully	Abs	Rel
Our business model changes	4	20%	5	25%	8	40%	3	15%	20	100%
We adapt existing products and services	3	15%	3	15%	11	55%	3	15%	20	100%
We offer new products and services	2	10%	2	10%	10	50%	6	30%	20	100%
New markets, new business areas evolve	2	10%	5	25%	9	45%	4	20%	20	100%
New customers occur	3	15%	1	5%	12	60%	4	20%	20	100%
Materials usage: The company reduces material consumption through product and manufacturing optimisation.	3	15%	12	60%	4	20%	1	5%	20	100%
Managing quality & robustness	4	20%	7	35%	8	40%	1	5%	20	100%
We remove existing products and services from the market.	7	35%	8	40%	5	25%	0	0%	20	100%
Internal innovation (internal renewal change and adaption) is fostered.	2	10%	2	10%	13	65%	3	15%	20	100%

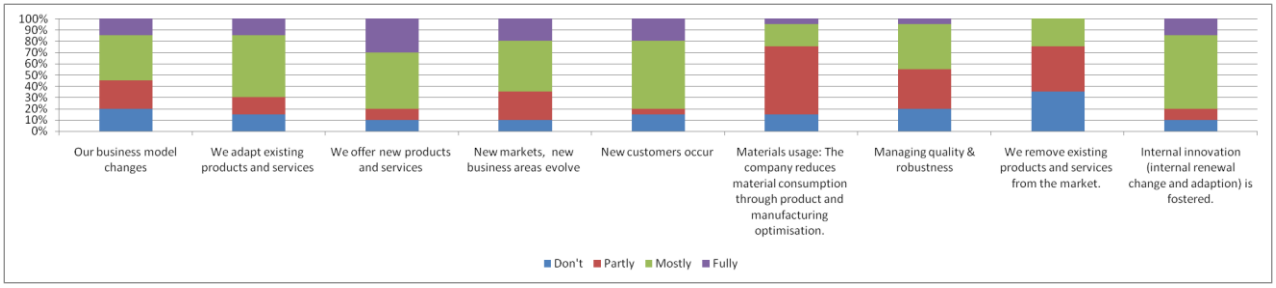

Figure 5: Business model development

Regarding a strategy for the digital transformation, half of the companies stated that they have an innovation strategy or have mostly developed one. Many reported that the willingness of managers to realize industry 4.0 does exist and to a certain extent rules, regulations and standards are dealt with. Most had partly financial resources to realize Industry 4.0 technology available. Mostly lacking is risk assessment for Industry 4.0 as well as defined employee objectives to realize Industry 4.0.

	Answers									
	I don't agree		I partly agree		I mostly agree		I fully agree		Total	
Option	Abs	Don't	Abs	Partly	Abs	Mostly	Abs	Fully	Abs	Rel
Roadmap	6	30%	9	45%	2	10%	3	15%	20	100%
Central coordination	7	35%	7	35%	3	15%	3	15%	20	100%
Financial resources	2	10%	12	60%	4	20%	2	10%	20	100%
Communication	3	15%	11	55%	4	20%	2	10%	20	100%
Employee objectives	9	45%	8	40%	1	5%	2	10%	20	100%
Risk assessment	9	45%	8	40%	1	5%	2	10%	20	100%
Willingness of managers	2	10%	8	40%	8	40%	2	10%	20	100%
Manager trainings	9	45%	5	25%	6	30%	0	0%	20	100%
Mastering	4	20%	9	45%	5	25%	2	10%	20	100%
Rules regulation and standards	4	20%	7	35%	5	25%	4	20%	20	100%
Innovation strategy	3	15%	7	35%	7	35%	3	15%	20	100%
Industry-4.0 technology strategy	6	30%	9	45%	3	15%	2	10%	20	100%
Investment strategy	8	40%	8	40%	3	15%	1	5%	20	100%

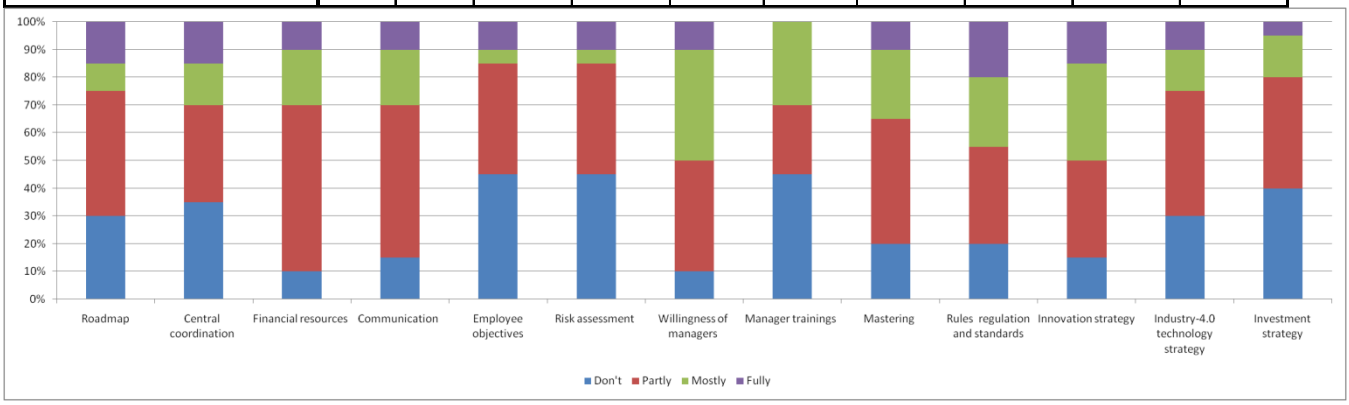

Figure 6: strategy towards Indutsry 4.0 technology

4.2 In case of suppliers:

- level of adaptation Q 18

- Motivation and plans Q19

Most mentioned with a good extent or wide range of offers were the technologies simulation and systems integration. 14 organizations stated that they offer products or services for these technologies, followed by industrial internet of things (11 mentions), big data (10 mentions) and cloud technologies (8 Mentions).

	Answers									
	No offer at all		Few offers		Good extent		Wide range of offers		Total	
Technology	Abs	No	Abs	Few	Abs	Good	Abs	Intense	Abs	Rel
autonomous robots	30	73%	6	15%	5	12%	0	0%	41	100%
simulation	17	41%	10	24%	12	29%	2	5%	41	100%
systems integration	22	54%	5	12%	12	29%	2	5%	41	100%
industrial internet of things	21	51%	9	22%	9	22%	2	5%	41	100%
cybersecurity	34	83%	5	12%	2	5%	0	0%	41	100%
cloud technologies	26	63%	7	17%	6	15%	2	5%	41	100%
additive manufacturing	37	90%	1	2%	3	7%	0	0%	41	100%
augmented reality	23	56%	14	34%	3	7%	1	2%	41	100%
big data and analytics	24	59%	7	17%	9	22%	1	2%	41	100%

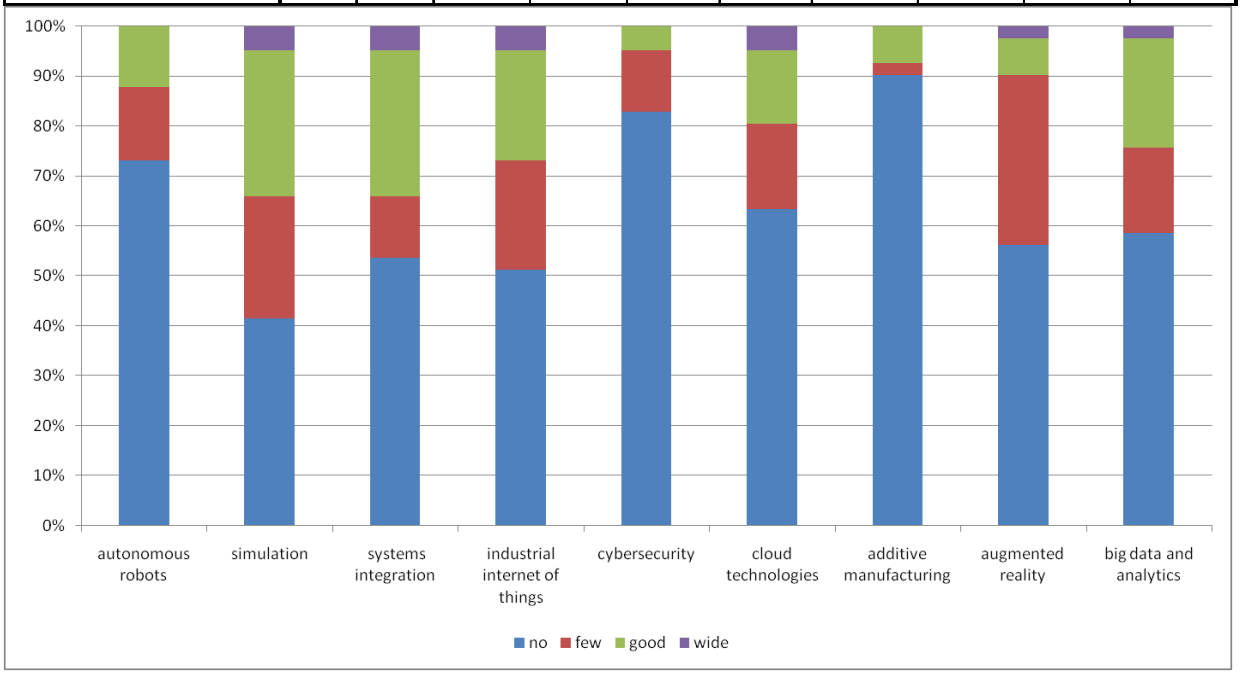

Figure 7: industry 4.0 technology offers

Regarding their future plans there is not much difference to the current offers. Only two stated that they want to introduce new cybersecurity offers, one company augmented reality offers, four companies widening their big data and analytics offers and one their simulation offers.

However, the technological readiness level of offered Industry 4.0 technologies in general is very low. As depicted in figure 9, the majority of managers (suppliers) stated that their Industry 4.0 technologies are in lowest technology readiness level.

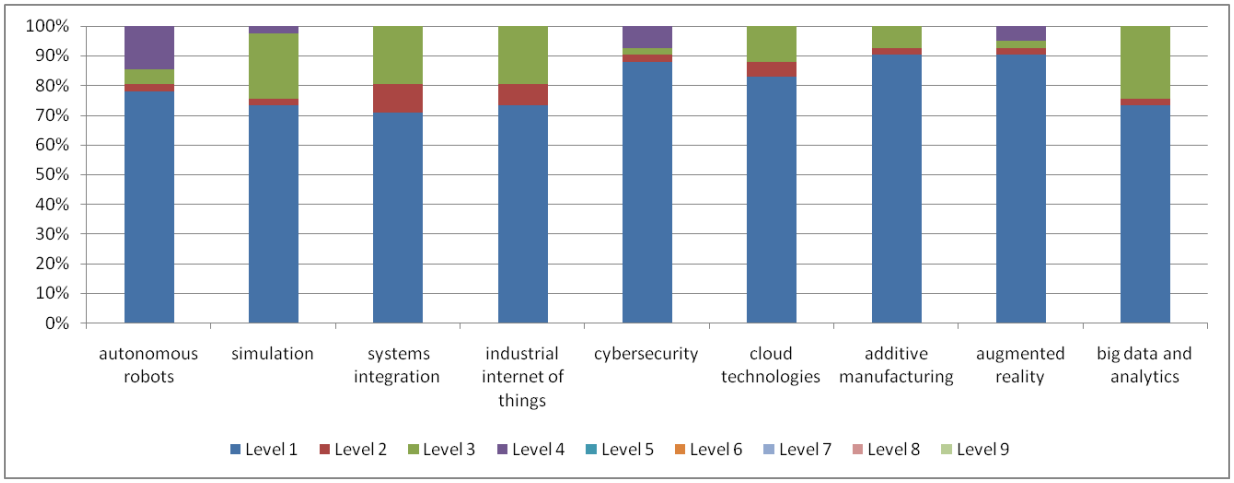

Figure 8: Industry 4.0 technology readiness level

5.Other enabling factors

Description of the SMEs position with regards to other factors considered enabling for innovation (Related variety; Human resources; Fundraising capacity; Development, others...)

The majority of SME (60%) did participate in funded projects, mainly on the country level.

Their most important services and products were to a great extent developed with the support of customers and suppliers (36 mentions). Other contributors were the technical office (19), the R&D office (13) and R&D investments (13).

In the R&D department the average rate of academics was about 63 %, whereas in the technical office only 35 % of the employees had an academic degree.