DigiFed

Digital Innovation Hubs Federation
For Large Scale adoption of
digital technologies by European SMEs

D4.1 - Report on good DigiFed DIH practices, SME needs and future DIH services

July 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864266.

Technical References

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Short description/ Executive Summary

The following document describes the results and work process of Task 4.1, under Work Package 4, of the DigiFed Innovation Action, aiming at collecting and analysing of the DigiFed-DIHs best practices and challenges. This process involves the comprehensive understanding of the different services provided by the different DIHs, the identification of the differences in performance between those that duplicate, and their overall impact and reception by SMEs. Best practices and the main challenges of the DIHs in each of their corresponding regions are identified and assessed. Finally, recommendations are provided regarding means to improve DIH-services, potential joint DIH-services, as well as success factors for DIHs in general.

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Document history

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Revision	V2.0	21.06.2021	Margherita	ZBL	Digital maturity, addressing low maturity SMEs
WG	V3.0	24.06.2021	Bastien Hualpa	MNL	Working group meeting (SEZ, BLM, MNL)
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List of abbreviations

AE	Application Experiment
B2B	Business to Business
CPS	Cyber Physical System
CFS	Certificate on the financial statement
CO	Confidential
DC	Digital Challenge
DIH – eDIH	Digital Innovation Hub – European DIH
DMP	Data Management Plan
DoA	Description of Action
EC	European Commission
EU	European Union
F2F	Face to Face
GA	Grant Agreement
GDPR	General Data Protection Regulation
GE	Generic Experiment
HW	Hardware
M	Month
PC	Project Coordinator
PM	Person Month
PMB	Project Management Board
PU	Public
RP	Reporting Period
SME	Small and Medium Enterprises
SW	Software
WP	Work Package

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1. Executive Summary

The present document, D4.1 sharing of experience and good practices of DigiFed DIHs prepared with WP4, describes the overall process to collect DigiFed-DIHs experience, the methodology to identify best practices and the analysis of challenges and recommendations.

This approach involves the comprehensive understanding of the different services provided by each DIHs, evaluating their **success factors and their unique value proposition**. The most successful ones have been identified, as well as the differences in performance between those that duplicate. The services with a high added value have been pointed out and been proposed to serve as **leads to build up each DIH portfolio of services**. This exercice has been evaluated by their overall impact and reception by SMEs. Best practices and the main challenges of the DIHs in each of their corresponding regions are identified and assessed.

Section 2, the first step in this process, is to deeply and comprehensively understand the services currently provided by the DigiFed-DIHs, their target segment, their most successful services and their impact on their target and their approach in general, as well as their main challenges, lessons learnt and identified best practices.

In the following subsection, to contextualize the overall support instruments implemented by DigiFed, we detail our three Innovation Pathways. The rest of the document is structured as follows:

Section 3 details the **overall methodology and roadmap** to achieve a comprehensive understanding of the main challenges and pitfalls, success factors and best practises of DIHs. Moreover, it elaborates on how to build upon these results such that they can be generalized into recommendations for external DIHs interested in implementing cross-border support instruments.

Section 4 details the process of **knowledge extraction**, particularly the development and results of the DIH-questionnaire and the execution of a DIH-best practices workshop within the DigiFed consortium.

Section 5 introduces the **workshop implementation and results** of such event, following step by step the participant's outcomes and benchmark.

Section 6 refines the DIH-best practices previously identified, as well as elaborates on the **main challenges and factors of success** for the implementation of DIH-services within the DigiFed-consortium.

Section 7 translates the previous findings in concrete recommendations explicitly stating the context and conditions under which these results and recommendations are valid.

Finally, Section 8 provides concluding remarks on the results and developments provided in this deliverable.

The deliverable is structured to adress key elements of **proper collaboration and best practices adoption**. To reach such expectations, DigiFed incentives DIHs by providing them with recommendations to improve their services, enable joint DIH-services, reinforce their capacity building and incremeant their success factors in favour of the European industry.

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2. Introduction on DigiFed context & its innovation pathways

2.1 DigiFed within the SAE initiative

Within the SAE initiative lies DigiFed dedicated to supporting EU industries to digitalize their product & services and reaching new markets enabled by **Cyber Physical Systems (CPS) & Embedded Systems**.

DigiFed gathers 12 partners with expertise in Digital technologies and innovation management from different countries with established ecosystems with a view to continue expanding and linking with other networks in order to create an EU-wide Federation of Digital Innovation Hubs. DigiFed partnerships are designed to strengthen a European high-tech ecosystem through the adoption of advanced digital technologies (CPS) and a combination of Regional, National and European funding instruments so that companies, SMEs but also midcaps, can benefit from knowledge sharing regardless of their location.

DigiFed supports and fosters the digitalization of the European industry in the field of CPS by two means. On the one hand, it aims to provide direct financial support, in the form of subsidies, to SMEs/start-ups/mid-caps for the development on new CPS solutions and the engagement and joint development of technical topics, the so-called *DigiFed Innovation Pathways*. On the other hand, DigiFed aims at developing and consolidating a network of DIHs based on the DigiFed ecosystem and network, to the purpose of improving and refining existing DIH-services as well as designing new services that exploit and take advantage of the DigiFed-ecosystem and -network.

In this context, the Innovation Pathways enable the experimentation of different structures and alternatives to provide services to SMEs. These structures are cross-border in nature and utilize the network of partners and DIHs that constitute the DigiFed consortium. Moreover, these structures will provide an example of possible collaboration between DIHs in different regions. This way, DigiFed aims also at providing a comprehensive view and recommendation on possible DIH-services.

2.2 DigiFed 's innovation Pathways and Support Tool

Three main innovation pathways are proposed by DigiFed:

Application Experiments[1] (AEs): grants financial as well as technical and business support for the development of smart applications in Europe are offered. Demonstrative projects are EU cross-borders and split into three possibilities:

- **Single AE: the applying company requests technical expertise from a DigiFed Technology partner to generate a new smart product or service.**
- **Twin AE: two applying companies from different European, or EU-associated, countries generate a new and innovative CPS application or solution.**
- **Twin AE with low-digitalized company: two applying companies from different Europan, or EU-associated, countries develop a new and innovative CPS application or solution with at least one partner in the consortium being of low-digital maturity. This configuration also considers the participation of a DigiFed Technology partner providing technical support and advice.**

Around 40 innovative and demonstrative AE projects involving at least 80 companies are targeted through 3 Open Calls to receive funding, from the total subsidy budget of **3.88M€**, and support in order to develop innovation solutions:

[1] https://digifed.org/open-calls/application-experiment/

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- Access to technical platforms in the domain of cyber-physical and embedded systems (CPS):

  AVL, CEA, Digital Catapult, Ikerlan, Ljubljana University and STMicroelectronics France/Italy.
- Product support aimed at bringing your innovations to target markets.
- Innovation management support focusing on sustainable business development – to help innovation get to the market via DigiFed and the Smart Anything Everywhere ecosystem (DIHs network).

Generic Experiments[2]: DigiFed Generic Experiments Communities (GEC) are designed to test new collaborations between research centres and a group of SMEs & Mid-Caps as well as develop new co-financing mechanisms between European and regional funding to foster European industry digitalization.

The objective of the Generic Experiment is to build communities of SMEs & Mid-Caps around a specific technical topic (GEC Topic) proposed by a DigiFed research centre (the GEC Owner).

GE Communities should aim to involve a group of about 10 European companies together with the experts from the research center. DigiFed target to launch minimum 3 different GE communities between 2020 – 2021.

Digital Challenges[3]: Digifed will experiment new co-funding mechanisms with companies directly involving the demand side. Digital Challenges are a match funding opportunity where advanced digital technology SMEs are selected through an open call to solve industry challenges set by corporate businesses.

The purpose of the Digital Challenge is to highlight attractive market needs to be addressed through CPS and embedded systems and for which new solutions are required.

DigiFed will be working with large European organisations, the Digital Challenge Owners, who will serve as early adopters of the accelerated innovations and provide additional support to the programme in the form of co-funding, access to innovation support and pilot sites. Digifed target to launch three Digital Challenges.

[2] https://digifed.org/open-calls/generic-experiment/
[3] https://digifed.org/open-calls/digital-challenges/digital-challenge-open-call-2/

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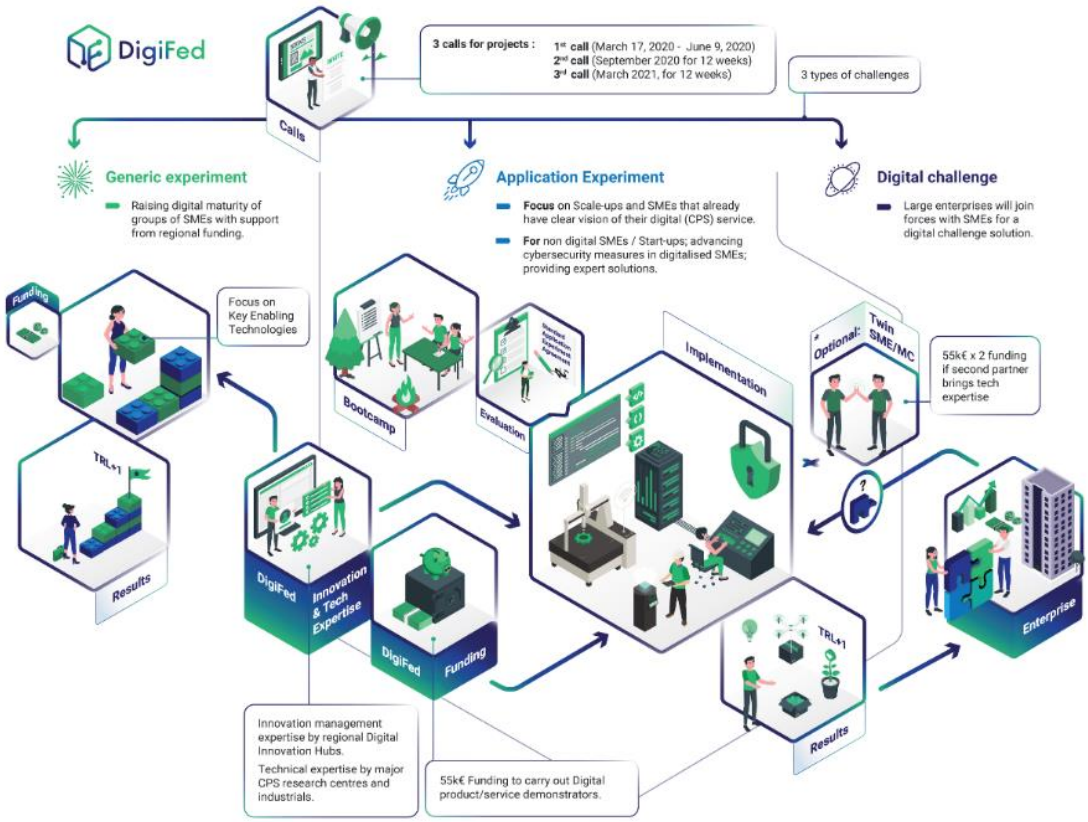

Figure 1. DigiFed project

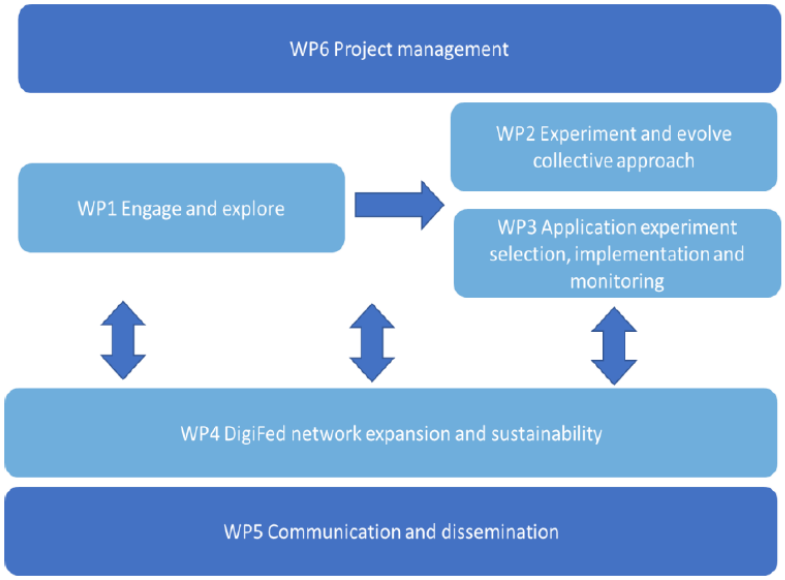

Figure 2. DigiFed WP structure

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3. Methodology and Roadmap

DigiFed consortiun gather 7 DIHs along Europe, the extraction and sharing of the knowledge among the different DIH that constitute DigiFed is essential for the understanding of the challenges and pitfalls that these DIHs face when supporting SMEs, bringing their services to their community and engaging with their local environment in general. Moreover, identifying, understanding and challenging the bext practices of each of these DIHs is fundamental to identify common paths to success and financial sustainability, in addition to increase the impact of their services. Finally, a clear understanding of best practices, challenges and opportunities will enable the refinement of existing services and development of joint (cross-border) services that complement the knowledge and abilities of DIHs beyond DigiFed, connecting SMEs and regions to increase competitiveness of European industries in the field of CPS.

- **French DIH MINASMART based in Auvergne-Rhône-Alpes is leaded by MINALOGIC.**
- **French DIH DIGIHALL based in Ile-de-France is leaded by CEA-List is an associated DIH.**
- **UK DIH based in Northeast Engmand is leaded by DIGITAL CATAPULT.**
- **German DIH based in Baden-Wüttemberg is leaded by SEZ.**
- **Spanish DIH based in Basque County is leaded by IKERLAN.**
- **Hungarian DIH based in Central Hungary is leaded by BME.**
- **Slovenian DIH covers all Slovena is leaded by University of Ljubljana.**

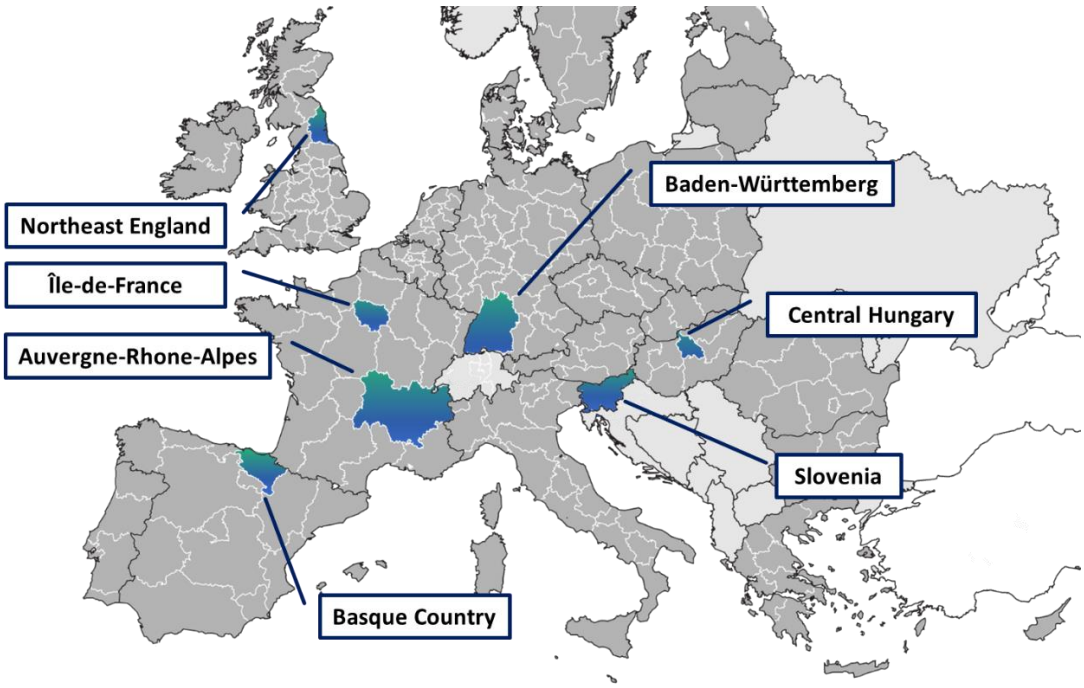

Figure 3. DigiFed-DIHs and corresponding region they represent

For this, it is relevant to deeply comprehend the regional positioning of these DIHs, their services, identify differences in their levels of success and whether these differences may be explained by local factors which could be overcome by cross-border collaboration. Figure 3 shows the geographical disposition of the DigiFed-DIHs and the regions they operate in. This geographical dispersion is very valuable for the DigiFed IA, since it enables the

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collection of diverse data, from different economic/industrial ecosystems, and thus to challenge our findings and each DIH-experiences more effectively.

The process to collect, analyze, and challenge the DigiFed-DIH best practices, as well as the refinement of existing services and development of joint DIH-services, including the transformation of these results into recommendations, is diagramatized in Figure 4.

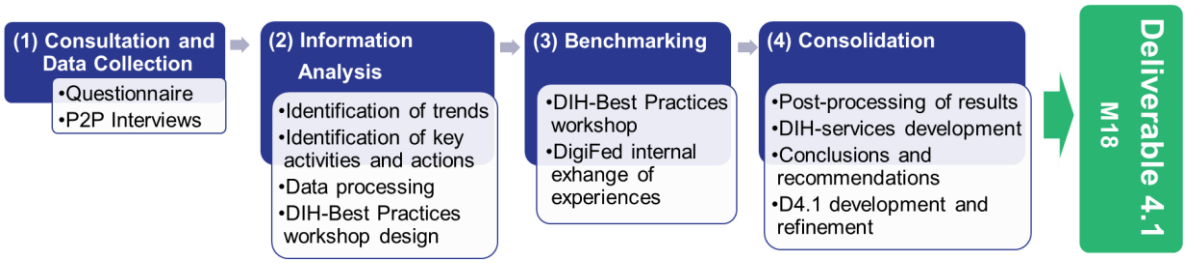

Figure 4. Methodology for the identification of best practices, challenges, and DIH-service development

The process is performed according to four stages:

- **Consultation and Data Collection: This stage focuses on the gathering of information from the different DigiFed-DIHs. In order to collect the data, a questionnaire was sent and distributed to the corresponding partners. This questionnaire was followed by one-on-one meetings to further understand specific services and topics related to the DIHs operation.**

- **Information Analysis: The information collected in Stage (1) must be duly analysed und understood, such that proper insights and a comprehensive understanding of the DIH-services and ecosystem can be achieved. For this, firstly, trends between the services, areas of operation, SMEs reception of services, and overall performance of the DIHs are identified. Afterwards, the key activities and actions of the DIHs are also identified (See detailed development of this task and the corresponding analysis and findings in Section 0). The gathered information is also processed to find additional tendencies that might provide insights regarding non-obvious tendencies between DIHs. To the purpose of challenging these findings, a DIH-Best Practices workshop is designed.**

- **Benchmarking: Outputs and findings of the collection and analysis stages are challenged and benchmark. In particular, DIH-Best Practices workshop was performed to internally discuss the different and most successful DIH-services provided by the different DIHs in DigiFed (For details see Section 0).**

- **Consolidation: Finally, the results, experiences, benchmarking, and detailed perspective of the DIH-services obtained in the previous stages were consolidated. This includes a proposal of refined DIH-services in consideration of the obtained results, as well as a perspective of possible cross-border joint DIH-services for DigiFed-DIHs. Moreover, these consolidated results are transformed into recommendations for the corresponding bodies, and to external DIHs, to the purpose of exporting these services and experiment additional alternatives for their implementation.**

Hence, the present document describes the execution of the whole process, as well as presents the recommendations to DIHs in general, regarding the main success factors, pitfalls, and challenges to implement (cross-border) DIH services.

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4. DigiFed innovation pathways and lessons learnt confronted to SME needs.

This section addresses the experience of implementing DigiFed innovation pathways and the role played by the Digital Innovation Hubs (DIHs). The preliminary feedbacks from the firsts open calls have been discussed to address SME needs. At this stage, the feedbacks are still limited but some early conclusions and recommendations are exposed here for each innovation pathways.

An additional recommendation will be to capitalize in the current process of digital maturity assessment to gather relevant data. As explained in this section, to evaluate SME needs and elaborate recommendations, it is crucial to encompass the overall vision of the organisation in relation to digital adoption. Being able to extract such information, allow us to understand their current state of affair and elaborate an adapted digital transformation plan to support companies' digital uptake.

More particularly, DigiFed focuses on Cyber Physical and Embedded Systems with a particular attention on security and privacy, autonomy and human-machine interaction. Its innovation pathways offer three main instruments: Generic Experiments target a group of SMEs to implement advanced technology demonstrators with co-funding from regional authorities; Application Experiments allow individual SMEs to define an R&I project to disrupt, upgrade or manufacture an innovative digital product or service; and the Digital Challenge, to establish partnerships with industrial partners who become sponsors of the digital challenge innovation pathway. The selected partners will serve as early adopters of the accelerated innovations and provide additional support to the programme in the form of co-funding, access to innovation support and pilot sites.

Each innovation pathway benefit from DIH the established ecosystems and networks. Throughout the following sections, we will be explaining how each DIH involved increases DigiFed innovation pathways implementation and impact in benefit of SME needs.

4.1 Single AE, Twin AE, and Twin AE with one low-digitalized company

As previously explained, application experiments are consortium of two (three on some expectations) partners involving at least one company. To reach and involve such companies, the stake remains on providing them with enough clear, relevant and agile information as possible, to guarantee DigiFed is targeting the right target but also to optimise the company's time and effort, as well as avoiding them any disappointment and waste of resources.

In this sense, having access to an extensive ecosystem and deep network, by having accurate knowledge of its actors, proximity and understanding of their needs and offers, remains crucial to identify potential beneficiaries and evaluate their needs. Moreover, articulating the offer and the demand, how they complement to each other, requires creating links and complementary, endeavour and responsibility of DIHs.

On one side, for AE single, research organisation can benefit from DIH support, on promoting, reaching and attracting companies. Finding the right partner technological partner for the company requires understanding their need and pointing out the possibilities offer, then, putting them in contact to establish a first contact and exploring their collaboration.

On the other, we can differentiate two type of targets, digital companies and traditional companies. The latter, requires special attention to build awareness on the potential of digital technologies, those sectorial companies can be far away from understanding the possibilities of digitalisation for their specific use cases, but again, there DIH have a role to play to show-off and build trust with them.

DigiFed experience highlights the need to properly diffuse the information, relying on the extensive network provided by DIHs. The quantitative process has to be followed by a qualitative approach to assist companies with business support, and in the specific case of AE twin, scouting and finding the proper partner.

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4.2 Digital Challenge

This innovation pathway is particularly interesting since it answers to a specific market demand with a large potential market. To better understand this mechanism, we have to identify the main actors, first the Digital Challenge Owner (DCO) which can be either a large company or a midcap, then DigiFed consortium, composed by the overall group but more particularly the partner (often the monitoring partner) who will support the DCO in such endeavour, and finally, the selected third party, the open call laureate.

DigiFed has learn that the relation with the DCO is essential to guarantee the efficient ideation, planification and implementation of the Challenge. Creating trust guarantees agile communication with structures (i.e. large companies) with complex management structure, decisional schemes and heavy legal departments. Indeed, finding the right contact in more than thousands of employees can sometimes be challenging. Moreover, processes can be slowed, either by management decision cycle scheme and/or legal department, who have strict rules.

The monitoring partner plays an essential role to ease and facilitate the Digital Challenge process. First, identifying, either by direct contact or thought the application form in DigiFed's website. Then, by supporting the DCO to express their needs, keeping in mind, the interested for both, the project and the potential third parties, which have to find the challenge and related markets, attractive enough to apply. Then, the full process of promoting, sourcing and helping companies to understand what the challenge is about, working on both, the preselection and the selection of candidates. Finally, by supporting throughout the experiment, organizing regular advancement project meeting, to monitor the implementation and playing an intermediary role between the DCO and the selected third party.

Selected third party, or parties, have to be supported on understanding the submission procedure and the challenge their tackling. DigiFed realized that the challenges were comprehensive, from both, technological requirements and market access, in fact, the third challenge with GE HYDRO FRANCE was win by a consortium of two, a technological center (i.e. **CATIE)** and a company (i.e. **Aguila**), the first providing technological competences and the second more oriented to market access.

4.3 Generic experiment

The Generic experiment opens large possibilities, to both, research organisation and companies. It relies on building a community and reaching a wide public to gradually narrow it scope to comply with each company specification. This innovation pathway could be described as 'technological push' instrument, providing the right scheme to develop technological bricks that answer to specific use cases coming from companies.
To reach such objectives, DIH are a great asset to reach but also maintain steady and deep animation with the companies willing to join and participate to these communities.

It is particularly interesting to integrate community building exercise, helping to gather technology experts, innovation project leader and European enterprises with common needs around defined digital technologies. This dynamic is pretty challenging, and DIH have integrated those different set of competences and understanding of each stakeholder, having the right approach, specific language and understanding of each counterpart needs.

DigiFed experience highlights the importance of selecting and describing the technology services in an accessible manner in order to attract companies and propose technology adapted to a large palette of possible use cases/applications and to SMEs. Another lesson learnt was the time consumed when the co-funding with National / Regional authorities are not identified from the early stage of DigiFed proposal.

4.4 Digital maturity, addressing low maturity SMEs

Digifed's main objective is to encourage the adoption of advanced digital technologies by EU SMEs with a focus on non-digital business. That said, the low maturity SMEs remains a crucial subject to be tackled throughout the implementation of the project, from which preliminary feedback and lessons learn can be drawn.

To reach out these targets, it remains crucial to define what are low maturity level, and furthermore how to comply with their expectations.

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In order to set up and drive companies' digitalization, its business, but also its organization along with its information systems, we need to know the company's digital maturity level. To flesh out a vision of its level, it is essential to know what the starting point and the organization's level of digital maturity.

For such objectives, DigiFed has developed a digital maturity process composed by three assessment tools:

1. A **DIGITAL MATURITY PRELIMINARY SHORT SURVEY** (1 question), submitted to all applicants and companies registered for any activity (e.g. webinars, bootcamps, etc.); which intends to get baseline information on the wider possible population of SMEs interacting with DigiFed at any level; this would allow the consortium to assess the attractiveness of the actions proposed towards the different target users (i.e. SMEs at low, medium or advanced maturity stage);
2. A **COMPANY-FOCUSED DIGITAL MATURITY SURVEY** (about 20 questions), based on a format consolidated in collaboration with KPMG, to be compiled by all AE/DC/GE at the project submission phase and repeated to AE/DC/GE selected companies at the end of their experiment implementation; this approach is intended to gather deeper information concerning the company structure, procedures and strategy characterizing digital maturity, from the full population of applicants and to investigate any possible improvements of the initially identified digital maturity status (only for the selected applicants) at the end of their involvement with DigiFed activities; as this questionnaire is focused on structural characteristics of the beneficiaries company, small modifications are expected to be appreciable as an outcome of the participation in DigiFed, but yet the consortium considered it relevant to analyse this aspect as well (including for control reason);
3. A **PRODUCT-FOCUSED DIGITAL MATURITY SURVEY** (about 5 questions) ad hoc tailored by the DigiFed team, to be addressed by all AE/DC/GE selected companies at the beginning and end of their experiment implementation. and focusing explicitly and uniquely on the product/service that constitute the object of their request for funding/participation in DigiFed activities.

The DigiFed assessment approach takes into consideration the following variables:

A - Dimension 'Digital Strategy'
1 Digital Strategy & Objectives
2 Digital Leadership
3 Digital Roadmap

B - Dimension 'Digital Governance'
4 Digital Performance Management
5 Digital Investment Planning / Business Case

C - Dimension 'Digital Culture'
6 Innovative Mindset
7 Communication

D - Dimension 'Digital Customers & Channels'
8 Channel Management
9 Customer
10 Products & Services

E - Dimension 'Digital Organization & Process'
11 Digital Organisation

F - Dimension 'Technology Management'
12 Data & Analytics
13 Cyber Security

G - Dimension 'Digital People & Capabilities'
14 HR Strategy & Planning
15 Digital Skillset & Development

The DigiFed digital maturity assessment protocol is summarized here below:

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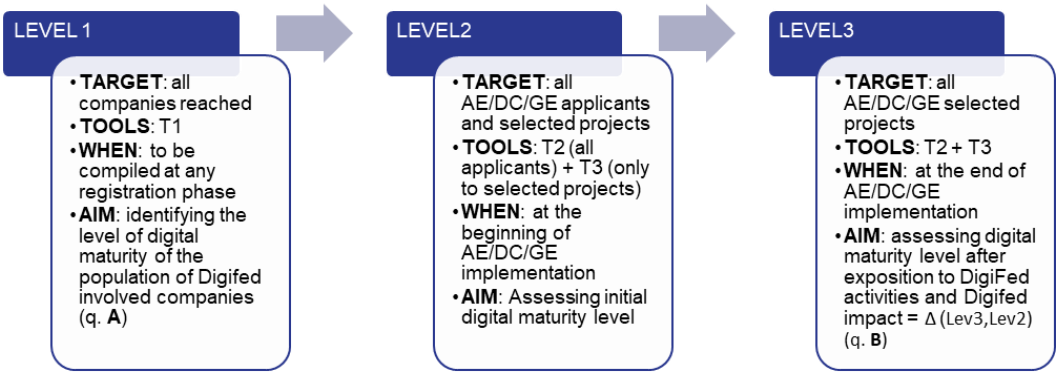

Figure 5. Maturity assessment process

Full details on the approach proposed and, on the results, gathered from the implementation of the above described procedure, will be reported by the end of the project within D3.3 *Final report on AEs and lessons learnt.* As of M18 (June 2021), the assessment approach is under implementation, with information stocktaking at the following status:

- **AE OC1 → Tool 2 submitted to the full population of applicants, Tool 3 submitted for T0 assessment to the selected beneficiaries; post-AE implementation request for information (Tool 2 and Tool 3) to be launched at the end of AEs implementation (most of them are expected to be finalized in Q4 2021;**

- **AE OC2 → Tool 1 and Tool 2 submitted to the full population of applicants and Tool 3 expected to be submitted by the beginning of July 2021 (M19), as by the end of June all beneficiaries will have to have signed the Standard Application Experiment Agreement and kicked-off the AE implementation;**

- **AE OC3 → Tool 1 and Tool 2 submitted to all applicants, information under collection and elaboration after the finalization of the submission process (which was closed on June 8th, 2021);**

- **DC/GE → Tool 1 and Tool 2 submitted or under submission.**

At the current stage, digital maturity assessment approach and assessment is under implementation (as described above) and only the analysis of full results will allow to elaborate proper conclusions, but yet preliminary insights on the data gathered so far seems to suggest that:

- **There is some discrepancy between the maturity levels emerged from the Tool 1 and Tool 2 that will need to be investigated;**

- **The involvement of Monitoring partners for the collection of Tool 3 information has been proven effective in facilitating the process and guaranteeing full responding rate;**

- **Several assessment approaches are currently under development for the investigation of digital maturity of DIH target population: alignment among the tools used would improve the comparability of results among different projects/initiatives.**

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All these points will be further investigated along with the project implementation and fully detailed in D3.3.

The benchmark was complemented by the contribution of two major feedbacks, on one hand the European Commission Joint Research Center (JRC) benchmark, on the other by the experienced coming from FED4SEA. For the latter, Blumorpho shared their experience on the KTH tool. Concerning the JRC benchmark, they have realized a preliminary analysis of 13 existing digital maturity assessment methods and tools available in the market. Those preselected tools are the following:

- Preliminary analysis of existing digital maturity assessment methods and tools available in the market (implemented by third parties, both public and private)
  1. DIHNET Champions Challenge, DIHNET project
  2. MDI 4.0 Model for Industry 4.0. TECNALIA, Spain
  3. VTT's DigiMaturity tool, AI DigiMaturity and Manu Maturity, Finland
  4. ACATECH MATURITY INDEX, Germany Academy for Science and Technology, Germany
  5. The IMP^{3}rove Digital Innovation Quotidient (DIQ), Germany
  6. Connecting Europe Facility (CEF) Monitoring, EC
  7. COTEC Maturity Tools: THEIA, THRUST, Innovation Scoring, Portugal
  8. The Digital Maturity Assessment Tool (DMAT), Aarhus University Denmark
  9. DREAMY 4.0, Politecnico di Milano, Italy
  10. HADA Advanced Digital Self-diagnostic Tool, Industria conectada 4.0, Spain
  11. ATI- Advanced Technologies for Industry, EC
  12. Ipar 4.0, Hungary
  13. The European Enterprise Network, EC

Figure 6. JRC preliminary analysis

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5. DIH-Best Practices Workshop and Benchmarking

DigiFed has been actively contributing to consolidate the collaboration between partners, furthermore, it relies on active Digital Innovation Hubs to reach those objectives and leverage the impact of companies' digitalisation. For such, **DigiFed partners carried out a preliminary joint benchmarking on DIH profiles to unveil their experience, compare their practices and understand their challenges**. The present workshop wants to provide the right framework to exchange, identify good practices and plan further collaboration schemes.

The rationale behind the establishment of collaboration scheme is to provide the right framework and mechanism to guarantee sustainability and DigiFed consortium activities. Moreover, it's the possibility to trigger opportunities such as:

- Facilitate access to **technologies, skills and expertise**
- **New business opportunities**
- **Economies of scales** for our activities
- Exchange of experiences on **good practices** to support digital transformation
- **Synergies and co-creating** in technology and knowledge development
- **Pan-EU value chains** and access to new **European markets**
- Increased **impact of public funding**

5.1 One-on-One Meetings

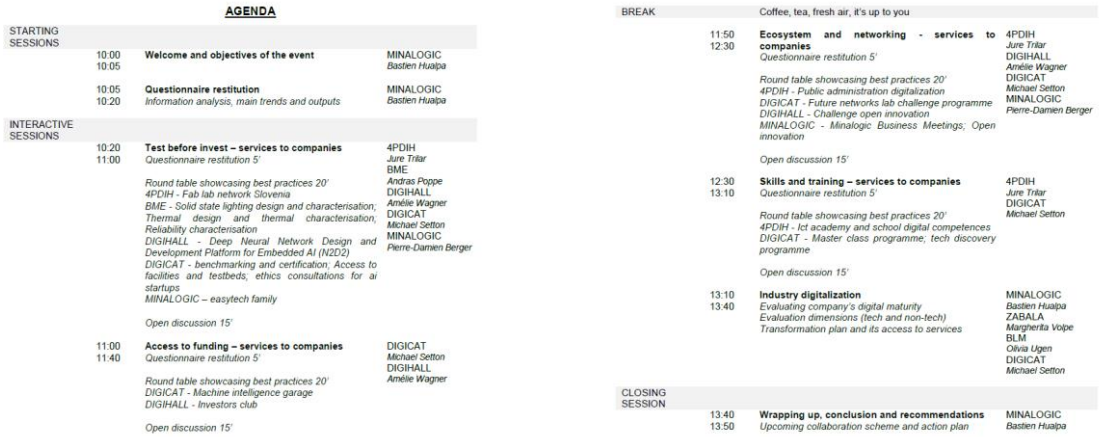
To actively engage each DIH into the process, Minalogic has been conducting one-on-one meetings to exchange more comprehensively with each participant, moreover, the objective was to explain what the event was about, to listen to any enquiries they might have and clarify their participation expectations.

The interviews were mainly conducted by phone and was very useful to complete the questionnaire, in fact, it was necessary to have these preliminary calls to get familiar with each other and DIH structuration. Throughout the conversation, partners were able to share their remarks and complete the questionnaire on more detailed matter, ultimately improving the quality of data collected.

5.2 DIH-Best Practices Workshop and Outputs

The event has been duly planned with months of anticipations and organised in collaboration with work package 4 partners, taking into consideration the description of work of DigiFed's agreement, recommendations from each partner and the availability of the participants.
An invitation was sent previous to the event and participants were requested to prepare a presentation with services and best practices to show off. As previously introduce, this was explained during one-on-one meetings and respected by each participant.

The invitation included an introductory note and the agenda :



AGENDA

STARTING SESSIONS			
	10:00 10:05	**Welcome and objectives of the event**	MINALOGIC *Bastien Hualpa*
	10:05 10:20	**Questionnaire restitution** *Information analysis, main trends and outputs*	MINALOGIC *Bastien Hualpa*
INTERACTIVE SESSIONS			
	10:20 11:00	**Test before invest – services to companies** *Questionnaire restitution 5'* *Round table showcasing best practices 20'* *4PDIH - Fab lab network Slovenia* *BME - Solid state lighting design and characterisation; Thermal design and thermal characterisation; Reliability characterisation* *DIGIHALL - Deep Neural Network Design and Development Platform for Embedded AI (N2D2)* *DIGICAT - benchmarking and certification; Access to facilities and testbeds; ethics consultations for ai startups* *MINALOGIC – easytech family* *Open discussion 15'*	4PDIH *Jure Trilar* BME *Andras Poppe* DIGIHALL *Amélie Wagner* DIGICAT *Michael Setton* MINALOGIC *Pierre-Damien Berger*
	11:00 11:40	**Access to funding – services to companies** *Questionnaire restitution 5'* *Round table showcasing best practices 20'* *DIGICAT - Machine intelligence garage* *DIGIHALL - Investors club* *Open discussion 15'*	DIGICAT *Michael Setton* DIGIHALL *Amélie Wagner*
BREAK		Coffee, tea, fresh air, it's up to you	
	11:50 12:30	**Ecosystem and networking - services to companies** *Questionnaire restitution 5'* *Round table showcasing best practices 20'* *4PDIH - Public administration digitalization* *DIGICAT - Future networks lab challenge programme* *DIGIHALL - Challenge open innovation* *MINALOGIC - Minalogic Business Meetings; Open innovation* *Open discussion 15'*	4PDIH *Jure Trilar* DIGIHALL *Amélie Wagner* DIGICAT *Michael Setton* MINALOGIC *Pierre-Damien Berger*
	12:30 13:10	**Skills and training – services to companies** *Questionnaire restitution 5'* *Round table showcasing best practices 20'* *4PDIH - Ict academy and school digital competences* *DIGICAT - Master class programme; tech discovery programme* *Open discussion 15'*	4PDIH *Jure Trilar* DIGICAT *Michael Setton*
	13:10 13:40	**Industry digitalization** *Evaluating company's digital maturity* *Evaluation dimensions (tech and non-tech)* *Transformation plan and its access to services*	MINALOGIC *Bastien Hualpa* ZABALA *Margherita Volpe* BLM *Olivia Ugen* DIGICAT *Michael Setton*
CLOSING SESSION			
	13:40 13:50	**Wrapping up, conclusion and recommendations** *Upcoming collaboration scheme and action plan*	MINALOGIC *Bastien Hualpa*

Figure 7. DigiFed DIHs Best Practice Workshop Agenda

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864266.

The title event was '*DIH best practices workshop*' and was held by web-conference on TEAMS on March 12th 2021, from 10.00-14.00 CET. Below the list of twenty attendees:

Partners	**Region, Country**	**Participants**
CEA LETI	Auvergne Rhone Alpes, France	Isabelle Chartier, Isabelle Dor
CEA LIST	Ile de France, France	Valentina Ivanova, Amélie Vagner
SYSTEMATIC	Ile de France, France	Thierry Louvet
ZAB	Brussels, Belgium	Margherita Volpe
DIGICAT	North East of England, United Kingdom	Michael Setton; Ana-Maria Gheorghe
MNL	Auvergne Rhone Alpes, France	Bastien Hualpa, Pierre-Damien Berger
SEZ	Karlsruhe, Germany	Fredy Rios-Silva, Sabine Afner-Zimmermann
BME	Central Hungary Region, Hungary	Ender Ferenc, Kerecsen Istvánné, Poppe Andras
UL	Slovenia	Jure Trilar
BLM	France	Olivia Uguen, Alicia Perez-Morillas
IKERLAN	Basque Country, Spain	Jesus Miguel Ruano
AVL	Austria	Omar Veledar

Minalogic welcomed the participant and introduced the agenda of the day (ref. figure 7). In order to start with the workshop, an icebreaker exercise was proposed by asking to define in three words, '*what are Digital Innovation Hubs?*'. The objective was to **display different concepts and perspective of each DIH**, since that depending on their country, region, organization, positioning and background. A simple but meaningful exercise, since each DIH has a different set up, it was useful to highlight these differences and try to start with a common understanding of what is a Digital Innovation Hub.

From the European Union perspective, Digital Innovation Hubs (DIHs) are one-stop-shops where companies – especially SMEs, startups and mid-caps– can get help to improve their business, production processes, products and services by means of digital technology. One of the key priorities of the Digitising European Industry Communication (DEI) is to support a strong network of DIHs to ensure that every company in Europe can take advantage of digital opportunities.

As a starting point, Digital Innovation Hubs wants to support companies on the creation of their innovation value-chain, taking into consideration three major challenges they are confronted to. First, the **uncertainty of the estimated profit** of their innovation, as the lack of clarity on markets and production efficiency. Secondly, the **high risk of the investment in large scale production**. Thirdly, the **capital need for innovation** and the investment in pilot production. In order to support companies to tackle such challenges and reduce the economic risk, DIH believes in European mutual effort, in such expertise, sharing equipment, integrating networks, educate together and combining markets.

Digital Innovation Hubs have both local and European functions. They represent their local ecosystem and up take them to the European realm. Adding value to their local companies and maximizing the impact at the European level. The understanding and **stimulation of the local ecosystem is essential to guarantee that each DIH reaches their expectations and serve European digitalisation ambitions**.

At the regional level, the DIH orchestrates the innovation ecosystems, represented by Industry (SMEs, Mid-caps, large industries, start-ups) public authorities (European, National and regional), research organisms (RTO, universities, labs), Education organism (vocational training, universities, private), investors (public and private) and business services organizations (accelerators, clusters, associations).

At the European level, it creates a network of building blocks to organize the European collaboration. Those **collaboration channels are meant to share and combine efforts** to support efficiently the company's innovation process. In this sense, the cooperation between European DIHs helps to make **competencies and technologies visible** and facilitate their application into various market sectors. An underpinning role is to encourage and support SMEs to participate in joint European projects and to access other sources of public and private financing.

In order to enhance these collaborations, DigiFed has been working on capturing good practices, benchmarking and analyzing them. The current workshop has the objective to provide the proper workspace to challenge the findings and discuss interests for SME sustainability potential, outreach and technological excellence. Ultimately, this workshop provides feeds the current deliverable.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864266.

To facilitate the exchange between participants and support the emergence of collaboration scheme, a reflection exercise was proposed, and the results are the following:

- **Collaboration objectives**

  What do both sides want to achieve, what are their needs?

To establish wishes and needs of the collaborating hubs and partners. This outlines the need and desired objectives and area of collaboration, as well as expected results from the collaboration. Taking into consideration Joined strategies or projects for RDI development, commitment to the collaboration and markets complementarity.

- **Collaboration implementation**

  What are the rules and mechanisms in which decision making is placed?

It's about the way the decision making on the collaboration is made operational, looking at the internal organizational perspective as well as the external perspective. Taking into consideration interests that the collaborating DIHs and regions take regarding opportunities for collaboration and import/export support to companies.

- **Ecosystem participation**

  Which stakeholders in our ecosystems are involved?

The wideness of the participating of stakeholders in the overall interregional collaboration. It is about Collaboration embeddedness in the collaborating DIHs (individuals' connection or institutional connection). The approach to connect the different user groups (SMEs, research, policy, etc), approach for communication/outreach to local ecosystem (from the other DIH) and connecting DIH consortia between each other.

- **Information sharing**

  How to share the information among us?

It's about ways that information in the 'collaboration' is shared and the frequency of sharing information and whether common approaches have been agreed with each other. It's important to structure and align these exchanges, establishing processes for the information exchange.

- **Business model**

  How is the collaboration funded and operational?

It's about finding ways to fund the collaboration – both in as a structural, potential collaboration and on a project level. This is strongly connected to the objectives and focus of the collaboration and would depend on the objectives, the information sharing and strategic alignment.

- **Modes of collaboration**

  In which way is the collaboration made operational?

It's about the perspective that the collaborating DIHs and regions take regarding opportunities for collaboration and import/export support to companies. The level of involvement (active/passive) and of interest (outbound/inbound) in the capacities from the other DIH.

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5.3 Benchmarking of Results

This deliverable provides comparative data from DIH experiences and services, the benchmark presented during the workshop highlights the main results of the questionnaire. The comparative analysis aims to emerge areas for improvement and performance.

The results have been discussed to identify strengths and show potential across all entities performing similar activities as well as cooperating in new areas. The process to collect the data, analyze the information was introduced during the workshop and afterward challenged among the participants to trigger the conversation.

5.3.1 General Information

First data show that DigiFed DIH are mostly composed (in order of representation) by Research technology organization (RTO), Clusters, Academics and public Authorities. Companies, both SMEs and large, are barely being involved as partners. The most represented sectors by SME are (in order of importance): **Industry, environment, smart city, agri food, health, transport, energy, building, space, defense and consumers**. DIH involved represent an aggregate of 3400 reached by their services.

DigiFed partners are involved in 6 applications for the Digital Europe programme first restricted call for EDIHs, which is expected to be launched in September 2021, to enable selected EIDHs to start their operation towards the second quarter of 2020:

- **Auvergne-Rhône-Alpes in France: MINASMART leaded by MINALOGIC**
- **Ile-de-France in France: DIGIHALL leaded by CEA-LIST and SYSTEMATIX**
- **Basque Country in Spain: Basque digital Innovation Hub**
- Central Hungary Region in Hungary: BME
- **Baden-Württemberg in Germany: SEZ**
- **Slovenia: 4PDIH leaded by Ljubljana University**

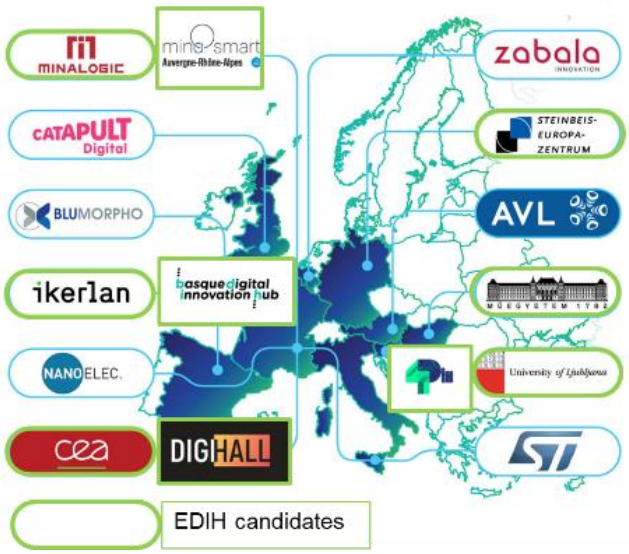

Figure 8 Map of DigiFed DIHs and European DIHs candidates

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5.3.2 Support to companies

In order to identify more representative markets and sectorial interests by DIH, each partner had to rank the most occurring sectors and the less occurring ones. Both outcomes spotlight collaboration opportunities, as the most occurring sectors could be a great to **reinforce exponentially leading positions**, and the less occurring sectors reflects **innovation needs and under-exploited opportunities**. These cross-pollination opportunities are meant to reinforce the positioning of leading DIH, as well as supporting those who have not yet integrated this initiative.

The most occurring sectors are health, industry 4.0, smart city and environment. They potentially represent markets with high specialisation whereas competences could be shared and reinforced. Moreover, the market offer and demand seems to be appealing. This could lead to synergies between partners to satisfy both, offer and demand.

The fewer occurring sectors are building, space/defence and consumers/public. These under-exploited sectors could be satisfied by high rated partners, for instance, SEZ has rated agri/food very low, in the contrary DIGIHALL and MINASMART very high, then we could image them taking the lead and sharing their experience to impulse the selected sector.

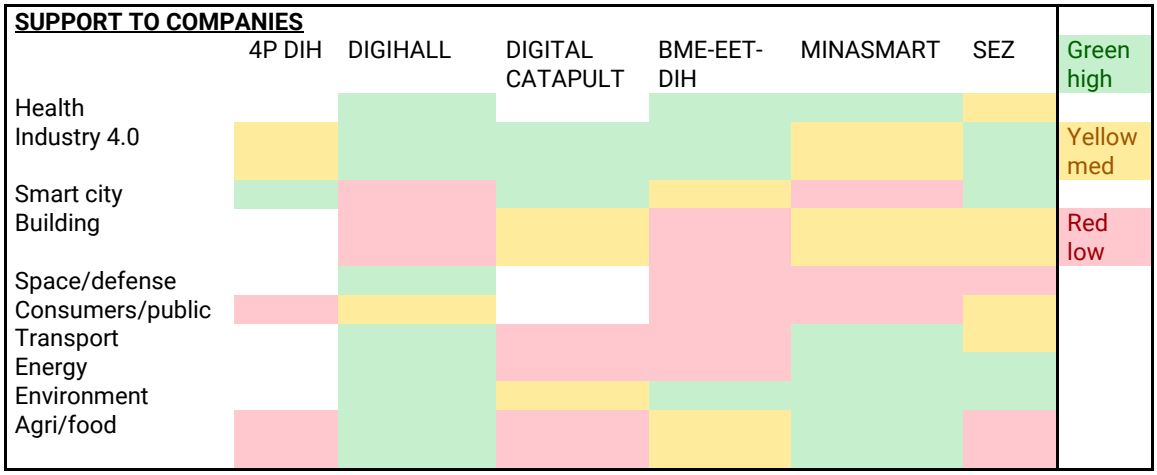

Figure 9 Industrial sectors most supported for each DigiFed DIHs

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5.3.3 Services to companies

The objective of this section is to analyse and compare the services provided by each DIH. The underpinning aim is to identify possible gaps of opportunity, representing potential demand for services. To evaluate such demand, the questionnaire takes into consideration the success of each service and their interest. The gap of opportunity is calculated by adding the success plus interest score minus the availability.

The questionnaire is based in the four pillars of services of the European Digital Innovation Hubs in Digital Europe Programme, the test before invest providing access to technical expertise and experimentation, support to find investment providing financing advice, ecosystem and networking for creating awareness and deploying DIH's services, and skills & training for reinforcing human resources capacities.

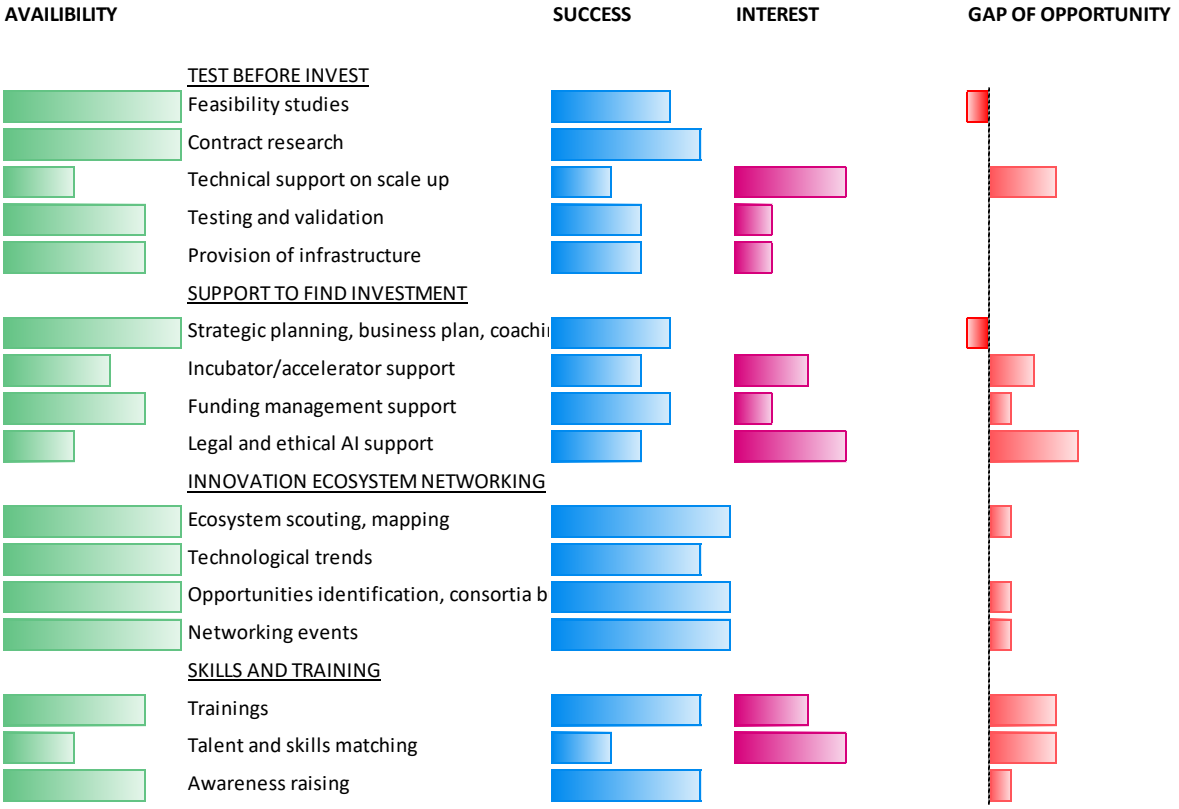

Figure 10. DigiFed DIHs' services data

The figure 8 above, illustrates the overall services provided by DigiFed DIH, more particularly, each bar represents the score rated by them. It sums up the results of the questionnaire filled individually.

We can observe that all categories and subcategories of services are pretty well provided, in particular innovation ecosystem and networking with high success but no peculiar interest of developing furthermore. We can deduce that these activities are pretty well rounded by each partner and their needs are somewhere else. On the contrary, the other three blocks seem to be of high interest, in particular services as technical support on scale up, with low availability, low success and high interest, resulting in an interesting score for gap of opportunity. In the support to find investment block, legal and ethical AI support and incubator/accelerator support show high scores with low availability and high interest. The skills and training block of services shows opportunity for training and talent and skills matching.

These services show potential for development and could be discusses furthermore between DigiFed partners, in fact, some of them have been showcased during the workshop and partners have already pointed out their desire to dive in furthermore, learning from each other and extrapolating successful services in their own ecosystem.

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As said, each DIH had the opportunity to showcase their services, believing those activities have high potential for development and collaboration. The objective is to promote what they do best. Services with unique value proposition willing to be exported abroad or/and reinforced. The presentations were the following (more details in 5.2):

- **TEST BEFORE INVEST**

Jure Trilar from 4PDIH presented Fab lab network Slovenia.
Andras Poppe from BME presented the solid-state lighting design and characterization, the thermal design and characterization reliability characterization.
Amélie Vagner from DIGIHALL presented the Deep Neural Network Design and Development Platform for Embedded AI (N2D2) DIGICAT, the benchmarking and certification; Access to facilities and testbeds; ethics consultations for ai startups.
Pierre Damien Berger from MINALOGIC presented the easytech family

- **ACCESS TO FUNDING**

Amélie Vagner from DIGIHALL presented the investors club.
Michael Setton from DIGICAT presented the Machine intelligence garage.

- **INNOVATION, ECOSYSTEM AND NETWORKING**

Jure Trilar from 4PDIH presented the Public administration digitalization
Michael Setton from DIGICAT presented the Future networks lab challenge programme
Amélie Vagner from DIGIHALL presented the challenge open innovation
Pierre Damien Berger from MINALOGIC presented the Minalogic Business Meetings and open innovation

- **SKILLS AND TRAINING**

Jure Trilar from 4PDIH presented the Ict academy and school digital competences
Michael Setton from DIGICAT presented the master class programme and tech discovery programme

These services were challenged and discussed against interest for SME for impact and potential. It means that each partner had to evaluate the outreach and success of its services. This benchmark allows us to avoid potential pitch falls and to benefit from each other experience, moreover, to identify the most beneficial activities for SME. At this stage, with few data collected from DigiFed's results, particularly from application experiments, generic experiment and digital challenges (WP1 and WP2 results), is still unclear what the feedbacks are, and the obstacle the companies are confronted to. Although, taking into consideration that each DIH has its own process of 'customer service satisfaction', by evaluating and monitoring the impact of their services, it seems interesting to contemplate a common process to facilitate, at the European level, the overall company innovation pathway.

5.3.4 Intra-DIH collaboration and networking

Digital Innovation Hubs have the dual mission of serving both local and European functions, working on internal as well as on external collaborations. To bring coherence to this double function, intra-DIH collaboration and networking is essential to articulate inter-DIH collaboration. Given the large number of players at the local ecosystem and in order to uptake these local activities to the European level, strong coordination is required. Therefore, some DIH have decided to create partnerships or even consortium to unify their resources to maximize their impact. Taking this into consideration, the purpose of this section is to highlight attractive collaboration at the local level.

The questionnaire shows that the most common type of collaboration is signposting and joint lobbying/publicity. The first activity, signposting, refer to publishing each other news and event in order to promote them more efficiently. The second, lobbying and publicity, are the capacity to unify forces in order to defend and promote each organisation interests, for instance to public authorities.

On the contrary, the questionnaire shows that sharing facilities and infrastructures and developing joint services are not activities commonly implemented between DIHs. A supposition would be that facilities and infrastructures might be more complex to developed for strategic, legal and financial reasons, but it can be pointed out that an opportunity resides there.

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Another collaboration opportunity might also reside in joint services, in order to mutualize skills and resources. This is precisely the subject of the current paper which aims at identifying successful activities implemented by each DIH and potentially co-developing them to enhance their impacts.

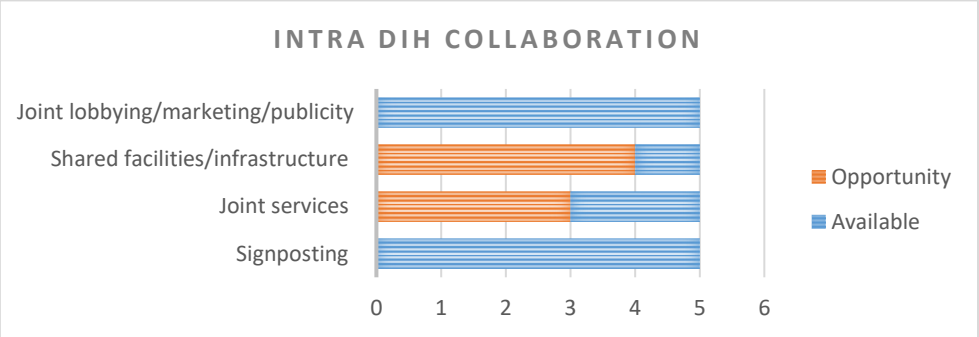

Figure 11. DIHs' intra collaboration

5.3.5 European and national involvement

The table here below gives a few examples of H2020 projects in which DigiFed's partners are involved, pre-existing consortia in which they already collaborate outside of DigiFed. The objective is to analyse their European positioning and evaluate potential partnerships. The underpinning objective is, potentially, to unite partners around leading topics and towards appealing public tender. To take into consideration that this list is not comprehensive and could be discuss furthermore. In fact, diving more into each partner involvement in European projects, could be a great leverage to create collaboration and synergies to maximise their impacts. Moreover, this first list deserves to be taken into consideration as inspiration of future Horizon Europe project that could be of interest for DigiFed's DIHs.

PROJECTS	TECHNOLOGY
DIGIFED	CPS
FED4SAE	CPS
AI REGIO	AI
EUROCPS	CPS
Euhubds4data	DATA
RIMA	ROBOTICS
PULSATE	LASER
AGROBOFOOD	ROBOTICS
DIH HERO	ROBOTICS
BE IN CPPS	CPS
CPS4EU	CPS
KET4DUALUSE	KET
KET4CLEAN PRODUCTION	KET

Figure 12. Collaboration DigiFed's DIH across h2020

All DigiFed partners are both deeply rooted in their local/regional/national ecosystems and well connected to major European partners, clusters and networks to achieve a strong and sustainable impact beyond the lifetime of the project. In fact, successful regional approaches to DIH support exist in all DigiFed partner regions, for example:

The region of Auvergne- Rhône-Alpes is one of the most active French regions in RTD (Research, Technology and Development) and innovation. It comprises a large number of high-tech clusters and DigiFed project partner MNL is one of the most active actors in this ecosystem. MNL also launched the DIH "MinaSmart" in 2018.

In the region of Central Hungary, BME is deeply rooted in both the national and regional ecosystem, e.g. leading the Hungarian Industry 4.0 technology platform and benefitting from close contacts to regional and national decisionmakers.

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In Slovenia, ULJ has comprehensive contacts to the national ministries responsible for digitisation, innovation and SME support and takes stock of these connections to discuss EU-national-regional synergies to increase DIH efficiency and support.

In United Kingdom, since the inception of local centres in 2015 DIH DigiCat has worked with more than 40 different partners across 4 distinct regions, ably led by; Sunderland Software City, Department for Economy - NI, Coast to Capital LEP and Universities.

In Baden-Württemberg for example, the regional Ministry of Economic Affairs funds several technology and transfer centres on digitisation and Industry 4.0. Also, as partner in the EEN, we are well connected to all major actors of European technology transfer, innovation and SME support.

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6. Identification of DIH-Best Practices and Challenges

6.1 Identification Process

Digital Innovation Hubs have a culture of innovation and efficiency that looks for constant lookout for best practices that can be propagated throughout their organization in order to make it optimal in all aspects. This is especially true for DigiFed partners hat are geographically dispersed, which perform similar activities and therefore offer many opportunities for adopting common practices and achieving high standards.

In order to reach such ambitions, the methodology for defining and identifying best practices includes giving the opportunity to each partner to express themselves and introduce us to their most successful activities. The workshop was the right framework to prepare and share their experience, following DigiFed's recommendations and questionnaire. In this sense, each partner introduced in power point the services they proposed to create synergies:

6.2 Description of DIH-Best Practices and Services

Each participant has previously identified and prepare a presentation to introduce their flagship services during the workshop:

DIH	GROUP OF SERVICE	SERVICE	DESCRIPTION	FURTHER INFORMATION
Minasmart	Innovation, ecosystem and networking	Minalogic Business Meetings and open innovation	MINALOGIC Business Meetings is a unique, international B2Bevent in the Region. This event, focused on digital technologies, brings together key buyers from international corporations from all over the world. The event is focused on B2B meetings between these key buyers and technology providers with the objective of creating opportunities for business and for partnerships.	https://www.minalogicbusinessmeetings.com/
4PDIH	Innovation, ecosystem and networking	Public administration digitalisation	Collaboration with the Ministry of Public Administration and the Association of Municipalities of Slovenia– collect the needs of the municipalities in order to prepare future policies and instruments. Challenge owners represent key challenges, through webinar innovators can connect with challenge owners to understand the need first-hand, innovators develop proposals and practice presentation, pitch to judges	https://4pdih.com/orodje/
DIGIHALL	Innovation, ecosystem and networking	Open innovation challenge	The open innovation Challenge aims at generating new partnerships by stimulating meetings between start-ups, SMEs and big companies. The cluster works with the latter to set the objectives and topics of open innovation and then scout for SMEs to identify innovative products and services to meet the big companies' needs.	https://nextmove.fr/services-2021/challenge-open-innovation/
Minasmart	Innovation, ecosystem and networking	Open innovation	Organizing meetings between a large account (private or public) and companies to initiate concrete opportunities for business and / or technological collaborations. The large account or principal expresses a technological need, markets and / or use cases, and MINASMART allows it to meet solution providers (companies) that can meet them.	https://www.minalogic.com/services/les-journees-open-innovation/
4PDIH	Skills and trainings	ICT academy and school digital competences	Professional trainings in the field of ICT, Cisco network solutions, Apple products and development of mobile applications on Android and iOS platforms. Digital competences, working on the Preparation for future policies and instruments for teachers in school to continuously develop their own digital skills and at the same time encourage students to use ICT and digital tools in their independent learning and development of crucial skills.	https://ict-academy.eu https://4pdih.com/en/2021/03/24/digital-maturity-schools/

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DIH	GROUP OF SERVICE	SERVICE	DESCRIPTION	FURTHER INFORMATION
DIGICAT	Skills and trainings	Master class programme. Tech discovery programme	Introductory webinar to a selected emerging technology at the early stages of the hype cycle (e.g. intro to AI, federated learning, LPWAN, low-power edge computing) held by 3-5 experts from the field from different organizations (DIHs and externals), showcasing possibilities through examples and discussing market outlook. Panel discussion and Q&A. Format of 90-minutes online workshop, eventually followed by local meet-ups The Tech discovery programme delivers 5 webinars jointly organized by both DIHs and industrial partners for a specific technology (e.g. edge computing, security): technologies available (benefits, costs), implementation, use cases and user testimonies. Format of 2 hours online webinars which are recorded and then accessible via the website.	
4PDIH	Test before invest	FabLab Network Slovenia	FabLab Network is a platform for learning, intergenerational integration, creativity and support to creative makers, startups and companies. The national reference FabLab Network Slovenia is a technologically supported environment for innovation, prototyping and invention, but is also aimed at encouraging circular economy and local entrepreneurship. The basic idea is to promote innovation and development of local economy. Some partners of the network have had long experience in operating within different forms of entrepreneurship environment. Formation of entrepreneurship will be encouraged in all Slovenian regions.	http://fablab.si/
BME EET	Test before invest	Thermal design and thermal characterisation; Reliability characterisation; Solid state lighting design and characterisation; Access to facilities and testbeds	Services thermal design: -Consulting services, including the technical support for the implementation -Thermal characterization of ICs and packages -Thermal modelling of PCBs and enclosures -Thermal imaging Service characterization: consulting services, including the technical support for the implementation. Infrastructures offer for Electrical and thermal parameters of the DUT (for LEDs: even light output characteristics) and freely customizable test sequences of temperature and humidity. Service -consulting services, including the technical support for the implementation -Testing, modelling and simulation of LEDs -Improve luminaire price/performance ratio with special emphasis on reliability and energy efficiency	
DIGICAT	Test before invest	Benchmarking & Certification; Access to facilities and testbeds; Ethics consultations for AI startups	IoT Benchmarking services: Power consumption laboratory tests; Communication performance tests; Device characterization; LoRa/LoRaWAN Compliance tests. For device producers, end-to-end solution integrators and providers Access to facilities: LPWAN testbeds (testing and validation); LoRaWAN open testbed; LoRaWAN geolocation testbed; deployed across London city centre; Sigfox, NB-IoT; Future Networks Lab. Target group: SMEs developing/testing/validating product ideas or piloting with potential customers, collaborators, partners for joint proposals. Ethics consultations for AI startups is a Structured consultation services for AI startups to use a proven **Ethics Framework** and discuss the ethical implications and challenges around their solution/technology with AI Ethics experts (**Ethics Committee**).	https://www.migarage.ai/ethics/ethics-framework/

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DIH	GROUP OF SERVICE	SERVICE	DESCRIPTION	FURTHER INFORMATION
Minasmart	Test before invest	Techno Transfer acceleration – Easy Family	Easytech is a program for SMEs, from all sectors of activity, wishing to integrate intelligence into their products. This agile device makes it possible to support and co-finance innovative projects integrating digital technologies from research organizations in the region.	https://www.minalogic.com/services/le-programme-easytech/
DIGICAT	Access to funding	European Investor Deep Dive; Machine Intelligence Garage	Investment Readiness - series of programmes that support the startups in understanding the investment landscape, building their fundraising strategy, understanding the technicalities of fundraising and better presenting their propositions. Target group: 10-15 startups (depending on the stage they're at, their commercial viability, etc). For online workshops we can have more startups tuning in. Machine Intelligence Garage is an accelerator for early stage AI startups. Participating companies gain access to computation power and relevant expertise, as well as a broad range of support activities in areas of business, investment, technology and applied AI ethics. As part of the programme there is targeted investment support and access to investor events and showcases.	
DIGIHALL	Access to funding	Investors club	SMEs awarded with the label 'Entreprise innovante des pôles' (EIP) benefit from privileged access to active investors in the investors' club, though pre-qualified meeting with funds managers. SMEs get a dedicated spot to meet investors individually. It is aimed at start ups and SMEs wishing to raise funds under the best conditions, by involving qualified investors from the competitiveness cluster ecosystem.	

Figure 13 Table of "flagship" service proposed by DigiFed DIHs

6.3 Benchmarking and Analysis [of Best Practices and Services]

It is widely agreed that the DigiFed partners need to **take coordinated action to trigger the full potential of digital technologies**, considering that fewer 20% of small and medium-sized enterprises (SMEs) have so far successfully integrated these into their businesses. The **DIHs will play a central role to stimulate the broad uptake of Cyber Physical Systems**. To achieve such objective, DigiFed expects to capitalise on its large experience on supporting SMEs and its unique outreach to innovation and businesses in Europe.

Through this benchmarking exercise, DigiFed DIHs have proven to be **embedded in their regional and national business and innovation support ecosystems,** being SMEs the main target group, additionally, DIHs offer their services widely to other ecosystem actors such as clusters' members, research and technology organisations and universities.

Beyond their local ecosystems, these best practices and services, show that **DIHs support transnational technology transfer, as well as innovation management capacity building**. In this sense, they connect enterprises, especially SMEs to academia, governments and citizens at different levels of government.

The common denominator of successful services is the one demonstrating to boost companies' collaboration, support their innovation take-up, internationalisation, resilience and scaling-up. To elevate them beyond their local realm, DIHs are key to transnational partnerships to help SMEs access global value chains and build bridges across ecosystems and they are therefore important change agents for the digital transformation. The services identified as successful with high potential (cf. figure 11. DIHs services marks or interest) are **the tools to connect supply and demand of digital skills and boost businesses collaboration for supporting investments for digital technology adoption and improve businesses productivity**.

In order to create as many synergies and structured exchanges as possible among DigiFed DIHs, **joint working groups will collaborate on the selected services**. To select these services, an email followed (i.e. doodle invitation) asking to each partner to position themselves in the most attractive services for them. Then, they will discuss,

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elaborate and establish recommendations actions to be implemented to elevate these services at the European level and demonstrate the promising collaborative results of DigiFed partners.

First results show particular interest in **'test before invest'** services (three services), followed by Innovation, '**ecosystem and networking service'** (two services) and then 'access to **funding services'** (one service). These have been identified and selected for their unique value proposition:

- **The 'Fab lab network Slovenia' has trigger DigiFed interest for its collaborative potential with fab labs.**

  Partner leader: UL Partner interested: BME; SEZ; CEA

- **The service 'Ethics consultations for AI startups', is tackling a subject that few organisation do.**

  Partner leader: DIGICAT Partner interested: SEZ; CEA; MINALOGIC

- **The 'Techno Transfer acceleration: Easy Family activities', shows interesting regional co-funding mechanism for SMEs.**

  Partner leader: MINALOGIC Partner interested: SEZ; CEA; DIGICAT; UL

- **The 'Investors club', provide support on one of the main issues for companies, funding them.**

  Partner leader: DIGICAT Partner interested: SEZ; MINALOGIC; UL

- **The 'Public administration digitalisation', activates collaboration schemes with public entities.**

  Partner leader: UL Partner interested: CEA; DIGICAT; MINALOGIC

- **The 'open innovation challenge', introduce innovation collabration between SMEs and large groups, triggering business opportunities.**

  Partner leader: MINALOGIC Partner interested: BME; CEA; UL; DIGICAT

To facilitate the collaboration between DIgiFed partners, the benchmark shows different options to make these operational, for instance:

- **Test before invest services: interregional technology roadmap, joined infrastructure, shared pool of experts, offering preferential access to each other infrastructures.**

- **Ecosystem and networking services: shared information, joint events, dissemination of each other information.**

- **Access to funding services: peer review meetings, exchange of innovative projects, joined participation in projects.**

Full description of services can be found in section 6.2.

6.4 Challenges and Pitfalls Identified

Creating collaboration is a challenging task and requires to understand each partner and meet their expectations. To reach such objectives, DigiFed needs to incentives each partner and take into consideration their needs to create a collaborative scheme that enhance every partner competences and capacities.

First, it seems essential to create the right framework for exchange, just like DigiFed did with the organisation of the workshop. The partners were involved and committed in the process, took the opportunity to present their activities and listen to each other. This dynamic should continue with frequent meetings to exchange and share experiences.

Another crucial topic is finance, or how to fund DIH operations to support companies with their digitalisation. As we know it, cascade Funding, also known as Financial Support for Third Parties (FSTP), is a great mechanism to distribute public funding directly to SME and/or mid-caps, in the uptake or development of digital innovation, but

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also fund DIH operations and test before invest. That said, the current consortium should capitalize on the current collaboration to identify Horizon Europe projects of interest to apply.

It is particularly interesting to take into consideration that in the framework of H2020, there are currently competitive calls or open calls that are destined to Digital Innovation hubs (**website**). These are attractive mechanism since they provide funding opportunities for DIHs, to develop their services and support companies. Those open calls are thematic and implemented along the year, mostly grouped in in two major CSA, first SAE and I4MS.

For instance, from I4MS:

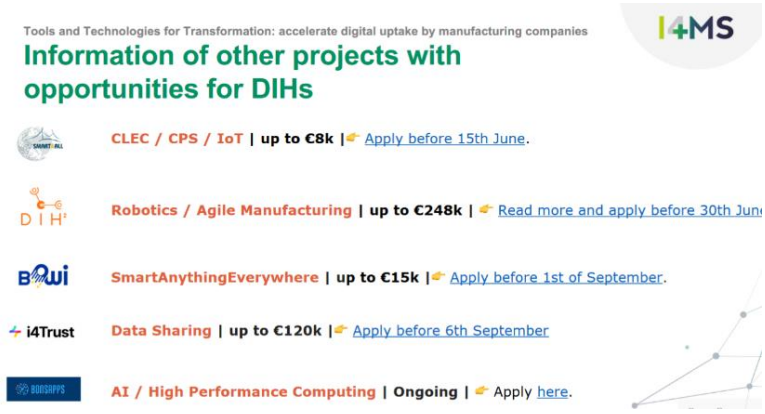

Figure 14. DIHs funding opportunities

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7. Recommendations on Refined and Joint-DIH Services

7.1 Refined DIH-Services and Opportunities

7.1.1 Inputs for the expansion of the DigiFed DIH-network (task 4.2)

The first DigiFed's network Expansion event took place the 17th November 2020, and it gathered 45 participants, with representation of 14 European regions in addition to the 7 regions represented by the DigiFed-DIHs.

The activity provided a platform to CPS focused IAs under SAE initiative, i.e. HUBCAP, DIH4CPS and FED4SAE, enabling them to display their tools, engagement strategy and services SMEs to wide pan-European audience. Moreover, active participation and involvement of other H2020 Initiatives, i.e. DIHNET and I4MS, was achieved.

The main outpouts and lessons learnt for DIHs were the following:

- **Collaboration**: Need for enhanced collaboration, exchange of knowledge and skills, and for a management style that supports a distributed and diverse SMEs landscape. DIHs should focus on pursuing suitable collaboration schemes that enable such exchange and benefit their affiliated SMEs/midcaps/startups
- **Sustainability**: Most DIHs emerged as a European initiative and are very reliant on EU funding. The development of suitable revenue models is essential to guarantee the long-term operation. From this perspective, their value proposition has to be justified and understood by SMEs such that DIHs services are sought for.
- **Services/Tools**: Needs of SMEs change drastically depending on the digital maturity of the local industry. Key services that SMEs are typically willing to pay for include technical support, match-making and networking. Instances to share innovative tools, e.g. DigiFed innovation pathways, and successful experiences between DIHs are desirable

7.1.2 Inputs for the DigiFed Sustainability model (task 4.4)

The sustainability model of DigiFed will be built following three main orientations.

- The sustainability of the DigiFed network. This means that our activities within the projects should contribute to create and maintain a strong and effective network that will be consistent enough in the future to develop further collaborations beyond the project termination.
- The sustainability for DigiFed's beneficiaries. This means that we all should aim at providing them with the support they need to further build their growth strategy beyond their experiment with DigiFed to perpetuate DigiFed ecosystem.
- The integration of DigiFed's network and community within the DIHs & EDIHs community which development is one of the priorities of the European Commission in the Digital Europe Programme.

The work developed within the WP4, and especially this exchange on DIHs best practices, will be key to build a vivid DigiFed community relying on **real trust between partners and the willingness to continue to work further together**. Exchange of best practices is key to support the three objectives of the sustainability models.

- For the strength of DigiFed consortium, exchange of best practices is a condition sine qua non to learn from each other's and be able to build collaborative processes beyond the project. Even if the development of joint services and collaborations might still seem quite complex to be implemented, they should be a **starting point, a horizon to reach further objectives within the WP4 and beyond**.
- For the benefit of DigiFed beneficiaries, it is very important to reinforce the consortium activities **advocating for DigiFed differentiation and value proposition**. The success stories that the consortium will be able to support will be the flag ships of DigiFed brand and will lay the foundations of DigiFed community legacy. It is very important that the exchanges of best practices and the development of joint activities provide opportunities for success stories to emerge and scale-up.

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- DIHs and future EDIHs within DigiFed ecosystem are already included in a **wider ecosystem and should be able to identify opportunities for cooperation**. Those opportunities are even easier to identify when you already know how the others operate, their strength and weaknesses, and their potential needs. DigiFed community's expertise in CPS technologies is of interest for other DIHs and EDIHs which don't have this expertise. The strength of the CPS network and the reinforcement of DigiFed's value proposition and branding should be the priority of the upcoming actions building on the first steps described in this deliverable.

7.2 Recommendations & next actions

For DigiFed DIH sustainability, it is crucial to identify collaboration opportunities based on the market attractiveness, technologies available and services with high potential. To reach such objective, we are evaluating mapping the offer and the demand of each DIH, to identify synergies and complementarity between them.

To identify the offer and the demand, the matrix below (c.f. Table 2) will help us mapping the services proposed by each DIH for specifics sectors, as for instance health, environment, transport etc. The result will could be maps with different colors representing each stakeholder's region activity implication. The juxtaposition of those maps, will provide a quantitative overview of the services provided by each region, highlighting gaps (**opportunities for know-how importation and exportation transfer**) and also competition (**enabling benchmark and collaboration**).

This analysis of the volume of activity of DIH, takes into consideration the nature of the stakeholder and the type of services they provide. But to go further on combining the markets, the analysis shall include a qualitative approach to determine the **supply and demand of each region**, and by doing so, identifies stakeholders' needs in term of innovative services and matches them with providers from other European regions.

The underpinning objective is to oversee and to grasp the **full digital value chain dedicated to the full innovation process of the companies, in particular SMEs**.

DigiFed's DIH services SERVICES	DIGIHALL	DIGICAT	MINALOGIC	STEINBEIS	BME	UL	BLM	IKERLAN	AVL
(🔧) services offered :									
(⚙) services needed :									
INNOVATION ECOSYSTEM AND NETWORKING									
Diagnosis transformation plan	⚙		⚙	⚙	⚙		🔧		
Events	🔧	🔧	🔧	🔧	🔧	⚙	⚙	⚙	⚙
Ecosystem building	🔧	🔧	🔧	🔧	🔧	⚙	⚙	⚙	⚙
Representation, lobbying and promotion	🔧	⚙	⚙	⚙	⚙	⚙	⚙	🔧	⚙
Incubator/accelerator support for startups									
Marketplace dynamization								🔧	🔧
Helpdesk management									
RDI DEVELOPMENT									
Strategy RDI	🔧	🔧	🔧						
R&D project / Techno transfer / contract research	🔧	🔧	🔧						
Technical support for scale up	🔧	🔧	🔧						
Provider of tech infrastructure	🔧	🔧	🔧						
Testing and validation	🔧	🔧	🔧						
ACCESS TO FUNDING									
Innovation vouchers								🔧	🔧
Finance consulting			🔧						🔧
Support expertise	🔧								🔧
SKILLS & TALENTS									
Digital campuses	⚙	⚙		🔧	🔧	🔧	🔧		
Digitalisation and I4.0 training - technical training				🔧		🔧	🔧		
Train the trainers / competence training	⚙	⚙		⚙	⚙	⚙	🔧		
Job offers / recruitment						⚙			

Figure 15. Example of matrix of services proposed by each partner

DigiFed proposes to continue with WP4 meetings to discuss furthermore collaboration opportunities. In fact, next meetings should be the chance to present this deliverable and plan for next actions, in particular the identification of market potential and services of interest.

The methodology to identify market potential and gap of opportunity is defined in four steps.

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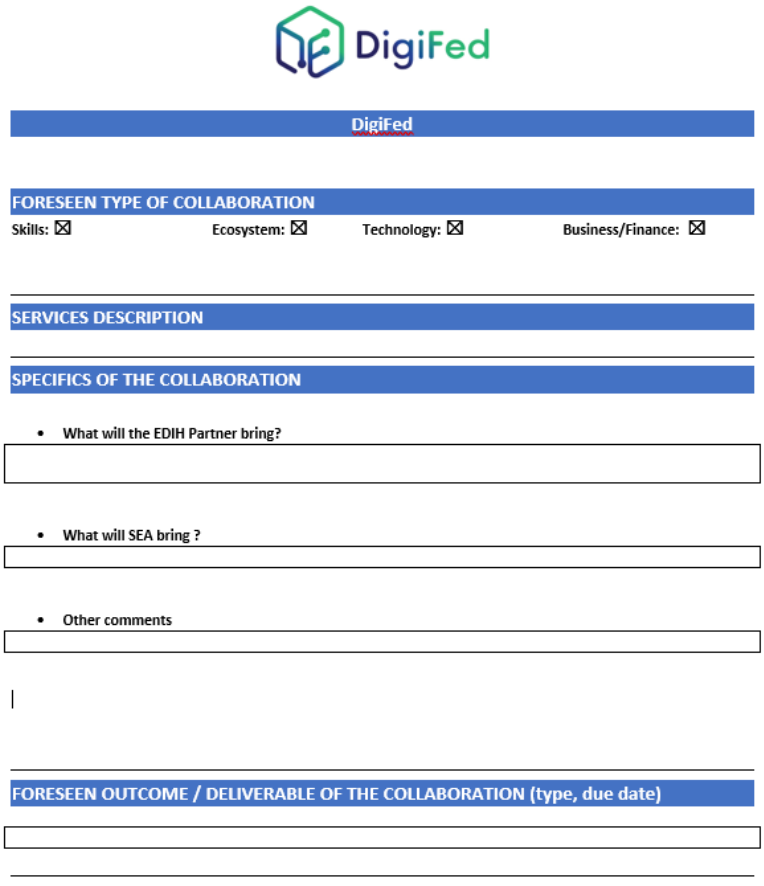
- **First step requires to select the sectors to be analysed, these can be the more or less recurring one (Industry, environment, smart city, agri food, health, transport, energy, building, space, defence and consumers.)**
- **Next step requires that each partner gets familiar with the matrix of services here above, understanding how to map, both offer and demand, of the services for each sector.**
- **Later on, to superimpose those maps to identify potential gap or overlaps.**
- **Finally, discuss the results for potential collaboration on specific market with specifics players and services providers.**

Another proposal for establishing partnerships and consolidating DigiFed network, would be to complete a collaboration sheet with the type of collaboration foreseen. This document would describe the services and activities to be developed. Another section would specify the collaboration, what does each partner bring and what does the DigiFed community proposes to structure and articulate joint activities. Finally, the last section would point out foreseen outcomes, planning the deliverable of the collaboration. Example of document here below:


DigiFed

DigiFed

FORESEEN TYPE OF COLLABORATION

Skills: ☒ Ecosystem: ☒ Technology: ☒ Business/Finance: ☒

SERVICES DESCRIPTION

SPECIFICS OF THE COLLABORATION

- What will the EDIH Partner bring?
- What will SEA bring ?
- Other comments

FORESEEN OUTCOME / DELIVERABLE OF THE COLLABORATION (type, due date)

Figure 16. Collaboration sheet DigiFed

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8. Conclusion

This report describes the rationale and the workshop organization looking to grasp and enhance DIH collaboration within DigiFed. To reach such objective, a benchmark process was triggered, from collecting data among participants, analzysing beforehand the information, confronting the first results during the workshop, collecting trivial feedbacks and reporting on them in the current deliverable.

The document highlights the importance of **Digital Innovation Hubs in the expression of political and industrial commitment**, by supporting and implementing public and private policies to enhance innovation among companies and in particular small and medium entreprises. The reindustralisation of the european industry has to be focused in the development of long-termn competitive products and services that requiere **combining different competences and innovative solutions** .Therefore, the development of emerging industries, throught digitalization, is essential to provide growth and employment of the future.

To guarantee and exhaustive integration of local and European ecosystems, the Digital Innovation Hubs plays a key role. Moreover, the development of **new industrial value chains calls for the collaboration and integration of different innovation actors**, which includes research centres, academics, large enterprises and especially SMEs, across different sectors towards the implementation of a joint vision for digital transformation.

The necessity to create collaboration within DigiFed's DIH's network is real and create opportunities for new business, favor the capacity building on innovation actors and increases the efficiency of digital transformation activities. In fact, the exchange of experiences has shown the large benefits of consolidation DigiFed-DIHs network to improve their **capacity, the implementation of innovation support actions and the impact in the companies'** digitalization, as for instance but not exclusively:

- **Facilitate access to technologies, skills and expertise: sustained gain of increased expertise/experiences in the interregional collaboration;**
- **New business opportunities: Allowing participation in European networks to access EU-funds and strong EU partners;**
- **Economies of scales for our activities;**
- **Exchange of experiences on good practices to support digital transformation;**
- **Synergies and co-creating in technology and knowledge development;**
- **Pan-EU value chains and access to new European markets;**

This methodology used to identify best practices with high performance, high acceptance by companies and with unique value proposition, has highlighted specific initiatives and innovation support actions as :

- **Test before invest service, the 'Fab lab network Slovenia' as a platform for learning, intergenerational integration, creativity and support to creative makers, startups and companies. The basic idea is to promote innovation and development of local economy.**
- **Test before invest service, the 'Ethics consultations for AI startups', structured consultation services for AI startups to use a proven Ethics Framework and discuss the ethical implications and challenges around their solution/technology with AI Ethics experts (Ethics Committee).**
- **Test before invest service, the 'Techno Transfer acceleration: Easy Family activities', as a program for SMEs, from all sectors of activity, wishing to integrate intelligence into their products.This agile device makes it possible to support and co-finance innovative projects integrating digital technologies from research organizations in the region.**
- **Access to funding service, the 'Investors club', for SMEs awarded with the label 'Entreprise innovante des pôles' (EIP) benefit from privileged access to active investors in the investors' club, though pre-qualified meeting with funds managers. SMEs get a dedicated spot to meet investors individually. It is**

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aimed at start ups and SMEs wishing to raise funds under the best conditions, by involving qualified investors from the competitiveness cluster ecosystem.

- **Innovation, ecosystem and networking service, the 'Public administration digitalisation', the Collaboration with public entities, to collect the needs of the municipalities in order to prepare future policies and instruments. Challenge owners represent key challenges, through webinar innovators can connect with challenge owners to understand the need first-hand, innovators develop proposals and practice presentation, pitch to judges**

- **Innovation, ecosystem and networking service, the 'open innovation challenge' meant to generate new partnerships by stimulating meetings between start-ups, SMEs and big companies. The DIH works with the latter to set the objectives, topics, technological needs, markets requirement and / or use cases, to scout to identify innovative solution providers (companies) that can meet the large companies' needs.**

Additionally, this paper encourages Digital innovation Hubs to connect and gather existing initiatives and networks aiming to create a **Europewide comprehensive network of DIHs** working in the field of cyber-physical and embedded systems, and beyond. In fact, this endeavour has been triggered by the DigiFed consortium to reach out to as many relevant stakeholders in support of digitisation, CPS, IoT and Industry 4.0 as possible. Discussion have started with networks as DIHNET, supporting Digital Innovation Hub Networks across Europe and the coordination and support actions Smart Anything Everywhere initiative and , I4MS for cascade funding dedicated to DIHs and with other national and regional initiatives.

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