TRANSNATIONAL REPORT OF INNOVATIVE SERVICES

Deliverable D.T3.8.4

03/2022

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Contents

Executive Summary/Management Summary

The 4STEPS project is addressing the main challenge of Industry 4.0 as a tool towards a new, digital industrial revolution holding the promise of increased flexibility in manufacturing, mass customization, increased speed, better quality, improved productivity, and its development is supporting the RIS3 in the target regions in the different sectors.

The project is organized among two administrative work packages (Management & Communication) and three operative work packages, that are:

- The SME towards the scenario and themes of Industry 4.0 (WP1)
- From catalogue to action: local implementation of an intervention plan (WP2)
  … and …
- The Digital Innovation Hubs in action (WP3)

This deliverable at hand is the final deliverable within WP3: The Digital Innovation Hubs in action and summarizes the pilot activities conducted within the 4Steps project.

In doing so, this deliverable provides (1) an evaluation report of the six 4Steps DIH's, its Services developed and provided (to business and industry), action(s) developed and provided (within the 4Steps project lifetime), and an evaluation (based on the strengths and opportunities of particular Hub) as well as (2) a future outlook of the Hubs based on the estimation of the Hub's contribution to the Interreg CE's economies with regard to (a) sustainability, (b) human-centricity, and (c) resilience.

1. Introduction

The deliverable at hand is composed of three main chapters. In chapter 2, the pilot evaluation of particular Hub is presented. This chapter is composed of X sections that present (a) the pilot evaluation, (b) the services developed and provided, (c) the action(s) developed and provided and (d) the strengths and opportunities of particular Hub. In chapter 3, the future sustainability of the DIH and its impact for the region/Interreg CE region get presented. This chapter is composed of three sections that present the Hubs impact on (a) the sustainability (including environmental, economic and social sustainability aspects), (b) human-centricity (including workers' health, wellbeing, and empowerment, as well as re-skilling and up-skilling activities), and (c) resilience of industry? (including technological and process/supply chain/organizational aspects). Chapter 4 concludes the deliverable at hand.

2. Pilot Evaluation: The DIH in action

This chapter presents the pilot evaluation of developed 4Steps Digital Innovation Hubs. This chapter is divided into four sections that present (2.1) The DIH in action, (2.2) The services developed and provided, (2.3) The actions developed and provided and (2.4) the DIH evaluation and appreciation.

2.1. The DIH in action

This section presents the 4Steps DIH's in action.

2.1.1. Italy

CNA Emilia-Romagna supports the directives presented by the regional government within the "Industry 4.0" national plan, and is investing in the implementation of a network of Digital Innovation Hubs at regional level, with the aim of accompanying companies in the transition to the new business model 4.0, key theme of the project 4 steps. Through its Digital Innovation Hubs, CNA Emilia-Romagna supports companies to help them understand their digital maturity, identify priority areas of intervention and use the public tax incentives made available by the Industry 4.0 Plan.

2.1.2. Poland

Pilot Action conducted by ARRSA was divided into two parts: (1) D.T3.2.1 - development of a Digital Innovation Hub based on the infrastructure of FabLab and (2) D.T3.2.2 - improvement of this infrastructure with a robotic arms showroom and new portfolio of services.

(1) D.T3.2.1

Digital Innovation Hub named iLaBB 43300 was established and presented on the 4th March 2021 during an on-line live event 'Industry 4.0: Making local-going globally' organized in the framework EU Industry Week format.

On this event representatives of ARRSA and FabLab as well as technology practitioners presented case studies about Industry 4.0 technologies available in the region that can help SMEs to expand on the global market, improve their effectiveness and competitiveness.

Following that, ARRSA made further efforts to develop the structure of DIH and set its role in the regional ecosystem of innovation.

We became a member of Digitalisation Working Group established by EURADA (European Association of Development Agencies), within the structure of which we have access to best practices in terms of DIH development as well as to knowledge and expertise of key European digitalisation experts.

On the other hand, we became a partner of European Digital Innovation Hub consortium – Silesia Smart Systems (SSS-EDIH) led by Katowice Special Economic Zone, together with all relevant stakeholders like technical universities, research institutes, business support organisations.

SSS-EDIH was already preselected on the national level and the application for EC call was submitted.

(2) D.T3.2.2

In parallel, in accordance to the 4STEPS application form, we have expanded our FabLab's technology park with two robotic arms – SCARA type and 6-axis.

With this purchase we were able to open the robotic arms showroom and invite relevant stakeholders for events and workshops, when we demonstrate this technology and showcase advantages of automation of processes.

To ensure the highest impact we organized different types of showroom activities (also adjusted to the COVID-19 pandemic): on-spot technology breakfast in FabLab, outside on the bigger event, tailored and individual meetings, on-line webinars.

Additionally, we have set a portfolio of new services that we would like to implement with the usage of robotic arms and FabLab as a creative space, also after the project lifetime.

2.1.3. Czech Republic

In the Czech Republic, the pilot activities were divided into several different activities in order to develop the knowledge of the individual SME participants and also to connect the different actors and create new links between them. Firstly, a concept for manager training was developed, based on which a special workshop for managers on the topic of

digitalisation of companies was also revised with topics such as strategy, new markets or risk management.

The next activity was workshops in the fablab to develop the digital skills of SME employees. These workshops focused on activities such as 3D printing, CNC, PCB, or working with a plotter.

The final activity was a matchmaking event to connect different actors who can establish cooperation, either in the form of financial support - investment or cooperation on another level.

2.1.4. Austria

The Digital Innovation Hub on Business Intelligence & Innovation is the output of FHV's participation within the Interreg Central Europe project 4Steps. This Hub is established as regional Open Innovation/Idea Lab, co-creation space, and (physical & digital) networking/matchmaking platform between business, industry, government, society and academia within the region of Vorarlberg. The Hub provides five services that address the fields of Artificial Intelligence, Innovation Management & Research, Methods & Tools, Resilience Engineering and System/Eco-System collaboration. Additionally, the established Hub provides a platform for networking and matchmaking between the Hub's target groups and stakeholders. During the 4Steps project lifetime, involved members provided a variety of actions. These are, for example, the design and development of the Hub's physical and digital presence (e.g. publication of the Hub at the S3Platform of the European Commission, DIHNET.eu, etc.), development of the services, resource and business planning, dissemination of the Hub through presentations at scientific and industrial conferences, publication of articles in newspaper and journals, booth presentations. Additionally, the members worked on the establishment of an international network for the Hub. In doing so, the DIH on Business Intelligence & Innovation was invited to and organized several conference and projects (in collaboration with regional business and industry).

2.1.5. Slovenia

DIH was setup as business support organisation that will serve as a centre of information for developing manufacturing businesses. Goal is to establish connections between companies that need help in developing its business models and companies that provide these solutions in area of digital transformation and technologies of Industry 4.0.

DIH is especially focused on supporting SMEs from industries that are prioritized by Slovene Smart Specialization Strategy (S4). These include smart cities and communities, smart buildings and smart factories.

2.1.6. Germany

The pilot included the evaluation of the operator 4.0 approach. There are already plenty of studies about the future vision of the operator 4.0, therefore the focus was placed on the feasibility of all or individual aspects of it for today's useful implementation. Parallel to this, demonstrations of portable devices for use in an industrial context were created and try-out possibilities were made possible. Three events were held to impart the acquired knowledge. Different event approaches were also tested to see with which the new technologies can be communicated and shown in the best possible way. These Events were directed at specialists from certain application fields and industrial sectors with the main topics augmented reality, virtual reality, 3D simulation and their use cases and examples from the industry.

2.1.7. Hungary

Our main aim in the pilot action was to analyse- with using advanced data analytics methods- national companies how they reacted to crises based on a national database. In the first part of our pilot action- namely D.T.3.7.1- a quantitative analysis was carried out and based on that finally four groups (segments) have been classified how companies were exposed to economic shocks. -level of their resilience-. In the second phase of the pilot activity (D.T3.7.2), based on the conclusions of the quantitative research as well as data from public balance sheets and profit and loss accounts, we filtered out businesses that showed signs of resilience following a business downturn in a given year. In this upcoming phase, we built on interviews, surveys and publicly available data (from company websites, media) to take one step ahead of understanding factors of resilience.

The procured national company database contained financial balance sheets and income statements on little bit more than 26 000 Hungarian companies- including also the companies which had undergone the analysis in the first half of the project in WPT1- and 73 variables were involved in the dataset. The investigated time period covers 2002-2019 and mainly companies from processing sector have been involved, since these partakers contribute the most to the Hungarian economy according to the Hungarian Central Statistical Agency.

2.2. Services developed and provided

This section presents the services developed and provided.

2.2.1. Italy

In order to support the improvement of the Emilia-Romagna business/production processes, CNA Emilia-Romagna has organized a path reserved to its DIHs, in order to focus

their experience and knowledge in a development project for companies, able to become a demonstration of the design management process.

Several tools were presented, one of them is the Design Thinking, a useful tool methodology for planning scenarios conditioned by change, which enable companies to grow on a global scale.

Another useful tool presented thanks to the support of RE: LAB makes it possible to analyze the positioning, in a 4.0 perspective, of SMEs in Emilia Romagna and the impact of digitization on businesses and supply chains with respect to the 9 dimensions of the "Technology Level of maturity". Finally, the Mackathon activity aimed at the dissemination of digital content to companies for a transition to a new business model 4.0. This activity is developed in collaboration with RE: Lab.

2.2.2. Poland

Services developed and provided within the WP T3 4STEPS project may be divided as follows:

- Ecosystem building & awareness raising
    - EU Industry Weeks – organization scheme for the Industry 4.0 awareness raising events with brokering and networking dimensions, in an on-line as well as hybrid formula – developing of DIH, format for dissemination and communication of the DIH activities and technological trends
- Technology events
    - Showroom Robotic Arms – scheme of creation of the robotic arms showroom from the beginning – purchasing of the equipment, procurement procedure etc. to scenarios of the possible events for different target groups

Each of the service may be transferred and adjusted to another region as well as different target group.

- Portfolio of new services – created with the scope of 4STEPS project, to be used within the DIH structure in the future:
    - Simulation and testing of manufacturing processes using robotic arms
    - 3D scanning, reverse engineering and quality control of production processes
    - 3D scanning workshops – for beginners
    - Microcontroller programming workshops (Arduino)
    - 3D printing for schools – beginner level
    - Train-the-trainer: 3D printing and rapid prototyping for teachers
    - Rapid prototyping: from idea to prototype
    - 4STEPS Digital Skills Workshops framework

2.2.3. Czech Republic

We successful realized educational workshops and linkage services. Considering the layout of the FabLab and the focus of the DEX Innovation Centre, education in the form of workshops focused on the development of digital skills, as well as networking events, is a good direction to pursue in providing services aimed at meeting the project objectives.

Services such as training workshops on 3D printing, CNC, or PCB and IOT are an ideal start for companies looking to develop their employees and test the possibilities for their own production. As well as networking between different actors and stakeholders.

2.2.4. Austria

The Digital Innovation Hub on Business Intelligence & Innovation provides five services to regional business and industry. These are, Artificial Intelligence (incl. system modelling, simulation, optimization and design of Evolutionary Algorithms), Innovation Management & Research (incl. Open Innovation/Living Lab, creative destruction, technology impact assessment), Methods & Tools (a method toolbox for innovation engineering; Grounded Theory research), Resilience Engineering (incl. resource engineering and capability development) and System/Eco-System collaboration (e.g. Digital Twin technology, robot/cobot technology).

2.2.5. Slovenia

DIH is offering following services:

- Individual digital readiness assessment.
- Coaching on the concepts of Industry 4.0.
- Analytical assessment and coaching of SMEs on the topic of sustainable value chain reporting.
- Workshops for manufacturing SMEs on the topic on understanding the importance of customer experience.
- Workshops for SMEs on how and where to access finances for digitalisation of theirs' business models and technologies.
- DIH offers a pilot platform for the e-life cycle of products (this also includes promotion, showcasing and coaching on the topic of ETIM standards).
- Raising awareness of the importance of cyber risk management in businesses and governmental bodies, developing the capacity of cybersecurity competence centres and collaborating between cybersecurity services providers.
- Promoting the development of specialist and user skills, also standards and certifications.

- Engaging in joint development projects for governmental programs and specific solutions for SMEs.
- Workshops for SMEs and companies in demo centre Smart Factory on topic of I4.0 and smart factories.

2.2.6. Germany

Consulting and Hardware Demonstrator

Small and medium-sized companies are getting informed about new business opportunities, they are provided with information and contacts for operator 4.0 technologies and kept up to date on trends in the fields of virtual reality, augmented reality and wearable devices.

The Demonstration Center is one of the tools for technology transfer and has been expanded with various wearable devices related to the operator 4.0 approach. It includes various hardware and software demonstrators with use cases for different wearable devices. It is on our site available and permanently accessible with the option to lend the hardware. In addition, it is possible to arrange dates for special and guided demonstrations by VDC employees in our rooms.

Furthermore, the VDC developed a concept to assess V/AR hardware and shares the evaluation reports. This makes it possible to assign the hardware to the use cases during the consultation.

2.2.7. Hungary

As the analysis in D.T3.7.1 reflects, based on the selected financial metric the impacts of the macroeconomic crisis of 2008 affected the most companies within the processing industry in Hungary a year later, so in 2009. The same holds regarding number of employees affected at those companies that were exposed to economic shock at a certain level, thus not just small companies with relatively small number of employees have been affected than this crisis truly hit a broad segment of society. Consequently, in 2010 a relatively comprehensive decrease in employee number was observed that was also presented in the analysis.

In our examination we focused on companies that were exposed to an economic shock in a given year and right after the year of shock they managed to compensate and gain momentum to reach the economic status (or even overshoot it) as the year prior to the shock. Based on literature definition, we could denote these companies as “one-year-reactive-resilient” companies Those companies which managed to steer back to the state prior to the economic shock only years later (more than one) are not considered as resilient in our investigation due to their slower reaction, they could be denoted as “multiannual-reactive-resilient” companies.

2.3. Action(s) developed and provided

This section presents the actions developed and provided.

2.3.1. Italy

Pilot 1 - DT311

Lab On Business support

Product and process design

Online webinar course on the methodology of **Design Thinking** addressed to CNA Digital Innovation HUB experts

Teachers/experts: Mr CARMELO DI BARTOLO and Mrs Valentina De Matteo

Date and time of the meetings:

- THURSDAY 24 JUNE: 10.00 am-1.00 pm
- WEDNESDAY 1 SEPTEMBER: 9.00-12.00 am working groups
- FRIDAY 10 SEPTEMBER: 9.00-12.00 am working groups
- THURSDAY 23 SEPTEMBER: 10.00 am-1.00 pm

Pilot 2 - DT312

How to develop innovation - Business-Ideas: Markets analysis; study on competitive and innovative processes: Positioning; Marketing mix; Communication

Online webinar workshop on product and process design in action – Application case studies on SMEs

Teachers/experts: Mrs. Camilla Fecchio and Mrs. Valentina De Matteo

Pilot 2 (D.T3.1.2) was designed in continuity with pilot 1 (D.T3.1.1). In this second phase, the two case histories presented in pilot 1 were taken into consideration.

The two pilot cases facilitated the learning of the local DIH representatives, in a practical and smart way.

The aims of the meetings were: to formalize a real model which can be positively used with the companies, enabling to focus attention on the real needs, by employing easy-to-use tools, and to develop new solutions and implement them through a process of continuous improvement in favour of companies.

Date and time of the meetings:

- 23 September 2021: 10.00-1.00 p.m. - end of pilot 1 and start of pilot 2
- 6 October 2021: 10.00-12.00 a.m. - back meeting of Working Group 1 on the packaging company

- 12 October 2021: 9.00-11.00 a.m. - working groups with presentation of the project by Working Group 1
- 20 October 2021 9.00-11.00 - back meeting of Working Group 2 on the wellness company
- 21 October 2021: 10.00 a.m.-1.00 p.m.- presentation of the project by Working Group 2, meeting in plenary and final analysis of the cases in the presence of the two companies.

Pilot 3 - DT313

Regional and European Innovation Network: new opportunities for companies

Teachers/experts: Roberto Montanari/Alex Zanon

21 January 2022 from 11.00 a.m. to 1.00 p.m.

According to the needs of companies, CNA Emilia-Romagna, in collaboration with RELAB, has planned the two events of the Pilot Action 3 (D.T3.1.3) addressed to the professionals of its DIHs and the companies of the Emilia Romagna Region.

The path includes 2 parts. The first part: a workshop, held on 21 January 2022 entitled: "Regional and European Innovation Network: new opportunities for companies". The experts intervened: Marcella Contini (CNA E-R), Roberto Montanari (RE: LAB) and Alex Zanon (People Change Management Project Leader SCS Consulting). This path was reserved to the professionals of its DIHs of the Emilia Romagna Region. Marcella Contini presented a picture of the I4.0 opportunities and services that CNA Emilia-Romagna, through the 4 steps project, reserves to the companies interested in approaching I4.0 topics. The speech of RE: LAB, by Luca Cattani of the University of Bologna, concerned the "Presentation of data and regional report on the technological maturity of companies".

The third speaker, Alex Zanon, explained how learning of new knowledge can also take place through new tools and enabling technologies. More and more often training takes place at the workplace, and it is becoming more important nowadays to qualify workers within one's organization. Technologies come in handy as they can become a support for training and facilitate learning.

The second part consists in the activity of Mackathon aimed at disseminating digital content to companies for a transition to a new business model 4.0. It is developed in collaboration with RE:Lab s.r.l. and takes up the concepts of "Marathon" and "Hackaton" promoting a moment of sharing design within which to converge various skills.

2.3.2. Poland

As mentioned above, the pilot action implemented by ARRSA may be divided into couple of activities, for different target groups and in different formats:

- **1 EU Industry Week (D.T3.2.1)**, where 5 SMEs from the technology suppliers side took part and agreed to cooperate within the framework of DIH. There is a total

number of 538 views of the video on our YouTube channel (counting on the date of providing the report) with 45 same-time unique viewers at the live transmission. The information about the event was disseminated both in the traditional industrial sector as well as among Industry 4.0 related technology companies

- **1 on-spot technology (D.T3.2.2**) event in the formula of **Technology Breakfast: Robotics**, when we demonstrated the robotic arms with a production line simulation. The total number of 13 participants – representatives of the SMEs - took part in the event.
- **5 individual consultations (D.T3.2.2)** in terms of possible usage of robotic arms – 1 for the SME representative and 4 for the representatives of academic sector (students) – adjustment made due to COVID-19 restrictions
- **1 open FabLab Showroom of Robotic Arms for schools (D.T3.2.2)** – pupils were able to get familiar with creative space of FabLab and learn about how robotic arms are working and what skills are needed to operate such equipment
- **1 outside FabLab Showroom of Robotic Arms (D.T3.2.2)** – participation in the BBDays4.IT festival – robotic arms booth at the venue of the event – demonstration and simulation of the work of simple robotic line; event dedicated to ICT and technological companies
- **On-line webinar (D.T3.2.2)** – available on a daily basis on our YouTube channel – open for everyone, presenting in accessible way how robotic arms are working, what software is needed etc.

2.3.3. Czech Republic

During the pilot activities, DEXIC held a total of 4 meetings, including 3 workshops and one matchmaking event. All activities aimed to support companies in their development and thus promote the digitalisation of SMEs in the region. The workshops involved various companies across the regions and also stakeholders who are thematically involved in the area such as I4.0 or RIS3. What we realized?

1. CNC machining and engraving in production - Workshop
2. 3D printing for companies and freelancers - Workshop
3. Digital transformation of companies - Workshop
4. Digital transformation of companies - Meet the partners for I4.0 - matchmaking event

2.3.4. Austria

The members of the Digital Innovation Hub on Business Intelligence & Innovation started from scratch. There weren't any infrastructures nor resources before the 4Steps project. Within the 4Steps project period, members of the Digital Innovation

Hub on Business Intelligence & Innovation developed a huge variety of actions. These are, for example,

- The Hub design and development, incl. its physical and digital presence
- Resource planning & business planning
- Service design & development
- Dissemination of the Hub in business, industry and academia
- Regional and transregional anchoring and networking
- Internationalization, cooperation with international organizations, projects and initiatives
- Organization of tailored conferences and workshops for business and industry
- Conceptualization of future projects and services at national and international level
- Participation in heterogenous consortia
- Supervision
- Publication in newspaper and international journals
- Participation and organization of scientific conferences

2.3.5. Slovenia

10 individual digital readiness assessments and coaching of different manufacturing SMEs were carried out in the scope of the 4STEPS projects. The service was developed as a workshop which takes place at the seat of the company. The workshop has three main goals. The first is to inform the company of their digital readiness and digital maturity level to give them an understanding of their progress and provide additional information about Industry 4.0 and the digital transformation in theory. The second goal is to give the company guidelines and new ideas for further development in I4.0 technologies and digitalisation. The last goal is to provide companies with information regarding public project calls and other financing options that may aid them in the digital transformation. To give the company an idea of their digital readiness the TML survey and index is used. The workshop participants include relevant actors within the company in the field of digitalisation as well as members of management. If possible, representatives of other relevant digitalisation projects take part as a networking function.

The results of the workshop are given in a report including the analysis of the TML survey, the level of development in the I4.0 and other digital pillars and recommendations for future focus areas in the field of digitalisation.

2.3.6. Germany

Actions include events on new technologies and various use cases. In addition to the other services, consulting is for the target group also available including the operator 4.0 approach. The availability of the hardware and software demonstrations is also a benefit to the target group, as it supports the test before invest approach and reduces mis investments.

2.3.7. Hungary

Since resilience and being resilient are currently playing an important role in the most recent European strategies and initiatives, our advanced work carried out in the 4STEPS project can be considered a base which might be further exploited in the upcoming years.

According to literature with respect to level of the economic indicator in the comeback year compared to the level of the year of the distress and prior to it the companies can be regarded as fragile, robust, resilient or antifragile. The companies in case they experienced crisis- including the ones already involved in WP T1- belonged to these groups, but it has to be highlighted that one company can belong to different segments depending on the examined year.

In the framework of the qualitative analysis (D.T3.7.2) we presented 12 different case studies on companies, identified with various resilience trends, based on the groups defined in the D.T3.7.1 quantitative analysis. The fragile companies were not analysed in this part of our work, only the robust, the resilient and the antifragile. More precisely, 3 companies (including one WPT1 company) per group, plus 3 companies from the control group (all of them had been involved in WP T1), so all in all 12 companies were examined in the D.T3.7.2 qualitative analysis.

A common feature of all the examined companies in the qualitative analysis (D.T3.7.2) is that they were founded in the 90s or early 2000s, none of them was established later. These companies have by now a lot of institutional experiences and tacit knowledge, very likely to push them towards the more resilient character.

Taking a good look at the analysis, we can see that the potential traits of resilience are definitively identified in many of these companies. Interestingly – and also partly due to a selection bias – these companies are more of the “oak” types, the old, traditional ones, who have been through a lot and gained a lot of expertise during the decades.

2.4. DIH evaluation and appreciation

This section presents the DIH evaluation and appreciation.

2.4.1. Italy

Strengths	Opportunities
• Active network of local key actors (competence center, High Technology Network...) • Innovative services compared to the 9 enabling technologies of Industry 4.0 • Assessment of innovation needs and technology transfer • Effective financial assistance and access to credit • Impact on thousands of cross-sector enterprises • Presence of companies that produce /offer technologies and enterprises that implement them	• CNA HUB 4.0 coordinates a network of 10 Digital Innovation Hubs (DIH), providing SMEs with tools, services and advice within the Industry 4.0 programme • Matching between the business world and research • Scouting funding opportunities • Participation in EUROPEAN PROGRAMMES • Enterprise Europe Network member

2.4.2. Poland

In general, all the assumptions of the pilot action were fulfilled. Feedback from the participants was good. The most appreciated issue was the diversity of formats and tailoring the activities to the needs of certain target group.

COVID-19 pandemic and related restrictions forced some adjustments in the previous workplan and calendar of activities.

Creation of Digital Innovation Hub was considered relevant for the local ecosystem of innovation. The need of umbrella organization, a facilitator of the ecosystem capacity building was often highlighted. ARRSA as a DIH coordinator strengthen its position in the region in terms of digital and innovative services. With 4STEPS project activities we were able to map all the relevant actors in the region that should be considered as important in terms of fourth industrial revolution.

Extension of FabLab operations brought new target groups to the space. Before, mostly education and academic sector were the most relevant, with developing a DIH also SMEs became a relevant target group – both from the side of cooperating partners as well as participants of the events and actions.

Strengths & opportunities of pilot actions:

- high capacity to be replicated in the future as well as expanded to different sectors and other Industry 4.0 technologies – small scale testing can be further developed and improved
- Strong connections established with the relevant stakeholders from the region ensures further development of DIH structures and gives possibility of common participation in European initiatives (EU territorial cooperation, Horizon 2020, I3, cascade funding projects)
- Visibility of DIH and ARRSA as a coordinator – enlargement of the partners' network – new companies and business support organisation
- Synergies with other implementing projects – also on-going after the lifetime of 4STEPS project

Possible improvements:

- Communication – both in terms of reaching possible partners and participants and in terms of disseminating the information about the project results

2.4.3. Czech Republic

Strengths	Opportunities
• transferability of activities to other workshops • space for skills and knowledge development • a variety of rapid prototyping equipment • easy access to equipment for small companies and startups • technical support team for those interested in developing their knowledge or business plans	• extension of equipment for greater variability of prototypes • realization of final theses for high school students • development of cooperation with schools focused on industry and technology • new business development for young talents and start-ups

2.4.4. Austria

Strengths	Opportunities
As announced in a workshop with future managers the strengths of the Digital Innovation Hub on Business Intelligence & Innovation are, for example:	As announced in a workshop with future managers the opportunities of the Digital Innovation Hub on Business Intelligence & Innovation are, for example:

• Provides infrastructure to players of the regional innovation system • Brings external knowledge and expertise into the region; collective use of resources; international cooperation between research and technology companies • Interconnects the region with other regions; Collaborates and cooperates with other Digital Innovation Hubs, Knowledge Centres and Knowledge Clusters among the European Regions (and beyond); Access to local/regional experts in several topic areas • Experts in knowledge transfer available for workshop/expert groups/interest groups • tying together technology and innovation agendas; shared standards and quality measures to raise the overall quality of projects	• Collaborative research for up-and-coming topics; technology- and Innovation exchange (which minimize the transactions costs); Easier access to new technologies • Generating new project ideas through networking; new project ideas through inter-disciplinary collaboration; new project collaborations • Increase in regional robustness due to better/stronger regional cross-industry network (established through BIIH) • Bringing together competing participants to achieve collaborative solutions • Advanced innovation engineering with stakeholders (S3 stakeholders)

2.4.5. Slovenia

Strengths	**Opportunities**
• Provider of support services of I4.0 and digital transformation to SMEs. • Provider of information to companies on access of finances. • Pilot platform for e-cycle of product ETIM. • Strong network of companies from 26 branch associations and 13 regional chambers.	• Active participation in projects on regional, national and EU level. • Establishing connections and matching between different businesses. • Membership and cooperation in multiple business networks. • Finding new business partners and funding opportunities.

• Access to demo centre Smart factory.	• Expanding knowledge and skills of DIH and its departments.

2.4.6. Germany

Strengths	Opportunities
• Collaboration: Facilitates easier collaboration between universities, research institutes and industry in projects, working groups and in general. • Knowledge transfer: With other DIH and cluster initiatives in the European Union and also internationally • Hardware Rental and demonstrator: With this service the access to the latest technologies and their evaluation is also possible for small and medium-sized companies (test before invest). • Contacts and networking: Through our network and the many partnerships and members, we have access to various regional and national experts in different areas • Representation: Representation of the interests of region and company in working groups and politics	• Savings: Access to missing expertise and resources among members and partners • Project development: Realization of new projects with network partners • Elaborating: Participation and contributing to the development of new standards • Education: Participation in the creation of descriptions for professions and apprenticeships • Networking: Bringing competitors together to jointly develop solutions

2.4.7. Hungary

Strengths	Opportunities
Capable of carrying out advanced data analysis in terms of companies' reacted to crisis Our knowledge on resilience has been widened: In our research- both quantitative and qualitative- we concluded that crisis can be diverse and might be completely unique and company-specific. Based on the scientific literature review, we also managed to identify four different groups (segments) in connection with the different level of resilience and how companies reacted to crisis. We managed to identify the most relevant potential factors behind resilience regarding robust, resilience and antifragile companies We categorised the previously involved (WPT1) companies- where all necessary data were available- in terms of their resilience level in each year One company can belong to different segments depending on the examined year.	Further analysis in the topic might be carried out based on the results of the quantitative and qualitative analysis Other aspects of resilience beside reactive-resilience might be elaborated. Geographic data could be incorporated to the investigation It is advised for the further steps of analysis and research into resilience to work on the enhancement of the quantitative selection procedure as well as to elaborate a detailed methodology, interview panel and questionnaire for qualitative analysis of various resilient form behaviours. Bankruptcy prediction models could be used to have a deeper understanding on economic resilience and form other (most probably still just a subset of) resilient groups and their features. Due to the detailed interview- might be carried out- we can learn more about the factors that led to (non)-resilient behaviour and use those as control factors when identifying the resilient companies. The experience and good practices of the resilient companies might be also transferred to other companies in order to decrease or even avoid the crisis amongst the firms.

3. Future sustainability of the DIH

This chapter presents the future sustainability of developed 4Steps Digital Innovation Hubs. This chapter is divided into three sections that are about (3.1) Sustainability? (including environmental, economic and social sustainability aspects) (3.2) Human-centricity? (including workers' health, wellbeing, and empowerment, as well as re-skilling and up-skilling activities) (3.3) Resilience of industry? (including technological and process/supply chain/organizational aspects).

3.1. Sustainability? (including environmental, economic and social sustainability aspects)

This section is about the future sustainability of particular Hub. It includes an evaluation about the environmental, economic and social sustainability aspects per Hub.

3.1.1. Italy

In order to raise SMEs' awareness and skills about the opportunities offered by the transition to a more sustainable business model, CNA Emilia-Romagna carries out information workshops and training on sustainability, resource efficiency and circular economy and first-level sustainability assessments. In order to facilitate a sustainable growth of SMEs, on the basis of the assessed clients' needs, the partners will provide dedicated advisory services on EU legislation and directives related to sustainability, EU certification schemes and technical standards, new sustainable business models based on innovation, circular economy, green entrepreneurship, resource efficiency and clean energy, and access to financial instruments facilitating green transition. With the aim to better support SMEs, CNA Emilia-Romagna maps the actors relevant to sustainability and cooperates with key stakeholders for organizing joint activities and events and to signpost clients to them for specific advanced services.

3.1.2. Poland

Testing of the pilot action enabled ARRSA to explore regional ecosystem of innovation, map relevant stakeholders and make strong connections with some of them. Robotic arms showroom and development of new services gave us new possibilities and connected us with new target groups. The biggest challenge for ARRSA as a DIH coordinator will be to ensure its sustainability – both in terms of the financial model as well as governance.

Steps already taken to facilitate the process of creation sustainable structure of DIH:

- Participation in different EU initiatives – i.e. Digitalisation Working Group of EURADA, European Digital Innovation Hub Consortium
- Mapping of relevant Industry 4.0 initiatives and applying to become a member of, e.g I4MS community
- cooperation with local and regional organizations with same priorities
- creating synergies with other EU funded projects, applying for new funds with the projects from the same Industry 4.0 scope
- following the trends – setting up-to-date workplan of activities, tailored to different target groups and taking into account new global trend – like shifting to Industry 5.0

3.1.3. Czech Republic

DIH has potential not only environmental but also social and economic, as it is a hub that allows ideas to be developed without the need for company investment. By sharing space as well as equipment, there is also a saving of materials, energy and money for the creation of every product that can be created in Liberec DIH.

3.1.4. Austria

A major part of the Digital Innovation Hub on Business Intelligence & Innovation is the sustainability of systems. The Hub, therefore, offers a broad service portfolio addressing the technical and social aspects of a system (or its sub-systems). In doing so, key is to keep an ecosystem approach: resource utilization vs. resource capitalization, efficiency vs. effectivity, innovation vs. tradition, etc.

3.1.5. Slovenia

With its activities DIH is helping SMEs to actively start with processes of digital transformation and concepts of I4.0 which in term will not only increase overall productivity and profits, but also greatly reduce the usage of energy and materials for manufacturing processes.

3.1.6. Germany

As a Hub and with the services that we offer we help companies save resources and make targeted and sustainable investments. Investments that have been made are not replaced after a short time due to errors or identified unsuitability, they can be used in the long term. Because information about new technologies is accessible, it can be carried out in a targeted manner for proven technologies. In addition, the companies benefit from the experience of the network. Either directly from the companies that have already made a certain experience or investment, or indirectly through our

advice, which is based on this knowledge and their results. This avoids the same tasks and projects being carried out, which then lead to the same result.

3.1.7. Hungary

Having identified four different groups (segments) in connection with the different level of resilience and how companies reacted to crisis and the identification of the most relevant potential factors behind resilience can be considered sustainable. The results of the quantitative and qualitative analysis reflect that one company can belong to different segments depending on the examined year, so the resilient characteristics, factors should be enhanced in the companies and these characteristics might be also transferred to other companies in order to decrease or even avoid the crisis in their lifetime which would contribute to the competitiveness of the firms.

Nevertheless, statistical evidence has been found that reactive resilience as a temporal characteristic of individual companies has no positive influence on long-term performance and survival rate and therefore shall be considered as a short-term positive attribute that helps alleviating larger macroeconomic crises or at least suppresses and prolongs the magnitude of such turbulences by keeping unemployment rate at a lower level etc. In the long-run once reactive-resilient companies on a statistical level shall be considered as wounded economic characters that might need to be identified and helped to bring them to the same level as the appropriate control groups.

3.2. Human-centricity? (including workers' health, wellbeing, and empowerment, as well as re-skilling and up-skilling activities)

This section is about the human-centricity of particular Hub. It includes an evaluation about the workers' health, wellbeing, and empowerment, as well as re-skilling and up-skilling activities.

3.2.1. Italy

The Pilots organized have received a lot of interest from the professionals of the 10 DIHs, who have acknowledged the importance to examine in depth the issues of Industry 4.0 as an opportunity to build a real business strategy. The aim of the workshops was to present to the managers of the local DIHs a practical and fast methodology that would enable them to formalize a real model that can be used with businesses, aimed at focusing attention on the real needs / requirements of companies.

DIHs use a user-oriented approach. This is reflected in the awareness to the development and implementation of services that consider all stakeholders for conscious improvement. This involves offering tools and services to improve the quality of entire industrial processes by assessing the state of the art of technological processes, the needs expressed by companies, and developing innovative tailor-made

solutions. The results obtained from shared design models with industrial and technological players are key examples of how, through a structured dialogue, it is possible to establish greater trust with technological solutions and a consequent improvement of businesses and relationships. Acquiring such a user-centric approach also enables companies to improve dialogue within the structure itself. This can also lead to an improvement in the quality of work in terms of employee training and well-being.

3.2.2. Poland

3.2.3. Czech Republic

The aim is to develop skills and education, thanks to which the inexperienced or unskilled can get a new job opportunity and companies, on the other hand, can develop their employees and thus maintain their job positions, or strengthen their position in the company.

3.2.4. Austria

The Digital Innovation Hub on Business Intelligence & Innovation goes beyond the Industry4.0 paradigm. Instead of purely focusing on technology and digital technology, the Hub integrates a social dimension. For example, the developed services about Innovation Management & Research, Methods & Tools and Resilience Engineering put a major on the human creativity and innovativeness. In doing so, this is services support in continuous adaption, renewal and innovation of particular system (e.g. the organization as a whole, or its sub-groups and members).

3.2.5. Slovenia

DIH services are not only focused on technologies of I4.0, but specially on I5.0 which is an improvement of already established concepts of I4.0 with added human centric mindset. These services strive to digitally transform SMEs in a way that workers become the main focus. DIH workshops are not meant only for upper management but also include middle and other relevant staff for both re-skilling and up-skilling.

3.2.6. Germany

The possibility of consulting keeps the companies and their employees up to date. Creative and innovation-friendly employees who may not be able to implement their ideas alone in the company receive insights into results and successfully implementation and application use cases. With this information and knowledge, they

can give their idea more weightage and present and implement it more successfully in their own company. This increases satisfaction and wellbeing of the involved employee.

3.2.7. Hungary

The qualitative analysis (D.T3.7.2) highlighted that investing into company staff with for example organising trainings, watching out for employees' needs can be considered a clear factor behind success. Besides, successful management of generational change (if necessary) is also playing a significant role in being resilient or even not experiencing shocks.

3.3. Resilience of industry? (including technological and process/supply chain/organizational aspects)

This section is about the resilience of particular Hub and its impact for business and industry. It includes an evaluation about the technological and process/supply chain/organizational aspects per Hub.

3.3.1. Italy

The pilots were structured by also assessing the impact in terms of industry resilience. In this sense, dialogue among stakeholders was facilitated with innovative tools suitable for a new virtual interaction. In addition, tools were provided to facilitate structural and business reorganizations, especially considering the new needs that have emerged in a market context affected by the impact of a global pandemic.

3.3.2. Poland

3.3.3. Czech Republic

Last but not least, the goal is to support companies in their development. If companies develop their employees while supporting the transition to digital operations, they will provide a much better chance for the sustainable growth of their businesses. Digitization is one of the engines of companion's responsible behavior and is a key prerequisite for the success of companies in the future.

3.3.4. Austria

The Digital Innovation Hub on Business Intelligence & Innovation has developed a service to increase system resilience. This service is not only to engineer resources towards VRIN resources but also to develop and maintain distinct capabilities for

increased system robustness and resilience. In doing so, the members of the Hub apply a systematic approach for the analysis and evaluation of the status quo but also for the design and development of a resilient and innovative future of the particular system (e.g. the organization as a whole, or its sub-groups and members).

3.3.5. Slovenia

With implementation of I4.0 technologies and continues improvements by the digital transformation companies will have not only have financial gains, but by increased productivity, manufacturing flexibility and agile business model they'll gain on overall resilience to the negative outside effects such as material shortage, raising cost of energy, longer supply times, etc.

3.3.6. Germany

With the knowledge and experience of proven technologies and investments within the Hub, these experiences can be passed on to the industry. The industry's ability to make targeted investments and avoid correction loops is increased. This allows the industry to have an advantage in implementing useful solutions while increasing its competitiveness. Mis Investments can be avoided and lessons learned can be taken into account and implemented in advance. This also accelerates technological development, adoption and acceptance in an industry.

3.3.7. Hungary

We also managed to identify four different groups (segments) in connection with the different level of resilience and how companies reacted to crisis. It has to be highlighted that one company can belong to different segments depending on the examined year.

We identified the most relevant potential factors behind resilience regarding robust, resilience and antifragile companies and we also defined some success factors detailed in D.T3.7.2.

In a future work other aspects of resilience beside reactive-resilience should be elaborated and models shall be worked out in order to numerically characterize companies and collect best-practices for preparing and avoiding negative impacts during operation. Further hypothesis tests could be figured out and performed and geographic data could be incorporated to the investigation. As a more advanced outlook from the present study, bankruptcy prediction models could be used to have a deeper understanding on economic resilience and form other (most probably still just a subset of) resilient groups and their features.