

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**
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1. Introduction of the 4STEPS project

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 by I4.0 revolution and need to increase transnational collaboration in facing this challenge.

The main project objective is to 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 the quadruple helix, thanks to a bottom up approach. SMEs will be the main target and they will be involved via the CE network of the Digital Innovation Hubs (DIH)- including also the relevant stakeholders of the R&D sector, governance actors, society thanks to a holistic approach. 4STEPS will lead to an improved level of innovative productive methods and application of I4.0 thanks to a Catalogue development of main possible services offered, a Technology Maturity Level Index development, Transnational Action plan and the creation of the Digital Innovation Hubs, tested during the pilot actions. Within this approach of networking 4STEPS will include also a solution preparing the CE citizen towards the digital future during targeted workshop for digital skills improvement. The project approach developed within the 4STEPS project will consider the Industry 4.0 plans applied in CE countries which is are linked to the digitalised production system that will result in a wide range of changes to manufacturing processes, outcomes and business models.

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 a transnational 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

Industry 4.0 is a German national initiative, launched in 2010, at the Hannover Fair. Since then, the German government has turned this initiative into a strategy for German companies and the country as a whole. The main goals of this strategy are focused on creating smart products, processes and processes and smart factories. I4.0 was also summarized and endorsed by the entire European Union and its members. As part of the Horizon 2020 European Research Program, it also financially supports I4.0 through calls for proposals. Slovenia has integrated I4.0 into its own **Smart Specialization Strategy (S4)**, which aims to create a critical mass of knowledge through integration, thus achieving a technological breakthrough and, consequently, increasing added value and increasing profitability.

On a national level, Slovenia as the third most industrial nation in the EU is engaging in Industry 4.0 in the framework of the Slovenia's Smart Specialisation Strategy (S4)¹. S4 covers a broad range of development policies related to innovation, focusing on the promotion of research and innovation, industrial policy, entrepreneurship, education system, rural development, and international relations.

¹ The S4 document can be accessed at the following web address:
<https://rio.jrc.ec.europa.eu/en/file/10067/download?token=-52r2yjM>



The strategic objectives of S4, with innovation being ranked at the top of political priorities, are:

- Developing and positioning Slovenia as an attractive innovative economy, with a focus on the development of medium and high-tech and comprehensive solutions for niche areas where Slovenia has key capacities and know-how to compete in the global market.
- Establishing dynamic, strategically guided, responsive, highly advanced, globally up-to-date and connected research, innovative and entrepreneurial ecosystem.

One of the defined S4 priority areas is Industry 4.0, focusing on (distributed) production management and control, quality assurance, regulation and data processing, intralogistics, automation, smart machines and equipment, mechatronic systems, actuators and smart sensors.

Slovenian manufacturing organizations are not very well prepared to adopt Industry 4.0 principles and thus, their transition could be slower, more expensive, and generally more stressful (Črešnar and others 2018; 305). Technologies to be used under Industry 4.0 priority area are cross-cutting and will be applied in selected Slovenian key economic sectors: basic and fabricated metal products, electronic and electrical engineering industry, ICT, mechanical engineering, and automotive industry.

- 2.2. National and regional priorities regarding I4.0

Smart specialization is a platform for focusing development investment in areas where Slovenia has a critical mass of knowledge, capacities and competences and where it has the innovative potential to position itself in global markets. S4 is a strategy for enhancing the competitiveness of an economy by enhancing its innovation capacity, diversifying its existing industry and services, and growing new and rapidly growing industries or businesses.

Objectives of S4:

- Increasing value added per employee;
- Improving competitiveness in global markets with increased knowledge and technologies in Slovenia's exports;
- Boosting entrepreneurial activity.

S4 is the implementing document of Slovenian strategic documents already adopted (for example, Research and Innovation Strategies and Slovenian Industrial Policies).

The implementation of S4 is based on:

- niche targeting across identified priority areas,
- a targeted, comprehensive and tailored package of measures,
- a new model of development cooperation between key innovation stakeholders and
- a globally integrated approach.



National strategic development priorities

On the basis of S4, national strategic development priorities have been identified, where Slovenia has a critical mass of knowledge, capacities and competences and comparative advantages, thus having the potential to position itself in global markets. National strategic development priorities therefore dictate priority investments in research, development and innovation in Slovenia.

Crucially, the priorities were not defined “top-down” but based on a new development model of the quadruple helix, in partnership between the economy, knowledge institutions, other stakeholders and the state.

National strategic development priorities were identified at the time of S4 preparation through an in-depth stakeholder consultation process in 2014-2015.

S4 identifies three priority pillars and nine application areas with focus areas and technologies:

I. Digital:

- Smart cities and communities;
- Smart buildings and a timber chain home;

II. Circular:

- Networks for the Transition to the Circular Economy;
- Sustainable food;
- Sustainable tourism;

III. (S) Industry 4.0:

- **Factories of the Future;**
- **Health-medicine;**
- **Mobility;**
- **Materials as end products.**

(S)Industry 4.0 is one of the priorities of S4. This priority area pertains to those areas of application which, as a rule, have a dominant actor or a group of strong actors with an already-established cooperation with the scientific sphere but where the opportunities are not fully taken advantage of in terms of:

- a) stronger strategic links between strong private sector actors in order to offer integrated solutions and consequently to have a joint appearance on the market
- b) stronger links with research organisations in developing products with respect to the upcoming needs in the medium and long term
- c) stronger links with small and medium-sized enterprises in terms of strengthening supplier networks as well as creating development networks
- d) promoting the creation of new product directions by promoting the establishment of new companies
- e) modernisation and digitalisation of production processes and production cycle management



2.2.1. FACTORIES OF THE FUTURE (FOF)

Objective

- Comprehensive technological restructuring of tool industry by raising value added per employee by 25%, i.e. on average EUR 45.000 per employee by 2023.
- Raising the level of digitalisation with automation and robotisation in manufacturing: in the automotive industry the rate of robotisation is comparatively high² so emphasis will primarily be put on introducing automation³. In all other areas automation as well as increasing the number of robots is key with the target standing at a 50% increase, i.e. an increase from 48 to 72 per 10.000 employees. In the framework of demonstration factories value added per employee will rise by at least 20%.
- Connect knowledge and creativity of stakeholders in the field of photonics for new impetus and new market opportunities in the global markets with the aim of achieving the average value added of EUR 75.000 by 2023.
- Increase export of automated industrial systems and equipment by at least 25% by 2023, in particular in tool industry, robotics and smart industrial mechatronic systems.

Focus areas and technologies

- Focus areas

1. Production optimisation: (distributed) production management and control, quality assurance, regulation and data processing, intralogistics, automation
2. Optimisation and automation of production processes: smart machines and equipment, mechatronic systems, actuators and smart sensors

- Technologies

Technologies to be used under the area of application Factories of the Future are cross-cutting and will - as a priority - be applied also in other areas of application as shown in the below-given table (the identification of areas of application derives from the entrepreneurial discovery process).

Table 1: Identification of priority areas of application where enabling technologies under this domain shall be applied in accordance with the entrepreneurial discover process

	1.1. Smart cities	1.2. Smart buildings and homes	2.1. Circular economy	3.2. Health - medicine	3.3. Mobility	3.4. Materials
1. Robotics			✓	✓	✓	✓
2. Nanotechnologies		✓	✓	✓		✓
3. Modern production technologies for materials		✓	✓	✓	✓	
4. Plasma technologies			✓	✓	✓	✓
5. Photonics and micro- and nanoelectronics	✓	✓		✓	✓	
6. Control technology		✓	✓			



Empirical bases and Slovenian competitive advantage

In the field “Manufacture of machinery and equipment” (C28), including “Manufacture of other special-purpose machinery” (C28.9), Slovenia has revealed comparative advantages in terms of intermediate and final products (see Burger and Kotnik 2014). The long-term dynamics, with the exception of the analysed period of the last two years, demonstrates continued strengthening of comparative advantage from 2004 onwards. The study FIDEA 2014 identifies huge untapped export potential which exceeds EUR 3.5 billion in the product group 84. The area also has great research potential. For example, in the field of photonics Slovenia has the highest number of diode-pumped solid-state medical lasers per capita with a series of small and medium-sized highly specialized companies many of which have become world leaders. In terms of the number of toolmakers per million inhabitants, Slovenia takes the second place with Japan having the highest number in the world. In terms of excellence of services Slovenia is second in Europe, preceded only by Portugal. This demonstrates that there is great potential for development.

During the entrepreneurial discovery process 16 initiatives, pertaining to the area of Factories of the Future, were prepared with an estimated investment value of EUR 950 million. Over 200 stakeholders participated in the preparation of these initiatives of which over 150 are representatives of the economy.

The area of smart factories is an extremely integrating and horizontal area with a marked interest of users as well as providers of smart factory technologies.

International dimension

International partnerships have already been established, in particular through active involvement in platforms such as EFFRA, ISTMA, Žemva, CEEPUS, MATERA ERA-NET - Bonaco, MATERA- ERA-NET-Multifuncoat, Photonics 21, PPP platform euRobotics etc. Links with similar clusters in Central European countries (Austria, Poland, Czech Republic, Slovakia and Hungary) and the Balkans (Croatia, Serbia, Romania, Bulgaria) have also been established. Such links will serve as the basis for cooperation, in particular in the framework of territorial cooperation projects.

2.2.2. HEALTH - MEDICINE

Objective

Establish a strong partnership in the area of health - medicine which will:

- position Slovenia as one of the global pillars of development in the field of biopharmaceuticals in symbiosis with large, medium-sized and small enterprises and newly established enterprises
- establish Slovenia as a top-level research centre for translational research in the field of pharmacy and therapeutics
- enhance the development of new product directions related to natural substances and spa tourism (natural medicines, dermatological cosmetics and cell therapeutics and rehabilitation)
- link pharmaceutical industry in terms of human resources development

2023 objective: increase export of companies by over 30% of which small and medium-sized enterprises should increase export by at least EUR 250 million. In addition to promoting the establishment of at least 20 new companies the objective is also to attract at least one foreign direct investment which will employ over 50 people.

Focus areas and technologies

- Biopharmaceuticals
- Translational medicine: diagnostics and therapeutics
- Cancer treatment - diagnosis and therapy
- Resistant bacteria



- Natural medicines and cosmetics

Empirical bases and SI competitive advantage

The economic activity “Manufacture of pharmaceutical raw materials and preparations” stands out in terms of revealed export and technological comparative advantages that are dynamically strengthened (see Burger and Kotnik 2014). This economic activity uses 25% of total gross expenditure for research and development and is one of the top areas in terms of the intensity of cooperation between public research organisations and the economy (SRA, 2013). The study FIDEA 2014 shows that Slovenian manufacturers, who export medicines worth nearly EUR 2 million, are leading companies in this area price-wise.

In addition to pharmacy, which is an extremely concentrated economic activity, Slovenia possesses comparative advantages also in the field of “Manufacture of medical and dental instruments and supplies” (C32.5). This area is dominated by small and medium-sized enterprises where value added per employee is considerably lower than in pharmaceutical economic activity; however, this is a very dynamic area with great potential. In the period 2009-2012 growth of value added per employee stood at 13.6% and the growth in exports stood at 25.8% (Burger and Kotnik 2014) with companies being very active in terms of international integration, e.g. within the Seventh EU Framework Programme. The fact that this is a promising area is further emphasised by the estimate of non-realised export potential in accordance with which the volume of export in optical, measuring, medical or surgical instruments and apparatus (Section 90) could triple compared to the current EUR 465 millions of average annual export (FIDEA 2014).

“Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations” (C20.4) is also a promising area with revealed comparative advantages and identified high dynamics when it comes to increasing value added per employee and enhancing exports.

During the entrepreneurial discovery process 24 initiatives, pertaining to the area of Health - medicine, were prepared with an estimated investment value of over EUR 500 million. Over 170 stakeholders participated in the preparation of these initiatives of which the majority are representatives of the economy.

Focus areas were identified as the areas with the highest complementarity and knowledge concentration rate as well as with the highest market potential.

International dimension

Strong international partnerships have been established through a number of organisations and platforms such as: EATRIS.ERIC, EFPIA (European Federation of Pharmaceutical Industries and Associations, International Probiotics Association, IPA, AACR American Association for Cancer Research; ESTRO The European Society for Therapeutic Radiology and Oncology, European Technology Platform for Advanced Engineering Materials and Technologies - EuMaT, EUFEPS European Federation for Pharmaceutical Sciences. Companies and research institutions have also established direct links with the world’s leading manufacturers in the field of medicine. A number of partners have already established links and developed joint projects in the framework of territorial cooperation with Croatia, Austria (Styria, Carinthia and Vienna) and Italy (Friuli). Among the multitude of research projects financed under Horizon 2020 and other programmes the project Artemis should be mentioned which was accepted for the first phase under the Teaming tender with the aim of setting up a Centre of excellence for translational medicine which will coordinate and develop research and innovation activity in Central and Southeast Europe.

2.2.3. MOBILITY

Objective

- transition from developing individual components and materials to developing demanding and complex energy-efficient products with higher value added, consistent with the new EU standards in the field of emission reductions (EURO 6c, EURO 7) and in the field of security (EURO NCAP)
- strengthen Slovenian manufactures as pre-development suppliers



2023 objectives:

- raise value added of companies by 20%
- increase the number of pre-development suppliers from 15 to 22 (45% increase)

The above-given objectives will be achieved through:

- a) Focusing on ambitious medium- and long-term research and development projects with a strong role of knowledge institutions which will result in:
 - joint business investment in development, manufacture and marketing, amounting to at least EUR 500 million
 - doubled volume of business investment in knowledge institutions, amounting to at least EUR 15 million by 2020
 - increased number of researchers (FTE) in companies by at least 25%
- b) Implementation of five demonstration or pilot projects introducing factories of the future with full automation of the manufacturing process.
- c) Strengthening links between large companies and medium and small-sized enterprises ▫ by 2020 at least 50% of leading partnership companies will introduce open innovation business models which will strengthen and further develop their supply chain.

Focus areas and technologies

1. Niche components and systems for internal combustion engines
2. E-mobility and energy storage systems
3. Systems and components for security and comfort (interior and exterior)
4. Materials for the automotive industry

Empirical bases and SI competitive advantage

Mobility is one of the key areas of Slovenian economy as it creates around 10% of GDP with the supply chain, which does not have one single car manufacturer, generating EUR 3.8 billion in turnover. The supply chain includes over 100 Tier 1 and Tier 2 suppliers and more than 600 lower-level sub-suppliers. “Manufacture of motor vehicles, trailers and semi-trailers” (C29) demonstrates revealed comparative advantages with below-average technological intensity with respect to leading countries, which is indeed a priority for the coming period. In terms of competitiveness this is not just about the role of a dominant car manufacturer which is shown by the revealed comparative advantage in the area of “Manufacture of parts and accessories for motor vehicles” (C29.3) where the period 2008-2012 saw increased value added per employee by over 14% and an increase in exports by over 27% (Burger and Kotnik 2014). With enhanced interdisciplinary character the automotive industry is directly intertwined with the metal processing industry, electrical engineering industry, tool industry and mechanical engineering industry. A wide range of cooperation with public research and educational sectors has been established.

Due to high price pressures, which are transmitted down the supply chain, and due to the fact that most of the suppliers are Tier 2 suppliers, the Slovenian suppliers face high pricing pressure and, on the other hand, high quality demands regarding their solution. To enhance the performance of Slovenian automotive supply industry Slovenia should take a higher position in the supply chain (Tier 1), which provides a direct supply to vehicle manufacturers, or develop niche products and technologies (pre-development supplier), duly protected by patents, which will facilitate supplying exclusive products for global car manufacturers despite the lower position in the supply chain.



A strategic partnership has already been established in the area of Mobility which will have to be further strengthened. The partnership has and will continue to enhance specialisation in niche markets by taking advantage of economies of scale, in particular when it comes to research, development and marketing.

International dimension

Stakeholders in the area of mobility are actively involved in European level associations and participate in interest as well as development initiatives, namely CLEPA (European Association of Automotive Suppliers), ERTRAC (European Road Transport Research Advisory Council), SMARTGRIDS (European Technology Platform for the Electricity Networks of the Future), EARPA (European Automotive Research Partners Association) and EGV (European Green Vehicles Initiative). Stakeholders also maintain permanent contact with technological trends on a global scale. Through CLEPA the Slovenian automotive suppliers maintain a global level network for example in the framework of JAMA (the Japanese association of automotive suppliers). Intensive cooperation has also been established with industrial and scientific-development partners from European countries through joint marketing or development projects financed mainly under EU programmes. The most important scientific partners in this area include AVL (Austria), Fraunhofer Institute (Germany), Centro Ricerche FIAT (Italy), Virtual Vehicle Research Centre (Graz, Austria), IK4 Research Alliance (Spain).

2.2.4. DEVELOPMENT OF MATERIALS AS END PRODUCTS

Objective

Strengthen cooperation of manufacturers of finished materials achieving high value added and competing - with each other and with knowledge institutions - in international value chains.

2023 objectives:

1. raise value added per employee in companies manufacturing alloys by 25% by 2023
2. increase exports and value added per employee in the field of smart coatings by 20%
3. increase investment in development by 15%, value added by 5% and exports of multi-component smart materials by 10%

Focus areas and technologies

1. Sustainable production technologies in metallurgy
2. Multi-component smart materials and coatings

Empirical bases and SI competitive advantage

In the area of “Manufacture of basic metals” (C24) and “Manufacture of fabricated metal products, except machinery and equipment” (C25) Slovenia has revealed comparative advantages and is in terms of technological intensity comparable to leading European countries (Burger and Kotnik 2014). The study FIDEA 2014 also demonstrates that Slovenia is highly competitive in terms of the prices of a number of iron, steel and aluminium products (product codes 7208-7228 and 7601-7607) where Slovenia takes an equal or even better position compared to the most successful European manufactures. In the framework of this economic activity Slovenia has generated EUR 9 billion of net income and is involved in many supply chains. Slovenia focuses on the development of advanced metallic materials for demanding applications following the trends of transition to a circular economy. According to the data of the programme “Metallurgy Europe - Renaissance program for 2012-2022” the combination of the primary manufacture of metallic materials and their further processing and integrated metal products including recycling, represent value added of approximately EUR 1.3 trillion a year in the EU alone. During the entrepreneurial discovery process 16 initiatives were prepared with a clearly pronounced market potential and intense research and development component in terms of developing specialised products.



Another area where Slovenia has great potential is smart multi-component materials and coatings. “Manufacture of man-made fibres” (C20.6) demonstrates both revealed comparative advantage as well as dynamic growth of value added per employee and exports in the 2008-2012 period. OECD data further show that the comparative advantages are being dynamically strengthened (Burger and Kotnik 2014: 64). Comparative advantages also exist in related fields such as “Preparation and spinning of textile fibres” (C13.1) marked by high growth in value added per employee and exports, as well as in “Manufacture of other textiles” (C13.9). Slovenia also possesses the necessary competences and capacities in complementary areas such as “Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms” (C20.1). Slovenian companies have a strong position also in the area of coatings where “Manufacture of paints, varnishes and similar coatings” (C20.3) discloses revealed comparative advantages with the global market of smart coatings growing from EUR 540 million in 2015 to EUR 5.2 billion by 2020.

During the entrepreneurial discovery process 25 initiatives, pertaining to the area of Materials as end products, were prepared with an estimated investment value of over EUR 850 million.

Over 200 stakeholders participated in the preparation of these initiatives with half of the stakeholders representing the economy.

Focus areas were identified as the areas with the highest complementarity rate as well as with the highest market potential.

International dimension

Slovenian representatives actively participated in the preparation of the European programme “Metallurgy Europe - Renaissance programme” for 2012-2022. In light of the relevance of technological development of new materials and their application this initiative brought together some of the largest European industrial companies, e.g. Airbus Group, Siemens, Daimler, BMW, Rolls-Royce, Philips, Linde, ESI, Arcelor Mittal, Sandvik, SKF, Thyssen Krupp, Tata Steel, Fiat etc. Cooperation with international partners is also planned as well as participation in EU initiatives, in particular with German, Austrian and Italian initiatives, under the initiative CECIMO, Factory of the Future in Manufacture. In the field of multi-component materials the stakeholders participate in various associations and networks, e.g. Central and East European Polymer Network (www.ceepn.org) and European Polymer Federation (www.europolyfed.org), CIRFS - European Man-Made Fibres Association, European Technology Platform for Water (WssTP). Stakeholders also participate in numerous projects and programmes, e.g. under the programme Central Europe: Innovative value chain development for sustainable plastics in Central Europe (acronym: PLASTiCE, No.: 3CE368P1, www.plastice.org); under the programme IPA Adriatic: Derelict Fishing Gear Management System in the Adriatic Region, (acronym: DeFishGear, No.: STR/00010, www.defishgear.net); under the programme COST MP1105 - FLARETEX etc.

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

With a new package of legislative proposals in the field of regional development and cohesion policy for the period 2021-2027, which is expected to be harmonized and adopted in early 2020, the European Commission has proposed an update of cohesion policy. This is the EU's main investment policy, with which the Union most expresses its solidarity.

One of the main features of the Commission's proposal for a modernized cohesion policy is its focus on key investment priorities where the EU can achieve the best results. Most of the European Regional Development Fund's funding will thus go to innovation, small business support, digital technologies and industry modernization. The funds will also be used to promote the transition to a low-carbon, circular economy and the fight against climate change, which will contribute to the implementation of the Paris Agreement.

POLICY OBJECTIVES



The Commission therefore proposes five priority areas that will drive investment:

- a smarter Europe (innovative and smart economic transformation)
- a greener, low carbon Europe (including energy transition, a circular economy, climate change adaptation and risk management)
- a more connected Europe (ICT mobility and connectivity)
- a more social Europe (European pillar of social rights and support for healthcare)
- Closer to the citizens of Europe (sustainable development of urban, rural and coastal areas and local initiatives)

COHESION PACKAGE FOR SLOVENIA

For Slovenia, the proposal envisages almost € 3.1 billion in cohesion funds, a 9 % cut from the current MFF, but negotiations on the final amount are still ongoing. It is important to note that there has been a 10 % reduction in cohesion funding at EU level.

The Commission, however, maintains in the proposal three categories of regional development:

- less developed, reaching 75 % of the EU average per capita GDP;
- transitional, reaching between 75 and 100 % of the average GDP per capita, and
- developed in excess of 100 % of GDP per capita average.

Slovenia is divided into two cohesion regions - Western Slovenia and Eastern Slovenia. According to the available statistics for 2016, the western cohesion region reaches 99 percent of the EU average development, the eastern 68 percent, and the whole of Slovenia 83 percent.

It is crucial for Slovenia that the fall in funds is kept to a minimum, and that it is important to maintain the ability to finance the structural transformation of regions throughout Slovenia, even though Western Slovenia is reaching the average level of development of the Union and the transition period is over.

The Commission also set lower limits for co-financing for the period 2021-2027, emphasizing that European co-financing is only a complement to national co-financing. This measure is intended to strengthen, among other things, the beneficiaries' sense of responsibility for the implementation of their project. Thus, the ceiling for co-financing in less developed regions is 70% and in transition regions 55% (more developed regions are eligible for 40% co-financing).

Slovenian S4 will be updated, but at this point we do not have enough information. The main objectives and priorities will stay the same, but some of the objectives and focus areas will be updated.

3. Description of the sample

In Slovenia we have gathered 39 questionnaires from manufacturing companies, among which 9 were large companies and 30 companies were SMEs.



-3.1 Criteria for the sample's selection

Due to small economy in Slovenia we were not able to narrow down the criteria for company's selection to participate in the SME questionnaire for Definition of the transnational tool for the analysis. We did not focus on any specific industrial sector, like it is also seen in the analysis, but more on the companies that in the near future are planning to take the first steps for the implementation of Industry 4.0.

We targeted well standing manufacturing companies with more than 10 employees, which have a clear vision for business development strategy and are interested to cooperate with us in the piloting phase.

- 3.2 Economic sectors represented

In our sample we have mostly include Secondary Economic sector (manufacturing), which includes industries that produce a finished, usable product or are involved in construction. This sector generally takes the output of the primary sector and manufactures finished goods or where they are suitable for use by other businesses, for export, or sale to domestic consumers. This sector is often divided into light industry and heavy industry. Many of these industries consume large quantities of energy and require factories and machinery to convert raw materials into goods and products. They also produce waste materials and waste heat that may cause environmental problems or cause pollution. The secondary sector supports both the primary and tertiary sector.

Please state what industrial sector your company, your suppliers and customers belong to.			
	Your company	Your suppliers	Your customers
food products	4	2	5
aerospace	0	0	3
nautical industry, ships and boats	1	0	6
automotive	13	6	14
Textile, clothing, footwear, fashion	0	0	3
wood and furniture	1	1	5
publishing activities	0	0	0
Plastics materials	3	14	5
glass, ceramics, stone	0	2	1
engineering and architectural activities	3	2	2
electrical equipment	17	16	14
construction of buildings / plants	1	3	6
commerce & trade	5	8	5
tourism / catering	0	0	4
transport, logistics, warehousing, postal activities	3	9	1
computer, electronic and optical products	6	12	8
Computer programming, consultancy and related activities	2	10	0
mining	0	1	1
chemicals	0	6	3
metal products, except machinery	8	15	6



pharmaceutics	0	0	2
medical devices	7	1	5
machinery and equipment	9	20	8
railway locomotives and rolling stock	1	1	5
other transport equipment	0	1	4
consumer goods	4	1	6
civil engineering	0	1	3
broadcasting activities	0	0	0
financial serviceactivities	0	5	0
scientific research and development	3	4	3
office administrative, office support and othe business support	0	1	1
public administration	0	1	1
defence	0	0	0
education	0	3	1
libraries, archives, museums and othe cultural activities	0	0	0
TOTAL NUMBER OF ANSWERS:	91	146	131

We have tried to assemble the sample from various industrial sectors in Slovenia. We have gathered 18 % of companies from sector of electrical equipment, 14 % from automotive, 10 % from machinery and equipment, 9 % from metal products except machinery, 8 % from medical equipment, 7 % from computer, electronics and related activities. Other sectors were below 5 %. Some of the sectors are underrepresented in Slovenia, so we did not manage to include in the samples the sectors as: aerospace, textile, publishing activities, etc.

Most of the suppliers of chosen companies - 13 % came from machinery and equipment sector, 11 % from electrical equipment sector, 10 % from metal products except machinery, 10 % from plastic materials, 8 % from computer, electronic and optical products and 7 % computer, electronics and related activities. Other sectors had less than 5 %.

Customers of chosen companies are more evenly distributed. Most of customers - 10 % are from automotive sector, other 10 % are from electrical equipment sector, 6 % from computer, electronic and optical products and 6 % machinery and equipment. The rest sectors were bellow 5 %.

- 3.3.Size

In Slovenia we have gathered 39 questionnaires, among which 9 were large companies and 30 companies were SMEs.

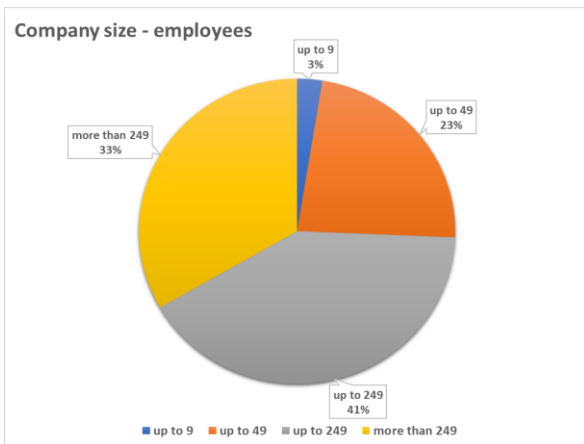
Table 2: Size of the selected companies

What is your company size?					
employees		turnover/year		total balance/year	
up to 9	1	up to 2 Mio€/year	1	up to 2 Mio€/year	3
up to 49	9	up to 10 Mio€/year	13	up to 10 Mio€/year	11
up to 249	16	up to 50 Mio€/year	13	up to 43 Mio€/year	7
more than 249	13	more than 50 Mio€/year	9	more than 43 Mio€/year	4
TOTAL	39		36		25



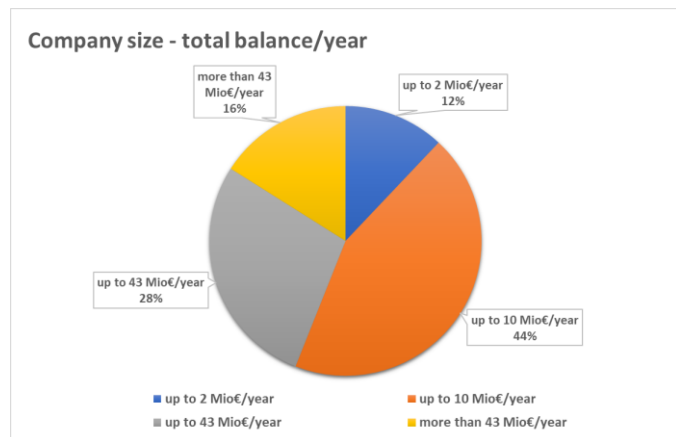
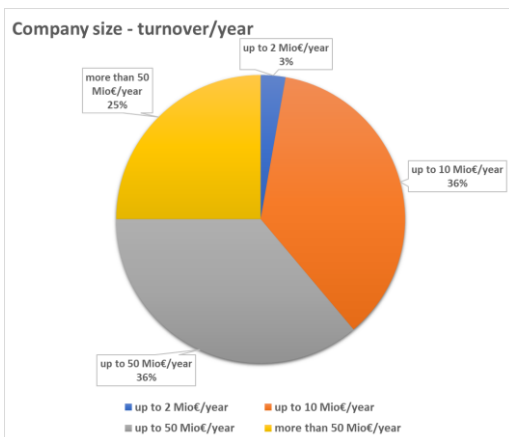
In the sample we had 3 % of companies which have up to 9 employees, 23 % of companies which have up to 49 employees, 41 % of companies which have up to 249 employees and 33 % companies which have more than 250 employees.

Table 3: Number of employees of the selected companies



9 selected companies had more than 50 mio EUR of turnover, so by definition of European Commission (EC) they are considered as large companies. In the sample were also included 1 micro company, 9 small companies and 20 medium sized companies.

Table 4: Turnover and total balance / year of the selected companies



- 3.4 Geographic distribution

In the Sample we included companies from both Slovenian Macro-regions: Eastern Slovenia and Western Slovenia. Slovenia is a really small country with less than 2.000.000 inhabitants and around 200.000 companies, so we did not make any criteria about geographical distribution.



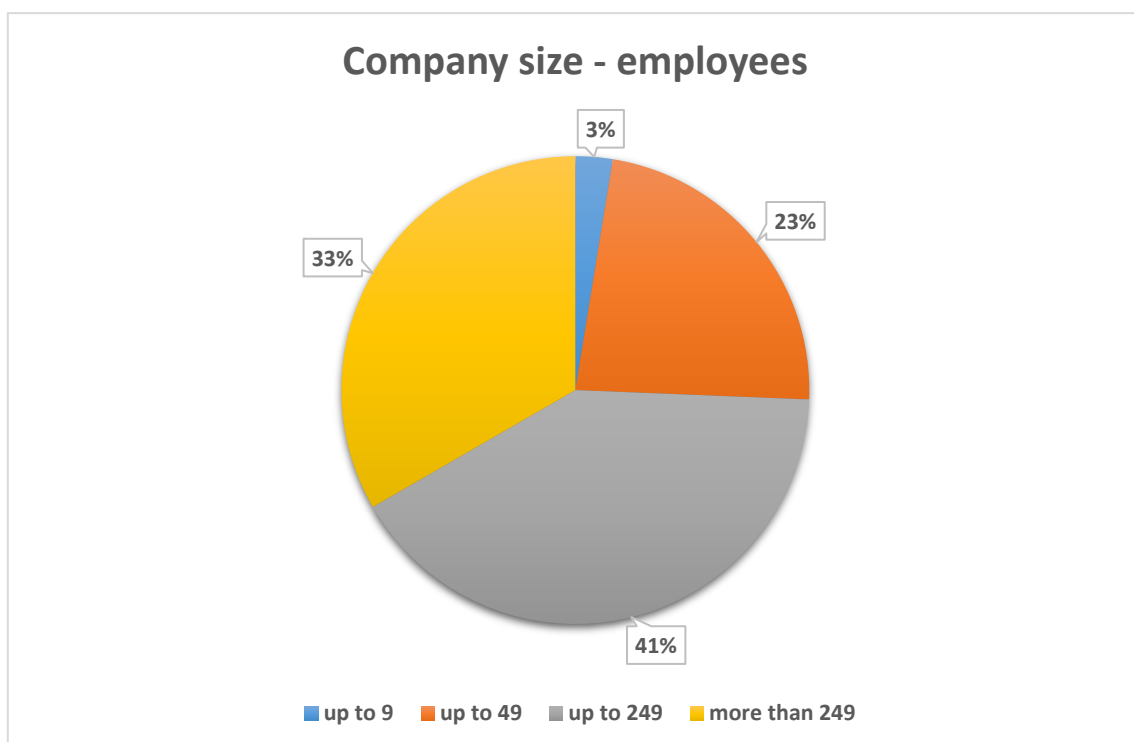
4. The SMEs and the 9 pillars

Specific to each region

Mapping of the

attitude of the interviewed SMEs towards the 9 enabling technologies

In a mapping phase of project 4Steps we wanted to include as many companies as possible from different manufacturing industries. Of all invited companies 39 has decided to participate in this project and to complete the given questionnaire. We would like to emphasize that in Slovenia we have a specific economy. This means that our economy is based on relatively small and medium-sized companies depending on the number of employees. We wanted to include different sizes, but as you can see from below graph, that more interested in cooperation were relatively medium sized company and some large one as well.

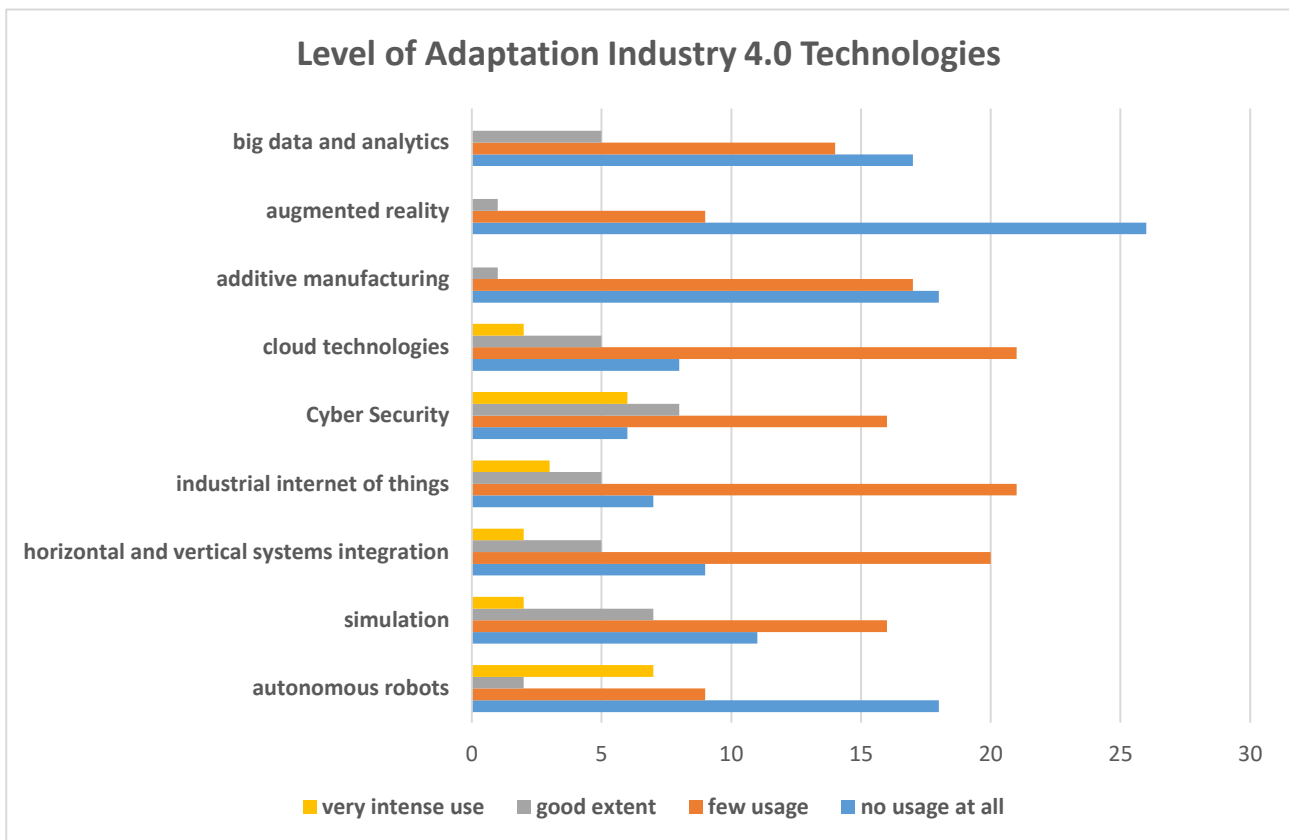




4.1. In case of end users:

- level of adaptation Q 13

At question number 13 we asked the companies about the level of adaptation of technologies which are included in industry 4.0 and how large is their intensity. We analyzed the answers and noticed that we have only a few companies which intensively use Industry 4.0 technologies. They are most confronted in technologies such as autonomous robots (7 companies) and cyber security (6 companies) from all 39 companies. All the rest technologies are used in good extent or few usages. Most alarming is that most of the chosen companies had not at all used the mentioned technologies, like we can see in bellow graph.

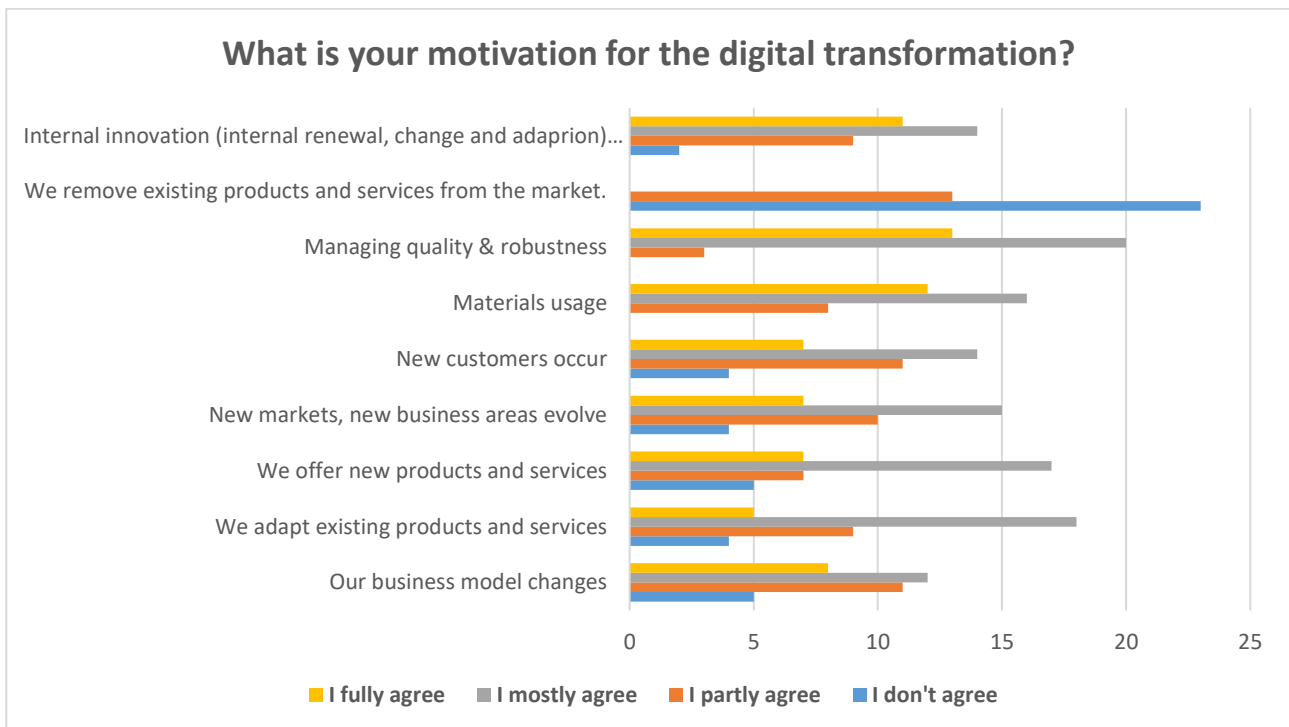




- Motivation Q14

When we asked companies, what is their motivation for the digital transformation we have received the bellow answers which we are presenting graphically for better understanding.

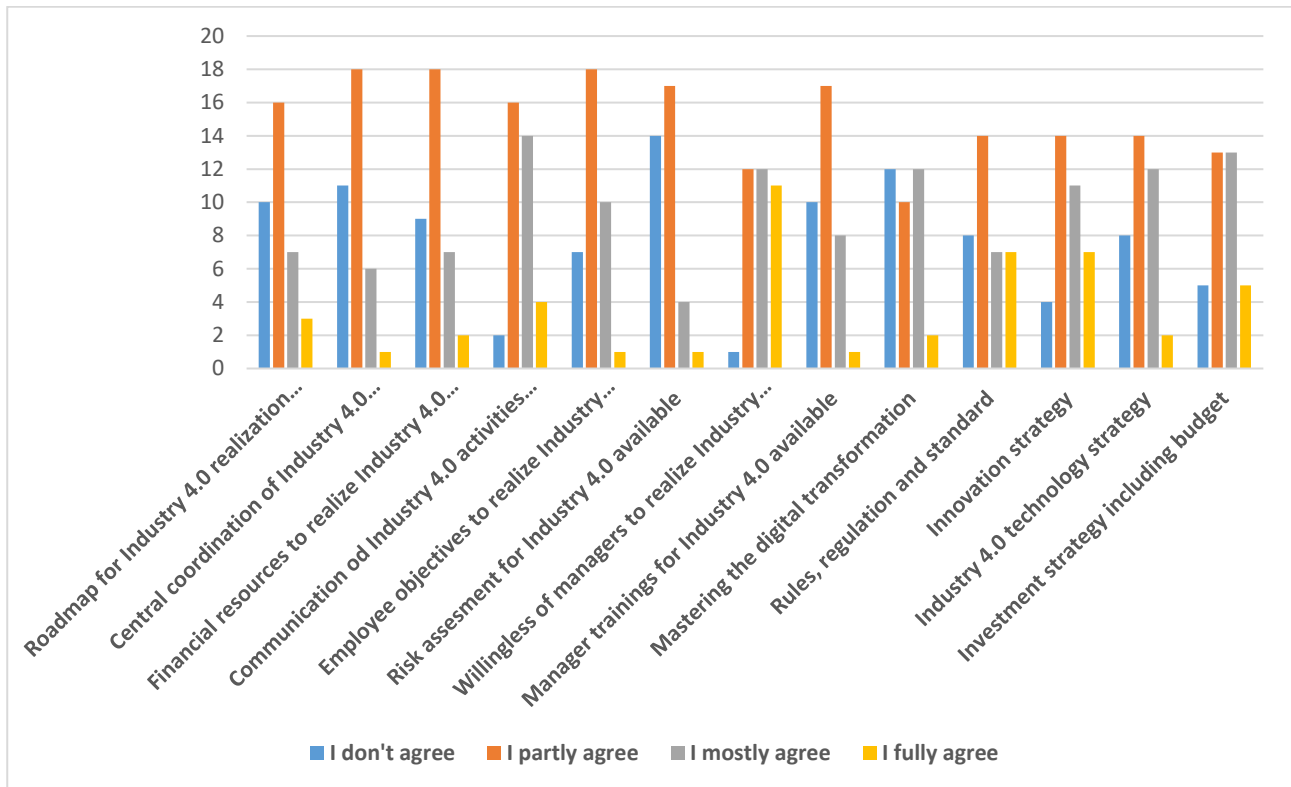
Most of the companies (21) did not agree that the motivation of the digital transformation relates to removing of the existing products and services from the market. Most of the companies (12) fully agrees that digital transformation is connected with managing quality and robustness.



- Strategy Q 15

Regarding the question 15 “Do you have a strategy for your digital transformation?” included companies in the sample give us a clear picture the they are aware that their business model is changing, so they adapt their existing products and services to meet the needs of digital transformation.

The vast majority of respondents answered with answer “I partly agree”.

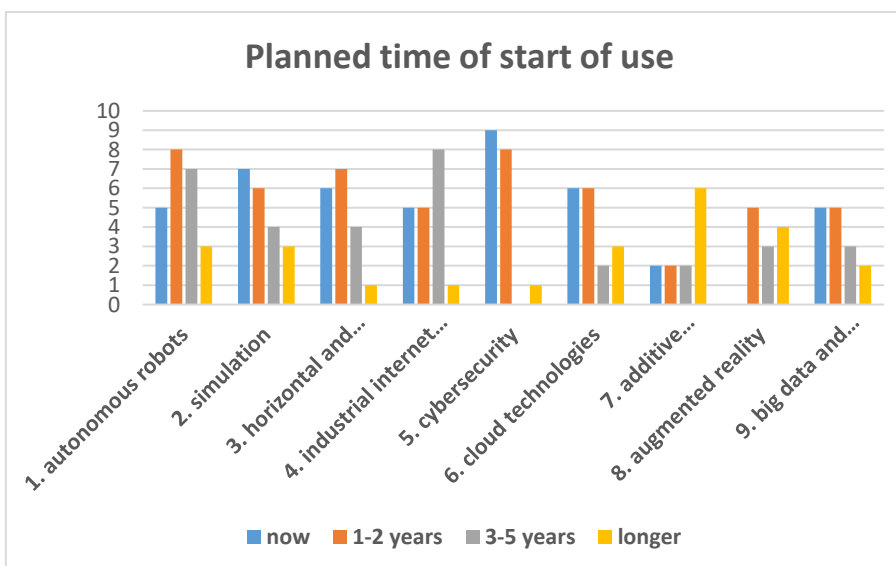
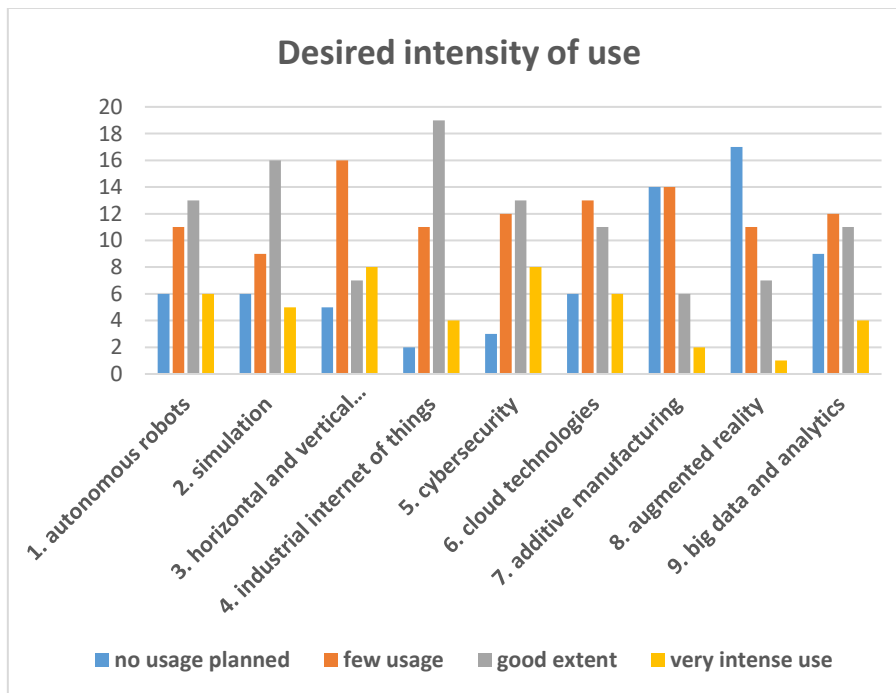


	I don't agree	I partly agree	I mostly agree	I fully agree
Roadmap for Industry 4.0 realization available	10	16	7	3
Central coordination of Industry 4.0 activities	11	18	6	1
Financial resources to realize Industry 4.0 available	9	18	7	2
Communication od Industry 4.0 activities ongoing	2	16	14	4
Employee objectives to realize Industry 4.0 defined	7	18	10	1
Risk assesment for Industry 4.0 available	14	17	4	1
Willingness of managers to realize Industry 4.0	1	12	12	11
Manager trainings for Industry 4.0 available	10	17	8	1
Mastering the digital transformation	12	10	12	2
Rules, regulation and standard	8	14	7	7
Innovation strategy	4	14	11	7
Industry 4.0 technology strategy	8	14	12	2
Investment strategy including budget	5	13	13	5
Other (please state)	0	0	0	0
Can you state a total budget (in EUR per year)?	0	0	0	0



- Needs Q 16

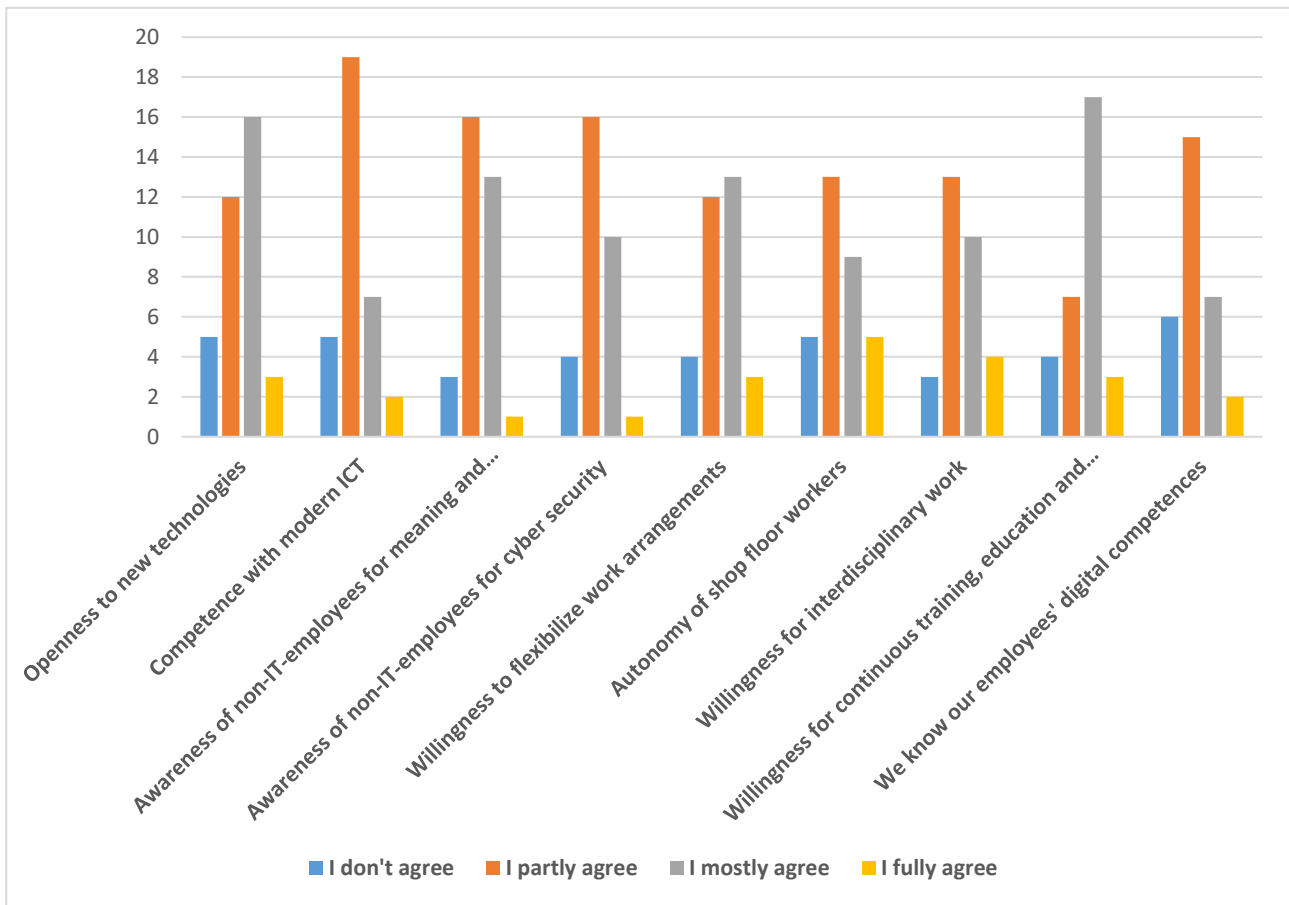
At the question 16 we asked companies about the needs of Industry 4.0 Technologies: To what extent are you planning to use Industry 4.0 methods & technologies and when? We concluded that in this segment of the question the industry deviates among each technology. But overall, we find out that the companies do not have a specific strategy for the implementation of digital transformation. Most of them they do not have the funds intended to carry out the transformation, although the vast majority are aware that they will have to take the implementation steps towards digitalisation.





- In what extent are SMEs employees apprepared for digital transformation Q17

When asked companies about the extent to which their employees are prepared for digital transformation, we find out that Slovenian companies are aware of the importance of digitalization. According to the given answers employees are also ready to educate and are largely open to new technologies.

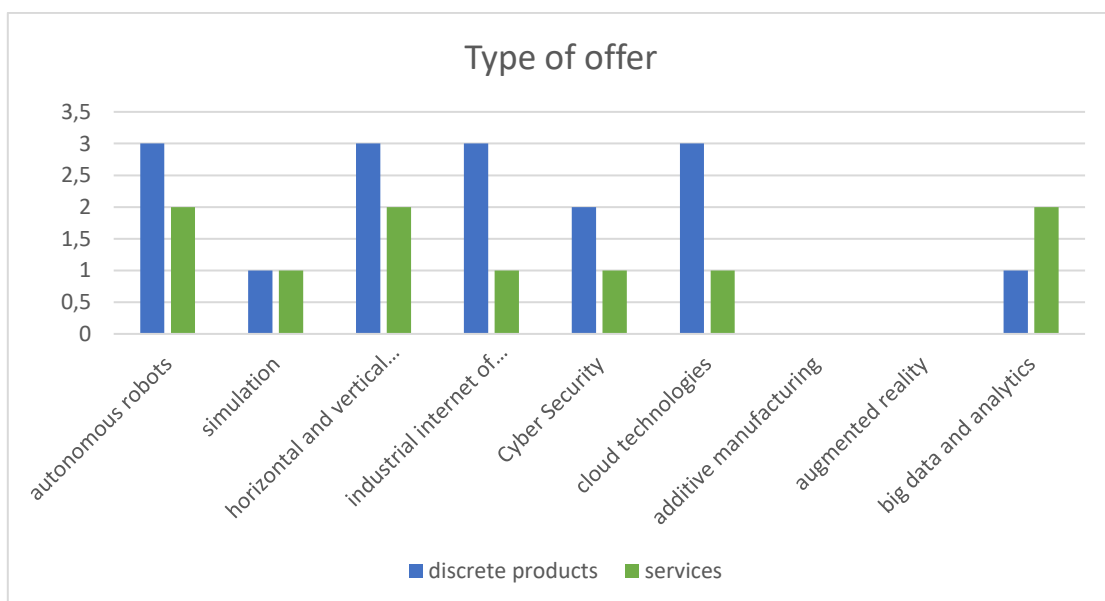




4.2 In case of suppliers:

- level of adaptation Q 18

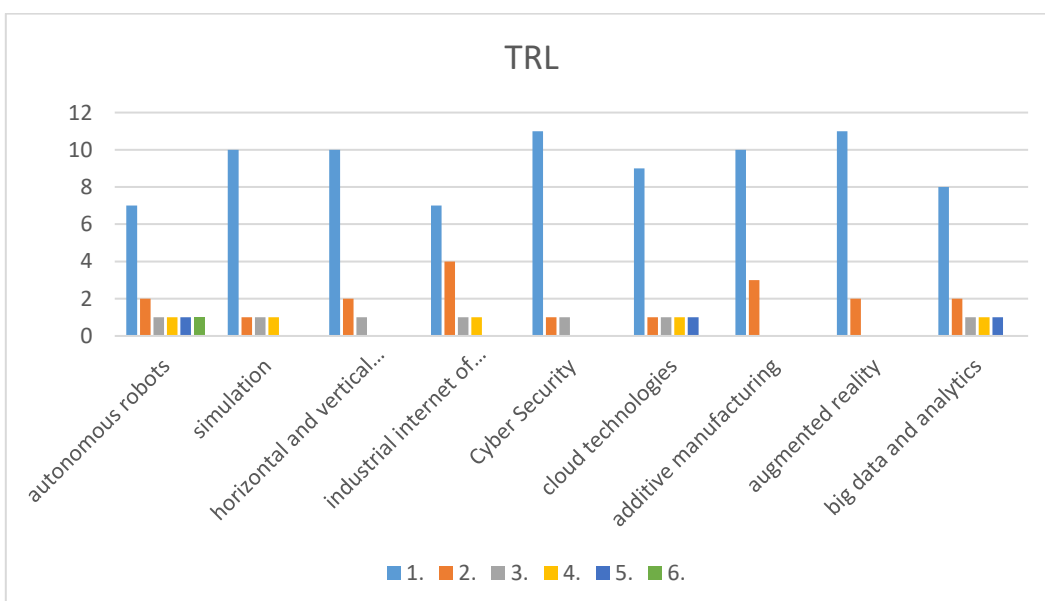
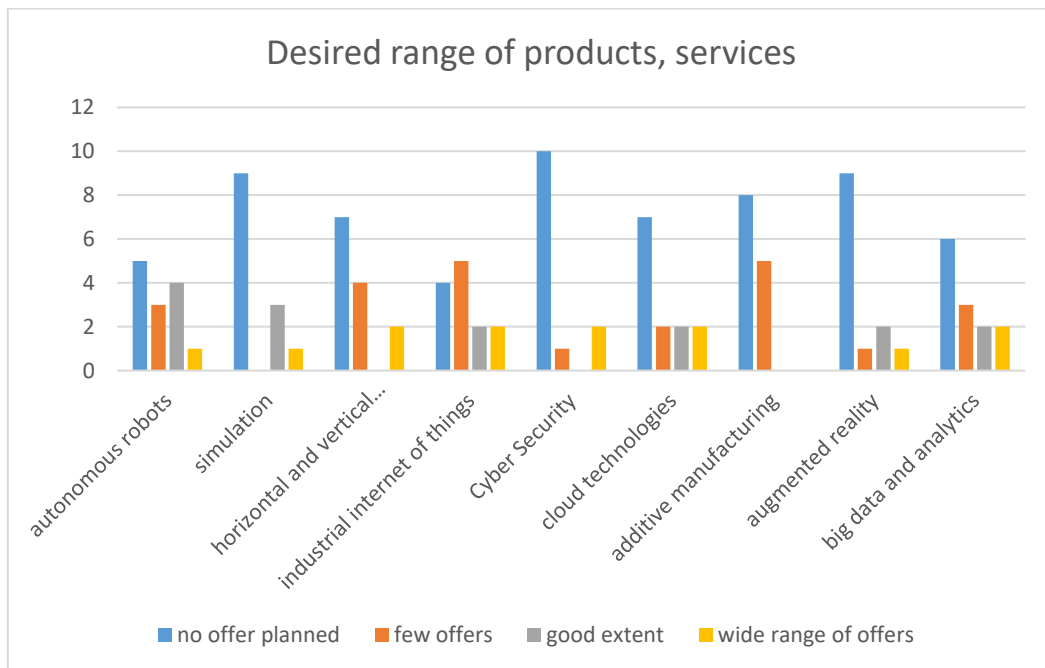
At question “To what extent are you currently offering Industry 4.0 products and / or services?” our Slovenian companies have mostly replied that they do not yet offer products or services for Industry 4.0. In the vast majority they will likely offer more discrete products than services.





- Motivation and plans Q19

Survey results show that Slovenian companies currently have little to do with industry 4.0. But they are desired to prepare offers of Industry 4.0 products and services. This can be understood as kind of opportunity for new businesses in Slovenia. Their technology readiness level (TRL) is at this point very low, most companies are at level 2. We had only 1 company which answered that autonomous robots are at level TRL 6.

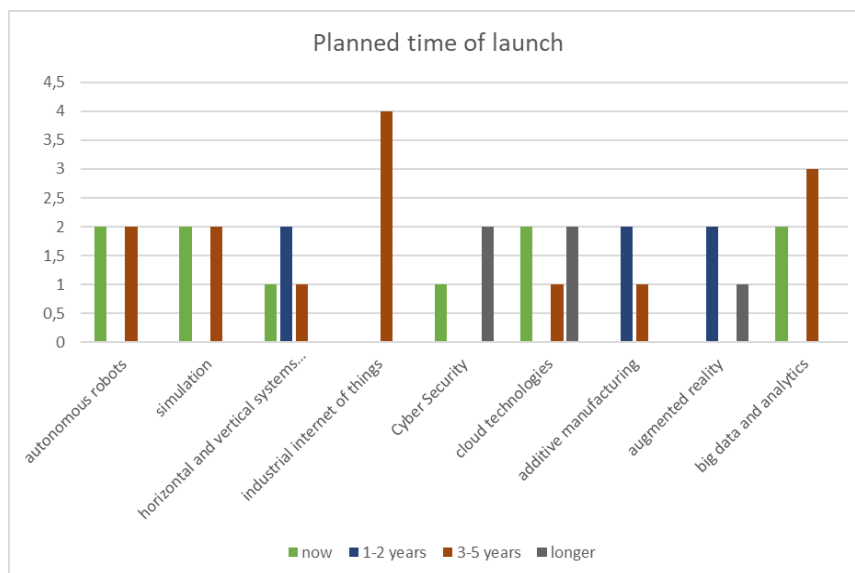




5. Other enabling factors

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

Companies are largely aware of the importance of being forced to make certain changes related to Industry 4.0 in the next 1 to 5 years, and to direct the processes towards digitization if they wish to remain competitive. Almost none of the contributors, at the same time, has a high level of awareness that they would have reserved funds for the purpose of digital transformation in the short-term strategy and short-term investment plan.



They estimate that the employees of the companies are ready to take on the new challenges related to education, refinement in various segments of industrialization 4.0. They are aware that new technologies will need to be confronted with and conquered and adopted for their own sake. However, we estimate that in the current situation, corporate executives do not recognize a sufficient motivation to devote more energy to transformation. The reason is probably also that only a small part of the business in individual companies is realized in connection with industry 4.0, a larger share at the product level and some small in the service industry.