I4.0 SUPPORTING TOOL CATALOGUE

Deliverable D.T1.2.3	FINAL VERISON
I4.0 supporting tool catalogue	03/2020

Project Number	CE1492
Project Name	Towards the application of Industry 4.0 in SMEs
Project Acronym	4STEPS
Work package	WPT1-The SME towards the scenario and themes of Industry 4.0
Activity	Activity 1.2- RIS3 SMEs and Industry 4.0
Deliverable	**Deliverable D.T1.2.3**: I4.0 Supporting tool catalogue
WP responsible partner	Pannon Business Network PP6
Dissemination Level	Public
Date of Preparation	1. Template in word: 01.2020 prepared by PBN based on PPs' inputs 2. Final version: With the contributions of all PPs: 03. 2020.
This document must be referred to as	**I4.0 Supporting tool catalogue**
Author	Template: prepared by PBN based on PPs' feedbacks Final version: PBN internally+ PBN external support (KITE IT KFT) with the contributions of all PPs
Contributors	ALL PPs provided contributions in the respective chapters and PBN PP6 merged the contributions into one final document

Table of contents

1. Introduction of the 4STEPS project

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.

2. Short summary of SME involvement on transnational level (information gained from the Transnational Mapping Report in the framework of D.T1.2.1)

In the framework of previous activities of the project, project partners were required to conduct the already adopted "transnational tool" for analysis, the Industry 4.0 questionnaire (D.T1.1.2) with SMEs in their regions. According to the project requirements, at least 350 SMEs were expected to be involved (undergo the analysis/fill the questionnaire) within the partnership on an equal distribution level, so 50 companies were supposed to be involved by partner. However, during the SME involvement procedure some partners informed PP6 (PBN as WPT1 leader) as well as PP1 (CNA as Lead Partner) that because of numerous reasons (e.g: not adequate company network, not appropriate SME support..) they were not going to be able to reach the expected 50 filled questionnaires. Based on a common agreement, of the partnership, the minimum requirement was reduced to 30 filled questionnaires, and the remaining ones were covered by the Italian partners (PP1 CNA; PP2: RE:LAB). Due to the tremendous effort of all partners, the partnership reached 355 filled questionnaires in the following distribution: CNA+RELAB together: 77; ARRSA: 50, FHV, 47; DEXIC: 44; PBN:50; GZS: 39; VDC 48.

Following the finalisation of SME involvement, every partner (LP+PP2 are working together) was preparing separate mapping reports based on the results of their own SME involvement in their regions, following the common report structure approved by the partnership.

Based on the specific country reports provided by each partner, as well as due to the transnational dataset, PBN (as WPT1 Lead) prepared the report on transnational level, and its key findings are the followings:

- Countries data sample are different, due to various customer base (e.g.: Polish micro companies, small Italian businesses, relatively large Slovenian ones; Hungarian and Italian business dominantly from metal industry, while German companies from ICT, others are more balanced)
- *TOP3 key sources of digital transformation:*
    - ❖ Supplier/Customer push
    - ❖ R&D office
    - ❖ Technical office
- *Company size determines the source of transformation:*
    - ❖ Smaller companies customer/supplier
    - ❖ Larger companies R&D and Technical office
- *Research in house capacity*
    - ❖ German and Austrian companies are far more equip p ed than others
    - ❖ Italy and Poland far behind
- *European Union Fund absorption*
    - ❖ Large companies and mid-caps are active on European scale
    - ❖ Medium and small companies are present in regional/national funds
    - ❖ Micro companies are inactive
- *Adaption of digital technologies by country*
    - ❖ German and Austrian companies are dominantly to a good extent
    - ❖ Czech and Slovenian businesses are medium users
    - ❖ Italian, Polish, Hungarian companies lag behind
- *Adaptation of technologies by digital technologies:*
    - ❖ Mobile robots and Augmented reality are not used
    - ❖ For medium sized companies: simulation, system integration, data analytics, cyber
    - ❖ security and I IoT are overrepresented

- *Way to raise interest for digital transformation*
    - ❖ New customers
    - ❖ New markets
    - ❖ Flexible production
- *Demand for specific digital technologies yet country specifics are important*
    - ❖ 1.Industrial IoT
    - ❖ 2.Horizontal and Vertical integration
    - ❖ 3.Simulation
    - ❖ 4.Big Data and Analytics
- *Current usage is planned to be improved slightly*
    - ❖ Autonomous robot
    - ❖ Industrial Internet of things
    - ❖ Additive manufacturing

3. Objective of this current Supporting Catalogue

The current Catalogue intends to collect the possible services provided by PPs in relation with Industry 4.0. The Catalogue- involved the supporting services by PPs-will make available to companies so that they can find a correlation between their need of innovation and 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)

This Supporting Catalogue tool will be useful to improve the level of innovation, business and economic development in all the central Europe countries and beyond, identifying the most suitable solutions options for the companies interested in I4.0 pillars application.

In the current Catalogue, feedbacks and contributions are required from all project partners in the project. In the beginning of the Catalogue, PPs are expected to describe their organisation shortly, and in the following chapters they will have to focus on their competencies and skills in relation to the nine Industry 4.0 technological pillars. Apart from the specific technological competencies PPs shall detail further enabling factors, and the information depicted here, might be also utilised by companies. Among others, project partners are expected to describe their own research and development results in connection with the 9 pillars. In the second part of the Catalogue, PPs shall point out their connection network including their links to S3 policy stakeholders, Digital Innovation Hubs, and with further relevant

stakeholders. Besides, PPs are expected to mention their relevant currently running international projects which correspond with Industry 4.0 topic.

The information and contribution provided by the project partners will be utilised by SMEs, so they can find a correlation between their need of innovation and the services offered by PPs.

The material of the Catalogue will be prepared in an appealing way and will be available in several platforms (web, text, multimedia) in order to communicate its information in an effective, simple and attractive way.

4. Short General introduction of the Project Partners

4.1 CNA Emilia Romagna

CNA (National Confederation of Crafts and SMEs – founded in 1946) is the national and unitary system of general representation of the Italian enterprise and more specifically of Crafts and Small and Medium-Sized Enterprises and other related associations, as well as of women entrepreneurs and any other body representing autonomous work and pensioners.

CNA is a non-profit organization, a private association for the representation of its members' interests. It achieves its aims relating directly with Public Institution and with all social, economic and political partners.

CNA is entirely self-funded. Its incomes derive from the membership fees paid by the firms who decide to enroll to CNA.

The structure of CNA consists of 19 regional offices (CNA Regionali), 96 territorial offices (CNA Territoriali), about 9.000 people work in 1.100 Confederation offices.

In Italy, CNA counts approximately 647.000 associated members. CNA has a strong presence in Emilia Romagna, where it associates more than 60.000 businesses.

CNA Emilia Romagna – founded in 1978 - breaks down into 10 territorial Associations (Bologna, Modena, Reggio Emilia, Parma, Piacenza, Ferrara, Forlì, Ravenna, Rimini, Imola), which are spread throughout the region in 234 local offices.

Thanks to this network, CNA provides a wide range of services.

CNA supplies its members with many services, such as:

- Assistance in administration, tax accounting, payrolls, income-tax returns, fiscal matters, labor legislation, environmental legislation
- Assistance in the establishments of new enterprises, fiscal services
- Labor counselling, contract support

- Credit and financial counselling for small businesses (e.g. access to credit lines for craft businesses…)
- Training, promotion, internationalization, innovation services
- Assistance and consultancy in the fields of health and pensions
- Technical assistance to all the SMEs interested in Environmental Sustainability problems.

CNA represents the interest of the associated companies in Emilia Romagna as regards the policies developed by the Regional Institutions (for example Regione Emilia-Romagna).

It is a work of lobbying focused on taking in consideration the needs of the small and medium companies of the region, both for the development of regional policies and for the distribution of public resources (services or money).

The range of interests we should represent is defined both through the direct dialogue with the companies and the constructive exchange with the 10 territories we coordinate.

The main business fields of CNA member firms are:

- ✓ CNA Production (mechanics, wood, furniture, interior design, chemistry, boating …)
- ✓ CNA Building Sector (constructions and similar activities, stone cutting …)
- ✓ CNA Community Services (motor mechanics, dry cleaners-laundries, cleaning companies …)
- ✓ CNA Installation and Maintenance operators (heating, electric and electronic plants)
- ✓ CNA Transportation of Goods and Passengers
- ✓ CNA Food (food, agriculture, and all the other activities related to the food sector)
- ✓ CNA Fashion (textiles, clothing, shoes, furriers, dress making/tailors …)
- ✓ CNA Well-being and health (dental technicians, opticians, orthopaedics, hairstylists)
- ✓ Fitness and related similar activities
- ✓ CNA Communication and advanced services (graphic art, image, press, and informatics, ICT and related activities)
- ✓ CNA Art and Tradition (manufacture of metals and precious stones, ceramics, restoration of movable goods of cultural interest, traditional instruments …)
- ✓ CNA Trade and Tourism
- ✓ Beach facilities

Since 2015 CNA Emilia Romagna has been partner of the SIMPLER Consortium and Enterprise Europe Network, the largest European network in supporting SMEs innovation, internationalization and competitiveness. The network operates in over 60 countries through 600 organisations grouped into local consortia.

Through the SIMPLER Consortium, which constitutes the access point for the regions Lombardy and Emilia-Romagna to the Enterprise Europe Network, CNA Emilia Romagna provides support services for innovation, internationalization and competitiveness to companies, through a partnership composed by Finlombarda Spa, Innovhub-SSI/Az. Speciale CCIAA Milano, FAST, Unioncamere Lombardia, Confindustria

Lombardia, CNA Lombardia, ART-ER, Unioncamere Emilia-Romagna, Promos Italia Scrl – Unità locale di Ravenna and Confindustria Emilia-Romagna.

4.2.RE:Lab s.r.l

RE:Lab is a SME born in 2004 as an academic spin-off of the Human-Machine Interaction Group of the University of Modena and Reggio Emilia. RE:Lab is mainly focused on the design and development of hardware and software embedded systems, human interaction, prototyping and user experience.

The co-existence of ergonomic and engineering competences has fostered the development of its integrated approach called Interaction Engineering. With this respect, the interaction system is designed starting from an analysis of the needs and features of the end users and of the operational context. The system is developed through prototyping and validation cycles with end users up to the release of a product that complies to the final customers' and the industrial operators' needs. Depending on the customer's requests, RE:Lab can follow the entire HMI development process, from concept to the early stage prototype. From technical specifications to the graphic material engineered for the production phase and to the development of software, firmware and custom hardware. By adopting state-of-the-art research methods and tools, RE:Lab enables designers to make decisions based on sound qualitative and quantitative experimental evidence; our goal is the definition of interaction systems that guarantee the greatest satisfaction of the end user.

In designing interfaces with the customers, RE:Lab defines the most effective interaction strategies appropriate to the context of the final use. UI experts at RE:Lab analyze interfaces to identify weaknesses and potential problems with respect to ISO design guidelines (eg ISO 9241-11).

Thanks to the close cooperation with surrounding economical clusters (more than 300 companies, most of them in the area of automotive, mechatronic and biomedical in one of the richest economic area in Italy) RELA RE:Lab operates in several different industrial domains.

Through its Research and Project Design Department, RE:Lab promotes R&D projects with a strongly innovative approach, an effective governance system, high profile international partnerships and a significant industrial impact. RE:Lab has been involved in several European projects, such as the FP7 MOGENTES, CITYLOG and VERITAS, the H2020 RESOLVE, AUTOMATE and SAFESTRIP, as well as the ARTEMIS/ECSEL projects CAMMI, DESERVE, HOLIDES and PRYSTINE.

4.3. Regional Development Agency Bielsko-Biala

Regional Development Agency was established in 1992 in Bielsko-Biała with the focus on initiating, organizing and supporting the development of the Southern Subregion of Śląskie Voivodeship and its national and foreign promotion. Through its active involvement in regional policy making, business environment creation, business support activities and services, ARRSA gained sufficient experience and has established wide network of cooperation with international, national and regional organizations and authorities, science parks and clusters. From the beginning of its activity, ARRSA has followed global and European trends and news in the scope of innovation, technologies and regional and strategic development. Due to that, in 2014 ARRSA established a FabLab, first fabrication laboratory in the south of Poland with the aim to promote novel, bottom-up approach building on open, technology-driven innovation and acting as an education platform. Throughout the years ARRSA has been developing FabLab with the purchase of new equipment and expanding the range of services offered. FabLab has become a local center of innovation with cutting-edge technologies available for everyone and wide network of contacts and relevant stakeholders concentrated around. On the base of that and following the concept of smart specialisation, digitalization trends and Industry 4.0 principles, ARRSA decided to create a digital innovation hub – a one-stop-shop for innovation, operating not only to raise awareness about cutting-edge technologies among the community, but also to help companies to become more competitive with regard to their business/production processes, products or services using digitalization.

ARRSA ambition is for iLaBB 43300 to become an efficient tool for increasing regional competitiveness by:

- being local innovation center that disseminates cutting edge technologies
- raising awareness of digital fabrication, rapid prototyping and innovative technologies through organising workshops and trainings - educational program, talent creation and competence building
- introducing ideas to the market and transferring them into the product
- merging all parts of local innovation ecosystem, involving new actors and increasing existing innovative potential of the region
- stimulating regional labor market as a competence development center
- enabling companies to follow the Industry 4.0 principles and improve efficiency of their services and products

4.4. Vorarlberg University of Applied Sciences

The Vorarlberg University of Applied Sciences (FHV) is the leading university in the western part of Austria. It was founded in 1994. FHV maintains heterogeneous research departments and performs high quality research in close collaboration with industry/business and governance (within the region of

Vorarlberg and its neighboring regions). Department Business Informatics (BI; former Product- & Process Engineering), partner of the 4Steps project, is active in the field of digital transformation, Industry4.0, Smart Factory and Physical Internet in combination with Manufacturing, Logistics/SCM and ICT. The department BI built up of knowledge and expertise about digitalization within organizations–especially SME's.

Figure 1: Wide range of laboratories of Vorarlberg University of Applied Sciences (FHV)

As depicted in Figure 1, the Vorarlberg University of Applied Sciences (FHV) provides a wide range of laboratories within the field of Industry 4.0 and Digital Transformation (e.g. see pictures below). Primarily, these laboratories are used for student and adult education. However, if an organization is interested in the use of laboratories, FHV creates synergies for academic-organizational cooperation. Fields of investigation are multiple and not only depend on manufacturing but also on ICT, microtechnology, energy, social sciences, human ergonomics, etc.

FHV employs key scientific staff, incl. junior and senior researchers, lecturers and (research) professors, within the pillars of Industry 4.0. Furthermore, FHV tightly collaborates and cooperates with business and industry organizations within the region of Vorarlberg and its neighbouring regions. The Vorarlberg University of Applied Sciences has a strong focus on research and science and pro-actively disseminates research results into lectures with students, adults, organizations, etc. FHV confirms an educational mission within the region of Vorarlberg, FHV maintains and runs bachelor and master programs within the field of Industry 4.0 (e.g. Digital Innovation (Bachelor), Informatics (Bachelor & Master), Business Process Management (Master), etc.). The bachelor course Digital Innovation, for example, is closely linked to the field of business informatics and service system science and to the department Business Informatics.

4.5. DEX Innovation Centre

DEX Innovation Centre (DEX IC) was founded in August 2012 as a non-profit organisation in Liberec, the Czech Republic, based on previous many years research and innovation work under the brand of the Czech DEX company.

DEX Innovation Centre´s mission is until today to "Improve society by ICT related innovation and research".

In the very beginning, DEX IC fields of expertise were Smart and integrated transport, Energy efficiency and Health and Well-being. We operate in all of these industries until today. However, DEX IC also focus on broadband and ICT security, e-solutions, education and entrepreneurship support.

DEX Innovation Centre has conceptualized, initiated, written, managed and implemented more than 20 successful international projects or initiatives. Since 2019, DEX Innovation Centre is also the official and only EIT Health RIS Hub and InnoEnergy Hub in the Czech Republic. Thanks to this activities DEX Innovation Centre helping to discover young and promising talents from the Czech Republic, helping them to grow in the business and innovation field. However, the DEX Innovation Centre has also successfully co-operated with SMEs on a wide range of projects that focus largely on research and innovation development.

4.6. Pannon Business Network Association

PBN was founded in 2006, with the participation of the regional Clusters & Industrial Parks. PBN as a regional business development catalyst aims at strengthening the economic performance of small and medium sized businesses in the Western Hungarian Region. As a leading public economic development organization in the region, the network contributes to the quality of employment and the improvement of the competitiveness of enterprises with the cooperation and networking of the regional stakeholders. PBN - since its foundation - as a regional economic development organization supports micro-, small- and medium-sized enterprises to strengthen economic power in Hungary. High Growth Companies from any sector, mechatronic, machinery, wood and food businesses are the strategic sectors.

Additional task of PBN is to map the opportunities of the founders-with priority to clusters and industrial parks- and to contribute the reinforcement of their operation. PBN is further assisting the economy development of Western Hungary be strengthening international relations and analysis of international practices.

Our association regularly apply the quadruple helix model while developing project ideas and proposals which are driven by strategic approach to international co-operation.

In order to realise our objectives PBN is actively participating in numerous international, EU funded projects with research and business development organisations and with the support of the Hungarian Ministry for National Economy.

Since 2006 PBN has taken part in more than 60 international projects and has contact with more than 500 EU partners. At the moment PBN is managing 20 EU projects, co-financed by Interreg Europe, Central, Danube and H2020 Programs.

With the cooperation of PBN an advanced manufacturing centre, called AM-LAB (PBN's spin-off company) was established in 2017, and since then this laboratory has gained the DIH status.

The am-LAB is a service centre specialized on the application and presentation of most recent manufacturing technologies to develop smart end-user product in strong co-operation with our key customers.

In AM-LAB skilled and motivated multidisciplinary team of economists, engineers, medical staff, sales manager and international project coordinators work together who prefer lifelong learning

Applied physics, sensor technology, modelling, ICT are representing the core technical competencies, while data analysis and visualization, project engineering, ROI calculations of the business perspectives.

Sensor technology applications, polymer printing integration, strong interactions of smart production technologies ensure the smart character of the products and services offered by the aM-LAB team.

Due to cooperation with national institutions PBN supported approx. 300 companies in 2018.

For further information about PBN and AM-LAB please visit the following websites and feel free to contact us!

https://pbn.hu/en/

http://www.amlab.hu/en/index.php

4.7. Chamber of Commerce of Slovenia

CCIS is a non-profit, non-governmental, independent business organisation representing the interest of its members. With over 160 years of tradition, it is the most influential business organisation in Slovenia.

CCIS unites 26 branch associations, representing all important industry sectors of Slovenia, under its roof. CCIS has 13 regional offices in Slovenia. CCIS is composed of branch business associations, regional associations and professional departments. CCIS represents all important industry sectors of Slovenia. The

130 employees of CCIS provide know-how expertise and know-how from various fields vital to the business community. CCIS is partner for the government in preparing legislation and policy strategies. CCIS offers all types of services to companies (especially SME) to support them and create a business-friendly environment. Among support activities to companies, innovation support plays a major role. The innovation support unit offers advice and services to companies to develop new products and services, investigate more efficient processes, or improve productivity. It facilitates access to public research institutions and their services. The team of the innovation support unit helps companies to exploit innovative potential, manage intellectual property and access finance. CCIS is member of the Enterprise Europe Network (EEN). CCIS performs some economic activities on the market to a small extend like rent of rooms, selling of publications, etc.

CCIS is a key partner at national and regional level, offering business and innovation support to companies. It is involved in 8 national strategic partnerships implementing the Slovenian S3, two of them as leader. CCIS is a partner to government for legislation preparation and implementation, with representatives in numerous governmental and other public bodies and organisations. The chamber has included environmental protection in its list of services since the end of the 1970's, resulting in the establishment of a special department in 2002. It is involved in all key environmental topics relevant for the business community, from obligatory, legislative demands to voluntary initiatives and good practice.

CCIS is involved in a wide range of projects on national, cross-border, transnational and EU level. In the last 3 years CCIS participated (lead) more than 10 cross-border projects and participated in 3 transnational projects (Interreg MED & SEE), many CIP actions, COSME, H2020 and FP7, LIFE+, ERASMUS+ and LLP in total more than 30 projects. CCIS coordinated the following: - SI-K Exportcoop (cross-border SI-A), SME support to internationalisation, 2011-2014 - MEET Change (LLP), Skill development in companies, 2012-2014 - KnowME (DG Employment), Knowledge for Metal and Electro Industry, 2014-2015 - skillME (ERASMUS+) Future Skills needs in Metal and Electro industry, 2015-2017. The following projects are particularly relevant to the theme of the 4STEPS project: - IMAGEEN (CIP, CCIS-coordinator), Eco-design for SME manufacturers, budget: 689.697 EUR, 2013-2014 - POLY4EMI (CIP): Polymers for Emerging Industries, 186.743 EUR, 2014 – 2016 - ADRIATinn (IPA Adriatic), Build innovation, cross-border clusters of SMEs and R&D Institutes, 2013 - 2016 CCIS is partner in the recently approved project ICON (under the Central Europe 1st call).

4.8. Virtual Dimension Center

The Virtual Dimension Center (VDC) is Germany's leading competence network for Virtual Engineering. Technology and service providers, users, research institutions and multipliers work together in the VDC network along the entire value chain of Virtual Engineering- namely in 3D- simulation, 3D-visualization, product lifecycle management (PLM), and Virtual Reality (VR). The VDC members gain improved innovation activity and a higher productivity by acquiring additional information and cost advantages. The VDC, located in the Stuttgart Region in the South of Germany, is a non-profit competence and innovation center. Over 100 members and partners of this network are enterprises, universities, research institutions and education

facilities which offer these 3D- technologies or have actively integrated these technologies into their product development process. Special attention is paid to the imbedding of SMEs so as to increase their innovation and competition abilities through technology and knowledge transfer within the network.

5. Partners' competencies/skills (tangible and intangible) and services in the Industry 4.0 pillars

Short and understandable explanation of your skills/competencies in every pillar where you have your competence in 2020.

Note:

- ***Here tangible (Assets & Resources) and/or intangible (competences & assets) shall be described per each pillar where PP has competence***
- ***Services provided by PPs in each pillar shall be also discussed in this chapter***

5.0. Process-oriented support of Chamber of Commerce and Industry of Slovenia

CCIS is independent business organisation representing the interest of its members. The Chamber is not divided after Industry 4.0 pillars, because we are not technologically oriented, but process oriented, but still we are connecting all 9 pillars on horizontal level. CCIS has many competences and skills (tangible and intangible assets) and services for supporting the implementation of Industry 4.0, which we are describing below.

In the piloting phase CCIS will help companies prepare their first digital transformation projects for implementing the industry 4.0.

At the national level, the format of the company's digital strategy is set out in 8 chapters, and that we, as the CCIS, will provide companies with initial knowledge in this area:

- Customer experience
- Data strategy
- Business support processes and digital solutions
- Digitalin business models, products and services
- Strategy for the development of digital staff and jobs
- Digital culture Development Strategy
- Cyber Security
- Industry 4.0

Tangible assets:

Design thinking Lab - is a hub for Innovation and Creativity which offers companies the ideal spatial conditions for creative developments and to make use of the potential of the Design Thinking and also implementation of Industry 4.0. Design thinking is a comprehensive approach to solutions, which stimulates creativity in working groups of participants from different areas. It is an innovating process, which allows the development of new solutions for any given problem. Concepts are created and then revised in various cycles and tested using prototypes. The focus is on users' needs in order to ensure that the final result is tailored to users. This holistic approach with creative solutions enables companies to develop innovations.

Figure 1: Design Thinking Lab (DTL)

Conference centre - Our premises holds facilities for over 600 participants - is equipped with user-friendly equipment: there are multipurpose halls, seminar rooms and meeting rooms of various sizes available, interpretation booth, as well as a hall for special events with a view of Ljubljana Castle and a brainstorming room for project work. In front of the halls the attractive lobby is suitable for catering, socializing and promotional activities.

Figure 2: CCIS Conference Centre

Intangible assets:

Founder of Digital Innovation Hub Slovenia (DIH Slovenia) - is Industry Digital Transformation one-stop-shop in Slovenia and beyond. It creates awareness and provide services to grow digital competencies, share digital experience and case studies locally, regionally and internationally, influence the government to adapt regulation and open its data to foster entrepreneurship.

Through building the network and establishing a sustainable ecosystem at national level, DIH Slovenia aims at connecting and supporting different industrial sectors, providing for a broad spectrum of needs and striving to support all industries that can seize and benefit from the opportunities of digital transformation. DIH Slovenia focuses on supporting the industries that are highlighted as priority ones by Slovene Smart Specialization Strategy (S4), such as: smart cities and communities, smart buildings and smart factories. However, it does not exclude other industries from S4, ranging from high-tech to more traditional ones.

Key initial partners of DIH Slovenia are coming from the S4 specialization platform Smart Factories Cluster, ICT horizontal network (SRIP PMiS), Smart cities and communities, industry (members of above mentioned Smart Factories Cluster, TECOS), universities (University of Ljubljana, University of Maribor) as the largest research organization in Slovenia, SME's supportive environment (Association for Informatics and Telecommunications, Chamber of Commerce and Industry of Slovenia, Technology park Ljubljana (connecting SME and several research institutes for innovation), Smart Factories Cluster, Wood Industry Cluster, IIBA Slovenia Chapter and others.

In-house Branch associations - unites 26 branch associations, representing all important industry sectors of Slovenia, under its roof. The most important ones for implementation 4Steps project are:

- Electronics and Electrical Industry Association: is an independent, voluntary, non-profit, interest association of legal and natural persons engaged in a gainful economic activity in the electronic and electrical industry, related activities and related services. Association is organized to formulate positions and policies towards the social partners, legislative and governmental institutions and other national and international associations in the interest of its members. It provides professional assistance in the form of information, advice, training and the presentation and transmission of proposals.
- Association of Informatics and Telecommunications: The most important task of the association is to increase investments in ICT technologies in the economy and public administration and to improve the business conditions for companies from the ICT sector. We strive to connect the country and ICT companies and cooperate in marketing and launching these solutions abroad. By connecting providers and their solutions, we encourage the joint appearance and marketing of complete solutions in foreign markets. The association acts in accordance with the interests of the ICT companies of the association members and co-creates a business environment (ecosystem) that helps end-users companies leverage ICT technologies and solutions in the most efficient way.

Association is actively promoting and raising awareness of cyber security solutions. Association of Informatics and Telecommunications has also created "Cyber security section". The ambition of the Cyber security section is to integrate and reconcile the interests of cybersecurity consumers and cybersecurity providers. SME companies are joining the Cybersecurity section to avoid addressing cyber security issues on their own and to focus most of their resources on developing their core business and not solving cyber problems. They are assisted by section membership in developing secure solutions, influencing the development of the market in Slovenia and supporting their entry into the global market. By implementing the Work program of the Cyber security section, we are bringing together the economy, the public sector and government institutions and individual experts to jointly develop cyber security capabilities to promote the digital development of the economy.

- Metal Processing Association: is the largest voluntary community of companies in Slovenian metal industry. It is organized in order to formulate positions and requests to the legislative and governmental bodies, to the social partners and other domestic and international organizations in the interest of its members. It carries out activities for enhancing the competitiveness and financial efficiency of its members by organizing joint promotional activities, promoting development and consulting projects, participating in the upgrading of the vocational training system and exercising public authority related to the protection of domestic industrial production.
- Metals and Non-metals Association: is an autonomous, non-political and professional organization that connects companies with the main registered activity of production and processing of metals and non-metals as autonomous members of the association. The association asserts its members' interests in terms of business management, professional development, advancement of work and business, improving their competitiveness in the domestic and foreign markets by forming positions and policies towards social partners, legislative and governmental institutions and other domestic and international associations. The Association provides expert assistance to members in the form of information, advice, training and the presentation and transmission of proposals.
- Transport Association: we ensure long-term successful fulfilment of our members' expectations. Although the association is not a business company, we strive to operate successfully in challenging competitive conditions between various related associations in the market.

In-house sections dealing with relevant topics with digital transformations and Industry 4.0:

- Cyber Security section: the purpose of the section is to bring together the economy, the public sector and government institutions and individual experts to jointly develop cyber security capabilities to contribute to the digital development of the economy. By actively cooperating with all stakeholders in cyber security in the Republic of Slovenia, we encourage the development of cyber capabilities of Slovenian companies, providers and users of services, and contribute to the

overall development of cyber security in the Republic of Slovenia. In the field of cybersecurity, we are actively involved in:

- Raising awareness of the importance of cyber risk management in leading businesses and government bodies.
- Developing the capacity of the cybersecurity competence centre for the needs of business and the public sector.
- Develop the collaboration of cybersecurity service providers, the public sector, service users and professionals.
- Promoting the development of specialist and user skills and enforcing standards and certifications.
- Joint development projects for government programs and specific solutions for SMEs.

- Department of Human Resources Development and Education: we focus on human resource development within Strategic Research and Innovation Partnerships (SRIPs) of Material for final products, Circular economy, ICT and Smart factories – under the umbrella of Slovenian Smart specialization strategy, primarily in the field of competence forecasting and capacity building. We are also cooperating as partners in several national projects, which mainly focus on developing entrepreneurial competences for children and adolescents as well as teachers and Career orientation councillors (mainly elementary and secondary school).
- Technology Development and Innovation department: is the department of technological development and innovation at the CCIS with the program Innovative Slovenia, which is a meeting point for innovative improvements and innovations within the CCIS and an active linker of the innovation ecosystem in Slovenia.

CCIS is one of the main stakeholders in development in development **Smart Specialization Strategy (S4)** - 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.

CCIS is involved in **8 of 9 Strategic Research and Innovation Partnership**: Factories of the Future (FoF), Mobility, Development Materials as end products, Smart Cities and Communities, Smart Buildings and homes (including wood chain), etc.

Business Coaching - national system SPOT - Slovenian Business Point – CCIS is implementing the Slovenian Business Point for Central Slovenia. The aim is to establish a comprehensive system of free state support services for businesses under a single brand. The SPOT system will provide business entities, entrepreneurs and potential entrepreneurs with new and improved electronic services, business consulting, information

and entrepreneurial training services, as well as an extensive range of services in the field of internationalization and foreign investment.

5.0.0 CNA's general contribution in relation with the currently used nine technological pillars in a horizontal way

***Note**: According to CNA's representatives CNA ER doesn't have the internal "vertical" competences for each specific technology but, on the basis of the needs expressed by the companies, we provide the answer/services by searching the appropriate skills within the High Technology Research Network (for which we have attached the image) and within the Network of our certified Advisors.*

CNA Emilia Romagna, in coherence with the National Plan for Industry 4.0 and the directives promoted by the Ministry of Economic Development, supports the companies in the passage towards the new production model of Industry 4.0, through its Digital Innovation Hub: CNA Hub 4.0. The know-how developed in years of collaboration with national and European partners on the themes of innovation and technology transfer has strengthened the role of CNA Emilia Romagna- CNA HUB 4.0 and its capacity to act as facilitator of digital innovation in the Emilia Romagna region, acting as a point of reference for European and regional projects and activities aimed at innovation. CNA HUB 4.0 coordinates a network of 10 Digital Innovation Hubs (DIH) located in the regional area, which offer SMEs tools, services and consultancy within the Industry 4.0 program, starting from an analysis system of the level of technology readiness of small companies able to simplify the identification of TRL.

Through its center for technology transfer and innovation CNA Innovazione, CNA Emilia Romagna actively participates within the High Technology Network, collaborating with Universities, Research Centers, the Enterprise Europe Network, the BI-REX Competence Center and other public and private subjects, to answer in a concrete and qualified way to the needs of the companies requiring external support for research and innovation and for the introduction of the nine key enabling technologies inside their organizations: autonomous robots, simulation, Horizontal and vertical systems integration, Industrial Internet of Things, Cybersecurity, Cloud technologies, Additive manufacturing, Augmented Reality and Big data and analytics.

Below, the map (Figure 4) of research and innovation skills of Emilia Romagna Regions.

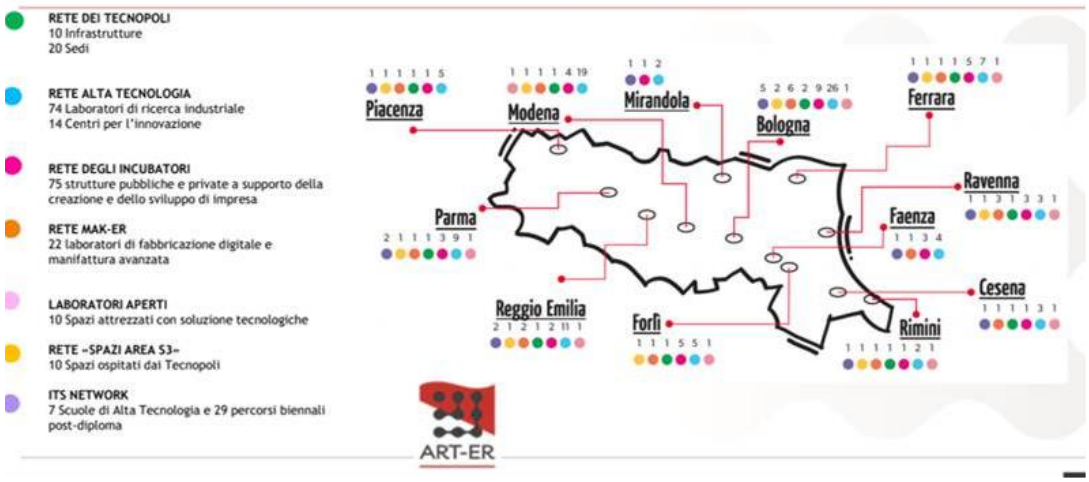


Figure 4: Research and innovation skills of Emilia-Romagna region

5.1. Autonomous robots

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

NOT RELEVANT

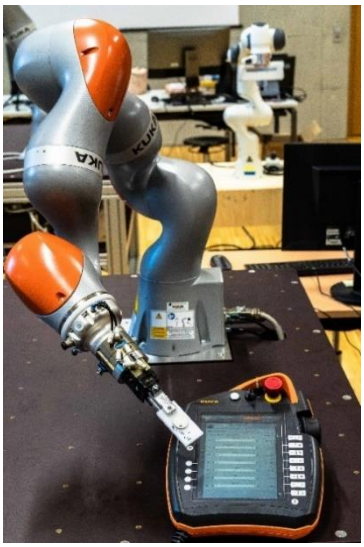
Regional Development Agency Bielsko-Biala

NO INPUT PROVIDED

Vorarlberg University of Applied Sciences

FHV proactively integrates autonomous robots into its scientific curricula and into project work (conducted with business, industry and academia). Students and adults (education) can make use of autonomous robot technology and learn and build up of a sophisticated knowledge base. FHV not only designs and develops software for autonomous robots but also creates new processes and services about the use of this technology in organizations. FHV supports in design and development of new business

models to capitalize the autonomous robot technology for organizations and thus to improve the competitive advantage (of organizations but also of the region). As depicted in below pictures, (Figure 5) FHV maintains a wide range of autonomous robots. Fields of application are, for example, productions, manufacturing, logistics and warehouse, etc.



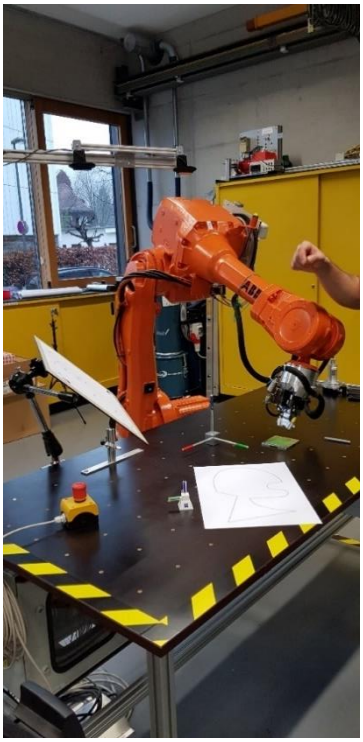


Figure 5: wide range of autonomous robots of FHV

Additionally, FHV runs the “Digital Factory” – a factory equipped with high-level technologies to design and test emergent trends, challenges and technologies. Fields of investigation are, for example:

- Factory and production control
- Data analyses for status reporting (dashboards)
- Predictive maintenance or production and quality optimization
- Automation of production processes and of interlinked business processes
- IT security aspects
- The collaboration of humans and machines
- Methods of digital twins
- The use of virtual and augmented reality
- The networking of machines and plants
- As well as a number of other topics dealing with digitization

On continuous basis, FHV disseminates achieved research results to international competitions. FHV students reach top results and get certified for their activities and efforts (example depicted in Figure 6) .

Figure 6: FHV’s student’s research result

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

PBN has experience and knowledge in the field of autonomous robots, and in this subchapter our tangible and intangible results shall be described.

MIR 100 Autonomous Robot:

PBN (AM-LAB) possesses an AMR (Autonomous Mobile Robot) in our working area, more precisely it is a MIR (Mobile Industrial Robot) 100 type equipped with a hook. AMRs are used to make the internal logistics autonomous in a workplace.

Previously, only AGVs (Automated Guided Vehicles) were the solution for automating internal transport, but AMRs are modern solutions because of numerous capabilities it has. The main characteristics of AMRs that they can navigate itself without using induction tapes, floor markings, and magnets. Instead of wires and reflective markers, they use sensors to map their surroundings and plan their route. Among others, they can avoid the obstacles, it chooses the most optimistic route, new positions and tasks can be easily programmed, and their programming does not require professional skills and can be acquired with ease. They can be controlled by smarthphones, tablet or PC. Because of their modern facilities it can be used safely in a Human-Machine environment, and their programs can be easily modified and expanded.

The main features of the MIR 100 type are the followings:

- Liftable weight: 100 kg
- Towable weight: 300 kg
- Accuracy: +- 50 mm difference from the position; +-10 mm difference from the docking station
- Maximum speed: 1,5 m/s
- Maximum speed backwards: 0,3 m/s
- Weight: 62,5 kg
- Operating time: 10 hours
- Battery charging: within 2 hours
- Communication: Wi-Fi, Bluetooth, Ethernet, PLC

Figure 7: MIR 100 type of Autonomous Robot belongs to PBN's DIH (AM-LAB) machine park

In AM-LAB skilled robotics technicians are dealing with development of Mir 100 in order to integrate it with other hardware solutions, in order to make the internal logistics as autonomous as possible.

Universal Robot 3 Collaborative Robot:

Besides the MIR 100 Autonomous Robot, PBN (AM-Lab) has also purchased a collaborative robot as well. Due to the rapid growth of the technology, more and more collaborative robots appeared, and currently, in the era of Industry 4.0, these robots play important roles, and they are key actors in production. Collaborative robots were invented to help human employees mainly in the automotive sector where Human-Machine interaction is already an ordinary situation. In general, collaborative robots are able to collect data which can be shared and analysed. Thanks to the collected data, the efficiency of the production might be increased, and in parallel, with predictive maintenance, the number of malfunctions might be decreased, also contributing to the reduction of failures.

Universal Robot (UR) belongs to one of the best players on the market when it comes to collaborative robotics. PBN (AM-LAB) has a UR 3 type collaborative robot. The aim of UR is to provide an affordable solution for automation for small and medium-sized businesses.

The main characteristics of our UR 3 are the followings:

- Radius: 1300 mm
- Loading Capacity: 10 kg

- Floorspace: 190 mm
- Weight: 10kg

Figure 8: UR 3 collaborative robot belongs to PBN's DIH (AM-LAB) machine park

The professional and experienced engineering staff of PBN, develop the automated processes with unique 3D printed applications. The aim of PBN's qualified engineers is to integrate this collaborative robot into the autonomous logistics chain with the help of PLC programming. These collaborative robots might serve productions data, which might be also contributing to production efficiency.

DJI Mavic2 Pro Drone:

The stock management system can be automated based on Industry 4.0 and digital solutions. Apart from MIR 200 and UR3, a drone (a flying autonomous robot) belongs to our machine park as well. This drone can be also considered as an item in an autonomous logistic centre. The engineers of PBN are currently working on the solution that the indoor drone to be capable of independent navigation, take pictures and video

Figure 9: DJI Mavic2 Pro Drone belongs to PBN's DIH (AM-LAB) machine park

records, reading and transmitting data from various identifiers into the common dataset, corporate governance information system of the company.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

Robots are available for measuring tracking of VR systems at the VDC.

5.2 Simulation:

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

3D scanning:

FabLab Bielsko-Biała which is run by RDA is a fabrication laboratory equipped with the cutting-edge technologies related to Industry 4.0.

One of the services that we are able to offer is 3D scanning which can be used in rapid prototyping, quality control and reverse engineering.

Figure 10: 3D scanning is available at ARRSA's FabLAB

1. **SMARTTECH3D UNIVERSE** - a mobile 3D scanner that combines high precision geometric measurements with the ability to realistically scan the color of texture necessary for digitizing objects. It is a complete hardware - software solution allowing the creation of 3D documentation of any objects and the processing of measurement results, e.g. for 3D printing. The scanner is ideally suited as a measurement tool in both technical and natural sectors.

In FabLab Bielsko-Biała we are using it especially for showcasing on different events and workshops with the purpose of promotion Industry 4.0 technologies, often in cooperation with local universities or local companies operating in similar technologies (will be described in further sections).

Figure 11. 3D scanner is available at ARRSA's FabLAB

2. **3D Systems Sense**, thanks to its small size and, consequently, mobility, makes it possible to create a digital spatial model of any object located in our surroundings. Together with the included software it allows to prepare a scanned model for a 3D printer.

   In FabLab Bielsko-Biała it is usually used for the training purposes and showcasing its possibilities to children and young people. We have created a training program for local schools, which part is dedicated to the process of 3D scanning, showing the equipment, its possibilities and raising awareness of how it could be used.

Figure 12: 3D Systems Sense is available at ARRSA's FabLAB

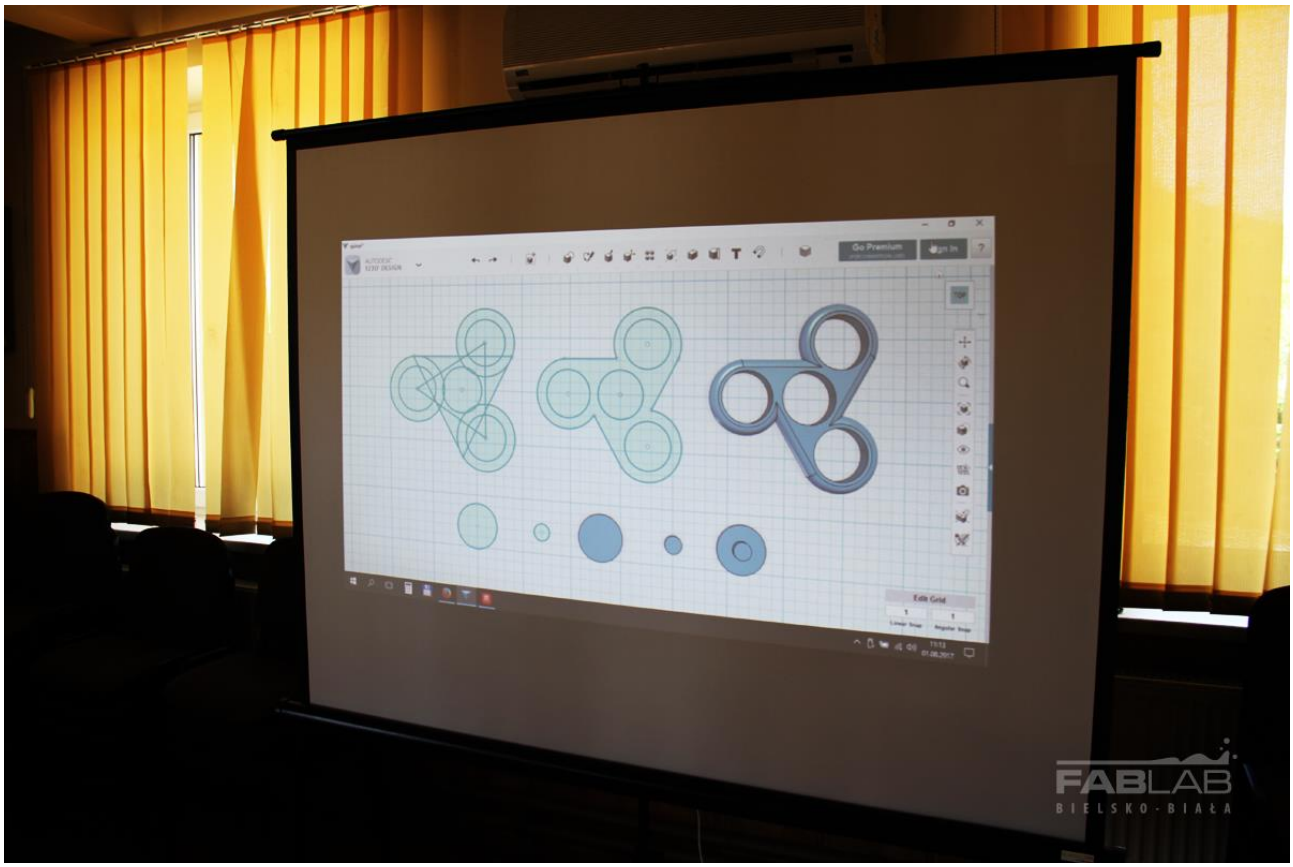
3. **Structure Sensor** is a project that made its debut on Kickstarter, where it managed to raise the required $100,000 in just 3.5 h. It is a small device adapted by default to work with Apple tablets. In our lab we use it with iPad Air 2 and thanks to its mobility and ease of use it allows you to scan objects, map rooms and even have fun in augmented reality.

   As mentioned in p. 2 – small 3D scanners are usually used in educational and raising awareness activities.

Figure 13: Structure Sensor is available at ARRSA's FabLAb

3D modelling

3D modelling and rapid prototyping – with 3D fabrication, post processing, offering program and integration of electronics prototypes. On the base of our FabLab we have provided numerous consultations, services and trainings. Until now vast majority of those were provided for free, and mostly for children, youth and students in the form of basic level workshops. We would like to extend both our target groups as well as range of the activities. Beside the education area, we would like to work with the entrepreneurship sector and not only in terms of free workshops but also by providing services and become a R&D base for local companies and enable them access to cutting-edge technologies and testing laboratory for their prototypes.


FABLAB
BIELSKO-BIAŁA

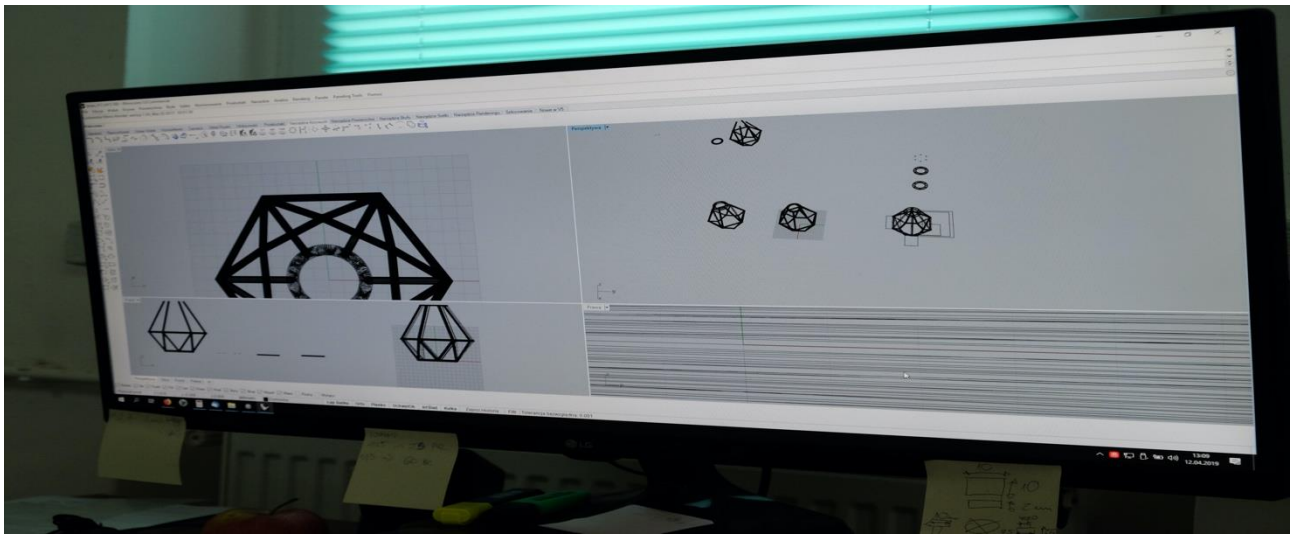


Figure 14: ARRSA's 3D modelling solutions

Having those technologies in house, with relation to the 3D printing described above, we can offer a complex service of simulation of products and processes.

Vorarlberg University of Applied Sciences

FHV, especially its team "artificial intelligence" (in the department Business Informatics), proactively works on simulation and optimization. This team, composed of mathematicians, informaticians and engineers, performs intra-organizational projects in close collaboration with local business and industry. In the centre of research investigation are the application of machine learning methods, detection, evaluation and prognosis, quality management and risk analysis, product and service personalization, use of simulation and optimization methods, modelling, process / design optimization, use of Distributed Execution Framework (DEF), environment for parallel and distributed computing. Additional, within this pillar, FHV runs the Josef Ressel Zentrum: an academic cooperation platform with business and industry to applied research within the fields of

- Machine learning methods - recognition, evaluation and prognosis - quality management and risk analyses
- product and service personalisation - use of simulation and optimisation methods - modelling - process / design optimization
- use of Distributed Execution Framework (DEF) - environment for parallel and distributed computing

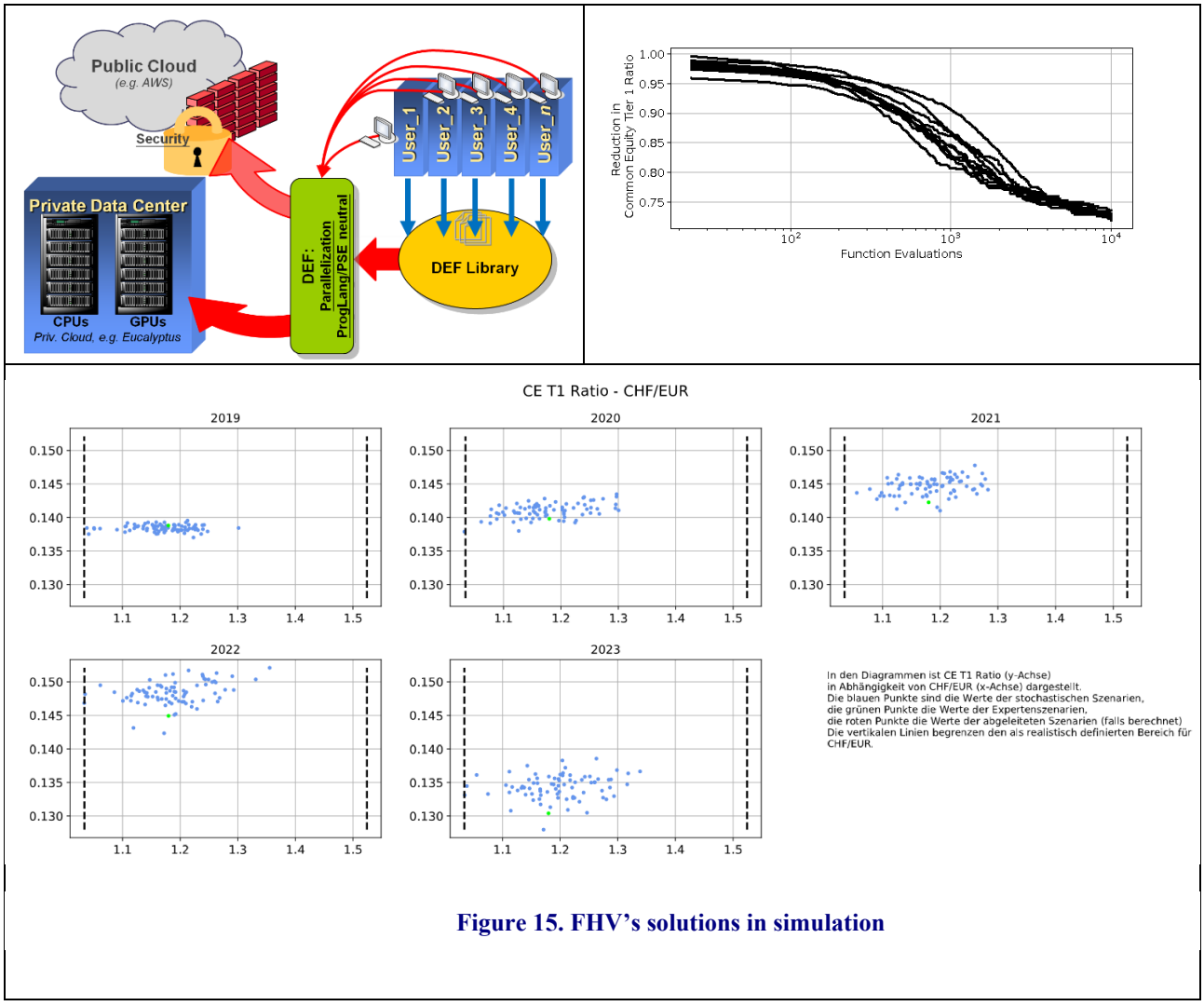


Figure 15. FHV's solutions in simulation

Within the pillar "simulation" many scholarly papers have been submitted to well-known scientific conferences and published in academic journals.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

The multidisciplinary science team of PBN is constantly monitoring the latest and leading softwares and technologies on the market, in order to extend the technical knowledge and to up-to-date and can communicate the recent results to our partners.

Modelling:

Due to the market leader model softwares, we are capable of realise non-conventional and creative product design in a cost-efficient way. The experienced engineer staff of PBN, is using- among-others Cinema 4D, and Visual Components 3D simulation and visualisation softwares.

Due to these softwares the shop floor or the production line of a company /factory can be simulated. In addition, these professional softwares, like Cinema 4D give the opportunity to present a product in a cost-efficient, unique, and special innovative way.

3D scanner:

PBN possesses this world-class device which offers cost-efficient digitalization solution for rapid prototyping. Main components are non-destructive material testing, digitization of objects and 3D-file from the observed surface.

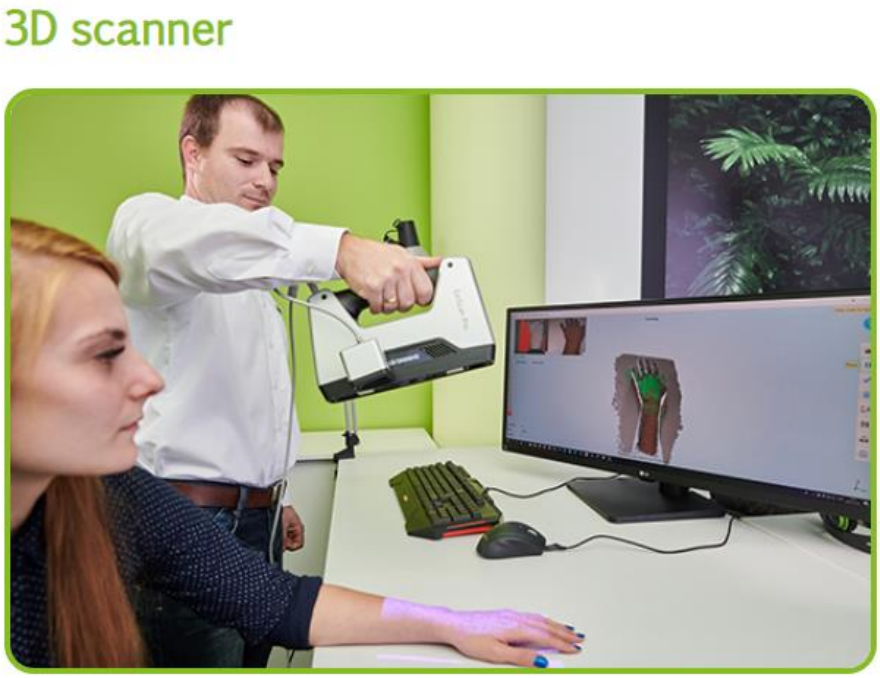


Figure 16: 3D scanner is available at PBN's DIH (AM-LAB)

Digital twinning:

When it comes to simulation, we have to mention the digital twinning as on of our competence, however the experience in this field is limited. Maximised production capacity, real time simulation of manufacturing, integration into a new machine into the production line and design a new shop floor are equally enabled by digital twinning.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

In the past VDC organized numerous simulation events for different industrial sectors. Many members of VDC are offering or using simulation software, in fields like product development or production planning.

VDC is consulting companies regarding use cases for and trends in augmented reality.

One of VDC services is hardware assessment, in which new hardware solutions, necessary for simulation and virtual reality, are evaluated.

The VDC has published whitepapers including simulation topics (e.g. for commercial vehicles) and several Simulation One Pager, which show best-practice approaches to the topic.

The VDC has a Democenter, including a Powerwall, an L-projection and several Head Mounted Displays, where simulation solutions can be presented to visitors and delegations.

Figure 17: Hardware Assessment solutions at VDC

Hardware Assessment:

A wide-angle and high-speed cameras for measuring the field of view and image quality are available.: Field of view measurements were carried out on 18 HMDSs, documented and compared with the manufacturer's information.

A suitable device was built to measure the weight distribution of an HMD on the head.

Result: Measurements of the weight distribution were carried out on 18 HMDs, documented and compared with the manufacturer's information.

Figure 18: Pictures taken at XR Expo 2019

5.3. Horizontal and vertical systems integration

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INPUT PROVIDED

Vorarlberg University of Applied Sciences

FHV proactively works on horizontal and vertical system integration projects. For example, FHV is project partner in Interreg IBH "KMUdigital" – an international project that aims to boost the industrial digitalization within extended enterprise network. The lab's objectives are, for example, to increase the attractiveness of the region, to increase the capacity for research and innovation, to extend cross-border cooperation between enterprises and science and to create competence clusters. Additionally, it aims to improve the skills of skilled workers and attracting new skilled workers. In the sub-project i4production, FHV discussed, designed and developed an extended manufacturing enterprise wherein information and IT resources are in seamless exchange. It aimed to create an international networked process map 4.0 with the integration of three showground factories at three different locations. In the centre of investigation was the design, production, logistics and supply chain management of a car, which is depicted in below picture. The challenge was to horizontally and vertically integrate different IT systems and machines for a seamless exchange of data and information.

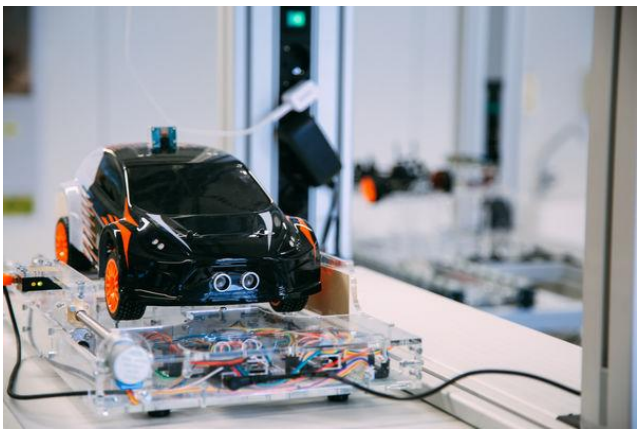


Figure 19: FHV's solution for horizontal and vertical integration

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

As far as the horizontal and vertical system integration pillar is concerned, the aim of PBN is to integrate all data, gained from the available mentioned machines at the different pillars, into a common system.

These data might be used in one production line, and the utilization of the gained (real-time) data might contribute to the lower number of malfunctions, and might result in a more (cost)efficient production

In the integrated dataset, every kind of data will have to be analysed and compared with the other data, as well as with the historic ones.

According to the statistics, it can be unequivocally stated that a big demand is shown towards the integrated dataset, therefore, we are endeavouring to reach this result.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

5.4. Industrial Internet of Things

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

RE:Lab is active in the IoT domain, both developing products and participating in R&D projects. Among its expertise:

- RE:Lab has developed the **DQuid technology** an Internet of Things connectivity platform that provides tools which allow remote control of various connected objects (e.g. information and functions of a vehicle, household products) via the App. The main tools of the technology are: DQuid Stack and DQuid SDK. DQuid Stack is a software library that can be integrated into the electronic component of an object to be connected. It allows the exchange of data from the object to the application that integrates the DQuid SDK in a secure and optimized way for the transmission channel (e.g. Bluetooth, BLE, WiFi). The DQuid SDK (Software Development Kit) gives developers the tools they need to use object data and display them through the app (see: http://www.dquid.com/)

Figure 20: Internet of things connectivity platform (DQuid technology) developed by RE:LAB

- RE:Lab has participated in the RESOLVE project (funded by the European Union's Horizon 2020 Research and Innovation Programme), which aimed at making Electric Light Vehicles (ELVs) a concrete alternative for everyday urban mobility. The project intended to favour the uptake of ELVs

while removing existing barriers. Coherently, its objectives are to reduce manufacturing costs for ELVs, to improve their energy efficiency and to optimize driver experience. The project results are shown using two demonstrator vehicles developed within the project under the leadership of Piaggio and KTM. A personalised App was developed in the project, using DQuid connectivity platform (see: http://www.resolve-project.eu/)

Figure 21: ELVs related to RE:LAB's RESOLVE project

- RE:Lab participates in the SAFE STRIP project (funded by the European Union's Horizon 2020 Research and Innovation Programme), which introduces an innovative technology integrating C-ITS (Cooperative Intelligent Transport System) applications within existing infrastructure, including I2V and V2I communication and VMS/VSL functions into low-cost strips embedded in the road pavement. These strips support Intelligent Transport System (ITS) services and apps, since they provide personalized messages for all road users (trucks, cars, pedestrians, cyclists and motorcyclists) and all generations of vehicles (autonomous, equipped with C-ITS systems, non equipped). This technology has low maintenance costs, it is fully reusable and it contains value added services, while also supporting predictive functions for road maintenance.

- RE:Lab participated in the JUMP project (financed by the POR-FESR 2014-2020, Axis 1, Action 1.2.2), which worked towards the realization and testing of a smart force platform which can provide information and analyze performance (e.g. in the healthcare, sports or education fields) thanks to the use of cameras and sensors. The force platform is covered in a highly versatile pavement which is adaptable to different surfaces in terms of type and dimension. It can be used in several leisure or educational activities, whenever data on active users need to be collected. The material covering the platform makes it invisible to the user, who can then move freely without being influenced by intrusive technology. Thanks to the tracking sensors and cameras, the smart platform collects and processes information which can be visualized on an app and on other communication systems based on effective, ergonomic and usable User Interfaces (see http://www.jump-project.it/)

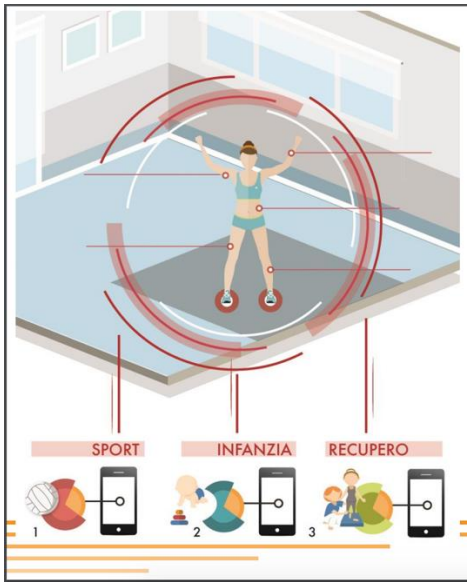


Figure 21: Application related to RE:LAB's JUMP project

Regional Development Agency Bielsko-Biala

NO INPUT PROVIDED

Vorarlberg University of Applied Sciences

Understanding of socio-economic and technical questions that arise in Blockchain-based systems requires novel data-driven methods, services and tools. FHV started to explore and exploit Blockchain Technology in Industry 4.0 and the (industrial) Internet of Things. The convergence of Blockchain with emerging technologies in I4.0 and IoT such as semantic database solutions, machine learning, cloud

manufacturing, 3D printing and machine-to-machine are at the center of the activities. The is to investigate, and develop scalable data science methods, tools and services that contribute to a better understanding of the structure and dynamics of Blockchain based ecosystems and environments. Additionally, activities and efforts at FHV addresses the economic potentials and problems of this new paradigm. The area will study economic questions that arise in any peer-to-peer system and investigate DLT based decentralized business models in specific application domains. Blockchain & similar distributed ledger technology (DLT) has the potential to fundamentally disrupt the current economic system by enabling the replacement of intermediaries by trust less peer-to-peer systems for value exchange. An ongoing project, wherein FHV is project partner is the 'Austrian Blockchain Centre'.

DEX Innovation Centre

In the case of the industrial Internet of Things, the digital innovation hub offers complete equipment for creating devices based on the meaning of the Internet of Things. DIH offers a variety of devices that are needed to build your own smart devices. Specifically, it is possible to find equipment such as computer programs, a printer for printed circuits (Voltera v-one), but also tools for their programming. Other equipment such as solders, drills, gauges, oscilloscopes and other necessary equipment for assembly are included.

With all the equipment already available, it is possible to create simple but more complex IOT devices.

Currently it is possible to use DIH in the form of renting space and equipment to provide complete equipment for prototyping and refurbishing. At the same time, it is possible to have some components, such as printed circuit boards, created based on the supplied data.

Offered services:

- Production of printed circuit boards.
- Space and equipment rental
- Technical support

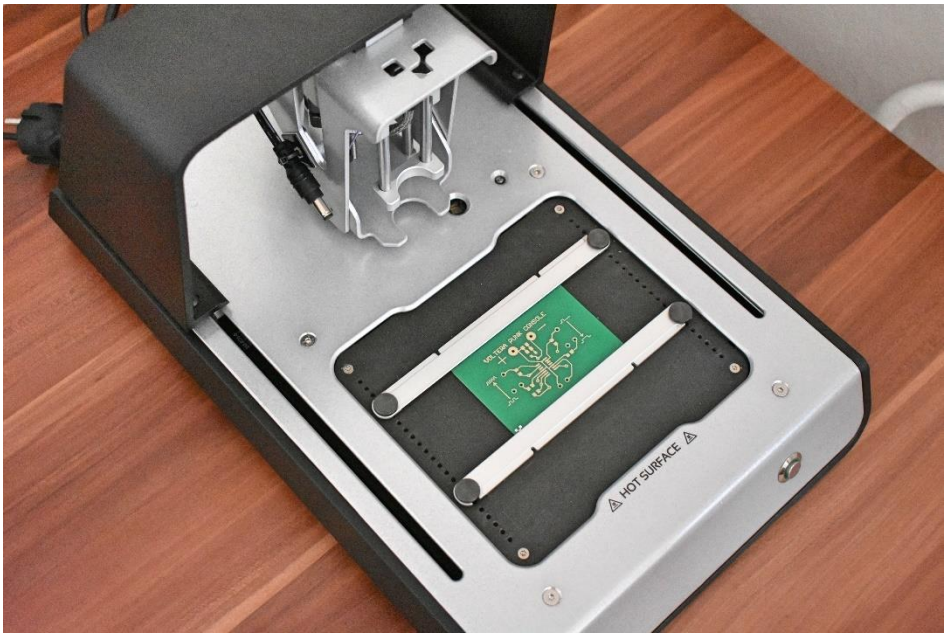


Figure 22: DEXIC solution in Industrial IoT

Pannon Business Network Association

Our association is dealing with the topic of Industrial Internet of things, and the following subchapter shall describe the way.

Our currently available 3D printers (detailed in section 5.7) are equipped with sensors which are measuring different features, like temperature, humidity, weight and other factors which might influence the quality of the product, produced by the 3D printer.

These data appear in a mySQL data base, and the most relevant and appropriate data have to be analysed from the database in order to determine whether the above mentioned factors (temperature, humidity…) influence the quality of the product or not.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

5.5. Cybersecurity

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

Cybersecurity does not belong to the priority areas of ARRSA, we are not dealing with this Industry 4.0 pillar.

Vorarlberg University of Applied Sciences

Since cybersecurity is one of the most important issues in the digital world, FHV not only educates students and adults about the threats in digitalization but also offer a qualification network about cybersecurity. This network aims at two fundamental prerequisites of the digital transformation, namely the guarantee of the security of information technology systems on the one hand and the necessary qualification of employees on the other. The modular structure of this network allows the practical application of the contents: the network can meet the requirements of network partners in the best possible way. In close relationship with regional business and industry, interested stakeholders can take advantage of tailored and targeted workshops and seminars within this qualification network.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

The topic of cybersecurity is not relevant from PBN side, we are not focusing on this Industry 4.0 pillar.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

5.6. Cloud technologies

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

Cloud technologies do not belong to the priority areas of ARRSA, we are not dealing with this Industry 4.0 pillar.

Vorarlberg University of Applied Sciences

NO INFO PROVIDED

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

Cloud technologies do not belong to the priority areas of PBN, we are not dealing with this Industry 4.0 pillar.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

Network emulator is available for testing distributed virtual work environments at the VDC.

5.7. Additive manufacturing

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

RE:Lab participates in the SUPER Craft project (financed by the POR-FESR 2014-2020, Axis 1, Action 1.2.2), which aims at developing a B2B platform capable to offer online tools and services for the use of emerging and enabling technologies, in the field of evolved design and digital crafts. The project's objective is to promote the processes of tailoring and personalization of products, through the use of additive technologies and digital manufacturing (see: https://www.supercraft.it).

RE:Lab has also a direct expertise, offered as a service, in quick and early prototyping. More in details, RE:Lab develops incremental prototypes (with toolchains such as Qt, Kanzi, and Altia) able to evolve until becoming the final product. Starting from the specifications and the graphic components, RE:Lab implements the logical HMI flows and functionalities up to the development of a prototype software that highlights the innovative functions of the concept shared with the customer, who, in this way, can test and validate the solution directly on the target platform.

Regional Development Agency Bielsko-Biala

Additive manufacturing is the most relevant Industry 4.0 pillar for ARRSA. Since 2014 we are running FabLab Bielsko-Biała – fabrication laboratory which is focused on 3D printing and rapid prototyping technologies. Our main scope of activities is education and raising awareness in terms of the possibilities of this cutting-edge technology. We are organising various training programs, open days and other events for different groups of stakeholders, especially young people and education sector, but also for business environment as well as general community.

Regarding technical aspects of our equipment, in our FabLab we have now 5 3D printers, operating in two basic technologies: FDM and SLA. The first is one of the most popular technology, that allows to create low cost prototypes, as well as more advanced objects and small series of products. With the second, as it is more accurate technology, we can show how 3D printing can be used in more precise industries such as the jewellery or medicine.

The machine park of our FabLab includes:

1. **MakerBot Replicator +** uses FDM (Fused Deposition Modeling) technology. The device was developed for fast and accurate prints. The working area is 295 x 195 x 165 mm and the layer resolution is from 100 to 400 microns. MakerBot Replicator+ is equipped with a built-in camera for remote viewing of the printing process on a computer or phone screen. Control the operation of the device with MakerBot Print software or remotely on your phone with MakerBot Mobile application. Flex Build Plate provides better adhesion of the initial layers to the platform. It makes it easier to remove the finished model from the work table without using tools, which eliminates the risk of damage. Convenient file transfer - Uploading projects for printing via Wi-Fi, USB, Ethernet or USB. Store files on the built-in 1 GB hard drive.

Figure 23: MakerBot Replicator belongs to ARRSA's FabLab machine park

2. **MakerBot Replicator 2X** also uses FDM technology, but thanks to the double print head it allows to print in two different colors at the same time. Thanks to the use of a heated table and closed chamber, it enables printing from ABS material. The working area is 250 x 160 x 150 mm and the layer resolution is from 100 to 340 microns. A full-featured desktop 3D printer with experimental dual extrusion that is optimized for printing with MakerBot ABS Filament. It allows to create professional-quality, high-resolution prototypes and complex models and print in two colours through precisely aligned dual nozzles, without swapping filament or pausing your print.

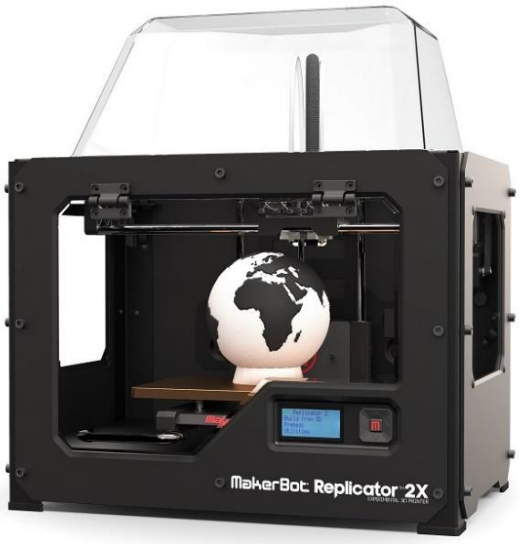


Figure 24: MakerBot Replicator 2X belongs to ARRSA's FabLab machine park

3. **MakerBot Z18** is the largest of our FDM printers. Due to its size, it is a device for creating large-size models. Thanks to a tight, heated chamber, it ensures excellent quality even with many hours of printing. The working area is 305 x 305 x 457 mm and the layer resolution is from 100 to 400 microns. The 3.5-inch LCD colour display, USB, Wi-Fi and Ethernet connectivity sets a new standard for 3D printers.

Figure 25: MakerBot Z18 belongs to ARRSA's FabLab machine park

4. **Tronxy X3S FDM** - DIY-type printers with a large working area. It is made of aluminum profiles. The printer is easy to modify, which allows to improve and adapt it to your needs. Electronics uses Atmega processor and Marlin software allowing to make changes from Arduino IDE programming environment. Working area is 300 x 300 x 420 mm and the resolution of layers is from 100 to 320 microns.

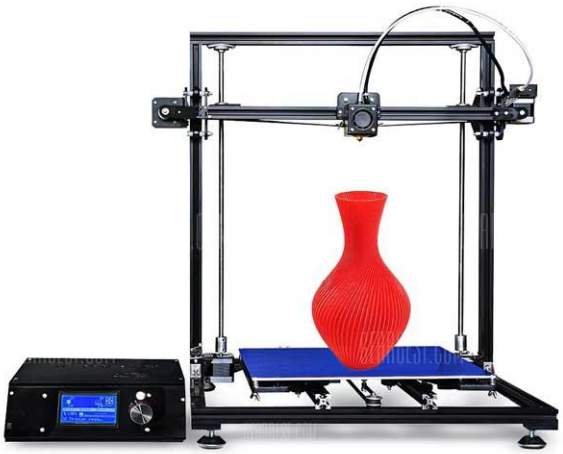


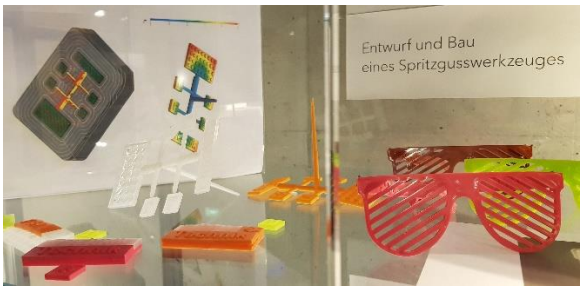
Figure 26: Tronxy X3S FDM belongs to ARRSA's FabLab machine park

5. **Formlabs Form 2** uses stereolithography (SLA) technology to create precise prints in the highest quality. SLA technology is based on curing a liquid resin using laser light. Thanks to innovative technological solutions we can achieve precision up to 25 micrometers. Such a layer height means dimensional accuracy and smoothness of the surface, which cannot be achieved by other 3D printing methods. Working area is 145 x 145 x 175 mm.

Figure 27: Formlabs Form 2 belongs to ARRSA's FabLab machine park

Vorarlberg University of Applied Sciences

FHV pro-actively makes use of 3D printing. 3D printing is driving digitization in production, but also requires improved management of product and process information to ensure confidence and quality in the changing product lifecycle and to help minimize risk in the value chain. These challenges are particularly great when the cooperation partners in digital production pursue different interests and are located in different countries and thus in different legal, political, economic and cultural areas. The 3D printers of FHV are used for student- and adult education. As depicted in below pictures, (Figure 28) FHV maintains advanced knowledge about 3D printing technology and the heterogenous materials to use.



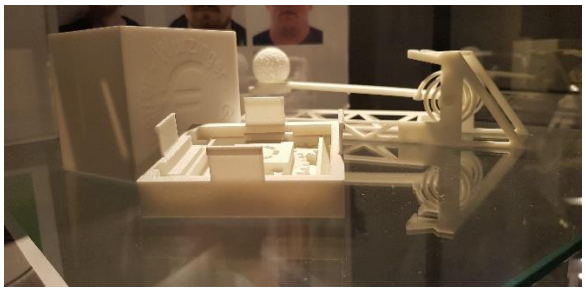


Figure 28: FHV maintains advanced knowledge about 3D printing technology and the heterogenous materials to use.

FHV is equipped with several 3D printers. Students and interested project partners (from business, industry and academia) can make use of these machines.

Figure 29: FHV is equipped with several 3D printers

DEX Innovation Centre

The widest range of equipment offered by DIH is 3D printers. DIH currently offers 4 simple FDM 3D printers from the most successful Czech manufacturer Josef Průša, but also from other manufacturers. In addition, DIH offers a very advanced SLS printer from Sinterit (Sinterit LISA SLS). Various dust materials can be used in this machine, ranging from solid metals such as titanium to structural plastics such as polyamide 12.

FDM printers can create almost any geometry and their range of applications is as wide as possible. Most suitable for end component hardening.

SLS printing, which DIH also offers, has the advantage of excellent print homogeneity and excellent mechanical properties compared to most competing plastics printing methods. It is therefore suitable for the production of functional parts.

In this case, DIH also works with the experience we have gained through workshops focused on the development of digital and entrepreneurial skills that have been realized for university students.

Offered services:

- 3D printing according to your own design
- Space and equipment rental
- Technical support


DEXIC
µFabLab
powered by Interreg Danube
Technologická dílna pro vývoj prototypů v centru Liberce
3D tisk
PCB
Robotizace
IoT

Figure 30: Additive manufacturing solutions at DEX IC

Pannon Business Network Association

Among the nine Industry 4.0. technological pillars, one of our top priority is additive manufacturing, and the related technologies and developments are being constantly monitored and followed by PBN (AM-LAB) technical staff. The goal is the integration of the additive manufacturing – based on wide spectrum of polymer printers and expertise - into the research and development, prototype production and into mass customized manufacturing.

When it comes to 3D printer technologies, several technologies can be differentiated, but basically two groups exist, the metal-based printing and the polimer based printing. Within them further significant printing technologies exist on the market.

In the followings, 3D printers shall be presented and detailed which belong to the machine park of our company.

The engineering staff of PBN are permanently using the below listed printers, in order to update their knowledge and experience how to use them in the most efficient and comfortable way.

Name of 3D printer: Ultimaker 3 Extended

- Technology: FDM (Fused deposition modeling)
- Building speed: 20 mm3/h
- Number of supported materials: 7
- Weight: 18kg
- Power: 0,221 kW
- Maximum Printing temperature: 280 C°
- Material recognition with NFC technology
- Equipped with: USB port, WI-FI/ LAN, integrated kamera
- Manufacturer: Ultimaker

Figure 31: Ultimaker 3 Extended belongs to PBN's DIH (AM-LAB) machine park

Name of 3D printer: Extreme Builder 1000

- Technology: FDM (Fused deposition modeling)
- Building speed: 18 mm3/h
- Number of supported materials: 8

- Weight: 220kg
- Power: 2200 kW
- Equipped with: SD card, WI-fi connection
- Manufacturer: Builder

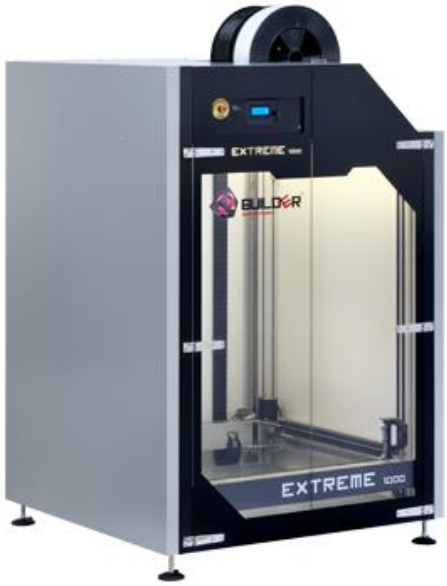


Figure 32: Extreme Builder 1000 belongs to PBN's DIH (AM-LAB) machine park

Name of 3D printer: Prusa i3 MK2

- Technology: FDM (Fused deposition modeling)
- Building speed: 18 mm3/h
- Number of supported materials: 15
- Weight: 7kg
- Power: 0,110 kW
- Manufacturer: Joseph Prusa

Figure 33: Prusa i3 MK2 belongs to PBN's DIH (AM-LAB) machine park

Name of 3D printer: Formlabs Form 2

- Technology: SLA (Stereolithography)
- Building speed: 24 mm3/h
- Number of supported materials: 11
- Weight: 13kg
- Power: 0,065 kW
- Manufacturer: Formlabs

Figure 34.: Formlabs Form 2 belongs to PBN's DIH (AM-LAB) machine park

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

5.8. Augmented Reality

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

RE:Lab is active in the area of Augmented Reality especially for the valorization of Cultural Heritage. Among its projects:

- RE:Lab has collaborated to the project of the Museo della Città (City Museum) of Rovereto (Northern Italy), with the design and development of apps and digital stations, accordingly to the curatorial set-up. The technologies used in such stations allow the visitor to enhance and enrich their fruition

of the work of art, living an experience where knowledge and information merge with the real and virtual world. The artistic heritage from the past dialogues with technologies of the present, disclosing new meanings and possibilities of sharing and interpretation for the user. In addition to the digital stations, visitors are equipped with a tablet with the app implemented, where you can choose through hashtags the theme of interest and the running time for the exhibitions. See: http://www.fondazionemcr.it/museo_della_citta

- RE:Lab has developed the technologies for the Suoni per Vedere (Sounds to see) exhibition at the Museum of Bolzano (2014), a system based on the eye-tracking technology for the visitor. As soon as the visitors in front of a painting and wearing a wireless headset close their eyes, as a result of the detection of this movement, the user receives a wireless 3D music content specifically related to such piece of art. RE:Lab has developed the technology for the recognition of eye movements as interaction, the technology for the wireless delivery of 3D sound and the whole setting for receiving this information

Figure 35: RE:LAB developed tchnology for AR (Suoni per Vedere)

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV uses augmented reality for a virtual tour. Users can look around and move from point to point in a 360° field of view. Interactive information elements can also be integrated. The immersive effect of such a tour depends, among other things, on how natural the navigation feels and whether the available computer power also allows fluid representations of movements. For this reason, various technologies are used, such as Head-Mounted Display with motion and position sensors or classic computer input devices and screens. In the course of this project, a virtual clean room will be created and made

accessible in order to subsequently test its effectiveness for various applications. FHV's use case is about clean rooms, which can only be entered under certain conditions (e.g. with protective clothing), an inspection in virtual reality is useful.

Additionally, within the project BIFOCAlps, FHV tested augmented reality and virtual reality in manufacturing. Based on a Porsche model, FHV tested product and process features, as depicted in below pictures.

Figure 36: FHV's solution for AR and VR

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

Augmented Reality can be considered as one of the most significant pillars in the priority of our company. The key actors in AR technologies are Meta and Microsoft Hololens, but among them **Microsoft Hololens provides the market leader solution in the field of Augmented Reality.**

Microsoft Hololens 1

PBN possesses a Microsoft Hololens type, and due to that we are visualising prototypes, production lines in virtual dimension. This technology can be applied either during the planning, engineering phases, for marketing objectives or for experience-based training.

The main characteristics of the Hololens are listed below:

- HoloLens is a full-featured AR device, equipped with an onboard computer
- Appeared on market in 2016, and since than it has been providing unique services
- The device is capable of voice and gesture control.
- It integrates virtual space with on-board sensors into a recognized physical space, thereby creating a mixed-reality.

The development of Hololens requires a complex knowledge of softwares and our technical staff is continuously acquiring the recent skills how to develop it. The modelling software can be Cinema 4D, 3D Studio, Maya etc… and the technical staff of PBN is permanently expanding their knowledge in these softwares. HoloLens also requires programming skills, so the engineers have also update their knowledge in numerous softwares in order they can use the HoloLens in a confident way, and can present it to companies and other stakeholders. With the help of HoloLens the data can be viewed and presented uing AR technology

Figure 37: Microsoft Hololens 1 belongs to PBN's DIH (AM-LAB) machine park

Smart phone application developed in Unity, using AR technology

Apart from HoloLens, the technical staff developed an application which shows the 3D printer parameters (running time, temperature..) in real time using Augmented Reality technology. The data of the 3D printer are gained from a mySQL data base. These data are transmitted to the application using a PHP script. The application has been developed in Unity, and the program written in this platform is advantageous, since it is compatible with iOS and Android as well as with the HoloLens too.

Microsoft Hololens 2

In autumn 2019 the Microsoft HoloLens 2 appeared on market and PBN managed to purchase one, so now the new version also belongs to the machine park. Similarly to Microsoft HoloLens 1, the technical staff will learn to use and apply the connected softwares, and then this brand new tool, might be also presented to relevant stakeholders.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

VDC is consulting companies regarding use cases for and trends in augmented reality. VDC organizes a working group for smart glasses. Participants are technology users and software developers. VDC is also organising specific exhibitions on augmented reality topics and smart glasses. The VDC service hardware assessment includes also augmented reality hardware.

5.9. Big data and analytics

CNA

No separate input provided (general info can be read in Chapter 5.0.0)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INPUT PROVIDED

Vorarlberg University of Applied Sciences

FHV runs several projects (e.g. KMU Data Science) in the field of big data and analytics and heterogenous employs researchers within this field (e.g. statisticians, information system engineers, quantitative researchers, etc.). Based on experience and research, FHV can fall back on a huge expertise and knowledge within this field. Results out of big data and analytics are used for simulation and optimization – thus the innovation (of services, products, processes, etc.) based on quantitative data.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

Big data and analytics do not belong to the main priorities of PBN, however, partly we are dealing with this field and we would like to deal with this pillar in the future as well.

Currently, more and more data are being collected from the different machines (see the details at the respective pillars above), and some of these data have been already analysed in order to present correlation between different features.

However, the future plan is, to integrate the available data into a common dataset and look for more complex data models as well as correlations between the available data. The goal is to exploit the different types of big data analytics, namely use the descriptive, the diagnostic, the predictive and prescriptive analyses as well.

In order to develop the big data analytics skills, some employees (12) at PBN (project management, financial +technical staff together as well) took part in a 50-hour-long data analysis course in 2019, which was taught by an experienced data analysist from a multinational company. Due to the course, the participant PBN staff could get to know the basis of data analysis, and they carried out data analyst tasks in Python programming language. As a result of the data analysis course, the technical staff of PBN could collect and analyse data gained from the machines in a more efficient way.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

5.10. Summary of Partner competencies

As Chapter 5 reflects, project partners' competence is diverse when it comes to the nine Industry 4.0 technological pillar. The chapter has shown that certainly one partner does not have competence in each pillar, and of course the extent of competence is different per partner in each of the listed technological pillar.

As the chapter reveals, two project partners -namely CNA from Italy, and CCIS from Slovenia- indicated that they are not specifically focusing on either of the pillars, but horizontally, they are covering most of the pillars due to their widespread technical network. CNA for example, through its center for technology transfer and innovation CNA Innovazione, CNA Emilia Romagna actively participates within the High Technology Network, collaborating relevant stakeholders to answer in a concrete and qualified way to the needs of the companies requiring external support for research and innovation and for the introduction of the nine key enabling technologies inside their organizations. Regarding Chamber of Commerce of Slovenia, they indicated that they are not technologically oriented, but process oriented, but still they are connecting all 9 pillars on horizontal level. CCIS has many competences and skills (tangible and intangible assets) and services for supporting the implementation of Industry 4.0, which were described in the chapter.

As far as the specific Industry 4.0 technological pillars are concerned, the contributions from the partners reflect that the majority of the partners have competence (mostly advanced experience) in the field of additive manufacturing and simulation pillars.

It has also turned out, that some partners have provided valuable inputs in connection with Augmented Reality (RE:LAB, FHV, PBN,VDC) and Industrial Internet of things (IIoT) (RE:LAB FHV DEXIC, PBN) so they might provide support for institutions in this area as well.

Chapter 5 of the transnational catalogue also depicts, that some partners are dealing with Autonomous Robots, (FHV, PBN, VDC), so they might advocate SMEs in this field too.

According to the contributions by partners, it can be seen that Horizontal and vertical integration, cybersecurity and cloud technologies, as well as big data analytics currently do not belong to the priorities of the majority of the partners, since only few partners are dealing with these pillars in their institutions.

6. Partners' planned competencies/skills (tangible and intangible) and services on the innovation enabling factors

Short and understandable explanation of your skills/competencies in every pillar where you are planning to increase your competence in the next few years.

Note:

- ***Here tangible (Assets & Resources) and/or intangible (competences & assets) shall be described per each pillar where PP is planning to increase competence***
- ***Planned services provided by PPs in each pillar shall be also discussed in this chapter***

6.0.: CNA's general contribution in relation with the planned nine technological pillars in a horizontal way

Note: *According to CNA's representatives CNA ER doesn't have the internal "vertical" competences for each specific technology but, on the basis of the needs expressed by the companies, we provide the answer/services by searching the appropriate skills within the High Technology Research Network (for which we have attached the image) and within the Network of our certified Advisors.*

CNA Emilia Romagna, in coherence with the National Plan for Industry 4.0 and the directives promoted by the Ministry of Economic Development, supports the companies in the passage towards the new production model of Industry 4.0, through its Digital Innovation Hub: CNA Hub 4.0. The know-how developed in years of collaboration with national and European partners on the themes of innovation and technology transfer has strengthened the role of CNA Emilia Romagna- CNA HUB 4.0 and its capacity to act as facilitator of digital innovation in the Emilia Romagna region, acting as a point of reference for European and regional projects and activities aimed at innovation. CNA HUB 4.0 coordinates a network of 10 Digital Innovation Hubs (DIH) located in the regional area, which offer SMEs tools, services and consultancy within the Industry 4.0 program, starting from an analysis system of the level of technology readiness of small companies able to simplify the identification of TRL.

Through its center for technology transfer and innovation CNA Innovazione, CNA Emilia Romagna actively participates within the High Technology Network, collaborating with Universities, Research Centers, the Enterprise Europe Network, the BI-REX Competence Center and other public and private subjects, to answer in a concrete and qualified way to the needs of the companies requiring external support for research and innovation and for the introduction of the nine key enabling technologies inside their organizations: autonomous robots, simulation, Horizontal and vertical systems integration, Industrial Internet of Things, Cybersecurity, Cloud technologies, Additive manufacturing, Augmented Reality and Big data and analytics.

6.1. Autonomous robots

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

ARRSA plans to develop its FabLab with a new equipment – 2 robotic arms. The purchase will be made within the 4STEPS project, under WP I1 with a total budget of 20K EURO.

Robotic arms together with the equipment that we already have in our FabLab will let us prepare more complex offer for all relevant stakeholders for the quadruple helix in the region.

With robotic arms we will be able to get into the world of autonomous robots, artificial intelligence and Internet of Things. We plan to organise training programs in terms of programming short production lines, machine learning and human-robot cooperation.

The purchase is planned for the end of 2020 – beginning of 2021.

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other scholarly media. FHV will perform scientific projects and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

In the near future, DEX IC plans to purchase a programmable robotic hand, which will enable it to expand the portfolio of services that will be offered as part of the Innovation Hub that is being created in Liberec. This hand will serve both for practical demonstrations and training, thus contributing to the use of similar robotic elements in SMEs.

DEX Innovation Centre would like to pursue the development of this area in the future, linking it to areas such as 3D printing and IOT, which are closely linked to area of autonomous robots.

Services offered (planned):

- Educational workshops
- Space and equipment rental
- Technical support

Pannon Business Network Association

PBN would like to expand its portfolio in connection with this pillar with purchasing additional autonomous robots in the near future.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.2. Simulation:

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

PBN would like to improve its technical knowledge in the field of simulation and expand the collaborations with (inter)national players in this field as well.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.3. Horizontal and vertical systems integration

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

NO INFO Provided

Pannon Business Network Association

The aim of PBN is to integrate all data, gained from the available mentioned machines at the different pillars, into a common system.

These data might be used in one production line, and the utilization of the gained (real-time) data might contribute to the lower number of malfunctions, and might result in a more (cost)efficient production

In the integrated dataset, every kind of data will have to be analysed and compared with the other data, as well as with the historic ones.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.4. Industrial Internet of things

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

RE:Lab plans to continue to develop this area of expertise

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

In the case of IOT we would like to focus even more on the creation of printed circuit boards and their mounting. Specifically, our goal is for DIH to offer the possibility of automatic assembly of printed circuit boards. We would like to complement our portfolio with a tool such as Pick and place machine that puts components on circuit boards at assembly phase. Typically these machines are used for surface mounted devices (SMD).

Services offered (planned):

- Production of printed circuit boards
- PCB design
- Educational workshops
- Space and equipment rental

- Technical support

Pannon Business Network Association

PBN would like to widen its expertise and knowledge as well as network in this field.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.5. Cybersecurity

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

Currently Cybersecurity does not belong to our priority, but in the near future we would like to increase our knowledge in this thematic field as well.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

VDC is planning to establish working groups in the field of Blockchain and IT security in virtual reality and digital copyright protection.

6.6. Cloud technologies

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from

business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

Currently Cloud technologies do not belong to our priority, but in the near future we would like to increase our knowledge in this thematic field as well.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

VDC is planning to establish working groups regarding the topics 5G and AR cloud technology.

6.7. Additive manufacturing

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

RE:Lab plans to continue to develop this area of expertise

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks. In the focus are projects and experiments with all kinds of material that makes the value chain more efficient.

DEX Innovation Centre

DIH currently offers a relatively large number of FDM and SLS printing options. However, our goal is also to offer the possibility of SLA technology, which has been known since 1984, but to this day considered a high quality type of 3D printing. In this case, we want DIH users to have an option of SLA-based printer.

This technology is associated with the need for additional equipment, which we also count for DIH, and will also want to buy a washing and curing station, which is necessary to both start and finish the print.

As part of the sustainable processes that we want to follow within our DIH, we also plan to add additional equipment for SLS printing. In this case, we will add equipment that ensures automatic sifts used powder and makes it ready for refreshment or use. This not only saves printing costs, but also saves materials and reduces waste.

Offered services (planned):

- 3D printing according to your own design
- 3D design
- Workshops
- Space and equipment rental
- Technical support

Pannon Business Network Association

Regarding the short-term goal (1year) in connection with additive manufacturing is to recycle the support material (e.g.: filament) in the 3D printing process, in order to decrease and minimise the waste materials as much as possible.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.8. Augmented Reality

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

RE:Lab plans to continue to develop this area of expertise

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

In autumn 2019 the Microsoft HoloLens 2 appeared on market and PBN managed to purchase one, so now the new version also belongs to the machine park. Similarly to Microsoft HoloLens 1, the technical staff will learn to use and apply the connected softwares, and then this brand new tool, might be also presented to relevant stakeholders.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.9. Big data and analytics

CNA

No separate input provided (general info can be read in Chapter 6.0.)

RE:Lab s.r.l

NOT RELEVANT

Regional Development Agency Bielsko-Biala

NO INFO PROVIDED

Vorarlberg University of Applied Sciences

FHV's continues its high-level research and will disseminate in industrial and scientific conferences, journals and other media. FHV will perform scientific and applied projects within this I4.0 pillar with partners from business, industry, academia and governance. FHV aims to further expand its existing partnerships and to participate in international (industrial and/or scientific) networks. In the center are the combination,

recombination, interpretation of heterogenous data with the aim to co-create innovation out of quantitative data and information.

DEX Innovation Centre

NO INFO PROVIDED

Pannon Business Network Association

The aim of PBN is to expand its expertise, and gain experience in this field, and in the near future they would like to take part in big data related projects.

Chamber of Commerce of Slovenia

NO SEPARATE input is provided, overall input is provided at section 5.0

Virtual Dimension Center

NO INFO PROVIDED

6.10. Summary of Partner competencies

Chapter 6 of the Catalogue was focusing on the short-term goals of the project partners in connection with the nine technological pillars. In general, it can be stated that partners would like to expand their expertise and knowledge in the thematic fields, but some partners have highlighted that they have concrete idea and plan for technological development.

Regarding the partners' development plans in relation with autonomous robots, ARRSA -in the framework of the 4STEPS project- is planning to develop its FabLab with two robotic arms, by Q1 2021. DEXIC from Czech Republic raised that they would like to implement a programmable robotic hand, which will enable it to expand the portfolio of services that will be offered as part of the Innovation Hub that is being created in Liberec.

In relation with horizontal and vertical integration, The aim of PBN is to integrate all data, gained from the available mentioned machines at the different pillars, into a common system.

Regarding Industrial Internet of things, DEXIC's goal is for DIH to offer the possibility of automatic assembly of printed circuit boards. They would like to complement their portfolio with a tool such as Pick and place machine that puts components on circuit boards at assembly phase.

What is also worth mentioning, that VDC, in the field of cybersecurity, is planning to establish working groups in the field of Blockchain and IT security in virtual reality and digital copyright protection.

VDC has short-term goals in connection with cloud technologies too; VDC is planning to establish working groups regarding the topics 5G and AR cloud technology.

DEXIC's plan is to offer the possibility of SLA technology and they want DIH users to have an option of SLA-based printer, and this plan belongs to the development of their additive manufacturing expertise. Regarding the short-term goal (1year) of PBN in connection with additive manufacturing, is to recycle the support material (e.g.: filament) in the 3D printing process, in order to decrease and minimise the waste materials as much as possible.

7. Partners' services on Innovation enabling factors:

Apart from the above mentioned 9 technological pillars, there are further factors which are enabling for innovation and do play important roles in the competencies per each partner. As a matter of facts, we believe that the needs and characteristics of companies with respect to innovation must also be considered in terms of managerial skills, not only in relation to the 9 pillars. In the following subchapter further enabling factors shall be discussed.

7.1. Human Capital and Competences

CNA

CNA Emilia Romagna activates training paths for the companies in order to generate value, start change, enhance their own potential and position themselves as protagonists.

HOW

1. DEVELOPMENT OF TRAINING COURSES TOGETHER WITH COMPANIES

CNA Emilia Romagna identifies the needs of companies in order to create an adequate business training plan.

For example: technical, legislative and managerial updating; focus on new skills.

2.TRAINING PATHS MANAGED BY EXPERTS

CNA Emilia Romagna offers training on the most innovative aspects of management organization, of internationalization, of research.

For example: Towards Factory 4.0; Digital Manufacturing and Made in Italy.

3.FINANCING FOR TRAINING

CNA Emilia Romagna identifies financing opportunities and proposes them to companies.

For example: European Social Fund; inter-professional funds; facilitations for apprenticeship.

4. INTEGRATION OF HIGHLY QUALIFIED PROFILES

CNA Emilia Romagna supports companies in the processes of efficiency in the management of their staff, which is a key element in promoting the success of their own company. Satisfied and motivated employees, low labour turnover and fluid generational renewal can become crucial factors not only in creating a constructive working climate, but also in increasing company productivity.

The goal is to plan gradual but effective intervention plans, aimed at solving any problems related to personnel management and generational renewal paths.

For example: career counselling; selection; offer-demand match, motivation paths for the working teams, support towards generational renewal paths, business transfer paths.

RE:Lab s.r.l

NO INFO PROVIDED

Regional Development Agency Bielsko-Biala

Having a great experience in implementation of international projects, ARRSA has established a high-qualified management team, what ensures the realisation of the mission which is to provide the highest quality services by activating endogenous potential and using available assistance programmes financed from domestic and foreign funds, in particular from the European Union.

The human resources that we have enables us to participate in all relevant projects in terms of the regional development as well as keeps our institution on track of the global trends in terms of technology, innovation and building capacities of the regions.

Alongside with the management team, we also have technical staff that is engaged with the activities related to our FabLab. Thanks to its competences, we are able to provide most of the activities with our own resources and on the very high level.

With the infrastructure of FabLab and our professional staff we have created a competence centre that enables innovation capacity in the region, gives complex knowledge and experience and can become a one-stop-shop for innovation for entrepreneurs and to-be-entrepreneurs.

Vorarlberg University of Applied Sciences

FHV employs heterogenous lectures, researchers (junior and senior researchers) and research professors that proactively facilitate learning and knowledge in the region of Vorarlberg. Based on their research (projects), these key employees are prompted to disseminate its research results in lectures and conferences as well as additionally publish them in scholarly articles and journals.

DEX Innovation Centre

DEX IC has a wealth of experience in international management and business support and development. Thanks to the successful implementation of many research projects, DEX IC also has a network of external experts from the fields of science and research, education, business and other areas with which it continues to cooperate creating new interesting projects.

In addition, the company also includes an expert on technologies such as 3D printing, which will be part of our laboratory and will provide support to all those interested in DIH services.

The network of our external experts consists of Technical University of Liberec experts, entrepreneurs, personal coaches, and others.

Pannon Business Network Association

The project management team of PBN

PBN unites people with complementary educational and practical background to form a creative and dynamic team.

Since the initial thoughts of the establishment and the foundation in 2006, we are committed to work for our region. With all our activities, projects and services, we have been intending to facilitate in national objectives on our regional level- job creation and improving of the living standard. Since our foundation, our network of companies, research organisations, and public bodies, has expanded, continuously delivering added value to our partners.

Our aim is to involve the representatives of the quadruple-helix model, while developing project ideas and proposals, which are driven by a strategic approach to international co-operation. Our general objective is to manage projects which are:

- clear, simple and transparent in their implementation;
- Creating critical mass, high visibility, and achieving strong impact in general
- Reinvigorate the business environment while strengthening the profile of our network partners;

- Creating much better alignment of European and national RTI policies

PBN has an experienced project manager team who are familiar with the European project world. Since 2006 PBN has taken part, and implemented more than 60 international projects in the framework of different financing programs like Interreg Europe, Interreg Central Europe, Interreg Danube, and Horizon 2020. As far as the topics of the previous projects are concerned, we were dealing with numerous field through the projects, but mainly SME development, active and assisted living, sustainable mobility, smart city and logistics were the main topics of the projects. Due to these projects, the project management team had the opportunity to expand their knowledge in the certain project, and widen the network with European partners. PBN, in the framework of the projects, has worked with more than 500 international partners throughout Europe, including different target groups like SMEs, large enterprises, clusters, universities as well as local, regional, and national public authorities too.

The establishment of AM-LAB, and its Digital Innovation Hub status

However, in the last few years, the priority has changed, and we focused on innovation management, and Industry 4.0 and digitization of companies have become the main priorities. Utilised the knowledge we have gained from the international projects, we established our Additive-Manufacturing Lab (abbreviated as AM-LAB) -as PBN's technology transfer spin off company- in 2017 which has already received the Digital Innovation Hub status. Therefore, the competences of our human resource has expanded in a large extent, since engineers joined our team from relevant industrial sectors. These new employees of PBN is now creating the technical staff our company, who are aware of the recent and innovative technologies and prefer life-long-learning. It is a multidisciplinary science team, with engineering, economics and medical background. Applied physics, sensor technology, modelling, ICT are representing the core technical competencies, while data analysis and visualization, project engineering, ROI calculations of the business perspectives. Medical doctors are supporting and supervising the health sector compliance. Sensor technology applications, polymer printing integration, strong interactions of smart production technologies ensure the smart character of the products and services offered by the team

In AM-LAB we have a wide portfolio of digitization tools, which is permanently expanding, (see the details in Chapter 5) and the technical staff is continuously acquiring the necessary knowledge to utilize the usage of these innovative tools.

High Growth Companies Program

One of our success stories from the recent years is the High Growth Companies Program, abbreviated as HGC program. This project belonged to the strategic program of the ministry and 220 manufacturing

companies were involved in this program nation-wide. The aim of this project was to develop the small and medium sized enterprises in Hungary with introducing the modern and innovative technological solutions available on market. In the beginning of this project the colleagues of PBN organised thematic workshops through the country, and in parallel they carried out a survey where they measured the Industry 4.0 readiness level asking the usage of the different technological pillars. The results were analysed, and individual development proposals were prepared to every involved company. In parallel the representatives of the companies took part in a mentoring workshop and visited sample Industry 4.0 companies abroad, where the technical staff of PBN introduced the I4.0 solutions to companies, and apart from them, other external experts also presented the proposals how to develop the companies, and how Industry 4.0 solutions might be exploited by them.

Artificial Intelligence Working Group:

Pannon Business Network is the working group leader of Artificial Intelligence working group, operated within the Priority Area 8, namely Competitiveness of Enterprises of the Danube Region Strategy. One of the main objectives of the Artificial Intelligence working group, is to foster the application of AI in the Danube Region in the key application areas using different kind of technologies. It is inevitable that SMEs adapt to and keep abreast of this new area and enhance and permanently update their knowledge in the field of AI to remain competitive. In order to achieve this goal, PBN during the establishment of the transnational WG, was addressing different types of representatives (such as experts, BSOs R&D associations) throughout the Danube Region who might collaborate and learn/experience good practices from each other in the field of Artificial Intelligence. Besides, the work of AI WG also contributes to bring together organisations and stakeholders whose main goal is to enable and foster technology development and innovation. PBN has prepared a comprehensive policy paper on future development areas of the AI, which includes an application field matrix mentioning the potential key application areas of AI and the relevant technologies to be used.

Chamber of Commerce of Slovenia

CCIS unites people with complementary educational and practical background to form a creative and dynamic team.

Department of Human Resources Development and Education: we focus on human resource development within Strategic Research and Innovation Partnerships (SRIPs) of Material for final products, Circular economy, ICT and Smart factories – under the umbrella of Slovenian Smart specialization strategy, primarily in the field of competence forecasting and capacity building. We are also cooperating as partners in several national projects, which mainly focus on developing entrepreneurial competences for children and

adolescents as well as teachers and Career orientation councillors (mainly elementary and secondary school).

- Competence Centre for Development of Human Resources
- Competence Center Development Materials as end products
- Competence Center Food,
- Competence Center Circular Economy
- Public Authorisation in Apprentership and Work-based learning
- CCIS is a member of Strategic Council in the Institute of the Republic of Slovenia for Vocational Education and Training
- We have a lot of projects in the field of development of competences: life long learning and future competences (Erasmus+ and Interreg projects)

Virtual Dimension Center

VDC has 5 fulltime employees with expertise in project management, knowledge about V/AR hardware and software solutions and maintains many contacts to relevant research organisations, technology users and technology providers.

7.2. Fundraising

CNA

CNA Emilia Romagna offers the companies consultancy and services in the fields of credit and finance, in order to guarantee them an adequate competitive and development level.

HOW

1.IDENTIFICATION OF SPECIFIC FINANCING

For example: regional calls; European funds.

2. SEARCH AND ASSISTANCE ON TAX BREAKS

For example: super-amortization and hyper-amortization; tax credit for research and development; incentive laws.

3“CREDIT PLAN”

CNA Emilia Romagna supports the companies in the planning and control processes that represent two fundamental actions when wishing to create effective support measures for business development.

They enable to implement processes and adopt strategic choices by getting economic and financial resources monitored.

It is important to explore the balance sheet and financial position, as well as the economic and managerial dynamics, in order to guide the company towards choices that can both restore the correct economic financial balance and facilitate making correct and functional strategic decisions.

For example: bank agreements; debt restoration; creation of a business control system; assessment of the economic-financial effects of investments.

RE:Lab s.r.l

No info provided

Regional Development Agency Bielsko-Biala

Having financial support mechanisms in the future structure of our DIH will be an added value for the entrepreneurs. Within the structure of ARRSA there are also two departments related to fundraising with the capital for investments:

1. Beskid Technology Accelerator is a typical example of a regional seed fund to enable entrepreneurs the access to the capital in the early stages of development of their projects. Accelerator manages the financial funds originating from the capital exists form the companies which shares Regional Development Agency owns (established within the framework of the EU funded project Technobit Vanture: Knowledge and Capital for innovation. These funds will also be reinvested in further innovative projects.

Innovative ideas submitted within Beskid Technology Accelerator, are supported through:

PREINCUBATION:

In the first stage of support can last up to 6 months and is granted by providing free consulting services with the goal of identification of innovative ideas and investigation of its market potential. Analysis of the type of innovative solution takes following stages:

- development of the business plan with market analysis and market potential and analysis of profitability of capital investment,

- analysis and recommendation of the results coming from Preincubation stage by Beskid Technology Accelerator members and submitting these results to ARR S.A Board of Directors for final approval.

After the Preincubation stage ARRSA proceeds to negotiation of the terms of the investment agreement with the selected idea makers. The investment agreement specifies in detail the method of financing, the size of the investment, the ownership structure of the company, the rights and obligations of the parties, the exit of the investment. The first stage (Preincubation), and approval of the idea by ARR S.A., will allow to qualify the incubated idea for the second stage – the capital investment.

CAPITAL INVESTMENT:

In the second stage (capital investment) the new capital company obtains the financial support, and ARR S.A. acquires shares in the company in an amount less than 50% of shares. In total, in the second stage, the maximum amount of support is 200 000 euro, which constitute de minimis aid.

2. Bielski Capital Projects Fund (BFPK) - a nonprofit business support institution. The mission and aim of BFPK Sp. z o.o. are to actively support and develop entrepreneurship by granting loans, guarantees (loans, sureties, leases, tender deposits) to micro, small and medium enterprises, based in the Silesian Voivodeship.

BFPK currently provides the following services for companies belonging to the SME sector:

- financial services:
    - loans
    - defect for tenders in the form of guarantees
    - guarantees for credits, loans and leases
- financial intermediation services:
    - seeking appropriate financing
    - financial installation consultancy
- advisory services:
    - consulting
    - business plans
    - financial analyses of undertakings
    - analysis of the profitability of capital inputs
    - market analysis
    - applications for union grants

The Fund was established in January 2002 on the initiative of the Bielsko-Biała Municipality. Its share capital amounts to PLN 3.96 million and the Fund is 100% owned by the Regional Development Agency.

As of 2 January 2020, BFPK was merged with ARRSA. Under the common name Entrepreneurship Support Fund (together with above mentioned BAT), whole existing offer for entrepreneurs has been fully maintained.

Having financial support mechanisms in the future structure of our DIH will be an added value for the entrepreneurs.

Vorarlberg University of Applied Sciences

FHV is active on national, Interreg and European levels to organize new partnerships and networks as well as enable a constant information and knowledge exchange in the region of Vorarlberg and other regions all over Europe. Ongoing initiatives are, for example:

Austrian Blockchain Centre mission is to be the one-stop-shop research centre for Blockchain (and related) technologies. These technologies shall be applied in industrial applications like industry 4.0/IoT as well as financial, energy, logistics, government and administrative applications. Those new applications and business models resulting from collaborations between established players, innovative start-ups and top R&D institutes will be the key for the creation of new jobs and establishing Austria among the top ten innovative countries in Europe. The R&D themes of the centre have been organized in five areas targeting economic, technological, applications as well as political and legal topics interfacing with existing COMET centres like CDP, SBA as well as international Blockchain initiatives. FHV is a pro-active partner within this project.

A-Ring project addresses the overall need to pool efforts in tackling major challenges with joint research and innovation approach steering EU Open Innovation path. A-RING will foster alignment between different research and innovation initiatives and institutional frameworks to effectively address societal challenges and increase uptake of strengths and assets. Innovative bottom-up process is pursued to align research and innovation strategies, gathering expectations from BS and innovation potential from Academia, granting citizens' needs linked to responsible research and innovation and ensuring transnational multilevel governance by developing a layer for a right policy process. The project partners design and develop a blueprint for a shared research and innovation agenda to promote joint S3 strategy framework. A-RING will establish a shared approach with mutual recognition across triple helix and targeted transnational activities, through Blueprint for SRIA, Policy Briefs and R&I Chart.

CityCircle project aims to establish close quadruple-helix cooperation to be able to utilize innovation and R&D potential within the Central Europe. By establishing circular economy quadruple-helix hubs as local innovation networks of private and public institutions in partner cities, CityCircle project will provide innovation systems to facilitate innovation and transfer of technology, services and business models. By providing hubs with tools and knowledge, the project will enable the hubs to generate innovative solutions in CE in their urban ecosystems in a long run. In addition, by setting-up a transnational CE network to support

transnational CE value chains, partner cities will internationalize their businesses and at the same time provide transnational coordination of RIS3 implementation.

Resindustry project aims to increase the energy independency of the EU industry sector, by decreasing its energy intensity through a higher integration of RES. The long-term objective is to increase the industry competitiveness by decreasing its energy bill, rising their energy independency, thus uncoupling their energy costs from geopolitical externalities. To achieve these long-term strategic objectives, the short-term objectives are to booster RES investment in industry by improving OPs with new policies for RES promotion.

DEX Innovation Centre

Due to its rich experience with international European projects, DEX IC can offer its experience in creating grant projects that can help SMEs in their development, cooperation and other areas.

Another strength that we could also include in fundraising is Matchmaking, with whom DEX IC has a wealth of experience. Thanks to many years of practice and good orientation in the international business environment, this activity can help SMEs to acquire new and important not only international contacts.

Last but not least, it is important to mention that DEX Innovation Centre is a representative of initiatives such as EIT health and InnoEnergy in the Czech Republic. DEX Innovation Centre can offer SMEs assistance primarily with the fundraising of research and development innovations. DEX Innovation Centre has a wealth of experience in these activities and can help companies to raise funds.

Pannon Business Network Association

The fundraising activity is not relevant from PBN side.

Chamber of Commerce of Slovenia

Within certain EU or national projects, we develop pilot activities through which companies can get financial and service support

Virtual Dimension Center

VDC did apply for and was engaged in many publicly funded projects in the past, on European, national and regional level. VDC also informs and consults about fundraising opportunities and provides a quarterly fundraising newsletter for interested companies and institutions.

Since its foundation VDC has successfully realized more than 50 (publicly funded) projects on European, national, and regional level.

7.3. Reasearch and Development

CNA

CNA Emilia Romagna accompanies its enterprises in defining instruments for the development of new products and processes for their economic expansion and digital transformation.

HOW

1. ORGANIZATIONAL INNOVATION

CNA Emilia Romagna helps the companies in their growth through the innovation of managerial and decisional models.

For example: business networks; lean manufacturing; creation of international partnerships.

2. COST EFFICIENCY

CNA Emilia Romagna supports companies in the analysis of efficiency to identify where costs can be optimized, reducing logistics and storage costs, and limiting inefficiencies and delivery times to the customer.

The interventions in the field of optimization of production and logistics processes have the advantage of being particularly short, with immediate and easily identifiable economic returns.

For example: optimization of internal and external logistic costs, increase in product quality and increase in production capacity.

3.DIGITALIZATION

CNA Emilia Romagna accompanies the enterprises throughout the selection of the most adequate computer solutions for each reality.

For example: purchase and installation of hardware; choice of the management software; implementation of websites and business networks.

4. MANAGEMENT CONSULTANCY

CNA Emilia Romagna implements process and product analyses from the perspective of Industry 4.0.

For example: survey of the innovation potential; implementation of development plans.

5. MATCHING THE BUSINESS WORLD WITH HIGH LEVEL SKILLS

For example: training internships; research apprenticeship.

6. TECHNOLOGY TRANSFER

CNA Emilia Romagna brings the technologies developed in research agencies to companies.

For example: agreed conditions; support to companies; training paths and seminars.

7. PATENTS AND CERTIFICATIONS

Offering new products and services to the market and customers is a necessary challenge for the company to remain competitive on constantly evolving markets. However, this choice must be connected to precise analysis of technologies and customer expectations, in order to identify the best strategies and the best interventions aimed at enhancing the offer. Supporting the company's competitiveness allows a better impact on the market and an increase in sales and profits.

The paths that can be activated by CNA Emilia Romagna are aimed to support the company in identifying the most suitable strategies and interventions to relaunch both existing products and develop and offer new ones.

For example: protection of industrial property rights.

RE:Lab s.r.l

RE:Lab has an active R&D Department, which often supports other stakeholders in the writing and management of projects at EU, national and regional level.

Regional Development Agency Bielsko-Biala

Within the structure of ARRSA there is no separate R&D department. We don’t have own research projects. We only help in the realisation of external projects with our knowledge, experience and equipment of our FabLab.

Vorarlberg University of Applied Sciences

NO INFO PROVIDED

DEX Innovation Centre

DEX IC has participated in various research projects and has been involved in the creation of more than 25 products. DEXIC has a wealth of experience in international research and development. In this respect, it now offers many years of experience which it can share or participate directly in research and development.

Since last year, besides our prototype space called DEXIC FabLab, which became the basis for our DIH, we are trying to further develop these activities and offer the possibility of own prototyping to students, startups and SMEs

Pannon Business Network Association

The technical staff of PBN (Am-LAB) is currently dealing with research and development, and we have already had some results in this field:

Name of the carried out project: Development of smart phone application to check the status of AM-LAB devices using Augmented Reality

The technical staff developed an application which shows the 3D printer parameters (running time, temperature..) in real time using Augmented Reality technology. The data of the 3D printer are gained from a mySQL data base. These data are transmitted to the application using a PHP script. The application has been developed in Unity, and the program written in this platform is advantageous, since it is compatible with iOS and Android as well as with the HoloLens too.

Figure 38: The application developed by PBN (Am-LAB) staff shows the data of the 3D printer using Augmented Reality

Name of the internal carried out project :3D Screening in Research Development:

3D scan and model, CAD file preparation, data collection analysis

During the development, we scanned 3D composite materials intended for military exercise on corporate order and shot with an unknown projectile. They would form the cladding of composite helicopters as they are light materials. For this reason, it cannot be expected that the projectile will not be able to pass through the material at all. The good composite that detaches a series of materials while the projectile passes, so that the fragments of the fragments absorb a lot of kinetic energy from the projectile.

After scanning 3D, we calculated the volume of the splashed material during the process, determined the amount of material left on the intrusion and outcome side of the projectile, and provided an estimate of the direction of impact of the projectile.

Scanning was relatively easy to perform and the processing of the data required more work. It was a completely novel problem for us, where the 3D scanning process was only part of the process to learn about the handling of other software, which could also test the skin models, and to explore the possibility of interpreting and calculating volumes on these models. The process was not routine and required in-depth details of several software.

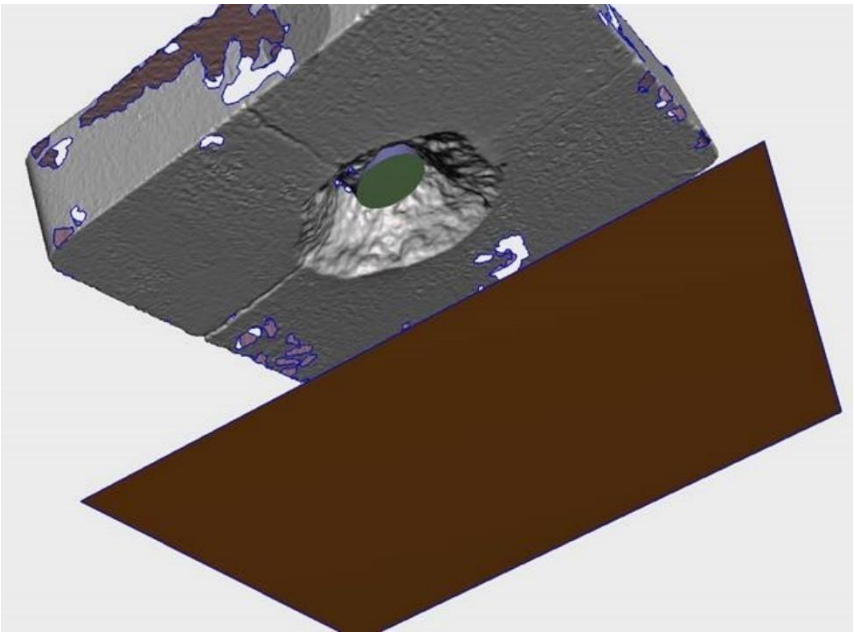


Figure 39: 3D scanner image – Total compositive material

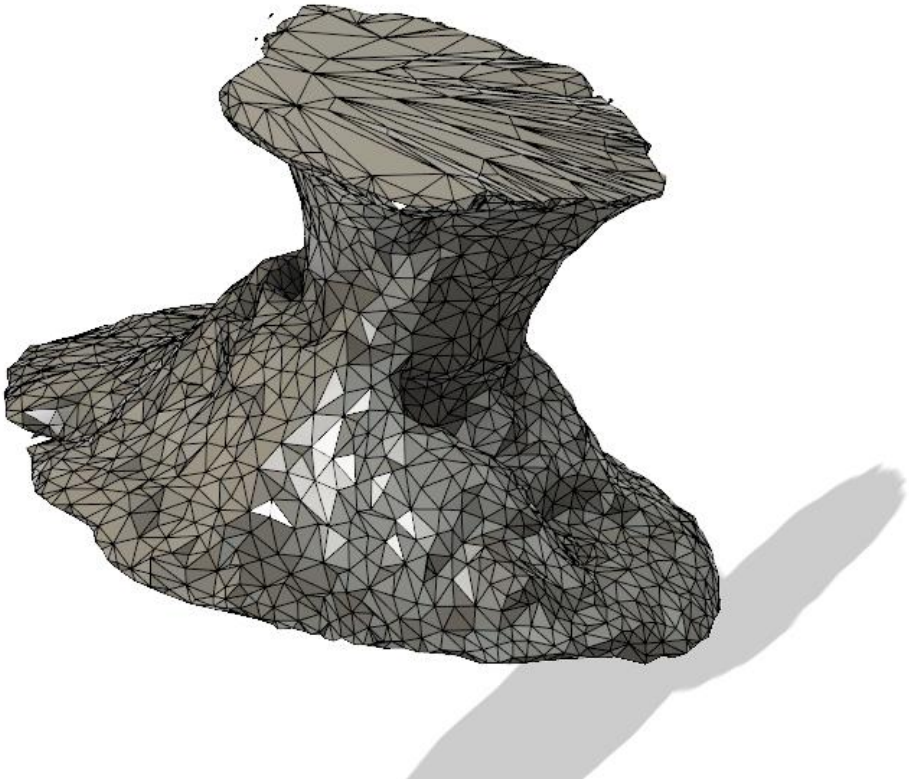


Figure 40: PBN's R&D project: volume estimation of material lost during intrusion

Name of the carried out project: Development of a unique bag logo, prototyping with additive manufacturing

The aim of the project is to create a metallic emblem suitable for serial production, using the customer's existing image (emblem), which can be used using traditional leather decorative technology.

As a first step of the project, the emblem of our partner had to be graphically adapted to make it suitable for additive manufacturing with modelling software. Then, with SLA technology, primary samples of products (plastic thermosamples) were created.

Following continuous consultation with the client, the final design has been developed, which has been adapted to precision metal surgery with the assistance of an external expert.

After the primary metal prototype was completed, the preparation and timing of the final batch production took place.

Figure 41: PBN's R&D project: **Primary Product Sample generated by SLA technology**

Name of the carried out project: Design of an adaptor fitted to an aerosol bottle, according to the customer's needs, and creation of a functional prototype with additive manufacturing.

Individual product design, multi-component product concepts, 3D printing, competitiveness of small-scale 3D printing against splashing, demonstration of product concept with AR technology, Hololens

The aim of the project is to develop functionally an adaptor that can be fixed to the aerosol bottle and to develop a suitable ergonomic mask in line with the shape language of our partner.

The developed product consists of several components (adapter, ergonomic mask and silicone padding for comfort).The design of these components had to take into account the manufacturing technology and dimensions of the cylinders.

We have created a functional adaptor, in which the raw material used and its mechanical properties (e.g. flexibility) are key, and the mask and silicone part attached to it have different material properties, which

Figure 42: PBN's R&D project: Adaptor components fixed to Aerosol cylinder

have been tested and implemented in different versions.

Figure 43: PBN's R&D project Ergonomic mask and adapter

Figure 44: PBN's R&D project: Silicon padding for comfort

Name of the carried out research: Collaborative robot – Demo development with 3D printing

UR3, Individual fastening with 3D printing, camera-based colour discrimination, sorting function, demo, Gripper development,

The aim of the project is to create a robotic demo programme, whereby the UR3 robot arm is able to distinguish, on the basis of their colour, between mixed black and green capsules and sort them. A product of one producer (RobotiQ), which cooperates closely with Universal Robot, was chosen. This was due to easy deployment and a high degree of compatibility. This device is a 2D camera system that differs from the 3D camera solutions in that it is able to read products in a plane.

Figure 45: PBN's R&D project: Robotic demo during programming

Project name: Sensory "identification"

Customer order, sensor development, 3D printing, unique design, sensor data visualisation, sensor data analysis for sensor calibration, Phyton programming

The aim of the development is to create an unalterable addition of an existing premium product, produced in a larger series, to the sensing mechanics used in the furniture industry, in order to interrupt the movement of the product (armchair) should any obstruction be detected in the foot space. The process of "education" of the product has not yet been completed, but there have been significant surprises in recent years.

The vocation of products is a development process where new methods need to be developed. It is generally possible to find a possible solution through a large number of blind tracks, which unfortunately is mostly optimal rather than perfect.

During the process, sensor templates have been designed and manufactured using 3D printing, which play a role in the physical construction of sensor measurements.

Prototyping is an important part of the process, where different designs are developed according to the design guidelines for 3D printing, which then presuppose simple assembly, elegant design and practical use.

In addition to the design of the prototypes and printing 3D, Python Scripts have been written to process the measured distance data, which fit third-level curves to the data points measured using appropriate function packages. The importance of this can be seen in the “geometry recognition” of sensors in the furniture, where, on the basis of the attached parameters, the microcontroller can decide whether to detect obstacles in the footspace and break the furniture’s moving mechanics by writing firmware with a low computational need.

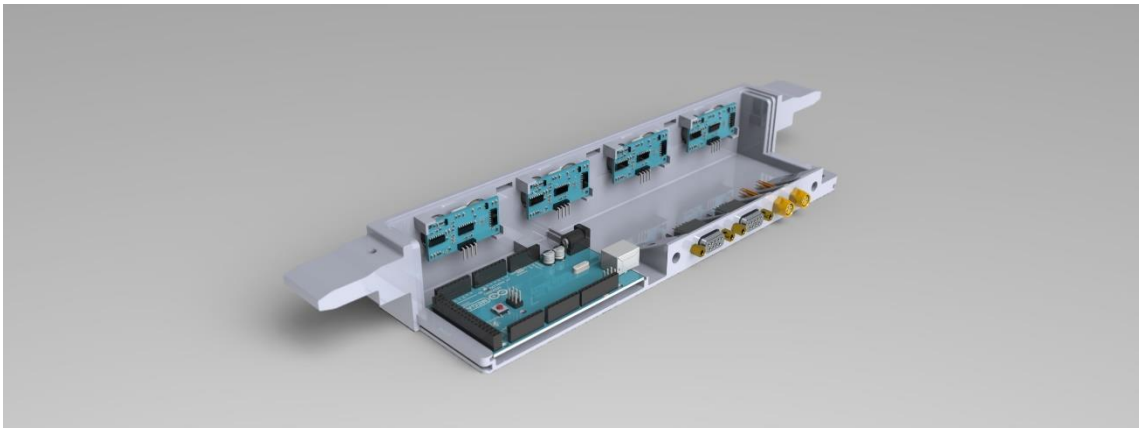


Figure 46: Sensor Retention template- internal view

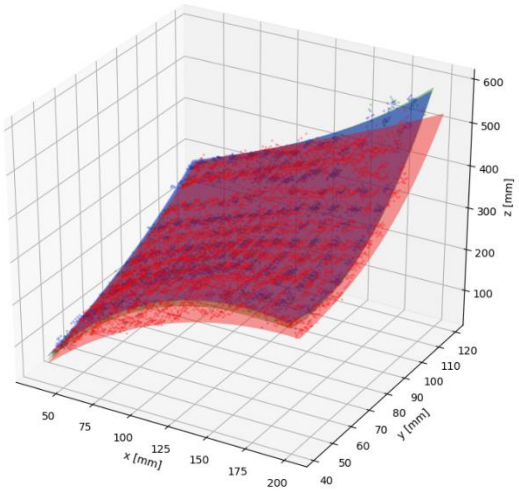


Figure 47: Processing of automated measurement data

Project name: Communication of various robotics devices for automated tasks

UR3 – MIR100 – Panda communication, MODBUS programming and encoding, automated processes

Managing two robot levers (UR3, Franca Emica Panda) and an autonomous truck (MIR100) from a programme that allows for joint and automated work.

The devices cannot be controlled directly, there is only a limited possibility to send the data, so each machine had to execute a state-of-the-art machine that process the command received and performs the task associated with that command. Programmes should be carefully designed, in particular to deal with errors. The programme shall be written in parallel on the control computer and on the devices.

Figure 48: Communication of various robotics devices for automated tasks

Tools during the execution of automated tasks

Project name: Automated drone in the inventory

Unique tool development, QR code from Video Reading, Automated Inventory, Data Communication, Drone Programming, DJI Mavic2 Pro

The aim is to put in place an indoor logistics solution whereby a drone (DJI Mavic2 Pro) will autonomously be able to take stock of the required storage area by recognising the QR codes used in the storage system.

The drone produces a live video from take-off to landing, and forwards it to a server where the video stream recognises the different QR codes in real time.

You can note them and do not read the same code twice. In parallel, you have downloaded images of QR codes and its itinerary in order to check the process at a later stage. The camera installed on the drone also allows for relatively remote recognition, which for a 8x8 centimetre code is about 3 @-@ 4 metres.

Figure 49: PBN's R&D project QR code read-in-flight

Project name: Sensor application

Extraction of plant and machine data, database construction, data filtering, real-time data display, sensor integration, graph display, application development, decision support

The aim of the development is to extract, database and display the operational data provided by 3D printers, robot arms and autonomous truck in am-LAB Digital Innovation HUB, as well as the data of sensors subsequently installed in these devices.

- The machines come from several different manufacturers and one manufacturer allows a large number of data from the process parameters, but one does not provide them.
- Many internal data are not relevant in most cases, but can provide valuable information in case of errors.

- One of the most important data is the status of the machine.
- In order to analyse the machine's data, it may be necessary to collect data from the outcome of the process.
- In a few months, millions of records were collected in the database, making the presentation of the data slow by searching the wrong data.

id	date	locationID	measurementID	unitID	value
8 588 071	2019-09-25 14:13:09	6	31	12	231,92500
8 588 070	2019-09-25 14:13:09	6	30	11	0,09200
8 588 069	2019-09-25 14:13:09	6	1	1	1,00000
8 588 073	2019-09-25 14:13:09	6	33	21	-55,00000
8 588 072	2019-09-25 14:13:09	6	32	22	18 500,00000
8 588 068	2019-09-25 14:13:05	10	1	1	1,00000
8 588 047	2019-09-25 14:13:03	5	32	22	12,87800
8 588 055	2019-09-25 14:13:03	8	31	12	228,34200
8 588 066	2019-09-25 14:13:03	22	33	21	-62,00000
8 588 048	2019-09-25 14:13:03	5	33	21	-59,00000
8 588 053	2019-09-25 14:13:03	7	1	1	2,00000
8 588 051	2019-09-25 14:13:03	7	32	22	26 085,00000
8 588 057	2019-09-25 14:13:03	8	1	1	1,00000
8 588 044	2019-09-25 14:13:03	5	1	1	1,00000
8 588 061	2019-09-25 14:13:03	21	33	21	-61,00000
8 588 059	2019-09-25 14:13:03	21	31	12	224,75500
8 588 056	2019-09-25 14:13:03	8	33	21	-60,00000
8 588 065	2019-09-25 14:13:03	22	32	22	26 893,00000
8 588 064	2019-09-25 14:13:03	22	31	12	224,55400
8 588 063	2019-09-25 14:13:03	22	30	11	0,08500
8 588 049	2019-09-25 14:13:03	7	30	11	0,09400
8 588 046	2019-09-25 14:13:03	5	31	12	229,15634
8 588 052	2019-09-25 14:13:03	7	33	21	-61,00000
8 588 058	2019-09-25 14:13:03	21	30	11	0,08500
8 588 062	2019-09-25 14:13:03	21	1	1	2,00000
8 588 060	2019-09-25 14:13:03	21	32	22	27 795,00000
8 588 054	2019-09-25 14:13:03	8	30	11	0,03300
8 588 045	2019-09-25 14:13:03	5	30	11	0,01289

Figure 50: Database with integration of data of different machines

Figure 51: Display of status data of different machines

Project name: Business animation (presentation of our plant through a series of actions)

A video showcasing our plant, equipment and equipment, our services. Our basic concept is that we have developed a 3D character (Cinema 4D and SolidWorks software) and then produced a storyboard. We then turned the scenes into a professional film style and coordinated our character with the real video in the form of animations using innovative technologies and film solutions that are also used in Hollywood.

The character we design for the project does not only appear in our promotional film, but also in a stand-alone 3D printed form as a firm's mascot. It is an integral part of any further promotion project, our corporate image.

The finished business animation can be seen here: https://www.youtube.com/watch?v=jXtJsR1nRPo

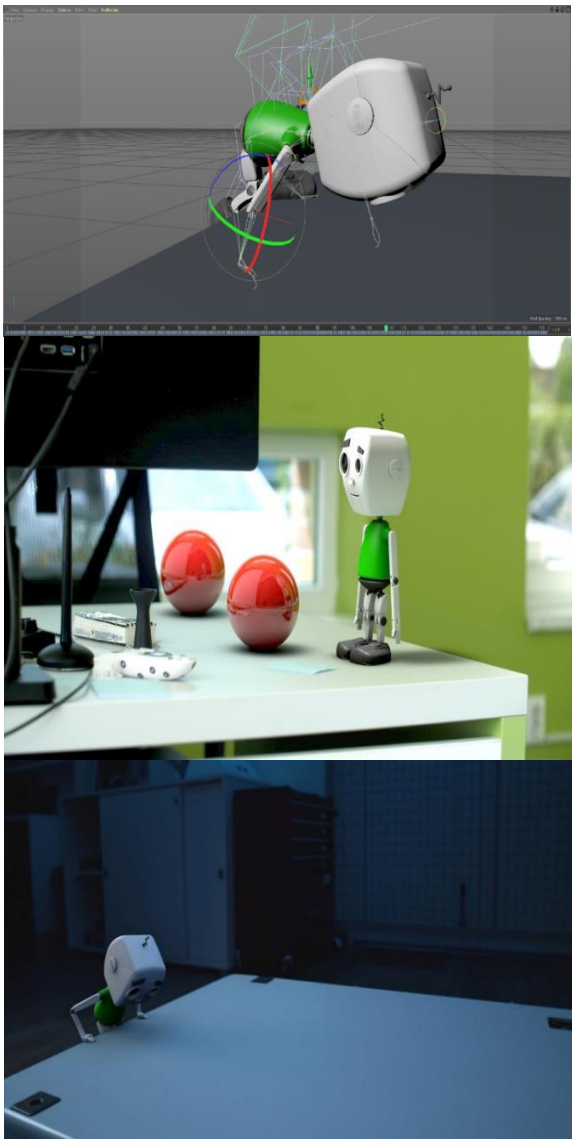


Figure 52: The animation work of PBN :3D character fits into the real environment

Chamber of Commerce of Slovenia

- **Technology Development and Innovation Department** – support companies at implementation of innovation culture. The field of technological development and innovation at the Chamber of Commerce and Industry of Slovenia with the program Innovative Slovenia is a meeting point for innovative improvements and innovations within the Chamber of Commerce and Industry and an active linker of the innovation ecosystem in Slovenia.

- CCIS organizes Annual regional and national innovation awards – **Innovation day** (https://daninovativnosti.gzs.si/ENG)
- CCIS is involved in **8 of 9 Strategic Research and Innovation Partnership (SRIP)**: Factories of the Future (FoF), Mobility, Development Materials as end products, Smart Cities and Communities, Smart Buildings and homes (including wood chain), etc.
- **Design thinking Lab** - is a hub for Innovation and Creativity which offers companies the ideal spatial conditions for creative developments and to make use of the potential of the Design Thinking and also implementation of Industry 4.0. Design thinking is a comprehensive approach to solutions, which stimulates creativity in working groups of participants from different areas. It is an innovating process, which allows the development of new solutions for any given problem. Concepts are created and then revised in various cycles and tested using prototypes. The focus is on users' needs in order to ensure that the final result is tailored to users. This holistic approach with creative solutions enables companies to develop innovations.

Virtual Dimension Center

NO INPUT PROVIDED

7.4. Internationalisation

CNA

CNA Emilia Romagna supports the growth of companies in the global market, by identifying the most adequate instruments for their international development.

HOW

1. SCOUTING OPPORTUNITIES OF FINANCING

CNA Emilia Romagna monitors the main financing sources, with special attention to the non-repayable funds, and accompanies enterprises in designing proposals.

For example: international partnerships; ministerial, regional and local calls.

2. PLANNING A COMMERCIAL ACTION

CNA Emilia Romagna supports companies in developing their national and international market.

For example: marketing plans; structure of the distribution channel; promotional events; trade exhibitions.

3. ACCESS TO NEW MARKETS

CNA Emilia Romagna implements market analyses and defines the most adequate strategies of commercial penetration.

For example: business meetings (B2B); integration of Export Managers and Digital Marketing experts.

RE:Lab s.r.l

NO INFO PROVIDED

Regional Development Agency Bielsko-Biala

As mentioned in the previous sub-chapters, ARRSA has a great experience in participation in various international projects and initiatives. For more than 25 years now, ARRSA has participated in nearly 80 international projects, what gives us the opportunity to create partnerships with almost 500 institutions from all over Europe and beyond.

The topics of the projects where strongly related to the capacities of the region, its specialisations, strategic areas of development as well as widely understood competitiveness raising and unlocking innovative potential.

Thanks to the participation in the international initiatives ARRSA brings knowledge and experience to the region, gives the opportunity to learn from the best and exchange good practices among a different regions facing same problems.

In terms of Industry 4.0, ARRSA is interested in this area constantly and since few years we are participating in various projects that gives us knowledge and possibilities of networking among experts in the field, which keeps us on track of the trend.

Just to mention, except of the 4STEPS project, we were also partners in FabLabNet (CE283) about enhancing the capacities of FabLabs. We are also a member of Industry 4.0 platform.

The concept of Digital Innovation Hubs and digitalization strategies will be one of the core areas of the global interest for the next years, this is why we would like to further develop our skills and capacities in this scope.

Vorarlberg University of Applied Sciences

FHV aims to create international networks and partnerships including academia, business and industry as well as governance. In doing so, FHV is active at all levels: regional, national, Interreg and European level to establish new and to enter existing industry- and scholarly partnerships and networks. For example, FHV

is well-known in the logistics- and supply chain community and organized the European Conference on ICT for Logistics for many years. Additionally, FHV is part of several academic networks, including EURAM, Logistic Research Austria, etc.

FHV is active in Interreg ABH, Interreg Alpine Space, Interreg Bay-Aut, Interreg Central Europe, Interreg Danube, Interreg IBH and Horizon Europe. Additionally, FHV is active on regional and national levels – e.g. FFG.

DEX Innovation Centre

DEX Innovation Centre has a large number of international contacts across different sectors. Thanks to long-term cooperation with research institutions, universities, private companies, but also international organizations with whom we cooperate in the long-term as well as in the short-term, it opens up a great field of possibilities for establishing new contacts for other companies and organizations.

Pannon Business Network Association

As it has been already discussed in Chapter 7.1, PBN has a nearly one and half decade experience in international project management, and we have already managed projects in different thematic fields, and in the framework of numerous funding programs. PBN is active in many territorial units of Europe through participating in international cooperation for example in the topic of AAL, SME development, Smart city, 3D technology and research and innovation. These areas are deeply connected to each other and enable us to widen our knowledge in diverse field and to learn globally. So far, we have had contacts with more than 500 European partners and have addressed different target groups including SMEs, large enterprises, clusters, universities as well as local, regional, and national public authorities too.

Our aim is to further widen our connection network with representatives who are experienced in Industry 4.0. and digitization topic. With the help of knowledge transfer, the knowledge of our internal staff would increase, and these knowledge and good practices might be shared with local companies in our region in order to help them to keep abreast of the latest technological innovations.

Currently we have 20 running European projects (H2020, Interreg Europe, Interreg Central, Interreg Danube) mainly focusing on Industry 4.0 and their application towards SMEs. Our staff is taking part not only on project meetings, but also on fairs, study visits, conferences where we can widen our knowledge.

Chamber of Commerce of Slovenia

The Centre for International Business (CEMP) at the Chamber of Commerce and Industry of Slovenia is one of the key players in promoting the internationalization of the Slovenian economy. Our activities in the field of international business, carried out under the GO INTERNATIONAL SLOVENIA program, are primarily intended to support our members, as well as other support services within the Chamber of Commerce and Industry. They are actively involved in all Strategic Research and Innovative Partnership (SRIP). They offer 3 main services: business consulting on foreign markets, business events (B2B delegations) and networking. They also co-ordinates Business Clubs and prepares Foreign markets manuals. They also provide access to economic advisers.

Virtual Dimension Center

VDC developed an internationalisation strategy in the past. The sub-areas of the internationalization strategy are as follows:

1. Information acquisition from abroad, via foreign target markets
2. (Create) Public image of the VDC and the VDC network abroad
3. Contact mediation abroad, from abroad
4. Technology transfer from abroad
5. Subsidies acquisition with foreign partners

Following activities were conducted:

- VDC delegation trip to France and Silicon Valley
- Market potential analysis „Application potential of Virtual Reality in the automotive and engineering industry of Brazil“
- Founding of the Visualization and Virtual Reality Networks Alliance (VisNetA)
- Cooperations through EU projects

Delegation trip Silicon Valley pictures:

Figure 53: Photos taken during VDC's repesentatives' study trip to Silicon Valley

7.5. Strategies to approach new markets

CNA

Know-how, supervision and expansion are the main elements of business success, crucial for all types and sizes of companies.

The support paths activated by CNA Emilia Romagna, also through the integration of temporary export managers in the company, provide the necessary tools to seize new business opportunities in a conscious and effective way.

HOW

1) Develop the national and international market

For example: analysis of turnover on the target markets.

2) Plan the commercial action

CNA Emilia Romagna supports the companies in identifying potential new target customers by planning the potential turnover in the reference markets.

The customers represent a fundamental resource for the company, to be protected and preserved in today's market, always ready to offer competitive and diversified products. Their satisfaction and consequent loyalty must become a priority objective to ensure the company a constant and consolidated sales success. CNA supports companies in the process of increasing and consolidating customers' loyalty, through the implementation of innovative and personalized services for the company and the use of effective channels and tools for recruiting new customers and interact with them.

For example: consolidation of presence on Social Networks and improvement of the use of the web and its tools; use of effective tools to improve customer loyalty strategies; efficiency of the customer service.

3) Promote the brand

CNA Emilia Romagna supports the company in identifying the most effective channels for promoting the corporate brand.

For example: development a branding e Social Media strategy.

RE:Lab s.r.l

no info provided

Regional Development Agency Bielsko-Biala

ARRSA since the beginning of its operations, has been trying to follow global trends and helping the region to become more competitive. With participation in local, regional, national and international events and initiatives we are trying to promote our region and gain knowledge and experience from others, more experienced.

Recently, a vast majority of our activities is related to the cutting-edge technologies, innovation and digitalisation. After the creation of our FabLab and becoming a member of Industry 4.0 platform, I4.0 is one the most important aspects of our activities. This is why we are attempting to become a Digital Innovation Hub for the entrepreneurs in the region.

Vorarlberg University of Applied Sciences

Not relevant for FHV

DEX Innovation Centre

Startup Acceleration Programs: 40 mentors and partner in other countries - if someone needs help, we can help with our contacts

Pannon Business Network Association

Since its foundation, PBN has been always open to new markets, and learn from experienced partners from all over Europe. The staff of PBN is permanently taking part (inter)national conferences, fairs, and study visits, where we can widen our perspective, and these events have enabled us to learn globally about numerous topics.

Currently the main focuses of our association are Industry 4.0 and digitization and their promotion among regional SMEs. In order to widen our knowledge in this field, we are contacting experienced partners among Europe, to acquire innovative solutions which are new on the market.

Chamber of Commerce of Slovenia

CCIS is involved in **8 of 9 Strategic Research and Innovation Partnership (SRIP)**: Factories of the Future (FoF), Mobility, Development Materials as end products, Smart Cities and Communities, Smart Buildings and homes (including wood chain), etc.

Through SRIPs new chains of value are being set up, which, due to the small size of Slovenia, are mostly international, so we are entering in international chains.

Virtual Dimension Center

NO INPUT PROVIDED

7.6. Further enabling factors if relevant:

In case further topics might be discussed every PP has the possibility to describe further elements if relevant:

Virtual Dimension Center

The Virtual Dimension Center (VDC) has been in existence since 2002 and is the most awarded cluster initiative in Baden-Württemberg, receiving the quality seal "Cluster Excellence Baden-Württemberg" in 2013, 2016 and 2019, among others.

The VDC Fellbach relies on a reliable, balanced and interdisciplinary organizational structure that has been continuously developed over 17 years. Numerous projects, events and technology relations have been realized since its foundation with 14 members at that time. In addition, VDC has a fully equipped Virtual Reality Demo Centre and is thus considered a nationwide model for an integrated economic-political approach in technology transfer towards SME.

7.7. Summary of partners' services on innovation enabling factors

Chapter 7 mentioned five different innovation enabling factors in order to give a widespread portfolio of project partners apart from the competence in the nine technological pillars, described in Chapter 5-6. In the framework of Chapter 7, the majority of the partners have highlighted that they have experienced staff in project management and international co-operations. In addition, some partners also underlined that they have also technical staff who are specialising in technological pillars, and in charge of development in the institution. The contribution of partners in Chapter 7 also reflect that project partners are dealing with industry 4.0 relevant topics, activities and (inter)national projects.

Due to the projects where project partners have been/are involved, they have the opportunity for taking part in pilot activities and support SMEs directly or indirectly.

As far as R&D activities are concerned, some partners have underlined that they -due to their wide network and technical staff- are actively taking part in R&D projects even in-house as well, and with these activities they could/can widen their expertise in a specific field as well as they can also widen their stakeholder network as well.

Partners have also mentioned that due to the numerous projects involvement they had the possibility to share their experience with international players, as well as they could also learn new knowledge from actors in the international market.

8. Connections with relevant stakeholders:

In this chapter PPs should list which already available connections they have in connection with the 9 technological pillars, and connections are planned to be established in the future shall be also described in this sub-chapter

8.1. Partners' current links to S3 policy stakeholders (regional+national level)

CNA

Already available connections

Following the directives of the Industry 4.0 Plan, CNA Emilia Romagna founded its Digital Innovation Hub, CNA HUB 4.0, with the aim to accompany companies in the transition to the new production model Business 4.0, through qualified consultancy and services, intercepting the most suitable suppliers with respect to the 9 enabling technologies of Industry 4.0.

In accordance with the National Plan and the Smart Specialization Strategy RIS3 of Emilia Romagna, which aims to build an increasingly dynamic, competitive region capable of generating employment growth by improving the efficiency of its structures and knowledge systems, CNA Emilia Romagna maintains a strong connection with all key regional, public and private stakeholders:

- Enterprise Europe Network,

- Ministry,

-Emilia Romagna Region,

-Municipalities,

- Business support organization,

- Chambers of Commerce / Digital companies points

- Research & Technology organization,

- High Technology Network,

- CLUSTERS of Emilia Romagna,

- Educational institutes,

- Competences Center,

- Universities,

-Research centers,

- FabLabs,

- Other DIHs.

CNA Emilia Romagna participates with the other stakeholders in the meetings organized by the Emilia Romagna Region for the development of the Smart Specialization Strategy RIS3 in the most important thematic areas (mechatronics and motors, agri-food, building and construction, energy and sustainability, health and well-being, innovation in services and cultural and creative industries) and for the definition of tenders and financing for SMEs.

Below, the map (Figure 53) regarding in specialization and internationalization in Emilia Romagna Region.

Figure 53. specialization and internationalization in Emilia Romagna Region

Connections that have to be established

Currently CNA Emilia Romagna is in contact with all the main stakeholders.

RE:Lab s.r.l

Already available connections:

Institutions

- RE:Lab has several connections with the **Emila Romagna Region**, especially with the **Department of Productive Activities** and with **ART-ER**.
- RE:Lab, as a company with a research profile, is part of the **High Technology Network** of the Emilia Romagna Region, as an accredited laboratory. https://www.retealtatecnologia.it/en/network

- RE:Lab is also a member of three **Clust-ER Associations** (*Innovate*, on innovation services; *Mech*, on Mechatronics and Motoristics; *Create*, on Cultural and Creative Industries), which, born within the framework of the High Technology Network, are communities of public and private bodies (research centres, businesses, training bodies) that share ideas, skills, tools, and resources to support the competitiveness of the most important production systems in Emilia-Romagna. https://www.retealtatecnologia.it/en/clust-er

Industrial area:

- Thanks to the close **cooperation with the surrounding economical clusters**, which accounts for more than 300 companies in one of the richest economic area in Italy, RE:Lab operates in several **different industrial domains**, such as interactive media, automotive, transportation, industrial automation and consumer electronics

Academics:

- RE:Lab collaborates with the University of Modena and Reggio Emilia (UNIMORE), especially in the field of Artificial Intellingence and Machine Learning.
- RE:Lab has a very tight connection with UNISOB, the University Suor Orsola Benincasa of Naples, in particular with Scienza Nuova, an integrated laboratory of innovative technologies for the social sciences, which has the aim of bringing the most advanced experiences of the development of science and technology to the world of humanistic knowledge
-

Connections that have to be established

no info provided

Regional Development Agency Bielsko-Biala

Already available connections

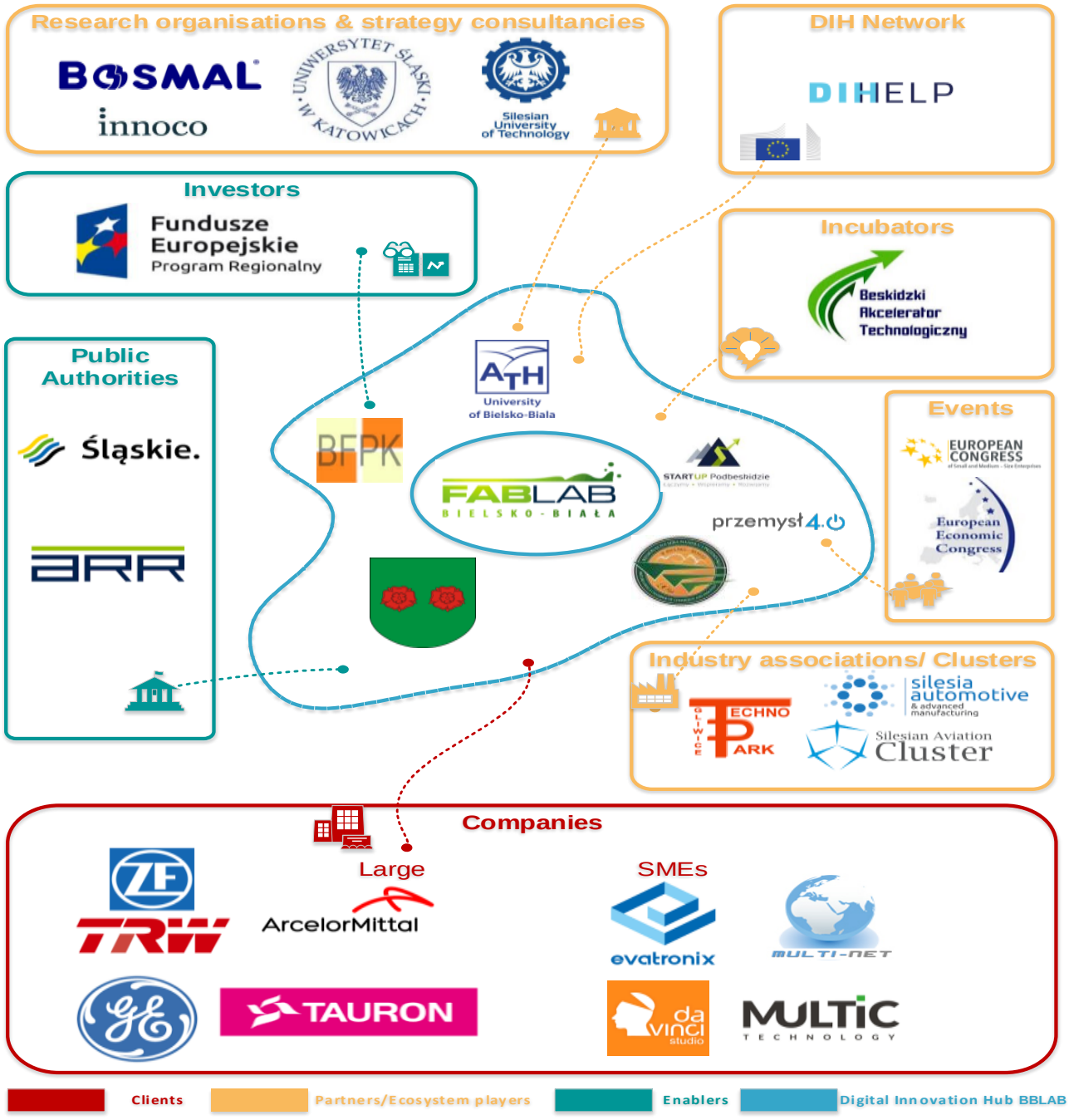


Figure 54: ARRSA's network with stakeholders

As it is shown on the graph above (Figure 54), ARRSA and FabLab Bielsko-Biała has already established a significant network of stakeholders from different sectors important from the point of view of creating digial innovation hub.

In our network of relevant stakeholders, we have representatives of the sectors of quadruple helix. When looking on a different classification, we our network consists of providers, suppliers and end users of Industry 4.0 technologies, as well as enablers and facilitators for developments and improvements.

Connections that have to be established

In terms of contacts that have to be established, we think that in terms of the future EU regulations and its approach to the digital innovation hubs, we should improve our connections with the national level institutions responsible for Industry 4.0 – both on a level of formal regulations as well as those working on promotion and dissemination of Industry 4.0.

Vorarlberg University of Applied Sciences

Already available connections

FHV is well-known in the S3 community and collaborates at all levels with S3 actors: regional, national and international. Regional actors that are in continuous exchange with FHV are, for example, the Government of the Federal State of Vorarlberg and Wirtschaftsstandort Vorarlberg GmbH. National actors are, for example, the Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, the Österreichische Raumordnungskonferenz and EFRE. International actors, are for example, Interreg, EUSALP, DG's of the European Commission

Connections that have to be established

no info provided

DEX Innovation Centre

DEXIC successfully carries out cross-sectoral activities and cooperates on its activities with various stakeholders. These are regional actors such as regions (eg Liberec), but also individual ministries and contributory organizations whose founders are cities or regions. Specifically, from the national point of view, it is about cooperation with, for example, the Ministry of Industry and Trade and in the case of the Ústí Region we have established successful cooperation with the Innovation Centre of the Ústí Region (ICUK).

Since 2019, DEX Innovation Centre is also the official and only EIT Health RIS Hub and InnoEnergy Hub in the Czech Republic and helps to find interesting talents from the Czech Republic, which help continues to move into the European Union's international acceleration programs.

Local partners do not play the most important role in the company's activities, but despite this, we strive for quality cooperation based on mutual trust, which has a positive impact not only on our region.

Connections that have to be established

Since we also want to involve SMEs from the Hradec Králové Region in our project in the long term, we would like to establish cooperation with the Hradec Králové Region in the future

Pannon Business Network Association

Already available connections

PBN is continuously expanding its contact network, as a result the number of S3policy stakeholders has also increased which PBN has contact with. PBN has contacts with S3 relevant policy stakeholders both on regional and national level.

Regarding the regional level, PBN has been working with the Chambers of Commerce of the regions (Vas, Zala, Győr-Moson-Sopron county) for years. Besides the chambers, PBN has been working with the local and regional public authorities, and in some cases they were involved in European projects as well. Apart from them, PBN has link to the Ministry for National Economy and to the National Research, Development and Innovation Office as well who were responsible for the preparation of the latest National Smart Specialisation Strategy in Hungary in 2014.

In the future we will be attempting to look for relevant actors and stakeholders in the policy field and establish new co-operations with them both on local regional, and national level.

Chamber of Commerce of Slovenia

Already available connections

The Ministry of Economic Development and Technology: provides support necessary to further strengthen the international competitiveness of Slovenian companies and change the composition of the Slovenian business sector so that it is adapted to the requirements of the global economy to the greatest possible extent. Through various measures it provides a stable, predictable and competitive economic environment for the growth and development of Slovenian companies on Slovenian and foreign markets. Its areas of work include internationalisation, entrepreneurship, technological development, tourism, the internal market, regional development and the wood industry.

Government Office for Development and European Cohesion Policy: is responsible for development and the implementation of the European cohesion policy. It handles the absorption of funds provided by the

European Structural Funds and the Cohesion Fund, as defined by the applicable legislation of the European Union. Ministries, government offices and other stakeholders are included in this process as the national managing authorities. The Office coordinates and monitors their activities for the implementation of the cohesion policy and reports to the Government.

Digital Innovation Hub Slovenia (DIH Slovenia): is Industry Digital Transformation one-stop-shop in Slovenia and beyond. It creates awareness and provide services to grow digital competencies, share digital experience and case studies locally, regionally and internationally, influence the government to adapt regulation and open its data to foster entrepreneurship.

University of Ljubljana: is the oldest and largest higher education and scientific research institution in Slovenia. University with its rich tradition was founded in 1919. It has approximately 38,000 undergraduate and postgraduate students and employs approximately 6,000 higher education teachers, researchers, assistants and administrative staff in 23 faculties and three arts academies. The central building, all three academies and faculties are located in the centre. Some of the most recent and modern buildings were constructed on the outskirts of Ljubljana, giving the university and its students a ubiquitous presence in the city.

University of Maribor: is the second largest and the second oldest Slovene university. Approximately 15.000 students study at one of the 17 faculties where they are being taken care of by around 1.800 employees. It carries an extremely important role in the region and plans to further develop in the direction of attracting the most talented students and providing a development context where excellence is at home at all levels. It is turning into a central development institution in constant connection with the economy and, together with its partners, is creating a centre of sustainable development for the wider region.

University of Primorska: their mission is to carry out education and scientific research in a professional and creative manner and to support the balanced development of Slovenia in the region, Europe, and globally. Its activities are in line with the national programme for higher education, the national research and development programme, strategic documents of the Republic of Slovenia, and guidelines for the development of a common European higher education and research area, with a particular emphasis on the Mediterranean region.

National Institute of Chemistry: has 351 employees (31. 12. 2019), of which around 292 carry out research work in 9 departments and two infrastructure centres; 149 of these have doctorates of science degrees. Research is oriented towards the development of new technologies and products, which will help to ensure the long-term development of Slovenia and which are internationally relevant. Industry is an important partner to the Institute in these endeavours. There are a number of Slovenian companies with whom the Institute has entered into close long-term cooperation, as well as a number of well-regarded foreign companies. From a financial point of view, this kind of cooperation represents 20% of the income of the Institute.

Agricultural Institute of Slovenia: is the leading research institute in the field of agriculture in Slovenia. It comprehensively deals with the issues of modern agriculture and is expanding its activities into the fields

of environmental protection and ecology. It employs 195 workers, of which 89 are researchers. The Agricultural Institute of Slovenia is a public non-profit research institute that performs fundamental, applied and development research and specialist tasks in agriculture, publishes the results of scientific research work as well as professional and supervision work, performs tasks based on authorisations and accreditations and checks the quality of agricultural products and products used in agriculture. The Institute also engages in the training of producers, education of young persons and consultation for various users in agriculture.

The Jožef Stefan Institute: is the leading Slovenian scientific research institute, covering a broad spectrum of basic and applied research. The staff of about 1050 specializes in natural sciences, life sciences and engineering. The subjects concern production and control technologies, communication and computer technologies, knowledge technologies, biotechnologies, new materials, environmental technologies, nanotechnologies, and nuclear engineering. The mission of the Jožef Stefan Institute is the accumulation - and dissemination - of knowledge at the frontiers of natural science and technology to the benefit of society at large through the pursuit of education, learning, research, and development of high technology at the highest international levels of excellence.

CCIS is involved in **8 of 9 Strategic Research and Innovation Partnership**: Factories of the Future (FoF), Mobility, Development Materials as end products, Smart Cities and Communities, Smart Buildings and homes (including wood chain), etc.

Connections that have to be established

no info provided

VIRTUAL DIMENSION CENTER

VDC has several connections with numerous stakeholders on local (Municipality of Fellbach / Region Stuttgart), regional (Baden-Württemberg), and national (Germany) level.

Already available connections

- City of Fellbach
- Stuttgart Region Economic Development Corporation
- Ministry of Economic Affairs, Labour and Housing Baden-Württemberg
- German Federal Ministry of Labour and Social Affairs
- Federal Ministry of Education and Research

Connections that have to be established

NO INFO PROVIDED

8.2. Partners' links to national DIHs

CNA

Already available connections

The Italian National Industry 4.0 Network provides 3 levels of companies support: the Competence Center (CC), the Digital Innovation Hubs and the Digital Enterprise Points (PID) which constitute the tool of the Ministry of Economic Development (MISE) to spread the know-how about the real benefits deriving from investments in technologies in Industry 4.0. CNA Emilia Romagna is part of the DIHs.

What distinguishes the three structures is basically the different level of information, training and skills in the field of Industry 4.0.

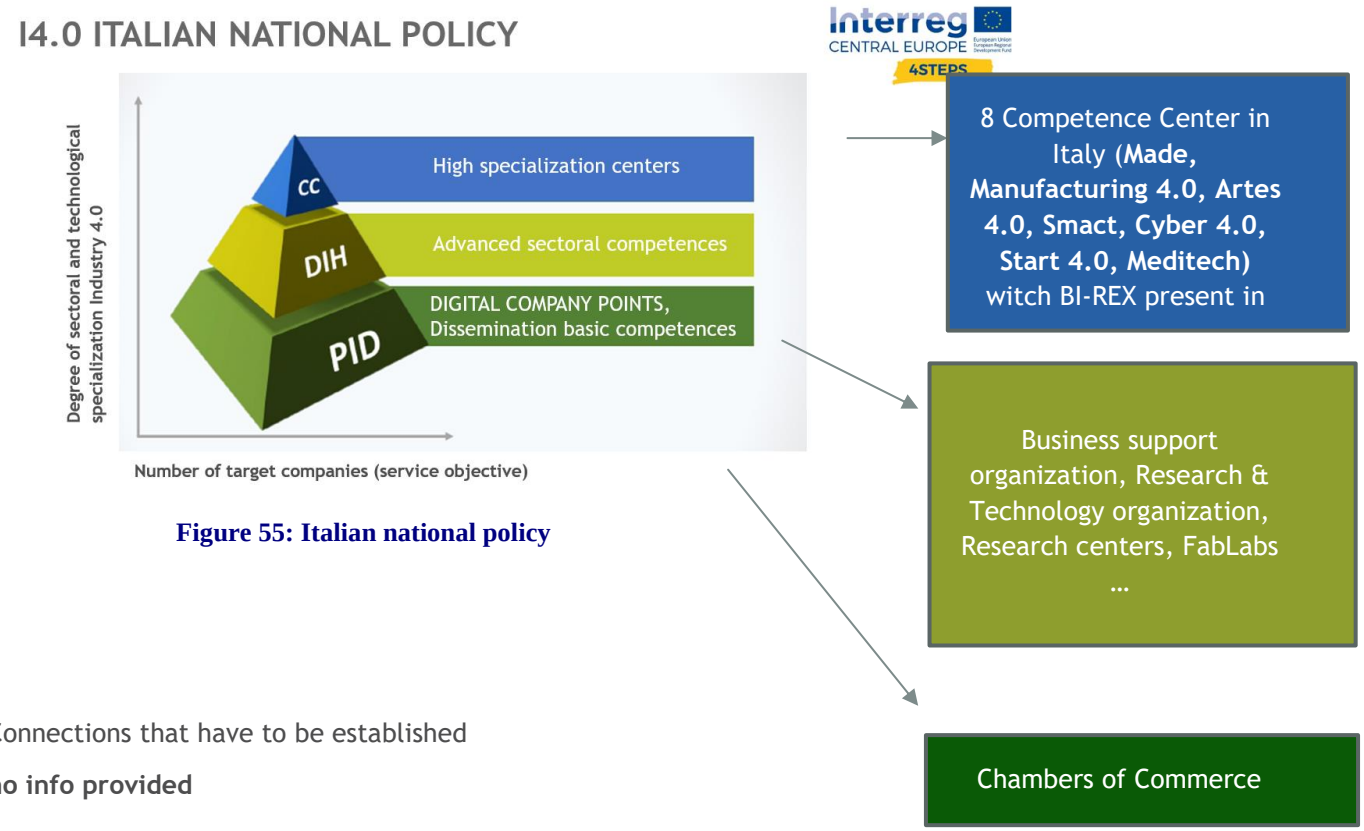


Figure 55: Italian national policy

Connections that have to be established

no info provided

RE:Lab s.r.l

Already available connections

RE:Lab works in close collaboration with CNA HUB 4.0, in particular providing scientific advice

Connections that have to be established

no info provided

Regional Development Agency Bielsko-Biala

Already available connections

National level DIHs have been established at the end of 2019 after the call for application for standardization of the Digital Innovation Hubs services. Till now we weren't able to create any connections with the DIHs that were chosen to run this project – 7 in total.

Connections that have to be established

We want to establish connection both with national DIHs (the one chosen by the national administrtions within the call) as well as other DIHs operating in Poland without this certain status.

We are also very interested in collaboration with DIHs from other countries, to exchange knowledge and experience with them and to participate in calls for proposal from various European programs.

Vorarlberg University of Applied Sciences

Already available connections

FHV is partner in the Austrian Digital Innovation Hub West. Additionally, FHV is designing and developing a Digital Innovation Hub for Artificial Intelligence and Industry 5.0, to be published on the European Commission's homepage.

Connections that have to be established

no info provided

DEX Innovation Centre

Already available connections

DEX Innovation Centre is part of the emerging platform for FabLabs and technical co-working spaces in the Czech Republic that want to develop collaboration between individual laboratories to help each other and transfer experience.

Connections that have to be established

Currently, DIH, which is created under the activities of the DEX Innovation Centre, has not established any cooperation since we are still in the first phase, but our goal is to seek to connect with other digital innovation hubs that have the same goals. We believe that such cooperation will facilitate access to technology but above all facilitate the transfer of knowledge, which is an essential part of such hubs

Pannon Business Network Association

Already available connections

In Hungary, there are three Digital Innovation Hubs, which are fully operational, and one of them is AM-LAB, PBN's technology-oriented spin-off company. One DIH is operated at Budapest University of Technology and Economics, and one is located in central Hungary, in Kecskemét, called Dig-i-HUB. We have links to both Hungarian DIHs.

Connections that have to be established

We would like to establish further connections with DIHs outside Hungary as well, whom we can work with and transfer know-how.

Chamber of Commerce of Slovenia

CCIS id a founder of Digital Innovation Hub Slovenia (DIH Slovenia), which is Industry Digital Transformation one-stop-shop in Slovenia and beyond. It creates awareness and provide services to grow digital competencies, share digital experience and case studies locally, regionally and internationally, influence the government to adapt regulation and open its data to foster entrepreneurship.

Through building the network and establishing a sustainable ecosystem at national level, DIH Slovenia aims at connecting and supporting different industrial sectors, providing for a broad spectrum of needs and striving to support all industries that can seize and benefit from the opportunities of digital transformation. DIH Slovenia focuses on supporting the industries that are highlighted as priority ones by Slovene Smart Specialization Strategy (S4), such as: smart cities and communities, smart buildings and smart factories. However, it does not exclude other industries from S4, ranging from high-tech to more traditional ones.

Key initial partners of DIH Slovenia are coming from the S4 specialization platform Smart Factories Cluster, ICT horizontal network (SRIP PMiS), Smart cities and communities, industry (members of above mentioned Smart Factories Cluster, TECOS), universities (University of Ljubljana, University of Maribor) as the largest research organization in Slovenia, SME's supportive environment (Association for Informatics and Telecommunications, Chamber of Commerce and Industry of Slovenia, Technology park Ljubljana

(connecting SME and several research institutes for innovation), Smart Factories Cluster, Wood Industry Cluster, IIBA Slovenia Chapter and others.

Connections that have to be established

We would like to establish further connections with DIHs outside Slovenia as well, whom we can work with and transfer know-how.

Virtual Dimension Center

Already available connections

- Regional Digital Hub Böblingen
- Microtech Südwest
- Packaging Valley
- FASA
- CVC Südwest
- Photonics BW
- GeoNet.MRN
- owlViProSim
- AFBW
- asc)s

Connections that have to be established

- Other regional Digital Hubs in Baden-Württemberg
- National Digital Hubs in Baden-Württemberg

8.3. Partners' connections with further relevant stakeholders

CNA

Already available connections

no info provided

Connections that have to be established

no info provided

RE:Lab s.r.l

Already available connections

no info provided

Connections that have to be established

no info provided

Regional Development Agency Bielsko-Biala

Already available connections

All relevant stakeholders were described in the section 8.1

Connections that have to be established

no info provided

Vorarlberg University of Applied Sciences

Already available connections

FHV is well-known in the S3 community and collaborates at all levels with S3 actors: regional, national and international. Regional actors that are in continuous exchange with FHV are, for example, the Government of the Federal State of Vorarlberg and Wirtschaftsstandort Vorarlberg GmbH. National actors are, for example, the Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, the Österreichische Raumordnungskonferenz and EFRE. International actors, are for example, Interreg, EUSALP, DG's of the European Commission. FHV aims to increase and reinforce these relationships but is open to enter new and already existing networks and partnerships.

Connections that have to be established

no info provided

DEX Innovation Centre

Already available connections

As part of the project, cooperation has already been established, for example, with the District Chamber of Commerce, which has proved to be a very good mediator on the way to the companies themselves. This cooperation has proved to be functional and we will continue to work towards its further development.

Connections that have to be established

DEX Innovation Centre wants to further develop cooperation with other stakeholders from the region who may have an opportunity both for DIH and especially for DIH users. That is why we will seek cooperation with the university, high schools, business representatives and other important actors from region.

Since the Economic Chamber has proved to be a very suitable partner for contact with SMEs, we want to develop cooperation with other economic chambers from the Liberec, Hradec Králové and Ústí regions.

Pannon Business Network Association

Already available connections

PBN has several connections with numerous stakeholders both on local, and regional level, and even on national level as well. In the past years PBN has continuously widened its own network with stakeholders, and the reliable and sustainable connection with them is guaranteed. Mainly in the Western-Transdanubia region, but also nationwide, we are in contact, and has already worked with lot of SMEs, who are mainly operating in the manufacturing industry. In the framework of some national and international projects we have carried out Industry 4.0 readiness /maturity surveys with Hungarian SMEs, and generally according to the results, in the majority of the Hungarian SMEs, the Industry 4.0 devices and services have not yet been implemented. Besides SMEs, PBN is in contact with the large multinational enterprises (the main employers) in the region, who are mainly also operating in the automotive industry. (e.g. BPW-Hungária Kft, (automotive) Ivy Technology Kft (electronics) Apart from the companies, PBN has good connection with several Hungarian Universities as well. (e.g.: Budapest University of Technology And Economics, Széchenyi University Győr).

Further relevant stakeholders (SMEs, Policy Makers, Universities, and RTD facilities) shall be addressed and be involved in the later phase of the project to discuss project implementation and results.

Connections that have to be established

no info provided

Chamber of Commerce of Slovenia

Already available connections

CCIS has several connections with numerous stakeholders both on local, and regional level, and even on national level as well. In the past years CCIS has continuously widened its own network with stakeholders, and the reliable and sustainable connection with them is guaranteed.

Connections that have to be established

no info provided

Virtual Dimension Center

Already available connections

VDC has relations with further relevant stakeholders, mainly companies operating in the fields of industry 4.0. These are hardware and software providers as well as technology users, including big companies from the automotive industry and the machinery sector, which are members or partners of the VDC-network.

Connections that have to be established

no input provided

8.4. Relevant projects

PPS should list synergic projects that could be connected to the nine technological pillars: they should limit the list to only those projects that could be really useful, and involved.

Note: In this chapter the running projects and the planned applications shall be also addressed

CNA

no info provided

RE:Lab s.r.l

- SAFE STRIP project (funded by the European Union's Horizon 2020 Research and Innovation Programme), which introduces an innovative technology integrating C-ITS (Cooperative Intelligent Transport System) applications within existing infrastructure, including I2V and V2I communication and VMS/VSL functions into low-cost strips embedded in the road pavement. These strips support Intelligent Transport System (ITS) services and apps, since they provide personalized messages for all road users (trucks, cars, pedestrians, cyclists and motorcyclists) and all generations of vehicles (autonomous, equipped with C-ITS systems, non equipped). This technology has low maintenance costs, it is fully reusable and it contains value added services, while also supporting predictive functions for road maintenance.

Regional Development Agency Bielsko-Biala

Projects that we consider relevant in terms of 4STEPS implementation are:

1. **FabLabNet** – CE283, Interreg Central Europe, Lead Partner: Muse FABLAB, webpage: http://www.fablabnet.net

Title of the project: „Making Central Europe more competitive by unlocking the innovation capacity of Fab Labs within an enhanced innovation ecosystem”

Aim: Fablabs into a central European network: 9 project partners - inspired by and strictly connected to 11 associated partners - share experiences and develop activities to boost their knowledge and capacity, following trends set by the European movement that emphasizes new business models, and marks the difference in current cultural & business world.

Implementation: 07. 2016 – 06. 2019

2. **DIHELP** – Digital Innovation Hub Enhanced Learning Program – mentoring program for DIHs and to-be DIHs

   Aim: DIHELP aims to develop a coherent, coordinated and sustainable approach to support European industries in all EU Member States at regional level using the concept of Digital innovation Hubs (DIH). To achieve this objective, DIHELP supports 30 Digital Innovation Hubs (DIHs) to develop and/or scale-up their activities through a mentoring and coaching programme that lasts for 9 months. Selected DIHs are receiving training and coaching on business development, financing and innovation management delivered both face-to-face and remotely as a part of the DIH Academy.

   Implementation: 03. 2019 – 10. 2019

3. InduCCI – CE1315, Interreg Central Europe, Lead Partner: Economic Development Corporation, City of Chemnitz, webpage: https://www.interreg-central.eu/Content.Node/InduCCI.html

   Title of the project: Cultural and Creative Industries in Traditional Industrial Regions as Drivers for Transformation in Economy and Society

   Aim: In InduCCI, Central European industrial regions have teamed up to tackle jointly the challenge of fostering CCI. Through policies and trainings, they intend to bring about supportive frameworks for CCI in industrial regions – on regional, national and EU levels. Through pilot actions, they investigate the potential of CCI as economic actor and innovator as well as driver of social change and new entrepreneurship. Most promising approaches are made available in a toolbox to other industrial regions and European CCI networks for policy take-up. Via CCI, a new pioneer spirit in Central European industrial regions could come into being – thus reviving a cultural heritage and developing a distinction, for which these regions once were known and famous for.

   Implementation: 04. 2019 – 12. 2021

Vorarlberg University of Applied Sciences

The Vorarlberg University of Applied Science (FHV) is a research-intensive organization and is present in all project funding tracks: EU, national and regional. Currently, FHV performs several projects within and the affiliated sector of Industry 4.0. These are:

BIFOCAlps: boosting innovation in factory of the future value chain in the Alps

BIFOCAlps main objective is to boost collaboration and synergies among main actors of the Alpine Space innovation system for a sustainable, smart and competitive development of the manufacturing value chain towards the Factory of the Future. The main outputs will be (1) a map of the sector at transnational level, to understand existing and potential good and best practices, technologies and competences along the value chain; (2) a validated methodology for enhancing FoF long-term sustainability through innovation and knowledge transfer among business, academic and policy actors, and (3) guidelines of strategic actions for influencing policy agenda based on an impact indicator system, to monitor and allow evaluation of performance in line with harmonisation of S3.

Austrian Blockchain Center

The Austrian Blockchain Centre mission is to be the one-stop-shop research centre for Blockchain (and related) technologies. These technologies shall be applied in industrial applications like industry 4.0/IoT as well as financial, energy, logistics, government and administrative applications. Those new applications and business models resulting from collaborations between established players, innovative start-ups and top R&D institutes will be the key for the creation of new jobs and establishing Austria among the top ten innovative countries in Europe. The R&D themes of the centre have been organized in five areas targeting economic, technological, applications as well as political and legal topics interfacing with existing COMET centres like CDP, SBA as well as international Blockchain initiatives. FHV is a pro-active partner within this project.

A-Ring: alpine research and innovation capacity governance

The A-Ring project addresses the overall need to pool efforts in tackling major challenges with joint research and innovation approach steering EU Open Innovation path. A-RING will foster alignment between different research and innovation initiatives and institutional frameworks to effectively address societal challenges and increase uptake of strengths and assets. Innovative bottom-up process is pursued to align research and innovation strategies, gathering expectations from BS and innovation potential from Academia, granting citizens' needs linked to responsible research and innovation and ensuring

transnational multilevel governance by developing a layer for a right policy process. The project partners design and develop a blueprint for a shared research and innovation agenda to promote joint S3 strategy framework. A-RING will establish a shared approach with mutual recognition across triple helix and targeted transnational activities, through Blueprint for SRIA, Policy Briefs and R&I Chart.

DataKMU: Vernetzung und Wissenstransfer im Bereich Data Science

(DataSME: Networking and Knowledge transfer in the field of Data Science)

In the Bavarian-Austrian border region is a lack of constant, permanent cooperation between the key players and their network partners. The DataKMU project, therefore, establishes a strategic, regional cooperation platform to increase the transfer potential and the transfer performance of the participating partners. The development of a strategy for the rapid, joint implementation of transfer projects, the development of new cross-border forms of cooperation and the realisation of twelve transfer projects should increase the transfer and innovation potential of the participating organisations. DataKMU thus establishes the basis for long-term cooperation with all target groups and stakeholders, which is a necessity due to the complexity of the tasks and lack of resources.

CityCircle: Circular economy hubs in peripheral urban centres in Central Europe

The CityCircle project aims to establish close quadruple-helix cooperation to be able to utilize innovation and R&D potential within the Central Europe. By establishing circular economy quadruple-helix hubs as local innovation networks of private and public institutions in partner cities, CityCircle project will provide innovation systems to facilitate innovation and transfer of technology, services and business models. By providing hubs with tools and knowledge, the project will enable the hubs to generate innovative solutions in CE in their urban ecosystems in a long run. In addition, by setting-up a transnational CE network to support transnational CE value chains, partner cities will internationalize their businesses and at the same time provide transnational coordination of RIS3 implementation.

KMUdigital “Data for KMU”

(SMEdigital “Data for SME”)

The generation of added value from data is a key technology for the design, development and operation of products and services. Products become intelligent and their users remain in continuous contact with the manufacturer after delivery. This shifts the focus from a one-time sale of a product to the provision of a continuous service. Due to organizational and financial requirements, the evaluation of data poses a major challenge for SMEs. Data4KMU develops easy-to-use data science instruments for SMEs for direct use in products, services and the associated business processes.

KMUdigital "i4Production"

(SMEdigital "i4Production")

The goal of the project is the development and simulation of an internationally networked process map 4.0 on the basis of three model factories in three countries. In a common, standardized automation concept, a cyber-physical system (CPS) in the form of a customer-specific model vehicle is produced in the internationally networked model factory. The digital process chain is intended to awaken an understanding of the resulting opportunities and risks among representatives of regional SMEs. Upon request, the SMEs will be scientifically supported and promoted in the implementation.

Resindustry

The Resindustry project aims to increase the energy independency of the EU industry sector, by decreasing its energy intensity through a higher integration of RES. The long-term objective is to increase the industry competitiveness by decreasing its energy bill, rising their energy independency, thus uncoupling their energy costs from geopolitical externalities. To achieve these long-term strategic objectives, the short-term objectives are to booster RES investment in industry by improving OPs with new policies for RES promotion.

DEX Innovation Centre

In the past, we have implemented a project called NewGenerationSkills, which aimed to promote innovation in the region through the development of entrepreneurial and digital skills among young people. Thanks to this we have gained interesting experience in the field of education. We will try to capitalize on this experience to the best possible extent in DIH activities such as workshops.

Between 2017 and 2018, DEX Innovation Centre implemented a project called V4 & I4, which aimed to raise public and private sector and citizens awareness of the challenges and opportunities in industry 4.0. The project was based on the fact that the V4 countries are slightly behind the leaders of industry 4.0 by Germany and Austria. The V4 & I4 project therefore wanted to contribute to improving this situation through regional and international workshops where information, knowledge and good practice were shared with selected candidates.

As an EIT Health HUB, we plan to realize 2 hackathons each year to address individuals and companies interested in healthcare innovation. Specifically, it will be hackathons that will deal with topics such as smart medical facilities and home and nursing facilities. We will realize these activities primarily for companies and individuals not only from the region to increase interest in technology and innovation.

Pannon Business Network Association

Currently PBN is currently managing 20 international projects, and the majority of them are dealing with Industry 4.0 topic and its utilisation among SMEs. The aims of these projects are to improve the innovative technological knowledge and support the regional SMEs:

The following list summarises the relevant projects and some main information about them where PBN is involved as a project partner:

Name of the project	Title of the project	Webpage of the project	Lead Partner of the Project	Funding Programme of the Project	Duration of the project
S3HUBSinCE	Unleashing the potential of transnational cooperation, through Digital Innovation Hubs, to promote RIS3 implementation	https://www.interreg-central.eu/Content.Node/S3HubsinCE.html	Carinthia University of Applied Sciences	Interreg Central Europe	01.03.2019-28.02.2022
DIH^2	A Pan-European Network of Robotics DIHs for Agile Production	http://www.dih-squared.eu/	VTT Technical Research Centre of Finland	Horizon 2020	01.01.2019-31.12.2022
Chain Reactions	CHAIN REACTIONS addresses the challenge for industrial regions not benefitting from innovation activities from large leading corporations to increase regional capacity to absorb new knowledge and turn it into competitiveness edge and business value.	https://www.interreg-central.eu/Content.Node/CHAIN-REACTIONS.html	Pannon Business Network	Interreg Central Europe	01.04.2019-31.03.2022
InnoPeer AVM	PEER-to-peer network of INNOvation agencies and	https://www.interreg-central.eu/Content.Node/In	Business Upper Austria - OÖ Wirtschaftsagentur GmbH	Interreg Central Europe	01.07.2017. - 30.06.2020

	business schools developing a novel transnational qualification programme on AdVanced Manufacturing for the needs of Central European SME	noPeerAVM.html			
INTENCIVE	INTENCIVE: INnovation and Technology ENhancing Customer OrIented Health SerVicEs	https://www.interregeurope.eu/intencive/	Regional Council of South Ostrobothnia	Interreg Europe	01.08.2019-31.01.2023
L4MS	The L4MS Marketplace will connect manufacturing SME's and mid-caps with automation solution providers.	http://www.l4ms.eu/content/l4ms-project-home	VTT Technical Research Centre of Finland	Horizon 2020	01.10.2017-31.03.2021

Chamber of Commerce of Slovenia

Currently CCIS is managing more than 50 international projects, and some of them are dealing with Industry 4.0 topic or advanced manufacturing and its utilisation among SMEs. The aims of these projects are to improve the innovative technological knowledge and support the regional SMEs:

The following list summarises the relevant projects and some main information about them where CCIS is involved as a lead partner or project partner:

Name of the project	Title of the project	Webpage of the project	Lead Partner of the Project	Funding Programme of the Project	Duration of the project
COCO4CCI	Culture and Creative Industries COOPERATION COLLIDER	https://www.interreg-central.eu/Content.Node/COCO4CCI.html	CCIS	Interreg Central Europe	1.4.2019 - 31.3.2022
ProsperAMnet	Progressing Service Performance and Export Results of Advanced Manufacturers Networks	https://www.interreg-central.eu/Content.Node/ProsperAMnet.html	University of Applied Sciences Upper Austria	Interreg Central Europe	1.4.2019 - 31.3.2022
DesAlps	Design your Business Innovation!	https://www.alpine-space.eu/projects/desalps/en/home	T2i	Interreg Alpine Space	01.11.2016 - 29.2.2020
Diva	Development of innovation and value-chain eco-systems: strengthening transborder innovation through CCIs	https://www.ita-slo.eu/sl/diva	Camera di Commercio Industria Artigianato e Agricoltura di Venezia Rovigo	Interreg Italia - Slovenija	1.3.2019 - 28.2.2022
Creo	The Cultural and Creative Occupations: New opportunities in the traditional industries	https://creo-project.blogspot.com/p/who-creo.html	Ikaslan Bizkaia	Erasmus+, K2	1.10.2018 - 30.9.2020
InTraRed	Innovation Transfer Ready SMEs		University of Peloponnese	Erasmus+, K2	1.10.2019 - 30.9.2021

Virtual Dimension Center

Running projects:

4STEPS

Cyber Access Baden-Württemberg: The Crosscluster Industry 4.0 consortium (microTEC Südwest, Virtual Dimension Center Fellbach and bwcon GmbH), together with interested companies from the retail, craft, aviation, medical technology and production sectors, is examining the prospects of collaborative distributed applications and is helping companies to use these technologies.

The concepts of the project are developed from the beginning together with the potential users of the emerging applications. Current opportunities and risks are discussed during a co-creative process and the different needs and potentials of companies in Baden-Württemberg are recorded. As a result, optimal application scenarios for the implementation of virtual technologies in the company are created using innovative methods and tools. The following application scenarios are being tested:

Distributed presentation: Objects and / or environments are presented virtually (during development or for marketing purposes, etc.)

Training: 3D qualification of a participant who is not present

Assistance systems: support of a work process (e.g. repair, assembly)

The project is funded by the Baden-Württemberg Ministry of Economic Affairs, Labour and Housing.

Applikationszentren V/AR: the project has set itself a variety of tasks: it will be about supporting small and medium-sized enterprises (SMEs) in particular with the introduction and application of new V / AR technologies. The national and international visibility of Baden-Württemberg as »V / AR-Land« should be promoted. It is important to effectively represent the interests of technology users from the economy vis-à-vis the large manufacturers by forming a critical mass. The V / AR start-up scene should also be included in the network with established companies and user companies. New event formats enable dialogue between manufacturers and users. For this purpose, numerous measures are planned as part of the project work. These include V / AR application lighthouses, V / AR workshops at Fraunhofer IAO and VDC, a V / AR start-up forum, match making (also in the sense of a user-manufacturer dialogue) and novel narrative Applications, for example for V / AR-based training. The project is funded by the Baden-Württemberg Ministry of Economic Affairs, Labour and Housing.

GeZu 4.0: "GeZu 4.0" aims to deal with the future of work in an SME-friendly manner. Extended experiment rooms will be set up in the immediate vicinity of the participating companies. There they deal with the challenges of digital change. The project also develops the role of the Quarter Manager 4.0: he supports the companies, initiates and accompanies the experiment rooms and sensitizes the companies to the issues of tomorrow's working world. In doing so, they also deal with the digitization of their processes and develop solutions. In addition to working groups and networks, the project partners are establishing new forms of collaboration - supported by innovative information and communication technologies. The "GeZu 4.0" project is intended to promote social and technical innovations. External actors from science, employer and employee representatives or start-ups provide additional ideas for the design of good, future-proof work. The project is funded by the German Federal Ministry of Labour and Social Affairs.

Planned applications:

Digitallotse Wirtschaft 4.0: Project will address new technologies and business model creation related with V/AR and new services for consulting SME.

8.5. Summary of the already available connections of PPs:

Chapter 8 examined the project partners' connections with relevant stakeholders. Within this chapter partners were asked to list and shorty detail their connections with S3 policy stakeholders including, local, regional, and national level as well. Apart from the policy players, project partners were required to mention their links to national Digital Innovation Hubs. In case partners might have additional links with relevant stakeholders they could add further players in a separate sub-chapter. Chapter 8 was also concentrating on project involvement of 4STEPS partners.

According to the contributions provided by partners, it can be undoubtedly stated that 4STEPS partners have already established connections with the most relevant stakeholders, including S3 policy makers, DIHs, and Industry 4.0 related institutions (Universities, R&D facilities, SMEs..)

Regarding policy makers, the contributions reflect that partners have connections with these players mainly on local and regional level. However, some partners have underlined that they would like to widen their policy stakeholder network with national actors as well.

As far as the DIH connection is concerned, it can be also defined, that partners have a wide network with DIHs, and they have already contacted them in most of the cases. Partners, like ARRSA and DEXIC, who have not established a connection with DIHs yet, they also highlighted that they would like to work with DIHs in the near future. Furthermore, what is true for every partner that further develop cooperation with other stakeholders from the country who may have an opportunity both for DIH and especially for DIH users. Besides, project partners are very interested in collaboration with DIHs from other countries.

When it comes to the project involvement, it can be also noticeable from the inputs, that project partners are really experience in project management, since they have already taken part in numerous Industry 4.0 related projects, where they could widen their knowledge and utilise their experience in this field.

9.Conclusion:

The general objective of this Catalogue was to examine the potential Industry 4.0 supporting services that the PPs shall make available to companies so that they can find a correlation between their need of innovation and contents of Industry 4.0.

The main chapters of the Catalogue were focusing on partners' current competencies and skills in relation with the nine Industry 4.0 technological pillars, and partners, in a separate chapter, were also required to highlight their short-term development plans, and envisaged activities in terms of the technological pillars.

As a matter of facts, we are convinced that the needs and characteristics of companies with respect to innovation must also be considered in terms of managerial skills, not only in relation to the 9 pillars. Therefore, project partners also provided their contributions in terms additional innovation enabling factors, namely Human Capital and Competence, Fundraising, R&D, Internationalisation as well as they had the opportunity to detail their strategies how to approach new markets.

In the last main chapter, project partners were specifying their already available and planned connections with S3 policy stakeholders, Digital Innovation Hubs, as well as with additional relevant Industry 4.0 related institutions. Besides, partners were also providing inputs about their Industry 4.0 related project involvement.

Taking into consideration partners' contribution in all chapters, it can be unequivocally stated that 4STEPS project partners are experienced not only in the utilisation of Industry 4.0 technological pillars, but also the respective chapters also highlighted that they have established a wide range of network with relevant stakeholders, including S3 policy stakeholders, Digital Innovation Hubs. Furthermore, project partners have long-term experience on the international level as well, since they have had connections with international actors, as well as the partners underlined that they have already taken part in several EU projects in connection with Industry 4.0 where they could exploit the supporting opportunities due to pilot actions.

Chapter 5 shed light on, that project partners are really experienced and have advanced knowledge in the most of the Industry 4.0 technological pillars. As Chapter 5 reflects, project partners' competence is diverse when it comes to the nine Industry 4.0 technological pillars. The chapter has shown that certainly one partner does not have competence in each pillar, and of course the extent of competence is different per partner in each of the listed technological pillar. Within the technological pillars, mainly additive manufacturing and simulation might be addressed, since most of the partners are dealing with, and have advanced knowledge in these areas.

Chapter 6 has revealed, that the short-term aims of project partners are to widen their expertise in the technological pillars, they are currently operating, as well as they are planning to start activities in other fields as well.

When we scrutinise the contributions of Chapter 7, it can be also seen that the majority of the partners have highlighted that they have experienced staff in project management and international co-operations. In addition, some partners have also underlined that they have also technical staff who are specialising in technological pillars, and in charge of development in the institution. The contribution of partners in Chapter 7 also reflects that project partners are dealing with industry 4.0 relevant topics, activities and (inter)national projects.

The contributions of partners in Chapter 8 have revealed that 4STEPS partners have already established connections with the most relevant stakeholders, including S3 policy makers, DIHs, and Industry 4.0 related institutions (Universities, R&D facilities, SMEs..)

When it comes to the project involvement, it can be also noticeable from the inputs, that project partners are really experience in project management, since they have already taken part in numerous Industry 4.0 related projects, where they could widen their knowledge and utilise their experience in this field.

In conclusion, taking every contribution into account, it can be stated that project partners of 4STEPS are rather experienced in the field of utilisation of technological pillars, as well as they have a wide connection network with Industry 4.0 related institutions. As a result, the inputs of partners in each chapter, might contribute to support SMEs, who can find a correlation between their needs of innovation and the contents of I 4.0 with the help of the current supporting Catalogue.

10. Proposal how to make the content of the Catalogue “attractive” and how it may appear in several forms:

The chapters of the Catalogue can be uploaded in a kind of moodle form: Please check this English platform as an example. Platform:moodle.silver-skills.eu User name 1st box: kriszbar Password 2nd box: kriszbar55 (On the main page, the 9 pillars or the PPs name would appear, and when somebody clicks on the pillar/PP name only the relevant part of the Catalogue would appear) Further discussion is needed between the partners to finalise the appearance of the Catalogue in several forms: web, text, multimedia