European Commission

DIGITAL INNOVATION HUBS NETWORK FOCUSSING ON ARTIFICIAL INTELLIGENCE

FINAL STUDY REPORT

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Digititising European Industry Initiative

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Acronyms and abbreviations

AI	Artificial Intelligence
AI HLEG	High-Level Expert Group on Artificial Intelligence
BDVA	Big Data Value Association
BMC	Business Model Canvas
CC	Competence Centre
CRM	Customer relationship management
DEI Initiative	Digitising European Industry Initiative
DEP	Digital Europe Programme
DIH	Digital Innovation Hub
e-CF	European e-Competence Framework
EPO	European Patent Office
EoI	Expression of Interest
ESCO	European Skills/ Competences, qualifications and Occupations
EU	European Commission
HPC	High-Performance Computing
I&M	Inspection and Maintenance
IoT	Internet of Things
IPR	Intellectual Property Right
IT	Information Technology
KPI	Key Performance Indicators
MOU	Memorandum of Understanding
ML	Machine Learning
NUTS	Nomenclature of Territorial Units for Statistics
PoC	Proof of Concept
RDI	Research, Development and Innovation
RIMA	Robotics for Infrastructure Inspection and Maintenance
RIS	Regional Innovation Scoreboard
RODIN	Robotics Digital Innovation Networks
SAE	Smart Anything Everywhere
SME	Small & Medium Enterprise

Abstract

Digital Innovation Hubs (DIH) are expected to play a major role in the Multiannual Financial Framework 2021- 2027, fostering the adoption of disruptive technologies - particularly Artificial Intelligence, High Performance Computing and Cybersecurity - by industry and public sector organisations.

Cooperation offers DIHs to perform this role more effectively, as it gives them the possibility to upgrade their respective technological capacities, service offerings and in-house skills.

Aware of the potential of collaboration, the European Commission and the European Parliament launched a preparatory action to create a European Network of 30 Digital Innovation Hubs with a focus on AI. The action - managed by PwC, in consortium with CARSA and Innovalia – aimed to develop schemes for structured cooperation among DIHs, to create a European Network of DIHs with focus on AI, and to provide policy recommendations for enhancing DIHs' collaboration.

The AI DIH Network project involved 30 DIHs from 20 countries in a coaching and mentoring programme centred on cooperation, including collaborative workshops, a peer-learning programme and webinar training sessions, with remote and on-site support of individual tutors. At the end of the programme, a Framework Cooperation Agreement has been signed by 25 DIHs at the Digitising European Industry Stakeholder Forum held in Madrid in November 2019.

Résumé

Les pôles d'innovation numérique (Digital Innovation Hubs, ou DIH) joueront un rôle important dans le cadre financier pluriannuel 2021-2027, visant à l'adoption et la promotion de technologies de rupture – tel que l'intelligence artificielle, le calcul de haute performance et la cybersécurité –part l'industrie et le secteur public.

La coopération permet aux DIH de jouer ce rôle plus efficacement, en leur offrant la possibilité de mettre à jour leurs capacités technologiques, leurs offres de services et leurs compétences internes.

La Commission européenne et le Parlement européen ont lancé une action préparatoire pour créer un réseau européen de 30 pôles d'innovation numérique spécialisé sur l'intelligence artificielle. L'action - lancée par PwC, en consortium avec CARSA et Innovalia - visait à développer des mécanismes de coopération entre DIH , à établir un réseau européen de DIH axé sur l'intelligence artificielle et à fournir des recommandations politiques pour améliorer la collaboration entre DIH.

Le projet AI DIH Network a reçu la collaboration de 30 DIH de 20 pays qui ont participé dans un programme de coaching et de mentorat, y compris des séminaires de cocréation, un programme d'apprentissage par les pairs et des sessions de formation en webinaire avec soutien à distance et sur place de tuteurs individuels. À la fin du programme, 25 DIH ont signé un accord-cadre de coopération pour le *Digitising European Industry Stakeholder Forum* qui s'est tenu à Madrid en novembre 2019.

Executive summary

Background and scope of the study

Digital Innovation Hubs (DIH) act as one-stop-shops that provide companies and organisations with access to digital transformation services: from training and education to knowledge sharing and collaboration services; from technology transfer and testing to finance and innovation support services.

Since their introduction as one of the key pillars of the Digitising European Industry initiative in 2016, Digital Innovation Hubs are continuing to play an increasingly important role in supporting the digital transformation of companies and industry across Europe.

In the next programming period (2021 -2027), under Horizon Europe and the Digital Europe Programme, further investments are foreseen to support DIH activity and promote the development of a network of DIHs. The aim is to continue to support the digitalisation of industry and the diffusion of advanced digital skills, especially in the areas of high-performance computing, artificial intelligence and cybersecurity.

Digital competences, skills and knowledge, and the testing facilities that provide access to advanced digital technologies, are unevenly distributed across DIHs in Europe. Collaboration throughout the network of DIHs is fundamental to ensure that all DIHs have access to the assets they need to provide adequate support to their ecosystems.

Over recent years, Digital Innovation Hubs have gained experience in international collaboration, in particular by partnering in Horizon 2020 projects and initiatives. However, to ensure the growth and mainstreaming of DIH collaboration, there is a need to identify specific schemes that DIHs can apply to, to support collaboration activities on a project (time-limited) and non-project (ongoing, ad hoc) basis.

The present study aims to develop a structured collaboration approach for DIHs working in the field of Artificial Intelligence and to propose the conditions needed to create a network of DIHs specialised in this field.

To achieve these objectives, a preliminary set of 30 Digital Innovation Hubs working in the field of Artificial Intelligence were invited to take part in a coaching and mentoring programme. Focused on cooperation, programme activities included face-to-face collaborative workshops, an online peer-learning programme and webinar training sessions, and the remote and on-site support of individual tutors.

At the end of the programme, a Framework Cooperation Agreement was signed by 25 DIHs. It establishes the AI DIH Network and provides a high-level legal framework for future DIH collaboration. Now that the foundations are established, the network is open and ready to grow. Other DIHs are welcome to join.

The DIHs involved in the preparatory action

In line with the general DIH landscape, the 30 DIHs selected for the project were very diverse in terms of size, organisational structure, services offered, experience in the field of AI and technology focus.

Such diversity posed challenges to the development of a structured approach for collaboration. There were examples of DIHs structured as clusters of organisations without an

overarching legal entity, which could make it difficult to define which entity should enter into a cooperation agreement. In addition, statutory differences between different types of organisations may result in complications when defining payment methods or liability caps for the parties in an agreement.

The participating DIHs were also diverse in terms of their experience in the field of Artificial Intelligence. As one might expect, their experience is closely correlated to their business and technological maturity. More experienced DIHs, for example, are able to offer a more varied set of services and can cover a wider array of AI-related sub-disciplines (Machine Learning, Computer Vision, etc.).

Looking at the state-of-the-art in cross-border collaboration, all of the DIHs involved in the project demonstrate some degree of experience in transnational activities. However, in most cases, this has been gained through partnerships in publicly-funded R&D projects and EU-driven initiatives. It is these types of partnerships that are currently the main trigger for DIH collaboration.

The profile of a DIH working in the field of Artificial Intelligence

The characteristics that distinguish a DIH operating in the field of Artificial Intelligence have been profiled based on an analysis of the business and operating models of the DIHs involved in the programme and inputs gathered from DIH representatives, as well as the Consortium's own expertise.

AI DIHs should extend their offerings with specific AI-related support services. Examples could include the introduction of: ethical AI certification services to assess AI solutions and certify their compliance with ethical frameworks, and to promote a human-centric approach to AI; and data platform services to make robust data available for AI training models, or to support AI awareness raising activities.

To offer these services, the DIHs need to leverage specific skills, internally and by accessing skills and competences available in their network. With reference to the ESCO framework[1], three main groups of skills and competences have been identified:

- transversal competences - managerial and soft skills needed for all of the activities included in the service offerings;
- technical skills related to AI - skills and knowledge which enable the delivery of AI-related services, such as knowledge of AI principles, computer science, software design, etc.;
- skills deemed to be particularly relevant to a specific service - e.g.: compliance with national and European professional codes of ethics and knowledge of the auditing techniques required to perform ethical AI certification.

In terms of operating models, DIH activity in the field of AI reflects:

- the need to provide access to physical and virtual infrastructure assets to support the development of AI solutions, such as HPCs, IoT sensors and platforms, and datasets to enable the development and testing of new business models, etc.;
- the need to incorporate an ethical AI component (i.e. a working group, a Committee

[1] European classification of skills/abilities, qualifications and jobs.

or a specific member from the research community) in the governance model of the DIH;

- the strong value added of a network that connects DIHs with other hubs, universities, research centres, start-ups and funds, and which provides access to the specific assets the DIH may need to deliver AI services.

Scenarios for cross-border cooperation

One of the main outcomes of the preparatory action is the definition of schemes and processes that DIHs working in the field of AI can use to collaborate. The schemes were developed in collaboration with the DIHs. They are based on inputs provided by the DIHs and the results of discussions with DIH representatives.

To define the cooperation schemes, the first step was to identify situations in which cross-border collaboration could deliver tangible benefits to the DIHs and other participating stakeholders. Cooperation is considered to be beneficial when it helps a DIH to deliver a better service to its ecosystem.

To identify those situations, the current services offered by the DIHs were analysed from a user perspective. The aim was to identify the stages of AI service delivery that can be enhanced/enabled by cooperating with partners at a cross-regional level.

Customer journey mapping was used as the methodology to perform this activity. This approach visually illustrates the needs of an individual customer (e.g. an SME, a start-up, a student, a public agency), the series of interactions and touchpoints that are necessary to fulfil those needs, and the customer experience throughout the process. This analysis is recommended to ensure that DIH services are aligned with their operational context and to improve the customer journey and experience.

For the specific purpose of the project, a standard customer journey mapping methodology was adapted to represent the specific activities of the DIHs during service delivery and the opportunities to improve those activities through cooperation.

This approach led to the identification of different 'cooperation use-cases'. Analysis of the objectives and processes of these co-created use-cases resulted in the identification of three final cooperation scenarios that represent the possible processes that could take place when DIHs cooperate with each other.

The table below provides a brief description of the scenarios and their possible applications, based on discussions with the DIHs.

Scenario	Description	AI service application examples
Service delivery partnership	A DIH decides to involve one or more partners in the delivery of a specific service to one of its clients, because it needs to complement the skills and/or the infrastructure assets it has at its disposal.	• AI training programmes; • Providing advanced AI data and computational infrastructure assets and expertise for application experiments; • Supporting RDI projects in the field of AI with complementary skills and knowledge;
Development of a new service	A DIH intends to widen its service offering with a new activity and decides to develop it in partnership with one or more DIHs that share the same objective.	• AI maturity assessment models and tools; • AI trend watching and observatories; • Cross-border AI standardisation, certification and labelling;

Matchmaking	A DIH looks for support from other DIHs across Europe to identify a financial, technological or research partner sought by its customer.	• Matchmaking to support AI data sharing; • Matchmaking to create EU consortia in the field of AI; • Matchmaking to match and connect AI personnel with AI job vacancies.

With the support of DIHs, the scenarios were analysed to understand the benefits, costs and risks to each player involved in the scheme and to identify the possible elements that could prevent cooperation. This was important because if the risks or costs of cooperation outweigh the benefits, it is unlikely that the DIH would undertake the cooperation activities envisaged in the scenario.

The analysis shows that the DIHs deem the cooperation scenarios to be more feasible if there are legal solutions available to mitigate the potential risks that collaboration may pose, in terms of endangering a DIH's relationship with their customer (e.g. if a partner does not provide quality services or if a DIH perceives that they may lose a customer through competition with a partner) or in relation to IP protection issues. In addition, financial incentives may help to support the additional costs that DIHs may incur when cooperating with others, especially in instances where that cooperation is not well-established.

The feasibility of the cooperation scenarios was further analysed through individual assessments of all DIHs involved in the project. Analysis of the feedback gathered shows that the three collaboration scenarios are considered to be both feasible and realistic. The DIHs did not identify any specific limitations to the potential application of the scenarios. In most cases, they are able to implement them without altering their current organisational structures.

In terms of resources, most DIHs believe that they currently have sufficient human resources to begin implementation of all of the scenarios. However, they highlight the need for extra financial resources to cover the additional costs that setting up collaboration initiatives would incur in addition to the standard delivery of a service (e.g. costs related to the scouting of potential partners, negotiation and drafting of the cooperation agreement, coordination among partners, etc.). In addition to these specific costs, most of the hubs consider funding to be necessary to support and promote horizontal activities, such as knowledge sharing and networking.

The Framework Cooperation Agreement: scope and key issues encountered

Analysis of the cooperation scenarios led to the definition of the high-level Framework Cooperation Agreement, which establishes a Network of Digital Innovation Hubs focused on Artificial Intelligence.

The Agreement provides a high-level legal framework for future collaboration between DIHs. It lays the foundation for cross-border cooperation and, more generally, it provides the preliminary elements required to launch future ad-hoc DIH collaboration agreements.

The finalisation of the Framework Cooperation Agreement required the identification of common provisions for DIHs. This process raised a number of challenges due to the diverse nature of DIH organisational and business structures. They include:

- Issues with the use of non-competition clauses. They are required by DIHs that act as private entities, but they are not acceptable to DIHs that are managed by universities, RTOs or research centres, due to their mission and statutes;
- Issues with limited liability. Some DIHs have statutory limits on the liability of parties that are particularly low. These limitations may hamper their ability to enter into international collaboration agreements;
- Limited ability to establish common payment methods (e.g. depending on local rules, publicly-funded DIHs may find it difficult to receive payments for their services);
- Difficulties in identifying which party should sign a cooperation agreement, in the case of DIHs that are structured as networks of multiple legal entities, and where there is no overarching legal entity.

These challenges, which may be relevant for the definition of other forms of DIH collaboration, were solved by introducing general provisions within the Framework Cooperation Agreement. Specific challenges that pertain to a particular form of DIH collaboration will need to be negotiated and agreed upon between DIHs in the context of a specific cooperation agreement. As part of the project, a cooperation agreement template was drafted to help DIHs to develop collaboration activities, such as joint/shared service development or delivery. The template is meant to facilitate the settlement of legal aspects in relation to collaboration activities and is designed for those DIHs that cannot rely on internal legal support.

Cooperation scenarios in action: the collaborative AI maturity assessment pilot

A pilot project was launched to test a DIH collaboration scenario in practice by investigating one of the areas of common interest within the group. The purpose of the pilot project is to co-create a shared AI maturity assessment tool.

Interest in the topic was identified during a series of peer-learning webinars that were delivered as part of the coaching and mentoring programme. Peer learning provided information on the status of the art in AI maturity assessment tools used by the DIHs. That information provided the starting point for the development of the shared tool.

The development of the model entailed the:

- definition of a shared legal framework, with particular reference to agreements on how to settle IPRs and data sharing;
- validation of the technical framework (i.e. the model is developed starting from the one used by the Munich Innovation Hub for applied AI, which has been refined and integrated by the pilot team);
- identification of a shared approach for the technical deployment of the tool;
- definition of a data model to ensure meaningful benchmarking across DIHs;
- development of agreements to comply with privacy and data protection regulations.

These activities are currently ongoing. The legal and technical framework have been defined and validated in parallel with work to define the data sharing model for benchmarking.

The pilot project serves two complementary purposes. It is providing participating DIHs with the opportunity to work together to develop a shared AI service and it is enabling them to test the feasibility and practicalities of cross-border collaboration with other DIHs. Participants volunteered to take part in the initiative because they recognise the potential value and benefits of collaboration to their businesses. By collaborating, DIHs can expand their service portfolios, share and access data on the AI maturity of European companies, and improve the

visibility of their services through common branding and marketing.

However, the initiative has revealed that the DIHs display different levels of cooperation readiness. Larger organisations proved more flexible than smaller organisations, in terms of resource allocation, enabling them to ensure continuous involvement and participation in the project. In-house legal expertise and previous experience in similar initiatives also proved to be important assets. Indeed, some of the DIHs were able to quickly address a number of the challenges they encountered by relying on strong internal legal competencies, whereas other organisations faced more difficulties when confronted by similar issues.

The number of DIHs involved decreased significantly throughout the different phases of the pilot. This created a more agile and efficient working group of DIH representatives and made it easier to build trust. Nonetheless, the decreasing number of DIHs confirmed there are still significant obstacles to cross-border collaboration. In particular, the lack of financial resources to support cooperation was identified as a key challenge for Digital Innovation Hubs when operating outside of the context of externally-funded projects.

Effective collaboration requires good coordination. The pilot was supported by a strong project management function, which was provided by the Consortium, as well as the continuous commitment of the pilot leader and a more restricted number of DIHs.

Final policy recommendations to enhance DIH cooperation

The project activities provided inputs to aid the development of a clear set of policy recommendations designed to enhance the potential for DIH collaboration and networking across EU Member States.

The main recommendations to *support DIH collaboration in the Digital Europe Programme*, are to:

- **Test and demonstrate the effectiveness and benefits of cooperation scenarios within EU programmes and projects**. Adoption of the cooperation scenarios developed by the AI DIH Network within the DEP would help to make DIHs familiar with structured collaboration schemes;
- **Define additional cooperation mechanisms for European and other DIHs**. As part of the DEP, EDIHs will receive funding to help them to strengthen their capacity and establish collaborative partnerships, especially at a cross-regional level, whereas other DIHs will continue to operate in parallel. The definition of additional mechanisms to support structured collaboration among EDIHs and other DIHs would help to strengthen the ability of the broad DIH community to deliver value to the EU ecosystem;
- **Incentivise collaboration until it becomes a well-established mechanism**. Collaboration implies additional costs in terms of time and resources that DIHs may not be able to cover. DIH customers may not be able or willing to pay more for services that are developed and/or delivered in collaboration with other DIHs, and regional governments may not be able to provide additional funding. Financial incentives are therefore needed to encourage and support the early stages of DIH collaboration, at least until the DIHs, their regions and customers can gain a clearer view of the real value and benefits of DIH collaboration, such that it becomes a mainstream activity;
- **Ensure support to settle legal aspects of collaboration**. Legal solutions are

needed to settle many aspects of collaboration; however, not all DIHs have the legal expertise to access or develop them. Access to standard templates to support collaboration (such as the template developed in connection with the Framework Cooperation Agreement) and legal expertise via a helpdesk would make it easier for DIHs to cooperate and would help to reduce the administrative time and cost that collaboration will incur;

- **Strengthen and improve thematic communities within the Digital Transformation Accelerator**. The larger the community, the more complex it is to identify common interests, build trust and cooperate effectively. By implication, these goals are much easier to achieve in a smaller community. The dual approach of a large DIH community and smaller thematic groups is recommended as the way forward, when creating communities within the Digital Transformation Accelerator. The smaller thematic groups would be based on DIH competences and focus and would carry out coordinated initiatives in specific fields, as AI;
- **Define the competency framework for European Digital Innovation Hubs**. To deliver a wide set of services - from ecosystem management to specialised technological support - a variety of soft and technical skills must be leveraged. The definition of a minimum set of competences that a European Digital Innovation Hub should have would help DIHs to understand how to improve their internal structures. It would also be beneficial to the EDIH selection process to establish eligibility criteria, in terms of access to skills and competences, that DIHs would need to meet;
- **Improve the assessment of DIH services and infrastructure assets, as part of the European Digital Innovation Hub selection process, to ensure consistency and to create a cohesive community**. One of the main barriers to DIH cooperation is related to trust. Does a potential partner have the necessary competences and capabilities to be a good partner? Can we trust their quality of service? One way to help to build trust within the DIH community would be introduce independent DIH assessments, including project evaluations and onsite inspections of DIH organisational structures and infrastructure assets. To better measure the effectiveness of DIH activity, DIH service delivery assessments could also be improved by introducing ad-hoc indicators to evaluate the quantity and quality of the services provided.

The main recommendations to *support networking and cooperation* are to:

- **Develop and promote a standard classification of DIH services and skills**. The state of the art in terms of mapping DIHs and their services is characterised by the presence of many different sources of information and different classifications in use. A standard ontology that could be tailored to each domain would help DIHs and stakeholders to better understand the capabilities and competences of every DIH;
- **Organise European workshops and demo-days for DIHs with competences in specific technological disciplines**. Cooperation is more likely to occur if DIHs are aware of potential partners with proven experience in a specific field. Events that bring together and connect DIHs, and that enable them to demonstrate their experience and capabilities in specific technology disciplines, would help to build awareness and trust within the community, and create opportunities for cooperation;
- **Develop a unique, proactive platform to support DIH collaboration**. The current

landscape is characterised by many digital platforms that are designed to support DIH interaction. Each platform is connected to a specific project or initiative and is limited in lifespan. To avoid the duplication of information and effort, a single and independent platform for all DIHs should be established;

- **Establish a sustainable independent back office function to animate and coordinate long-term DIH Network collaboration and growth**. DIH collaboration outside of EU-funded projects will require a cultural change within and across many DIHs and their partners. A sustainable back-office function is needed to encourage and help DIHs to make this shift and explore the competitive advantages that can be gained through collaboration.

The main recommendations to support the *future development of DIHs* are to:

- **Ensure consistency and coordination across the different initiatives connected to AI and DIHs**. There are a number of initiatives that are currently being implemented, with others due to be launched, to promote the uptake of AI and digital solutions by SMEs and public administrations, involving DIHs, competence centres, research centres and other stakeholders (e.g. AI4EU, CLAIRE, AI DIH Network, etc). Clear coordination mechanisms should be established to exploit the synergies that exist between initiatives and their participants;
- **Leverage DIHs to pursue EU priorities**. DIHs leverage their local knowledge and geographical proximity to communicate and engage with their stakeholders, as effectively as possible. That capacity should also be leveraged to pursue the implementation of AI and other EU priorities across Europe. For instance, DIHs could be involved in the definition of common European methodologies for the enforcement of the Ethics Guidelines for Trustworthy AI – developed by the AI High-Level Expert Group (AI HLEG). They could then assess whether projects and solutions developed within their ecosystem adhere with ethical guidelines or not and they could support practical operationalisation of AI ethical principles;
- **Prepare DIHs to work with the Public Sector**. In the context of the DEP, EDIHs will be required to help public administrations to adopt interoperable solutions, European Digital Service Infrastructure assets and building blocks (e.g. eID, eInvoicing, eDelivery, eSignature); to provide them with specific services (e.g. providing testing facilities or developing AI solutions) as well as to work with GovTech companies (e.g. SMEs, innovative start-ups, etc.) assisting public administrations. However, only a limited number of DIHs are accustomed to working with public sector clients. DIHs need help to develop the right skillset to work with public administrations and to understand how their role could be combined with the roles of organisations that are already operating in the sector, to avoid duplication of efforts and activities.

Résumé analytique

Contexte et portée de l'étude

Les « Digital Innovation Hubs (DIHs) » ou « Pôles d'Innovation Numérique », sont des guichets uniques qui permettent aux entreprises et aux organisations d'accéder à des services de transformation numérique. Les services fournis par les DIHs incluent notamment : la formation et le développement des compétences, des services de partage des connaissances et de collaboration, le transfert de technologies et expérimentations technologiques, ainsi que des services de recherche de financement et de soutien à l'innovation.

Depuis l'adoption des Digital Innovation Hubs comme l'un des principaux piliers de l'initiative européenne "Digitising European Industry" en 2016, les DIHs continuent à jouer un rôle de plus en plus important dans le soutien à la transformation numérique des entreprises et de l'industrie dans toute l'Europe.

Au cours de la prochaine période de programmation européenne (2021 -2027), dans le cadre d'Horizon Europe et du « Digital Europe Programme » (« Programme Europe Numérique »), de nouveaux investissements sont prévus afin de soutenir l'activité des DIHs et de promouvoir le développement d'un réseau européen de DIHs. L'objectif de ces efforts est de continuer à soutenir la transformation numérique de l'industrie et la diffusion de compétences numériques avancées, en particulier dans les domaines du calcul de haute performance, de l'intelligence artificielle et de la cybersécurité.

Cependant, les DIHs ne disposent pas tous des mêmes ressources, compétences et infrastructures expérimentales permettant l'accès aux technologies numériques avancées. La collaboration au sein du réseau européen de DIHs est fondamentale afin de garantir que tous les DIHs ont accès aux ressources dont ils ont besoin pour soutenir de façon appropriée la transformation numérique de leurs écosystèmes régionaux.

Ces dernières années, les DIHs ont acquis de l'expérience en matière de collaboration internationale, notamment en participant à des projets et initiatives liés au programme européen Horizon 2020. Toutefois, afin de garantir une collaboration accrue et régulière, l'identification de mécanismes spécifiques permettant aux DIHs de collaborer, à la fois dans le cadre de projets financés par l'UE, mais également en dehors de ces projets, est nécessaire.

La présente étude vise à développer une approche de collaboration structurée pour les DIHs travaillant dans le domaine de l'Intelligence Artificielle (IA), ainsi qu'à constituer les conditions nécessaires afin de créer un réseau de DIHs spécialisés dans ce domaine.

Pour atteindre ces objectifs, 30 DIHs travaillant dans le domaine de l'intelligence artificielle ont été invités à participer à un programme de coaching et de mentorat centré sur la coopération entre DIHs. Les activités du programme ont inclus des ateliers collaboratifs organisés en face-à-face, un programme en ligne d'apprentissage entre pairs et des sessions de formation par webinaire, tout en bénéficiant d'un soutien constant apporté par des tuteurs individuels.

À la fin du programme, un accord-cadre de coopération a été signé par 25 DIHs. Cet accord-cadre établit le réseau des DIHs en Intelligence Artificielle et fournit un cadre juridique pour la collaboration future entre les DIHs. Maintenant que les fondations sont établies, le réseau est ouvert et prêt à se développer. De nouveaux DIHs sont invités à rejoindre le réseau.

Les DIHs participant à l'action préparatoire

Les 30 DIHs sélectionnés pour le projet étaient très différents en termes de taille, de structure organisationnelle, de services, d'expérience dans le domaine de l'IA et d'orientation technologique.

Cette hétérogénéité a représenté un défi pour la définition de structures de collaboration commune aux différents DIHs. À tire d'exemple, plusieurs DIHs étaient structurés comme un groupe d'organisations sans entité juridique commune, ce qui pouvait rendre difficile l'identification de l'entité responsable pour la conclusion d'un accord de coopération. En outre, les différences de statut entre les différents types d'organisations pouvaient entraîner des complications lors de la détermination des méthodes de paiement ou des plafonds de responsabilité des parties.

En plus de cette diversité organisationnelle, les participants présentaient également des niveaux d'expérience très variés dans le domaine de l'intelligence artificielle. L'expérience d'un DIH est étroitement liée à son niveau de maturité commerciale et technologique. Les DIHs plus expérimentés offrent un ensemble de services plus variés et couvrent un éventail plus large de sous-disciplines liées à l'intelligence artificielle (apprentissage automatique, vision par ordinateur, etc.).

Tous les DIHs participant au projet avaient déjà préalablement mené des activités transnationales. Toutefois, dans la majorité des cas, ces expériences de collaborations transnationales ont été principalement acquises au sein de projets de R&D financés par l'Union Européenne. Ce sont principalement ces partenariats européens qui déclenchent la collaboration entre les DIHs.

Le profil d'un DIH spécialisé en Intelligence Artificielle

Les caractéristiques qui distinguent un DIH spécialisé en IA d'un autre DIH ont été profilées grâce à une analyse des modèles commerciaux et opérationnels des participants, de la contribution des représentants de DIHs et de l'expertise apportée par le consortium.

Les DIHs qui opèrent dans le domaine de l'IA devraient étendre leur offre de services à des services de soutien spécifique en IA. Cela inclut, par exemple, des services de certification éthique pour l'IA. Ces services permettent d'assurer que le développement de solutions d'IA se fasse dans le respect de l'éthique et des cadres légaux afférents, ainsi que de promouvoir le développement d'une IA au service de l'humain. En plus de ces services de ces certifications, ces DIHs peuvent mettre à disposition des plateformes de données fournissant des données solides pour la formation de modèles d'IA, ou pour réaliser des activités de diffusion de sensibilisation à l'IA, etc.

Afin de garantir leur capacité à délivrer ces services, les DIHs doivent pouvoir exploiter des compétences spécifiques, à la fois en interne, mais aussi en externe, en accédant aux ressources et compétences disponibles par le réseau de DIHs. En référence au cadre des ESCO[2], trois grands groupes d'aptitudes et de compétences ont été identifiés :

- les compétences transversales — les compétences managériales et relationnelles nécessaires pour toutes les activités inclues dans l'offre de services ;

[2] Classification des aptitudes, compétences, certifications et professions européennes

- les compétences techniques liées à l'IA — les compétences et connaissances permettant de fournir des services liés à l'IA, telles que la connaissance des principes de l'IA, l'informatique, la conception de logiciels, etc. ;
- les compétences jugées particulièrement pertinentes pour un service spécifique — par exemple : respect des codes d'éthique professionnelle nationaux et européens et connaissance des techniques d'audit pour effectuer une certification éthique en matière d'IA.

En termes de modèle de fonctionnement, l'activité du DIH dans le domaine de l'IA reflète :

- la nécessité de fournir un accès à des infrastructures physiques et virtuelles pour soutenir le développement de solutions d'IA, telles que les calculs de haute performance (CHP), les capteurs et plates-formes d'internet des objets, et les ensembles de données pour permettre de développer et tester de nouveaux modèles d'exploitation, etc.
- la nécessité d'intégrer une composante éthique de l'IA (c'est-à-dire un groupe de travail, un comité ou un membre spécifique de la communauté de recherche) dans le modèle de gouvernance du DIH ;
- la forte valeur ajoutée d'un réseau qui relie les DIHs à d'autres centres, universités, centres de recherche, start-ups et fonds de financement, et qui donne accès aux ressources spécifiques dont le DIH peut avoir besoin pour fournir des services d'IA.

Scénarios pour la coopération transfrontalière

L'un des principaux résultats obtenus au terme de l'action préparatoire est la définition — en collaboration avec les DIHs participants — de modèles et de processus collaboratifs pour les DIHs actifs dans le domaine de l'IA. Ces modèles ont été développés sur la base des contributions et des résultats des discussions tenues avec les représentants des différents DIHs.

Pour définir les modèles de coopération, la première étape a consisté à identifier les situations dans lesquelles la collaboration transfrontalière pourrait apporter des avantages tangibles aux DIHs et aux autres parties prenantes. La coopération est considérée comme bénéfique lorsqu'elle aide un DIH à fournir un meilleur service à son écosystème.

Pour identifier ces situations, les services actuels fournis par les DIHs ont été analysés du point de vue des utilisateurs. L'objectif étant d'identifier les étapes de la prestation de services en IA qui peuvent être améliorées/activées en coopérant avec des partenaires au niveau interrégional.

La méthodologie utilisée pour réaliser cette activité a été la « Modélisation du Parcours Client » (ou « Cartographie du Parcours Client »). Cette approche illustre visuellement les besoins d'un client individuel (par exemple une PME, une start-up, un étudiant, une administration publique), la série d'interactions et de points de contact nécessaires pour répondre à ces besoins, et l'expérience du client tout au long du processus. Cette analyse est idéale pour assurer que les services du DIH sont en adéquation avec leur contexte opérationnel ainsi que pour l'amélioration du parcours et de l'expérience client.

La méthodologie standard de la Modélisation du Parcours Client a été adaptée aux besoins spécifiques du projet. Cette méthodologie « sur-mesure » a permis de représenter les activités spécifiques des DIHs lors de la prestation de services, ainsi que les possibilités d'amélioration grâce à la collaboration transfrontalière.

Cette approche a permis l'analyse des différents cas où la coopération peut être utilisée ainsi que l'identification de trois « scénarios de coopération ».

Le tableau ci-dessous présente une brève description des scénarios et de leurs applications possibles, sur la base des discussions avec les DIHs.

Scenario	**Description**	**Exemples d'application aux services d'IA**
Partenariat pour la prestation de services	Un DIH décide d'impliquer un ou plusieurs partenaires dans la prestation d'un service spécifique à l'un de ses clients, car il doit compléter les compétences et/ou les infrastructures dont il dispose.	• Programme de formation en IA ; • Mise à disposition de données d'IA avancées et d'infrastructures de calcul et d'expertise pour les expériences d'application ; • Soutien aux projets de recherche et développement et d'innovation (RDI) dans le domaine de l'IA par des compétences et des connaissances complémentaires.
Développement d'un nouveau service	Un DIH entend élargir son offre de services avec une nouvelle activité et décide de la développer en partenariat avec un ou plusieurs autres DIH qui partagent le même objectif.	• Modèles et outils d'évaluation de la maturité en matière d'IA ; • Observation des tendances de l'IA ; • Normalisation et certification transfrontalières de l'IA.
Matchmaking	Un DIH recherche le soutien d'autres DIHs en Europe pour identifier un partenaire financier, technologique ou de recherche, pour son client.	• Mise en relation pour le partage de données en IA ; • Mise en relation pour créer des consortiums européens dans le domaine de l'IA ; • Mise en relation pour les offres d'emploi dans le domaine de l'IA.

Avec le soutien des DIHs, les scénarios ont été analysés pour comprendre les avantages, les coûts et les risques que chaque scénario entraîne pour les différents acteurs impliqués ainsi que pour identifier les éléments susceptibles d'empêcher ou de freiner la coopération. Cette démarche était importante car si les risques ou les coûts de la coopération l'emportent sur les avantages, il est peu probable que le DIH entreprenne les activités de coopération envisagées dans le scénario.

L'analyse montre que les DIHs estiment que les scénarios de coopération sont plus facilement réalisables s'il existe des solutions juridiques qui atténuent les risques potentiels que la collaboration peut présenter. Ces risques incluent, notamment, les questions de protection de la propriété intellectuelle ainsi que la mise en danger de la relation d'un DIH avec son client (par exemple si un partenaire ne fournit pas de services de qualité ou si un DIH perçoit qu'il peut perdre un client en raison de la concurrence avec un partenaire). En outre, les incitations financières peuvent contribuer à couvrir les coûts supplémentaires que les DIHs peuvent encourir lorsqu'ils coopèrent avec d'autres DIHs, en particulier dans les cas où cette coopération n'est pas bien établie.

La faisabilité des scénarios de coopération a été analysée plus en détail par le biais d'évaluations individuelles de tous les DIHs participant au projet. L'analyse des informations recueillies montre que les trois scénarios de collaboration sont considérés comme étant à la fois faisables et réalistes. Les DIHs n'ont pas identifié de limites spécifiques à la potentielle mise en œuvre de ces scénarios. Dans la plupart des cas, ils sont en mesure de les mettre en œuvre sans modifier leurs structures organisationnelles actuelles.

En termes de ressources, la plupart des DIHs estiment qu'ils disposent actuellement de ressources humaines suffisantes pour commencer la mise en œuvre des différents scénarios.

Toutefois, ils soulignent également la nécessité de disposer de ressources financières supplémentaires pour couvrir les coûts additionnels que la mise en place d'initiatives de collaboration entraînerait en plus de la prestation normale d'un service (par exemple, les coûts liés à la recherche de partenaires potentiels, à la négociation et à la rédaction de l'accord de coopération, à la coordination entre les partenaires, etc.) Outre ces coûts spécifiques, la plupart des DIHs considèrent que le financement est nécessaire pour soutenir et promouvoir les activités horizontales, telles que le partage des connaissances et la mise en réseau.

L'accord-cadre de coopération : portée et principaux problèmes rencontrés

L'analyse des scénarios de coopération a conduit à la définition de l'accord-cadre de coopération, qui établit un réseau de DIHs axé sur l'intelligence artificielle.

L'accord fournit un cadre juridique pour la collaboration future entre les DIHs. Il pose les bases de la coopération transfrontalière et, plus généralement, il fournit les éléments préliminaires nécessaires au lancement de futurs accords de collaboration ad hoc entre les DIHs.

La finalisation de l'accord-cadre de coopération a nécessité l'identification de dispositions communes pour les DIHs. Ce processus a soulevé un certain nombre de défis en raison de la diversité des structures organisationnelles et commerciales des DIHs :

- Les problèmes liés à l'utilisation des clauses de non-concurrence. Elles sont requises par les DIHs qui agissent comme des entités privées, mais elles ne sont pas acceptables pour les DIHs qui sont gérés par des universités, des organismes de recherche et de technologie (RTO) ou des centres de recherche, en raison de leur mission et de leurs statuts ;
- Les questions de responsabilité limitée. Certains DIHs ont des limites statutaires de responsabilité des parties prenantes qui sont particulièrement faibles. Ces limitations peuvent entraver leur capacité à conclure des accords de collaboration internationale ;
- Les limitations légales et administratives pour la définition de méthodes de paiement communes (par exemple, en fonction des règles locales, les DIHs financés par des fonds publics peuvent rencontrer des difficultés à recevoir des paiements pour leurs services) ;
- Des difficultés à déterminer quelle partie doit signer un accord de coopération, notamment dans le cas des DIHs qui sont structurés comme des groupes d'entités juridiques multiples, et lorsqu'il n'y a pas d'entité juridique commune.

Ces difficultés, qui peuvent être pertinentes pour la définition d'autres formes de collaboration entre les DIHs, ont été résolues par l'introduction de dispositions générales dans l'accord-cadre de coopération. Les défis spécifiques qui se rapportent à une forme particulière de collaboration entre les DIHs devront être négociés et convenus entre les DIHs dans le contexte d'un accord de coopération spécifique. Dans le cadre du projet, un modèle d'accord de coopération a été rédigé pour aider les DIH à développer des activités de collaboration, telles que le développement ou la prestation de services conjoints/partagés. Le modèle est destiné à faciliter le règlement des aspects juridiques liés aux activités de collaboration et est conçu pour les DIHs qui ne peuvent pas compter sur un soutien juridique interne.

Scénarios de coopération en action : le projet pilote d'évaluation de la maturité en matière d'IA

Un projet pilote a été lancé pour mettre en pratique un de ces scénarios collaboratifs sur un

des domaines d'intérêt commun aux différents DIHs. L'objectif du projet pilote est de co-créer un outil commun d'évaluation de la maturité en IA.

L'intérêt pour le projet pilote a été identifié au cours d'une série de webinaires d'apprentissage entre les DIHs qui ont été organisés dans le cadre du programme de coaching et de mentorat. Les échanges ont fourni des informations sur l'état de l'art des outils d'évaluation de la maturité en matière d'IA utilisés par les DIHs. Ces informations ont servi de point de départ à l'élaboration de l'outil partagé.

Le développement du modèle a impliqué :

- la définition d'un cadre juridique commun, avec une référence particulière aux accords sur la manière de régler les Droits de Propriété Intellectuelle (DPI) et le partage des données ;
- la validation du cadre technique (le modèle est développé à partir de celui utilisé par le Munich Innovation Hub pour l'IA appliquée, ce modèle a été affiné et intégré par l'équipe pilote) ;
- l'identification d'une approche commune pour le déploiement technique de l'outil ;
- la définition d'un modèle de données pour assurer une analyse comparative significative entre les DIHs ;
- l'élaboration d'accords visant à respecter les réglementations relatives à la protection de la vie privée et des données.

Bien que ces activités soient en cours de développement, le cadre juridique et technique a déjà été défini et validé parallèlement aux travaux visant à définir le modèle de partage des données pour l'évaluation comparative.

Le projet pilote répond à deux objectifs complémentaires. Il offre aux DIHs impliqués la possibilité de travailler ensemble pour développer des services en commun dans le domaine de l'IA et leur permet de tester la faisabilité et les aspects pratiques d'une collaboration transfrontalière avec d'autres DIHs. Les participants se sont portés volontaires pour prendre part à l'initiative parce qu'ils reconnaissent la valeur ajoutée et les avantages potentiels de la collaboration pour leurs organisations. En collaborant, les DIHs peuvent élargir leur portefeuille de services, partager et accéder à des données sur la maturité des entreprises européennes en matière d'IA et améliorer la visibilité de leurs services grâce à une marque et un marketing commun.

Néanmoins, l'initiative a révélé que les DIHs présentent différents niveaux de préparation à la coopération. Les grandes organisations se sont révélées plus flexibles que les petites en termes d'allocation de ressources, ce qui leur a permis de maintenir une implication et une participation continues au projet. L'expertise juridique interne et l'expérience acquise dans le cadre d'initiatives similaires se sont également révélées être des atouts importants. En effet, des DIHs ont pu rapidement relever un certain nombre de défis en s'appuyant sur de solides compétences juridiques internes, tandis que d'autres organisations ont rencontré davantage de difficultés lorsqu'elles ont été confrontées à des problèmes similaires.

Le nombre de DIHs impliqués a diminué de manière significative au cours des différentes phases du projet pilote. Cela a permis de créer un groupe de travail plus agile et plus efficace et a facilité l'instauration d'un climat de confiance. Néanmoins, la diminution du nombre de DIHs a confirmé qu'il existe toujours des obstacles importants à la collaboration transfrontalière. En particulier, le manque de ressources financières pour soutenir la coopération a été identifié comme un défi majeur pour les DIHs lorsqu'ils opèrent en dehors

du contexte des projets financés par des fonds externes.

Une collaboration efficace nécessite une bonne coordination. Le projet pilote a été soutenu par une solide gestion de projet, assurée par le consortium, ainsi que par l'engagement continu du chef de file du pilote et d'un nombre plus restreint de DIHs.

Recommandations stratégiques finales pour renforcer la coopération entre les DIHs

Les différentes activités menées dans le cadre de ce projet ont contribué à l'élaboration d'un ensemble clair de recommandations stratégiques visant à renforcer le potentiel de collaboration et de mise en réseau des DIHs dans les États Membres de l'UE.

Les principales recommandations visant à soutenir la collaboration des DIHs dans le cadre du programme "Digital Europe" sont les suivantes :

- **Tester et démontrer l'efficacité et les avantages des scénarios de coopération dans le cadre des programmes et projets de l'UE.** L'adoption des scénarios de coopération développés par le projet « AI DIH network » au sein du programme « Digital Europe » contribuerait à familiariser les DIHs avec les scénarios de collaboration structurés ;
- **Définir des mécanismes de coopération supplémentaires pour les DIH européens et autres DIHs**. Dans le cadre du programme « Digital Europe », les « European DIHs (EDIH) » recevront un financement pour les aider à renforcer leurs capacités et à établir des partenariats de collaboration, en particulier au niveau transrégional, tandis que d'autres DIHs (non qualifié en tant que « EDIH ») continueront à fonctionner en parallèle. La définition de mécanismes supplémentaires pour soutenir une collaboration structurée entre les EDIH et les autres DIHs contribuerait à renforcer la capacité de la communauté des DIHs à apporter une valeur ajoutée à l'écosystème de l'UE ;
- **Encourager la collaboration jusqu'à ce qu'elle devienne un mécanisme bien établi**. La collaboration implique des coûts supplémentaires en termes de temps et de ressources que les DIHs peuvent ne pas être en mesure de couvrir. Les clients des DIHs peuvent ne pas être capables ou désireux de payer davantage pour des services qui sont développés et/ou fournis en collaboration avec d'autres DIHs, et les gouvernements régionaux peuvent ne pas être en mesure de fournir un financement supplémentaire. Des incitations financières sont donc nécessaires pour encourager et soutenir les premières étapes de la collaboration entre les DIHs, au moins jusqu'à ce que les DIHs, leurs régions et leurs clients puissent avoir une vision plus claire de la valeur ajoutée et des avantages réels de la collaboration entre les DIHs, de sorte qu'elle devienne une activité courante ;
- **Assurer un soutien pour régler les aspects juridiques de la collaboration**. Des solutions juridiques sont nécessaires pour régler de nombreux aspects de la collaboration ; cependant, tous les DIHs ne disposent pas de l'expertise juridique nécessaire pour y accéder ou la développer. L'accès à des modèles standard de coopération pour soutenir la collaboration (tels que le modèle développé dans l'accord-cadre de coopération) et à l'expertise juridique via un service d'assistance faciliterait la coopération entre les DIHs et contribuerait à réduire le temps et les coûts administratifs qu'implique la collaboration ;
- **Renforcer et améliorer les communautés thématiques au sein de « l'accélérateur de la transformation numérique » du programme « Digital Europe ».** Plus la communauté est grande, plus il est complexe d'identifier les intérêts communs, d'instaurer la confiance et de coopérer efficacement. Par conséquent, ces

objectifs sont beaucoup plus faciles à atteindre au sein de petits groupes. La double approche à la fois d'une grande communauté de DIHs et de plus petits groupes thématiques est recommandée comme la voie à suivre, lors de la création de communautés au sein de « l'Accélérateur de la transformation numérique ». Les groupes thématiques plus petits seraient basés sur les compétences et l'orientation du DIH et mèneraient des initiatives coordonnées dans des domaines spécifiques, comme l'IA ;

- **Définir le cadre de compétences pour les « European Digital Innovation Hubs »**. Afin de fournir un large éventail de services - de la gestion des écosystèmes au soutien technologique spécialisé- il faut tirer parti des compétences techniques et non techniques diverses. La définition d'un « ensemble minimum de compétences » que devrait posséder un EDIH aiderait les DIHs à comprendre comment améliorer leurs structures internes. Cela serait également utile au processus de sélection des EDIHs afin d'établir des critères d'éligibilité, en termes d'accès aux capacités et compétences, auxquels les DIHs devraient répondre ;
- **Améliorer l'évaluation des services et des infrastructures des DIHs, dans le cadre du processus de sélection des EDIHs, afin de garantir la cohérence et de créer une communauté homogène**. L'un des principaux obstacles à la coopération entre les DIHs est la confiance. Un partenaire potentiel possède-t-il les compétences et les capacités nécessaires pour être un bon partenaire ? Peut-on avoir confiance en la qualité de son service ? Une façon d'aider à instaurer la confiance au sein de la communauté des DIHs serait d'introduire des évaluations indépendantes des DIHs, y compris des évaluations de projets et des inspections sur place, notamment des structures organisationnelles et des infrastructures des DIHs. Cela contribuerait à mieux mesurer l'efficacité des activités du DIH. Les évaluations des prestations de services du DIH pourraient également être améliorées en introduisant des indicateurs ad hoc afin d'évaluer la quantité et la qualité des services fournis.

Les principales recommandations pour soutenir la mise en réseau et la coopération sont les suivantes :

- **Développer et promouvoir une classification standard des services et des compétences des DIHs.** Actuellement, l'information disponible sur les DIHs et leurs services provient de nombreuses sources différentes et utilise des classifications différentes. Une ontologie standard qui pourrait être adaptée à chaque domaine aiderait les DIHs et les parties prenantes à mieux comprendre les capacités et les compétences de chaque DIH ;
- **Organiser des ateliers européens et des journées de démonstration pour les DIHs ayant des compétences dans des disciplines technologiques spécifiques.** La coopération a de plus grandes chances de se concrétiser si les DIHs connaissent des partenaires potentiels ayant une expérience avérée dans un domaine spécifique. Des événements qui rassemblent et mettent en relation les DIHs, et qui leur permettent de démontrer leur expérience et leurs capacités dans des disciplines technologiques spécifiques, contribueraient à sensibiliser la communauté et à créer des opportunités de coopération ;
- **Développer une plateforme unique et proactive pour soutenir la collaboration entre les DIHs.** Le paysage actuel est caractérisé par de nombreuses plateformes numériques conçues pour soutenir l'interaction des DIHs. Chaque plateforme est connectée à un projet ou une initiative spécifique et sa durée de vie est limitée à celle du projet ou de l'initiative. Pour éviter la duplication des informations et des efforts, une plate-forme unique et indépendante pour tous les DIHs devrait être établie ;

- **Mettre en place une fonction de back office indépendante et durable pour animer et coordonner la collaboration et la croissance sur le long terme du réseau des DIHs.** La collaboration des DIHs en dehors des projets financés par l'UE nécessitera un changement culturel au sein de nombreux DIHs et leurs partenaires. Une fonction de back-office durable est nécessaire pour encourager et aider les DIHs à opérer ce changement et à explorer les avantages concurrentiels qui peuvent être obtenus par la collaboration.

Les principales recommandations pour soutenir le développement futur des DIHs sont les suivantes :

- **Assurer la cohérence et la coordination entre les différentes initiatives liées à l'IA et aux DIHs**. Un certain nombre d'initiatives sont actuellement mises en œuvre, et d'autres devraient être lancées prochainement, afin de promouvoir l'adoption de l'IA et des solutions numériques par les PME et les administrations publiques, et qui impliquent les DIHs, les centres de compétence, les centres de recherche et d'autres parties prenantes (par exemple, les projets/initiatives : AI4EU, CLAIRE, AI DIH network, etc.). Des mécanismes de coordination clairs devraient être établis pour exploiter les synergies qui existent entre les initiatives et leurs participants ;
- **Tirer parti des DIHs pour poursuivre les priorités de l'UE**. Les DIHs mettent à profit leurs connaissances locales et leur proximité géographique pour communiquer et s'engager avec leurs parties prenantes, aussi efficacement que possible. Cette capacité devrait également être mise à profit pour poursuivre la mise en place de l'IA et des autres priorités de l'UE dans toute l'Europe. Par exemple, les DIHs pourraient être impliqués dans la définition de méthodologies européennes communes pour l'application des « Lignes directrices en matière d'éthique pour une IA digne de confiance » - développées par le groupe d'experts indépendants de haut niveau sur l'IA (AI HLEG). Les DIHs pourraient ensuite évaluer les projets et les solutions développés au sein de leur écosystème et déterminer s'ils respectent ou non les lignes directrices éthiques et ils pourraient également soutenir l'opérationnalisation pratique des principes éthiques de l'IA ;
- **Préparer les DIHs à travailler avec le secteur public**. Dans le cadre du programme « Digital Europe », les DIHs devront aider les administrations publiques à adopter des solutions interopérables, les « Digital Service Infrastructures » (« les infrastructures de services numériques ») et les « building blocks » (par exemple, eID, eInvoicing, eDelivery, eSignature) ; leur fournir des services spécifiques (par exemple, fournir des installations d'essai ou développer des solutions d'IA) et travailler avec des entreprises GovTech (par exemple, des PME, des start-ups innovantes, etc.) qui aident les administrations publiques. Toutefois, seul un nombre limité de DIHs est habitué à travailler avec des clients du secteur public. Les DIHs ont besoin d'aide pour développer l'ensemble des compétences nécessaires pour travailler avec les administrations publiques et pour comprendre comment leur rôle pourrait être combiné avec celui des organisations qui opèrent déjà dans le secteur, afin d'éviter la duplication des efforts et des activités.

Introduction

1 Introduction

1.1 Setting the scene

On 19 April 2016, the European Commission launched the first industry-related initiative of the Digital Single Market package, the Digitising European Industry (DEI) initiative. Building on those introduced at national and regional level, the latter aims to both trigger public and private investments in all industrial sectors and create the conditions for the digital revolution.

The actions of the DEI are structured along five pillars. Among them, the creation of a network of Digital Innovation Hubs (DIHs).

Digital Innovation Hubs are ecosystems including different regional players: SMEs, large industries, start-ups, researchers, accelerators and investors. Their mission is to support companies in becoming more competitive by exploiting the benefits of the digital transformation. To fulfil this role, DIHs act as one-stop-shop, assisting companies in their local region in the digitalisation of their business. In line with their regional characteristics and their smart specialisation strategy, Digital Innovation Hubs can focus on specific sector(s) or technologies.

Over the last four years, the European Commission has promoted the development of DIHs across Europe, with a dedicated budget of EUR 500 million under Horizon 2020. The resources have been dedicated to both support the development of the DIHs and promote collaboration initiatives among them.

Further investments are planned in the proposal for the upcoming Digital Europe Programme (DEP) – the EUR 9.2 billion programme focussing on building digital capacity and infrastructure in the EU over the next programming period – which foresees a reinforced role of DIHs.

Digital Innovation Hubs will continue to support the digitisation of industry and the diffusion of advanced digital skills, especially in the key areas of the DEP - high performance computing (HPC), artificial intelligence (AI) and cybersecurity.

The pivotal role of DIHs in supporting SMEs and public organisations in knowing and using AI is restated in the Coordinated Action Plan on Artificial Intelligence prepared by the European Commission in cooperation with Member States and Norway and endorsed by the European Council in June 2018.

According to the abovementioned Plan, DIHs are expected to help companies and public administrations in identifying datasets, developing algorithms, training AI and linking to computing facilities and other key initiatives of the plan, such as the "AI-on-demand platform".

The White Paper on Artificial Intelligence – issued by the Commission in February 2020 to set up policy options for promoting the uptake of AI and addressing associated risks – confirms the potential of DIHs to support SMEs in understanding and adopting AI. To this end, all DIHs should be able to provide basic support, while at least one hub per Member State should be highly specialised in the field.

Collaboration among Digital Innovation Hubs is deemed fundamental to ensure Digital

Innovation Hubs can count on all competences and infrastructure to support their ecosystems adequately in the field of Artificial Intelligence and in the other sectors.

In this context, the European Commission launched the present preparatory action to support collaboration among DIHs operating in AI. The action entailed the establishment of an initial network of 30 DIHs with focus on AI and the development of a blueprint for cross-border collaboration based on a thorough assessment of DIH business models, common systems, collaboration and governance structures. The design of such blueprint, together with the creation of a network of DIHs focusing on AI, serves the goal to foster collaboration among hubs and allow to foster access to digitisation and Artificial Intelligence across Europe.

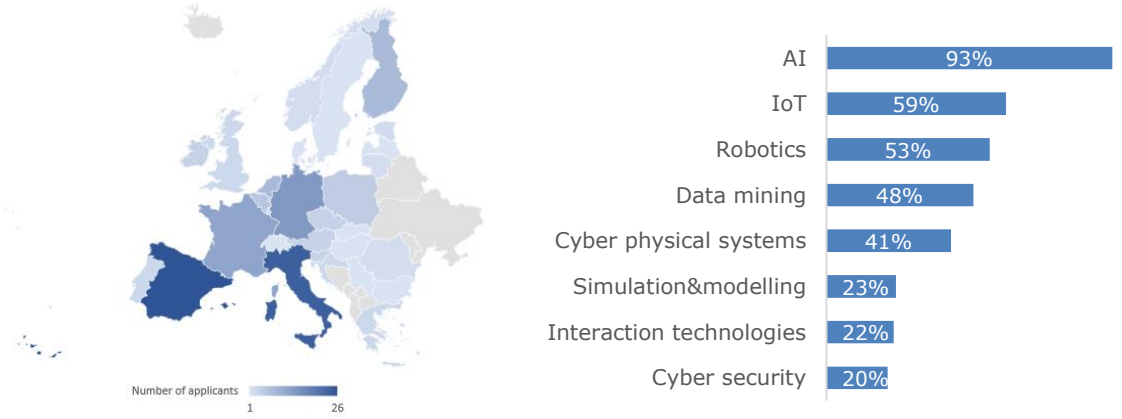
1.2 Overview of the approach

Overall, the activities of the preparatory action were divided in two main tasks closely connected with each other. Indeed, the Consortium team developed an integrated approach for ensuring their coordinated development and for responding to the main objectives of the project. As specified in the following paragraphs, while Task 1 was dedicated to the coaching and mentoring programme with the 30 selected DIHs, Task 2 was focussed on the policy recommendations to enhance collaboration that resulted from the activities carried out in Task 1.

- **Task 1. Demonstration activity of supporting the collaboration and networking between at least 30 Regional Digital Innovation Hubs in at least 8 different EU Member States**

  The first activity carried out under Task 1 consisted in the identification and selection of 30 Digital Innovation Hubs with focus on Artificial Intelligence to be involved in a coaching and mentoring programme centred on collaboration. The activity entailed the launch of an open call for Expression of Interest (EoI), which was participated by 150 hubs from 30 European countries (see figure below). In line with the scope of the call, most of applicants had a technological focus on Artificial Intelligence and Cognitive System as well as on domains strongly related to AI, such IoT and Robotics.

  Figure 1 – Geographical coverage of the call for EoI and technology focus of the applicants



Source: Own elaboration on applications received

Eligible applications were then assessed against specific criteria with different weights: *vision, mission and value proposition* (25%), *business model and networking potential* (35%), *collaboration* (30%) and *ecosystem* (10%). As a result of the process, described in detail in Annex B, 30 DIHs were finally selected.

These DIHs were involved in a coaching programme focussing on collaboration and its relevant aspects, including legal and financial ones. More specifically, participating Digital Innovation Hubs were involved in a number of activities, including webinars, collaborative workshops, mentoring sessions and on-site training sessions.

The activities performed under Task 1 provided valuable feedback and inputs for drafting the cooperation agreement establishing the AI DIH Network as well as for developing the analysis included in Task 2.

- **Task 2: Policy recommendations for enhancement of the collaboration and networking potential of digital hubs and accelerators across Europe**

  Task 2 entailed the preparation of the present report, including an analysis of the state-of-the-art in terms of collaboration and a set of recommendations for fostering cross-border cooperation among DIHs.

  The analysis was performed based on a methodology ensuring the inputs of DIHs and their experience in cooperation were taken into consideration and building on the research and expertise of the Consortium.

Information regarding barriers and obstacles to cooperation was collected via online surveys, semi-structured interviews and work groups. Data gathered through these channels were analysed and synthetized by the Consortium experts with the final aim of defining schemes for cross-border collaboration. Further, findings support the development of the policy recommendations included in this report and the blueprint for cross-border collaboration.

Analysis of the state of play in the selected regions

2 Analysis of the state of play in the selected regions

In this chapter an analysis of the regional context of the Digital Innovation Hubs selected to take part in the coaching and mentoring programme is presented.

Considering the strong link connecting DIHs and the region where these are located, the analysis enables to understand better the characteristics of each DIH and the opportunities it may have to create cooperation within and outside its region.

The selection process led to the identification of 30 DIHs located in 21 EU countries (20 Member States and 1 Associated Country) and 29 regions (NUTS 2)[3].

The features of these regions differ significantly. Suffice to say that, the selection covers regions that, according to the Regional Innovation Scoreboard developed by the European Commission, are classified as innovation leaders +, i.e. performing best among EU regions in terms of research systems and business innovation, and others that are considered as modest innovators, i.e. are ones of the least innovative regions in Europe (see table below).

Table 1 - Selected DIHs and their regions

DIH	Country	NUTS 2 Region	Innovation performance[4]
Know-Center GmbH	Austria	Region of Styria	Strong+
IMEC	Belgium	Flemish Brabant	Strong+
Croatian Robotics DIH (CROBOHUB)	Croatia	Continental Croatia	Moderate-
Czech Institute of Informatics, Robotics and Cybernetics (CIIRC)	Czech Republic	Prague	Strong-
Danish Technological Institute (DTI)	Denmark	Southern Region	Strong
Smart Industry Centre (SmartIC)	Estonia	Estonia Region	Moderate*
Finnish Center for Artificial Intelligence (FCAI)	Finland	Helsinki-Uusimaa Region	Leader+
Super IoT	Finland	Northern and Eastern Region	Strong+
DIGIHALL	France	Île de France	Strong+
Images et Réseaux - DIGIWEST	France	Brittany	Strong-
TeraLab	France	Île de France	Strong+
DFKI Human Centric AI Innovation Hub	Germany	Rhineland-Palatinate	Leader-

[3] Two selected DIHs are in the same region - Île de France
[4] Source: European Commission – Regional Innovation Scoreboard 2019

DIH	Country	NUTS 2 Region	Innovation performance[4]
Munich Innovation Hub for Applied AI	Germany	Bavaria	Leader+
VDTC of the Fraunhofer IFF	Germany	Saxony-Anhalt	Strong-
nZEB Smart Home	Greece	Central Macedonia	Moderate+
CeADAR	Ireland	Eastern and Midlands Region	Strong+
DIH Lombardia	Italy	Lombardy	Moderate+
IP4FVG	Italy	Friuli-Venezia Giulia	Strong-
RIF BioRobotics Institute (ARTES 4.0)	Italy	Tuscany	Moderate+
Latvian IT Cluster DIH	Latvia	Latvia Region	Moderate*
Lithuanian robotics DIH (LTroboticsDIH)	Lithuania	Capital Region	Moderate+
Smart Industry Hub South Netherlands (Smart Connected Suppliers Network)	Netherlands	North Brabant	Leader+
SINTEF[5]	Norway	-	Strong
HPC4Poland	Poland	Wielkopolska Region	Moderate-
PIAP HUB	Poland	Mazovia	Modest+
PRODUTECH	Portugal	Northern Region	Strong-
4P DIH	Slovenia	Western Slovenia	Moderate+
AIR4S	Spain	Community of Madrid	Moderate
Spanish DIH for HPC (esHPC)	Spain	Region of Catalonia	Moderate+
ITI Data Cycle Hub	Spain	Community of Valencia	Moderate

2.1 Austria – Region of Styria

According to the latest Eurostat data (2018), the region of Styria generated 12.5% (EUR 44.3 billion) of Austrian GDP in 2016, up nearly 2% on the previous year. In 2017, the region employed nearly 14% (623,400 people) of the national workforce, and it also recorded a lower unemployment rate (4.5%) than the national (5.5%) and European averages (7.6%). The services sector accounts for two thirds (67%) of regional employment, followed by the industry sector (28%) and forestry and agriculture (5%).[6]

[5] Since the Digital Innovation Hub SINTEF operates on a national scale, it was deemed as more relevant to focus the analysis of the regional context on Norway rather than on a specific NUTS 2 region
[6] European Commission, Regional Innovation Monitor, Styria: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/styria

Approximately 200 larger industrial companies form the basis of the local economy in Styria. They employ around 60,000 employees, 75% of which work in companies with up to 500 employees. These companies tend to be regionally competitive with regional customers or, alternatively, they act as niche players in international markets. Local SMEs predominantly provide production or business services within regional supply chains. Local business value chains are both competitive and important to the region as a whole.[7]

Styria's core sectors include the automotive industry, mechanical engineering, electronics and paper. Styria features the ACstyria automotive cluster, which is located around Graz and which incorporates more than 250 component suppliers. ECO WORLD STYRIA is another important cluster that brings together over 170 enterprises from the field of environmental technology. Other clusters are focused on sectors that include wood, human technology, materials and food technology.[8]

In 2017, 36% of the Styrian population aged 30 to 34 had completed tertiary education. The percentage is lower than the Austrian (41%) and the EU28 (40%) averages, although it is up by 65% on the figure recorded in 2012 (22%). The Styrian regional research infrastructure features five universities, two applied science universities and two higher education institutes, as well as five K1 and three K2 competence centres. There are also several private sector research centres in the region.[9]

Currently, there are 12 Austrian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 7 are fully operational and 5 are in the preparatory stage. Overall, eight of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, Styria hosts 4 DIHs, all of which are fully operational. The majority of these hubs (i.e. 3 out of 4) include Artificial Intelligence among their fields of specialisation.[10]

The Styrian DIH, the **Know-Center GmbH**, is working with the Technical University of Graz to help regional companies and sectors to access digital and AI technologies. Around 100 companies per year are serviced by Know-Center, 50 of them are bound by long term research partnerships (thus Know-Center's activities reach approx. 8000 end users in the companies). The DIH is collaborating with the Green Tech Cluster (public-private-partnership) to assess the value of big data to green tech companies, establish global contacts for Styrian green tech companies and provide R&D support. The DIH is also working closely with the Styrian Academic Cluster, as well as with regional and national start-up initiatives and incubators.[11] The Know-Center is actively cooperating with national and international research partners in specific research fields which are relevant to big data. The 'Digital networked Data' (DnD) Association has been set up in partnership with Secure Business Austria (SBA) and Virtual Reality and Visualization (VRVis) to raise the awareness on the importance of data-driven approaches. The Know-Center has co-authored a Whitepaper on Big Data technologies in Healthcare in partnership with Philips and other industry partners. In partnership with the Berlin Big Data Center (BBDC34) and the Smart Data Forum (SDF), and with German and Austrian government support, the Know-Center has set up the European Network of Centres

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7 Ibid
8 Ibid
9 Ibid
10 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool
11 Information provided by the Know-Center in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

of Excellence in Big Data research (Big Data Network)[12]. The Know-Center is also cooperating with the BDVA in order to connect with relevant stakeholders in the USA to understand their approaches to applied Big Data research and artificial intelligence. This intention is to create a successful roadmap for the future.[13]

2.2 Belgium – Flemish Brabant

According to the latest Eurostat data (2018), the region of Flemish Brabant generated 59% of Belgian GDP in 2016. The region boasts an employment rate of 68%, which is above the Belgian average (64%) but below the EU28 average (72%). The Flemish unemployment rate of 4.4% (2017) is considerably below the averages for Belgium (7.1%) and the EU28 (7.6%).[14]

The Flemish population has a relatively high level of education. 35% of the regional population aged from 25 to 64 years have completed tertiary education (ISCED 5 and 6). This is in line with the national average in Belgium and above the EU27 average of 28% (2012). The Flemish regional research infrastructure features five universities, including a Dutch language university in Brussels, four large strategic research centres (IMEC, VIB, VITO and Flanders Make) and a number of smaller centres of excellence (competence poles) and research centres for specific (mainly sectoral) knowledge development and transfer.[15]

Flemish Brabant' core sectors include industry (e.g. automotive, petrochemicals), ICT/high-tech, pharmaceuticals and transport. Major multinationals (MNEs) are present in the region (e.g. automotive), but it is Flemish SMEs, which often act as suppliers to MNEs, that are the main drivers of the region's economy. Flemish exports account for 80% of Belgian GDP and 83% of total Belgian exports.[16]

Flemish Brabant provides governmental support to a number of regional industrial networks that are active in the regional ecosystem. They include 6 'VLAIO speerpuntclusters' (spearhead clusters) and 20 innovative business networks (IBNs).

Currently, there are 29 Belgian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 15 are fully operational and 14 are in the preparatory stage. Overall, twenty of these hubs list Artificial Intelligence and Cognitive Systems among their technical competences. At regional level, Flanders hosts 13 DIHs, of which 8 are fully operational and 5 are in the preparatory stage. The majority of these hubs (i.e. 8 out of 13) declare to cover the field of Artificial Intelligence.[17]

Cooperation between DIHs and private and public sector stakeholders in the region is growing. The Flemish DIH, **IMEC**, is cooperating with all of the spearhead clusters mentioned above and a large number of the IBNs. On average, IMEC engages with around 600 industry partners and over 200 research organisations per year.[18]

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[12] The network currently connects over 55 centres across 16 European countries (2 of which are Austrian).
[13] Ibid
[14] European Commission, Regional Innovation Monitor, Flanders: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/flanders
[15] Ibid
[16] Ibid
[17] European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool
[18] Interuniversitair Micro-Electronica Centrum vzw (IMEC). Information provided by IMEC in their application

The IMEC ICON programme[19] provides government funding to partners that engage in collaborative R&D and innovation with the IMEC DIH.
An ambitious Flemish AI programme is also under development. Its purpose is to implement the Flemish Government's AI Action Plan,[20] aiming at making the region a leader in the AI industry and a focus of AI investment, contributing to the state-of-the-art in AI and supporting the introduction of new technologies in partnership with regional stakeholders. IMEC is developing and coordinating this initiative in close co-operation with Flemish universities, local RTOs and organisations representing Flemish industry. The programme is expected to have three pillars: (I) Ethics, education & outreach; (ii) Industry implementation; and (iii) Top tech research and platforms.[21] In addition, IMEC is also establishing bilateral cross-border initiatives with other DIHs and partners. Examples include the Holst Centre with TNO, the Smart Food & Health centre with Wageningen University & Research, Radboudumc & Radboud Universiteit, and a strategic partnership with CEA-LETI (part of the Minalogic DIH) on AI and Quantum Computing.[22]
Finally, IMEC DIH is fully in line with the current Flemish Smart Specialisation Strategy[23] and the Vision 2050 document of the Flemish Government.[24]

The region of Flemish Brabant is also a partner in the Vanguard Initiative[25], which is developing inter-regional cooperation and multi-level governance to support clusters and regional eco-systems focused on smart specialisations.
Current opportunities for cross-border cooperation are available through ERDF support programmes such as INTERREG V Flanders-The Netherlands, INTERREG 2 Seas & INTERREG Euregio programmes.

2.3 Croatia – Continental Croatia

According to the latest Eurostat data (2018), the region of Continental Croatia generated 68% (EUR 31.7 billion) of Croatian GDP (EUR 51.5 billion) in 2016.[26] In 2017, the region had an employment rate of 64%, lower than the EU28 average of 72%. In the same year, the unemployment rate (11.4%) was considerably higher than the average rate for the EU28 (7.6%). The tertiary educational attainment rate in 2017, was 29% of the population aged 30-34, lower than the EU28 average of 40%.[27]

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form (Expression of Interest) for participation in the DIH Network preparatory action.

[19] IMEC CON Programme: https://www.imec-int.com/en/icon

[20] Flemish AI Action Plan: https://www.ewivlaanderen.be/nieuws/30-miljoen-euro-voor-vlaams-actieplan-artificiele-intelligentie

[21] Interuniversitair Micro-Electronica Centrum vzw (IMEC). Information provided by IMEC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[22] Interuniversitair Micro-Electronica Centrum vzw (IMEC). Information provided by IMEC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[23] Flemish Smart Specialisation Strategy: http://s3platform.jrc.ec.europa.eu/regions/BE2/tags/BE2

[24] Vision 2050, Flemish Government: https://www.vlaanderen.be/nl/vlaamse-regering/visie-2050

[25] Vanguard Initiative – Flanders: https://www.s3vanguardinitiative.eu/partners/vlaanderen

[26] Eurostat, Regional statistics by NUTS classification, Regional economic accounts: https://ec.europa.eu/eurostat/web/regions/data/database https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_2gdp&lang=en

[27] Eurostat, Regions, Statistics Illustrated, Kontinentalna Hrvatska (Continental Croatia):

Although the services sector is the dominant employer in Croatia, the industry sector also accounts for a relatively large share of employment in Croatia. Employment growth is most likely to occur in the service sector (e.g. professional services, health and social care, vocational training).[28] Employment growth is nonetheless a sizeable challenge in Croatia due to slow growth and an ageing workforce (almost one third of the workforce is aged 50 or over). The trend of slow growth or stagnation in employment is predicted to continue over the next decade.

The main manufacturing sectors in Continental Croatia, and the country as a whole, include food, beverage and tobacco production/processing, basic metals and fabricated metal products, basic pharmaceutical products, machinery and equipment, and other mineral products. The manufacturing industry employs about 800,000 people in about 106,200 SMEs.[29]

There is a business support infrastructure in place in Croatia, but it needs further development. Support is currently provided by technology parks, regional agencies, business incubators and accelerators. At regional level, they provide infrastructure, mentoring, business support and, in some cases, seed funding to start-ups and young entrepreneurs. There are also various associations and clusters that support networking, knowledge and technology transfer, and collaboration between academia and industry.[30]

Croatia has an established education and training infrastructure to provide the labour market with a highly skilled workforce to support industries such as robotics. In Continental Croatia, for example, there are top performing faculties in ICT, automation and robotics at the University of Zagreb (Faculty of Electrical Engineering and Computing (UNIZG-FER) and Faculty of Mechanical Engineering and Naval Architecture (UNIZG-FSB)), which are located in close vicinity to the **Croatian Robotics DIH (CROBOHUB)**.[31]

Croatian R&D in robotics is dominated by public sector organisations that work together in the form of varied and specialised research groups. Private sector R&D needs to be developed to complement the strong public sector ecosystem.[32]

Financial support instruments and private sector funding sources are available to support innovative projects and SME activities. Examples range from regional, national and international public funding institutions, to banks, venture capitalists, crowdfunding platforms and business angels.[33]

Currently, there are 11 Croatian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 7 are fully operational and 4 are in the preparatory stage. Overall, six of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, the North-Western Region hosts 9 DIHs, of which 6 are fully operational and 3 are in the preparatory stage. The majority of these hubs (i.e. 6 out of

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https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

28 European Commission, Skills Panorama, Croatia: https://skillspanorama.cedefop.europa.eu/en/countries/croatia

29 Croatian Robotics Digital Innovation Hub (CROBOHUB). Information provided by CROBOHUB in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

30 Ibid

31 Croatian Robotics Digital Innovation Hub (CROBOHUB). Information provided by CROBOHUB in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

32 Ibid

33 Ibid

9) list Artificial Intelligence among their fields of specialisation.[34]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, in spite of the lack of specific initiatives are yet in place to promote DIH cooperation at any level (regional, national or international). The Ministry of Economy, Entrepreneurship and Crafts of the Republic of Croatia is however aware of the concept, role and importance of DIHs, and has recognised CROBOHUB as a role model and the most active DIH in Croatia. Negotiations are currently in progress with the Ministry, with a view to government providing financial support to Croatian DIHs.[35]

All DIH actions and services are developed and implemented in accordance with the National Smart Specialisation Strategy (S3) 2016 - 2020,[36] the National SME strategy 2013 - 2020, the National Education, Science and Technology Strategy 2014 - 2020, the National Industrial strategy 2014 – 2020, and the Strategy for Innovation Encouragement of Croatia 2014-2020. S3 implementation in Croatia, for example, has focused on creating an environment to support and encourage innovation and investment in R&D in order to develop new products, services and technologies to help modernise and diversify the Croatian economy. Robotics is one of the fields identified as a key enabler in that strategy, and CROBOHUB is supporting its implementation.[37]

At present, cross-border cooperation opportunities for Croatian DIHs are mostly limited to participation in EU-funded projects, such as those supported by the Horizon 2020 programme. Greater and more varied opportunities would be of great value and should be developed.[38]

2.4 Czech Republic – Prague

According to the latest Eurostat data (2018), the region of Prague generates around 25% (EUR 44.1 million) of Czech GDP. In 2017, the region had an employment rate of 98.3% and an unemployment rate of 1.7%. Almost three quarters of all employed people in Prague in the same year worked in services. This reflects the increasing share of service industries in the region and the decreasing share of production industries. Tertiary industries in Prague now represent more than 80% of value added. Tertiary educational attainment, as a percentage of the population aged 30-34, was 60% in 2017, significantly higher than the EU28 average (40%).[39]

In addition to services, Prague's core sectors include ICT and production and processing industries such as automotive, electronics, machinery, chemicals, pharmaceuticals, metals, food and beverage, wood and paper, printing and textiles. Although the high-tech sector in Prague and across the Czech Republic is developing at a slower pace than in other EU28

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[34] European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

[35] Croatian Robotics Digital Innovation Hub (CROBOHUB). Information provided by CROBOHUB in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[36] Croatian Smart Specialisation Strategy (S3) 2016-2020: https://rio.jrc.ec.europa.eu/en/library/smart-specialisation-strategy-republic-croatia-period-2016-2020-and-action-plan

[37] Croatian Robotics Digital Innovation Hub (CROBOHUB). Information provided by CROBOHUB in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[38] Ibid

[39] European Commission, Regional Innovation Monitor, Prague: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/prague

countries, the activities of MNEs are helping to produce a slight shift towards high-tech production (e.g. in the processing industry). Similarly, MNEs have also helped to generate a massive increase in employment and value added in the pharmaceutical industry and the ICT sector in the period 2000-2014.[40]

Almost one quarter of all Czech R&D organisations are located in Prague. These organisations account for half of all Czech R&D in the government sector and more than 30% in the public university sector. The region also hosts 26% of innovative Czech companies, 75% of Czech Academy of Science Institutes, 48% of public and private universities and 34% of other research institutes (public and private). Over 60% of Czech AI R&D capacity (allocated personnel FTEs & invested funds) are concentrated in the Prague region.

Currently, there are 10 Czech DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 7 are fully operational and 3 are in the preparatory stage. Overall, six of these hubs list Artificial Intelligence and Cognitive Systems among their competencies. At regional level, Prague hosts 3 DIHs, of which 2 are fully operational and 1 is in the preparatory stage. All three of these cover the field of Artificial Intelligence.[41]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly funded collaborative project work at present. In June 2018, the Czech Government approved a Programme Statement that specified digital transformation as a national priority. The Statement is fully aligned with the Czech Industry 4.0 Initiative that was approved in 2016. Digital transformation is at the core of the national Industry 4.0 initiative and the establishment of the Czech DIH led by the **Czech Institute of Informatics, Robotics and Cybernetics** (**CIIRC**) is considered the first practical result of Industry 4.0 and of the Industrial AI and Robotics initiative, opening up a range of new opportunities to assist the implementation of the initiative. Indeed, CIIRC has significantly contributed to the Industry 4.0 Initiative since its conception and is now acknowledged as a key implementation partner.[42] In 2019 the Czech AI national Strategy has also been published and CIIRC has been a strong contributor to its design.

A first example of DIH cooperation in the field of artificial intelligence is the Memorandum of Understanding on R&D Collaboration between CIIRC and the German Research Centre for Artificial Intelligence (DFKI) in 2016, which lay the groundwork for Czech-German cooperation in Industry 4.0. Subsequently, a joint H2020-Widespread-Teaming Phase II proposal was submitted to the EC with the aim of setting up a new Centre of Excellence in advanced industrial production. The project has received approximately EUR 15 million of contribute, started in September 2019, and will last 7 years. [43] In addition to this initial funding, Czech government will be adding on top EUR 34 million more for testbed research, development and deployment activities.

The Testbed for Industry 4.0, as the main facility for testing innovative approaches and solutions in this area, is a unique workplace enabling a distributed and fully integrated multi-site industrial production. 'Production as a Service' is a key idea of the joint Czech-German cooperation enabling establishment of the very first multi-site/distributed experimental facility

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40 Ibid

41 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

42 Czech Institute of Informatics, Robotics and Cybernetics (CIIRC). Information provided by CIIRC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

43 https://cordis.europa.eu/project/rcn/224164/factsheet/en

in Europe, representing virtually interconnected testbeds (in Prague, Brno and Saarbrucken) into a common integrated R&D infrastructure.[44]

Another example is CIIRC's partnership with the Paris Artificial Intelligence Research Institute (PRAIRIE), as also presented by France's President Emmanuel Macron in occasion of the launch of the French National AI Strategy in 2018P. RAIRIE is establishing an international network of partnerships to promote collaboration. CIIRC joined the initiative as a partner in 2018. In addition, CIIRC is already collaborating with Inria, one of the founding members of PRAIRIE, on the IMPACT (Intelligent Machine Perception) project. The IMPACT project brings together researchers from both Inria and CIIRC to advance knowledge in computer vision, machine learning and robotics.[45]

2.5 Denmark – Southern Region

According to the latest Eurostat data (2018), the Southern Region of Denmark generated 19% of Danish GDP in 2016. The region is the third largest contributor to national GDP after the Capital Region (40%) and the Central Region (20%). In 2017, the region had an employment rate of 75%, which was slightly above the EU28 average (72%), and an unemployment rate of 6%, which was slightly below the EU28 average (7.6%).[46]

The general level of education in the region of Southern Denmark (which has fluctuated in recent years) is lower than the rest of Denmark (excluding) the Zealand region. In 2017, tertiary educational attainment, as a percentage of the population aged 30-34, was about 37%, slightly below the EU28 average (40%) and significantly below the national average (49%). Improving levels of educational attainment and IT competencies in the workforce are key challenges facing policymakers in the region.[47]

The Southern Region features a high number of SMEs and the main business sectors are construction, food, medical and health, and transportation. The region also specialises in mechatronics, offshore energy (with the port city of Esbjerg as the offshore hub), tourism, automation and cleantech. Work is ongoing to build a cleantech cluster around the largest company in the region, Danfoss, a multinational cleantech company. The region is also a national centre for an emerging welfare technology cluster.[48]

The Southern Region is the most export intensive of all Danish regions. In 2013, 13% of all firms in region were exporters, over a percentage point above the national average. The region also has the highest five-year survival rate for new ventures across all Danish regions. In recent years, Danish productivity has decreased overall; however, it remains higher than the EU average. Productivity in the region rose by 1.3% between 2005 and 2015, higher than other Danish regions. Compared with overall productivity across all regions, Southern Denmark is the most productive (0.6% above the national rate).[49]

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44 Ibid

45 Czech Institute of Informatics, Robotics and Cybernetics (CIIRC). Information provided by CIIRC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

46 European Commission, Regional Innovation Monitor, Southern Denmark: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/southern-denmark-region

47 Ibid

48 Ibid

49 Ibid

User-driven innovation is an important feature of R&D activity within Southern Denmark and private companies provide more than half (64%) of all R&D investments in the region. It is supported by an established network structure that links regional companies with the decentralised structure of the University of Southern Denmark.[50]

Currently, there are 9 Danish DIHs registered in the Catalogue, of which 6 are fully operational and 3 are in the preparatory stage. Overall, six of these hubs declare to have competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, Southern Denmark hosts 2 DIHs, of which 1 is fully operational and 1 is in the preparatory stage. Both of these hubs include Artificial Intelligence among their fields of specialisation.[51]

The South Denmark ecosystem is considered to be one of the world's top robotics clusters. It combines 10 education and knowledge institutions, more than 100 technology providers (companies and start-ups) and over 50 end-users (SMEs and start-ups). Many system integrators are also involved and are helping companies to implement and use relevant technologies. The use of AI in the private sector is however still quite limited. To address this issue, the South Denmark DIH, the **Danish Technological Institute (DTI)**, is currently engaged in upskilling stakeholders within the regional ecosystem, as well as nationally and internationally.[52]

On a strategic level, DTI is an active contributor to national political strategic agendas. The recent National Digitalisation Strategy, for example, includes a dedicated focus on digital hubs and on supporting digital transformation in SMEs. DTI has a central role to play to help shape and operate hub activities at national level and to build sustainable partnerships to support SMEs in the ecosystem.[53]
DTI's role within the ecosystem is also pivotal. The DIH is responsible for helping to identify industry relevant research topics, providing state-of-the-art technology to end-users, and for upskilling end-users, technology providers and systems integrators. Continuous upskilling of system integrators, in particular, is vital to ensure that state-of-the-art technology is available to industry.[54]

There are no cross-border collaboration initiatives in operation at regional level at present. Activity in this area is expected to begin in 2019, although there is no official information currently available on what form it might take. At national level however, the Danish government is part of the 'AI in the Nordic-Baltic region' agreement, which was signed in May 2018. This marks the beginning of a concerted effort to develop cross-border collaboration, but it has yet to become operational.[55]

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50 European Commission, Regional Innovation Monitor, Southern Denmark: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/southern-denmark-region

51 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

52 Danish Technological Institute (DTI). Information provided by DTI in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

53 Ibid

54 Ibid

55 Ibid

2.6 Estonia – Estonia Region

According to the latest Eurostat data (2018), Estonia's GDP reached EUR 25.7 billion in 2018.[56] Estonia has an employment rate of 79%, which is above the EU28 average (72%), and an unemployment rate of 5.8% (2017), which is considerably below the EU28 average (7.6%). Tertiary educational attainment, as a percentage of the population aged 30-34, was 48% in 2017, compared to the EU28 average of 40%.[57]

The Estonian economy is dominated the tertiary sector, with service sectors contributing nearly three quarters (71%) of national GDP. The secondary sector (industrial sectors) contributes about 25% of GDP and the primary sector (including agriculture) contributes about 4%. Estonia's core sectors include business services (21% of overall output), government, education and healthcare (>17%), industrial production and processing (14.5%), commerce (13.5%), warehousing and communications (10%), construction (7%), and agriculture and forestry (2.2%).[58]

The most important industrial production and processing sectors in Estonia include mechanical engineering (25% of manufacturing production); timber and paper industry (20%), food industry (15%), metal industry (13%), chemical industry (10%) and light industry (< 5%). The importance of certain industrial sectors has changed quite significantly over the last decade. Industries such as mechanical engineering, the metal industry and the electronics industry have grown extensively. Conversely, more traditional industries such as timber and paper and light industry are now less prominent.[59]

Estonia's research infrastructure features 20 R&D institutions that have been positively evaluated by the Ministry of Education and Research, of which 6 are public universities. There are also 9 Research Centres of Excellence and 5 Competence Centres.[60]

Currently, there are 6 Estonian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 4 are fully operational and 2 are in the preparatory stage. Overall, four of these hubs list Artificial Intelligence and Cognitive Systems among their technical competencies. At a regional level (NUTS 3), the Northern Region hosts 4 DIHs, of which 3 are fully operational and 1 is in the preparatory stage. Half of these hubs declare to cover the field of Artificial Intelligence.[61]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly funded collaborative project work at present. The Estonian Ministry of Economic Affairs and Communications is currently developing measures

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56 Eurostat, Regional statistics by NUTS classification, Regional economic accounts: https://ec.europa.eu/eurostat/web/regions/data/database https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_2gdp&lang=en

57 European Commission, Regional Innovation Monitor, Helsinki-Uusimaa: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/helsinki-uusimaa-region

58 Estonica, Structure of the economy: http://www.estonica.org/en/Economy/General_overview_of_Estonian_economy/Structure_of_the_economy/

59 Ibid

60 European Commission, Euraxess, Research landscape in Estonia: https://euraxess.ec.europa.eu/information/content/estonia/research-landscape-estonia

61 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

to support cooperation within the framework of the new industrial policy. Indeed, government commitment is evidenced by the joint representation at DIH conferences (e.g. Warsaw conference in 2018) of both Ministry and Estonian DIH (e.g. SmartIC) representatives.[62]

2.7 Finland - Helsinki-Uusimaa Region

According to the latest Eurostat data (2018), the region of Helsinki-Uusimaa generated 39% of Finnish GDP in 2016. The region has an employment rate of 78%, which is above the EU28 average (72%), and an unemployment rate of 7.7% (2017) which is below the national average (8.6%) and slightly above the EU28 average (7.6%).[63]

The tertiary sector is highly important for the regional economy, accounting for 82.5% of the employed labour force in 2017. Financial, administrative and business services and public administration are key employment sectors. This is mostly because much of the national administration is located in the metropolitan region.[64]

The number of human resources in science and technology is increasing and in 2017 was higher in Helsinki-Uusimaa (651,400) than elsewhere in Finland. The difference between Helsinki-Uusimaa and other Finnish regions is partly explained by the fact that besides R&D, other economic activity and plenty of public administration is also located in the region.[65]

Indeed, R&D activity is particularly intensive in the region of Helsinki-Uusimaa. The region's Gross Domestic Expenditure on R&D (GERD) amounted to EUR 2.92 billion in 2015, which accounted for 48% of total Finnish GERD. With a GERD of 3.6% of GDP in 2015, R&D investment in Helsinki-Uusimaa exceeded both the national (2.9%) and the EU28 (2%) averages. In 2015, the business enterprise sector accounted for 67.6% of R&D expenditure in the region, above the national average (66.7%) (Eurostat 2018).[66]
The regional R&D infrastructure is composed of a range of complementary organisations. There are five universities (University of Helsinki, Aalto University, Hanken School of Economics, University of the Arts Helsinki and National Defense University) and seven universities of applied sciences with high levels of research capacity. The region also hosts many public and private research institutes. Currently there are 20 publicly financed research institutes in Finland in different policy sectors, and their core activities are concentrated in the metropolitan region. Many of these institutes, such as VTT Technical Research Centre of Finland, also have facilities located in other regions as well.[67]

Currently, there are 17 Finnish DIHs registered in the DIHs Catalogue, of which 13 are fully operational and 4 are in the preparatory stage. Overall, thirteen of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, Helsinki-Uusimaa hosts 5 DIHs, of which 2 are fully operational and 3 are in the

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[62] Smart Industry Centre (SmartIC). Information provided by SmartIC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.
[63] European Commission, Regional Innovation Monitor, Helsinki-Uusimaa: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/helsinki-uusimaa-region
[64] Ibid
[65] Ibid
[66] Ibid
[67] European Commission, Regional Innovation Monitor, Helsinki-Uusimaa: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/helsinki-uusimaa-region

preparatory stage. All five hubs in the region include Artificial Intelligence among their fields of specialisation.[68]

Aalto, University of Helsinki and VTT are the main AI specialists in the Helsinki-Uusimaa ecosystem. The regional DIH ecosystem is growing successfully. The **Finnish Center for Artificial Intelligence** (**FCAI**) has already brought several members onboard. They are mainly large companies specialised in IT and telecommunications (Elisa, Huawei, Nokia, NVIDIA, Reaktor, Tieto), finance (OP), health (Orion, Planmeca) and manufacturing (Cargotec, SAAB, Wärtsilä). Additionally, FCAI's collaboration partner Curious AI and the cities of Helsinki and Espoo are also involved in the DIH. Other companies, particularly SMEs, are able to join the ecosystem for a small fee (or without any fee), with a view to creating new public-private partnerships and B2B-relationships.[69]
The FCAI is aligned with the regional (Helsinki-Uusimaa Region) and the national (Finnish) strategies for digitising industry. In the region, FCAI can support industry renewal by utilising the opportunities provided by digitalisation, ICT and big data.[70]

2.8 Finland – Northern and Eastern Region

According to the latest Eurostat data (2018), the Northern and Eastern Region of Finland (Pohjois- ja Itä-Suomi) generated 20% (EUR 42.25 billion) of Finnish GDP (EUR 216.07 billion) in 2016.[71] The region has an employment rate of 71%, which is slightly below the EU28 average (72%), and an unemployment rate of 9.6% (2017), which is above the national average (8.6%) and the EU28 (7.6%). Tertiary educational attainment, as a percentage of the population aged 30-34, was 38% in 2017 (Eurostat, 2018). This is below both the national (44.6%) and the EU28 (40%) averages.[72]

Research, development and innovation (RDI) activities are strong in the information and communication technologies (ICT) sector especially in the Oulu-city region. The presence of high-tech companies such as Nokia has left a strong know-how on the whole territory. The first ICT science park was established in Oulu, and in fact, the Oulu Region has been recognised as a national centre for digital solutions. R&D in East & North Finland is also strong in other sectors such as clean technologies, circular economy and innovative technologies and production processes. These competencies, together with the strong ICT know-how are benefitting the emerging industries and growth sectors, like sustainable mining, bioeconomy and manufacturing industries. The challenge is to encourage and incentivise well-established and more traditional sectors such as machinery, forestry and paper production, to engage in R&D and innovation.[73]

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68 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

69 Finnish Center for Artificial Intelligence (FCAI). Information provided by FCAI in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

70 Ibid

71 Eurostat, Regional statistics by NUTS classification, Regional economic accounts: https://ec.europa.eu/eurostat/web/regions/data/database https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_2gdp&lang=en

72 European Commission, Regional Innovation Monitor, Northern and Eastern Finland: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/northern-and-eastern-finland

73 Ibid

R&D activity is relatively strong in the Northern and Eastern Region. The region's Gross Domestic Expenditure on R&D (GERD) amounted to EUR 1.05 billion in 2016, which accounted for 18% of total Finnish GERD. With a GERD of 2.5% of GDP in 2015, R&D investment in the region exceeded both the national (2.9%) and the EU28 (2%) averages. In 2015, the business enterprise sector accounted for 61.4% of R&D expenditure in the region, which is below the national average (66.7%).

Only three of the 14 universities in Finland are in the Northern and Eastern Region – University of Eastern Finland, University of Lapland and University of Oulu. In addition, there are seven applied science universities, as well as several public and private research institutes. This is reflected in the share of human resources in science and technology (46.2% of active population in 2017), which is significantly lower than the Finnish average of 52.4%, but slightly higher than the EU28 average of 44.8%. Overall however, the trend in the share of human resources in science and technology is positive, as the share has progressively increased from below 40% in 2010.[74]

The Northern and Eastern Region hosts 7 out of the 17 DIHs present in Finland. 6 of these hubs are fully operational and 1 is in the preparatory stage. The majority of these hubs (i.e. 6 out of 7) declare to have technical competencies in the field of Artificial Intelligence.[75]

The Smart Specialisation Strategy for East and North Finland identifies ICT and digitalisation as a priority and an important opportunity for the region and its businesses. The East and North Finland is part of the European Commission's 'Regions in Industrial Transition' Pilot Action. As part of the Pilot Action, the need for international collaboration was recognised by the regions, especially in the thematic areas closely linked to regions' smart specialisation strategies. Regions of East and North Finland are actively taking part to international partnerships and networks. Council of Oulu Region and the **SuperIoT** DIH are jointly committed to increasing the networking activities in the field of the Wireless ICT on the European level.[76]

2.9 France – Brittany

According to the latest Eurostat data (2018), the region of Brittany generated 4.23% of French GDP in 2016. In 2017, the region had an employment rate of 73%, which was slightly above the EU28 average (72%), and an unemployment rate of 7.3% (2017), which was considerably below the national average (9.4%) and slightly below the EU28 average (7.6%). Tertiary educational attainment, as a percentage of the population aged 30-34, was just under 40% in 2017, in line with the EU28 average (40%).[77]

The regional economy is renowned for its agriculture sector, which provided 4.5% of regional employment in 2016, significantly higher than the national average of 2.46% (Eurostat, 2018). Despite being known for its agriculture however, the Breton economy is mostly

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[74] Ibid

[75] European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

[76] Information provided by SuperIoT in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[77] European Commission, Regional Innovation Monitor, Brittany: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/brittany

orientated towards service activities. In 2017, the service sector provided 74% of regional employment (78% at national level). The industry sector is another key component of the regional economy. In 2017, the industry sector (including construction) accounted for 21% of regional employment, which was slightly above the national average (19%).[78]
The core sectors in Brittany are agri-food, automotive, shipbuilding and ICT. According to the Regional Strategy for Economic Development, Innovation and Internationalisation[79] (SRDEII 2014) for Brittany, each of these sectors is currently facing considerable challenges – e.g. market saturation, overcapacity of production (automotive), increased competition and costs (e.g. energy), resource issues (human resources, access to finance) – and need to undergo a restructuring process.[80]

There are seven competitive clusters based in the region: Pôle Image et Réseaux (ICT); Pôle Mer Bretagne – Atlantique (marine economy); Valorial (agri-food); ID4Car (automotive); EMC2 (production technologies); Vegepolys (plant production); and Atlanpole Biothérapie (health).

R&D in Brittany is supported by the "Bretagne-Loire" community of universities and institutes (Communauté d'Universités et d'Etablissements - ComUE). The community hosts the four main Breton universities (i.e. University of western Brittany, University of South Brittany, University of Rennes 1 and University of Rennes 2), as well as three other universities. National research institutes are also represented[81] [82].

The commercialisation of R&D results produced by public institutions are managed by the regional technology transfer accelerator company (Société pour l'Accélération des Transferts Technologiques – SATT). SATT is a public institution that identifies promising research projects and promotes them to private companies. ComUE is the main shareholder. It has a dedicated platform "Plug in Labs", which promotes public research to private companies.[83]
Research and innovation activities are mostly oriented towards the naval, telecommunication, automotive and food industries, which are considered to be among the strongest value chains of the region.[84]

Currently, there are 46 French DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 24 are fully operational and 22 are in the preparatory stage. Overall, thirty-two of these hubs list Artificial Intelligence and Cognitive Systems among their competencies. At regional level, Brittany hosts 5 DIHs, of which 3 is fully operational and 2 are in the preparatory stage. Three of these hubs in the region include Artificial Intelligence among their fields of specialisation.[85]

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[78] Ibid
[79] Regional Strategy for Economic Development, Innovation and Internationalisation, Brittany, 2014: https://www.bretagne.bzh/upload/docs/application/pdf/2013-12/srdeii_final.pdf
[80] Ibid – page 14.
[81] The national research institutes part of the community are the French Agency for Food, Environmental and Occupational Health & Safety (Agence Nationale de Sécurité Sanitaire de l'Alimentation, de l'Environnment et du Travail – ANSES); the National Centre for Scientific Research (Centre National de la Recherche Scientifique – CNRS); the French Research Institute for Marine Exploitation (Institut Français de Recherche pour l'Exploitation de la Mer Ifremer), whose headquarters are being transferred to Brest; and the French Institute for Research in Computer Science and Automation (Institut National de Recherche en Informatique et en Automatique – INRIA).
[82] European Commission, Regional Innovation Monitor, Brittany: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/brittany
[83] Ibid
[84] Ibid
[85] European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

Cooperation between DIHs and private and public sector stakeholders in the region is common practice and growing. Cooperation between regional DIHs can involve exhibitions, joint projects, cross-fertilisation and human and physical resource sharing. The actors involved are (the 6 first are included in the JRC Catalogue of DIHs) EMC2, ID2Santé, Atlanpole biothérapies, 7 technopoles de Bretagne, Photonics Bretagne, le pool French Tech Rennes Saint- Malo, IRT b<>com, IRT Jules Verne, ID4Car, S2E2, Novabuild, Végépolys, Valorial, Pôle Mer Bretagne Atlantique, Ouest média labs, Novabuild, Novalog, Moveo, Nucleopolis, CRAN, Agri'up, Normanide santé, gérontopole du Havre, Techsap ouest, Normandie énergies, and RFI.[86]

In terms of alignment with regional and national strategies, the **Images et reseaux-DIGIWEST** DIH, located in Brittany, has held the vice-presidency of the French Association of Competitiveness Clusters (Association Française des Pôles de Compétitivité) since 2017. The Association contributes to the Industry of the Future (IoF) National Plan to ensure that innovations, and particularly digital innovations, are aligned and properly utilised. The DIH has also held the Presidency of the Smart Energy French Clusters since 2015, actively contributing to the various Strategic Sectoral Committees (Comités Stratégiques de Filière, CSF) that deal with digital infrastructure, smart grid and electronics. The DIH is also involved with the Institute for Energy Transition (Institut pour la Transition Energétique), the photonics intercluster and the Professional Digital Union (syndicat professionnel du numérique). The DIH's activities are also aligned with the French national initiatives for digitising industry: Future Industrial Alliance (Alliance Industrie du Futur); Future Investments Programme (Programme des Investissements d'Avenir) and Digital Transformation (Transition Numerique).[87]

2.10 France – Île-de-France (Paris region)

According to the latest Eurostat data (2018), the Paris region generated 30.5% of French GDP in 2016. In 2017, the region had an employment rate of 73.5%, which was slightly above the EU28 average (72%), and an unemployment rate of 8.7%, which was lower than the national average (9.4%), but above the EU28 average (7.6%). Tertiary educational attainment, as a percentage of the population aged 30-34, was 59.5% in 2017, which was well above the EU28 average (40%).[88]

Regional employment is strongly orientated towards the services sector. Employment in services represents 87.6% of the region's total, compared to 78% at national level (Eurostat, 2018). Knowledge intensive business services account for a massive part of the jobs in this sector over the last 5 years. In 2017, they represented 53.1% of the total jobs, well above the French (46%) and European (40%) averages (Eurostat, 2018).[89]

Paris Region is the first industrial region in the country, in terms of number of jobs. Nevertheless, employment in the industry only represented 12% of the regional employment

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86 Images et Reseaux (I&R). Information provided by I&R in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

87 Ibid

88 European Commission, Regional Innovation Monitor, Île-de-France: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/ile-de-france-0

89 Ibid

in 2017, lower than the national share of 19% (Eurostat, 2018). In 25 years (1993-2017), the region has lost 50% of its industrial jobs while at the national level 30% of industrial jobs have been lost (INSEE, 2017). The key industries in the region include electronics and ICT, aeronautics, biotechnologies, finance, mobility, automobile, pharmaceuticals, and aerospace (InvestParisRegion, 2018).
In 2015, the share of companies with less than 9 employees in Paris Region represented 96.23% of the total number of companies. At the national level, the share of companies with less than 9 employees was quite similar and represented 96% (Eurostat, 2018).[90]

R&D in Paris Region is supported by world- renowned universities and élite schools. There are nine "communities" of universities and higher-education institutions in the Paris Region (Communauté d'Universités et d'Etablissements - ComUE): HÉsam[91], Sorbonne universités[92], Sorbonne Paris Cité[93], Paris Lumières[94], Paris Sciences et Lettres[95], Université Paris Seine[96], Université Paris-Est[97] and University Paris-Saclay.[98]

At regional level, the Île-de-France (Paris) Region hosts 8 DIHs, of which 4 are fully operational and 4 are in the preparatory stage. All eight hubs include Artificial Intelligence among their fields of specialisation.[99]

Cooperation between DIHs and private and public sector stakeholders in the region is growing. DIH cooperation is being developed, for example, as part of a trilateral cooperation initiative for Industry 4.0 between France, Germany and Italy. The actors involved are Alliance Industrie du Futur, Plattform Industrie 4.0 and Piano Industria 4.0. The initiative aims to provide policy recommendations at national level for the countries involved. **DIGIHALL**, the official DIH for the region, is a key participant in both the Alliance Industrie du Futur (hosting the national ecosystem innovation initiative, FactoryLab) and the trilateral cooperation initiative (focus on SME innovation and access to testbeds). As another example, another Parisien DIH, **TeraLab**, is developing a Joint AI Platform with TU München, through the German French Academy for Industry of the Future. The main goal is to support innovation and research between France and Germany and enrich the AI marketplace and AI services. The regions of Paris and Bavaria are also working on common economic development plans.[100]

2.11 Germany – Bavaria

According to the latest Eurostat data (2018), the region of Bavaria generated 18% of German GDP in 2016. The region has an employment rate of 82%, which is above the EU28 average (72%), and an unemployment rate of 2.3% (2017), which is well below the national (3.8%)

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[90] European Commission, Regional Innovation Monitor, Île-de-France: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/ile-de-france-0
[91] 5 higher-education institutions, training and research centres and corporate networks
[92] 10 higher-education institutions; training and research centres and corporate networks
[93] 15 higher-education institutions, training and research centres and corporate networks
[94] 2 higher-education institutions and one research centre
[95] 12 higher-education institutions, training and research centres and corporate networks
[96] 15 higher-education institutions, training and research centres and corporate networks
[97] 7 higher-education institutions, training and research centres and corporate networks
[98] Ibid
[99] European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool
[100] Information provided by DIGIHALL and TeraLab in their application forms (Expression of Interest) for participation in the DIH Network preparatory action.

and the EU28 (7.6%) averages. Most employees work in services (66.9%), followed by industry and construction (31.5%) and the agricultural sector (1.6%). These figures differ from the national averages (respectively 71.3%, 27.4% and 1.3%), indicating a strong emphasis on industry.[101] Across the seven sub-regions of Bavaria, tertiary educational attainment as a percentage of the population aged 30-34 was 35% in 2017, which is below the EU average (40%). However, the percentage varies from one Bavarian sub-region to another, from 30.6% in Schwaben to 48.3% in Oberbayern.[102]

In 2016, Bavaria was the second largest host of companies in Germany (619,311), behind North Rhine-Westphalia (716,004), with SMEs accounting for 99.6% of the total number of companies present in Bavaria (Statistisches Bundesamt, 2018). In 2017, Bavaria was the second largest exporting region in Germany, accounting for 19% of Germany's total exports (behind Baden-Württemberg with 20%).[103]

Bavaria's economy has undergone significant structural changes over the past 50 years, shifting from a traditional agricultural region towards one of Europe's most competitive industrial regions, featuring an important and growing services sector. Core industry sectors include automotive industries (including related supply chain sectors), electrical engineering, mechanical engineering, automation and robotics. In addition, Bavaria is one of the leading international regions for high-tech, information and communication technologies (ICT) and life sciences. Insurance and financial services and tourism are also important service sectors.[104]
Nevertheless, there are large regional economic disparities within Bavaria. The main economic activities are concentrated around the Munich area with several global players in the automotive industry (Audi, BMW, MAN, Knorr-Bremse), ICT (Siemens), media and publishing as well as a strong defence industry sector. Other important regional concentrations include Nuremberg, Augsburg and Ingolstadt.[105]

Currently, there are 55 German DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 29 are fully operational and 26 are in the preparatory stage. Overall, thirty-four of these hubs include Artificial Intelligence and Cognitive Systems among their technical competencies. At regional level, Bavaria hosts 6 DIHs, of which 2 are fully operational and 4 are in the preparatory stage. The majority of these hubs (i.e. 4 out of 6) declare to cover the field of Artificial Intelligence.[106]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. The **Munich Innovation Hub for applied AI** DIH aims to foster collaboration among different actors in the region with a specific focus on the field of Artificial Intelligence. In the pursue of its mission, the DIH works closely with the Cluster of Excellence hosted by the Technical University of Munich, promoting research in selected fields and building mutually beneficial

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101 European Commission, Regional Innovation Monitor, Bavaria: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/bavaria
102 European Commission, Eurostat, Regions, Statistics Illustrated: https://ec.europa.eu/eurostat/web/regions/statistics-illustrated
103 European Commission, Regional Innovation Monitor, Bavaria: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/bavaria
104 Ibid
105 Ibid
106 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

partnerships with an international profile and reach. Through its services, the HUB and the Cluster support digital transformation across all industries and society in Bavaria, backed by funding from the Bayern Digital I and II government framework programmes. These activities are also well aligned with a number of national digital industry initiatives, which include Industry 4.0, Digital Hub Initiative, Mittelstand 4.0, Autonomik für Industrie 4.0 and German AI.[107]

2.12 Germany – Rhineland-Palatinate

According to the latest Eurostat data (2018), the region of Rhineland-Palatinate generated 4.5% (EUR 140 billion) of German GDP in 2015. In 2017, the region had an employment rate of 68%, which is above the German average (64%) but below the EU28 average (72%). The regional unemployment rate of 3.3% (2017) was below the national average (3.8%) and well below the EU28 average (7.6%). The region's unemployment rate is actually the third lowest of all German states, just behind Bavaria and Baden-Württemberg. Tertiary educational attainment as a percentage of the population aged 30-34 was just under 30% in 2017, which is below the national average (34%) and well below the EU average (40%).[108]

Total exports from the Rhineland-Palatinate in 2017 accounted for 5.4% (EUR 54.9 billion) of total German exports according to the Federal Office of Statistics (Statistisches Bundesamt[109]). The total value of exports has increased by 36% since 2010 and Rhineland-Palatinate is now the sixth largest exporting region in Germany, behind Baden-Württemberg, Bavaria, North Rhine-Westphalia, Lower Saxony and Hesse.[110]

The region's main industries include chemicals, pharmaceuticals, automotive and mechanical engineering. Food and beverage are also significant sectors. For example, Rhineland-Palatinate is Germany's leading producer of wine, both in terms of grape cultivation and wine exports. Over recent decades, the state has undergone a significant sectoral shift towards a service economy. In 2017, most employees were working in services (71%), followed by industry (27.6%) and the agricultural sector (1.4%).[111]

Overall, the corporate landscape features a high number of specialised SMEs in industry and services sectors, as well as a few major multinational enterprises (e.g. BASF in Ludwigshafen). According the Federal Office of Statistics (Statistisches Bundesamt[112]), the region has the fourth largest share of SMEs of all German regions, behind Brandenburg, Schleswig-Holstein and Mecklenburg-Vorpommern. In 2016, 99.7% of all companies registered in Rhineland-

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107 Information provided by Munich Innovation Hub for Applied AI in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

108 European Commission, Regional Innovation Monitor, Rhineland-Palatinate: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/rhineland-palatinate

109 Federal Office of Statistics / Statistisches Bundesamt: https://www.destatis.de/DE/Home/_inhalt.html

110 European Commission, Regional Innovation Monitor, Rhineland-Palatinate: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/rhineland-palatinate

111 Ibid

112 Federal Office of Statistics / Statistisches Bundesamt: https://www.destatis.de/DE/Home/_inhalt.html

Palatinate were SMEs (160,002 out of 160,552 companies).[113]

Rhineland-Palatinate hosts 2 fully operational DIHs. Both the hubs include Artificial Intelligence among their technical competences.[114]

While cooperation between DIHs and private and public sector stakeholders in the region is gaining importance in size, it is mainly limited to publicly-funded collaborative project work. At regional level, the state government initiative 'Transferinitiative Rheinland-Pfalz' is a network of enterprises, research institutions, and universities. It is supported by the EU EFRE programme, the aim of which is to build partnerships to address specific topics such as 'Industrie 4.0'.[115]

The regional DIH, **DFKI Human Centric AI Innovation Hub**, is also directly involved in a number of cooperation initiatives. The DFKI is part of the 'Mittelstand Digital' Initiative[116] as a partner of the 'Mittelstand 4.0 Competence Centre Kaiserslautern' (German Federal Ministry for Economic Affairs and Energy). The national network of Mittelstand 4.0 Competence Centres acts as one-stop-shops to help SMEs in local ecosystems to go digital. The DFKI is a key partner within the national strategy for artificial intelligence 'AI Made in Germany' of the German Federal Government. DFKI is partner of two communities initiated by the European Institute of Innovation and Technology (EIT). The DFKI is also a founding member of the "Confederation of Laboratories for Artificial Intelligence Research in Europe (CLAIRE)", which now has more than 2300 supporters. [117]

2.13 Germany – Saxony-Anhalt

According to the latest Eurostat data (2018), the region of Saxony-Anhalt generated 1.9% of German GDP in 2016. The region has an employment rate of 77%, which is above the EU28 average (72%). The region's unemployment rate of 6.9% (2017) is above the average for Germany (3.8%) but below the EU28 average (7.6%). Most employees work in the service sector (70%), followed by industry and construction (28%) and the agricultural sector (2%). Tertiary educational attainment in Saxony-Anhalt as a percentage of the population aged 30-34 was 20% in 2017, which was almost half the EU average (40%) and 13 percentage points below the national average (34%).[118]

The latest data published by the Federal Office of Statistics (Statistisches Bundesamt[119]) shows that there were 75,457 companies in Saxony-Anhalt in 2016, accounting for 2.2% of the total number of companies in Germany. The core sectors in the region of Saxony-Anhalt

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[113] European Commission, Regional Innovation Monitor, Rhineland-Palatinate: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/rhineland-palatinate

[114] European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

[115] Information provided by DFKI Human Centric AI Innovation Hub in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[116] Mittelstand Digital Initiative: https://www.mittelstand-digital.de/MD/Navigation/DE/Home/home.html

[117] Information provided by DFKI Human Centric AI Innovation Hub in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[118] European Commission, Regional Innovation Monitor, Saxony Anhalt: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/saxony-anhalt

[119] Federal Office of Statistics / Statistisches Bundesamt: https://www.destatis.de/DE/Home/_inhalt.html

include logistics, renewable energy and chemical industries. Bayer, Total, and Dow Chemical are some of the important corporations located in the region. The cities of Halle, Merseburg and Bitterfeld are the main economic engines in Saxony-Anhalt. Together with Leipzig and Schkeuditz in Saxony, they are known as the 'Chemical Triangle' because of the strong concentration of chemical and oil refining industries in these areas.[120]

The region's R&D infrastructure features two universities (Martin-Luther University in Halle and Otto von Guericke University in Magdeburg), as well as five public and three private universities of applied sciences and art academies. Non-university and private research institutions also play a significant role in regional scientific and research activities. Five institutes of the Leibniz Association, three Max Planck institutes, six institutes and centres of the Fraunhofer Gesellschaft, the Helmholtz Centres for Environmental Research (UFZ) as well as the Magdeburg site of the German Centre for Neurodegenerative Diseases (DZNE) are located in the region.[121]

At regional level, Saxony-Anhalt hosts 1 fully operational DIH, which includes Artificial Intelligence among its focus topics.[122]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. Regional/inter-regional initiatives to support cooperation between DIHs and digitising industries are not yet in place. However, the **Virtual Development and Training Centre (VDTC) at Fraunhofer IFF** has taken advantage of a national initiative to increase the participation of Central European stakeholders in the European Research Area. The initiative, named ERA Net Bridge2ERA and entrusted by the German Federal Ministry of Education and Research (BMBF), aims at improving the integration of Central, Eastern and South Eastern European countries through joint research and innovation projects. VDTC at Fraunhofer IFF expects to start a project next year, funded through the BMBF's Bridge2ERA, to establish a DIH network on Digital Engineering. [123]

At regional level, the activities of the DIH are mainly carried through the activities of the two Mittelstand4.0-Kompetenzentren "vernetzt.wachsen" and "Planen und Bauen". The European/international activities of the DIH are carried solely through the Fraunhofer IFF as the funding structure of Mittelstand Digital does not allow for international outreach activities. At national level, the DIH engages in collaboration with the network of SME4.0 Competence Centres, taking the form of exchanges and joint conferences.[124]

2.14 Greece – Central Macedonia

According Eurostat data of 2018, the region of Central Macedonia generated 14% of Greek GDP in 2016. In 2017, the region had an employment rate of 56%, which is well below the EU28 average (72%). The region's unemployment rate of 23% (2017) is above the national

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120 European Commission, Regional Innovation Monitor, Saxony Anhalt: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/saxony-anhalt

121 Ibid

122 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

123 Information provided by VDTC at Fraunhofer IFF in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

124 Ibid

average (21.5%) and well above the EU28 average (7.6%). Tertiary educational attainment, as a percentage of the population aged 30-34, was nearly 47% in 2017, which is above the EU average (40%).[125]

Due to the economic crisis in 2008, the region's unemployment rate reached just over 30% in 2013. A number of factors combined to exacerbate the impact of the crisis. They included a sharp fall in consumer demand across a range of sectors (tourism, services, construction and industry), existing structural weaknesses in the economy, and a lack of private sector investment in what are often low value-added and low innovation sectors. Significant delays over the previous decade to key infrastructure projects, such as roads, airports and metro systems, also acted as an inhibitor to business investment and growth. The region's recovery requires solutions to a number of important structural challenges, such as economic reforms, improvements to productivity, infrastructure, innovation and investment.[126]

The most important services sectors in the region are financial services, transport and communications, recreational, tourism and transport services. The manufacturing sector is dominated by medium to low technology intensive sectors, such as the food industry, textiles and clothing, non-metallic mineral products and furniture where the majority of firms are SMEs. Larger companies are found in industries such as metal production, chemicals and plastics. The main exporting sectors are textiles, food and beverage, chemicals and plastics.[127]

The region's R&D infrastructure includes Aristotle University of Thessaloniki (AUTh), University of Makedonia, International Hellenic University, Alexander Technological Educational Institute (TEI) of Thessaloniki and the TEI of Kentriki Makedonia. Other key R&D actors in the region include Thessaloniki Technology Park and the Centre for Research and Technology Hellas (CERTH), which is a national centre of excellence that also forms part of the European Research Area (ERA).[128]

Currently, there are 14 Greek DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 9 are fully operational and 5 are in the preparatory stage. Overall, eight of these hubs declare technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, Central Macedonia hosts 5 DIHs in total. Among these, 3 DIHs are fully operational, while 2 DIHs are in the preparation stage. Two of these hubs declare to cover the field of Artificial Intelligence.[129]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. The **nZEB Smart Home** DIH led by ITI-CERTH collaborates with more than 200 national organisations, including all Greek universities and research centres, more than 70 private sector companies (SMEs to large companies, especially in engineering and ICT), public sector organisations (municipalities, hospitals, etc.) and industrial user partners.[130]

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125 European Commission, Regional Innovation Monitor, Central Macedonia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/region-kentriki-makedonia

126 European Commission, Regional Innovation Monitor, Central Macedonia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/region-kentriki-makedonia

127 Ibid

128 Ibid

129 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

130 Information provided by nZEB Smart Home (ITI-CERTH) in their application form (Expression of Interest)

At regional level, CERTH is also collaborating with the Alexander Innovation Zone S.A., which is a hub that brings together local universities, research institutes, and incubators to support and connect cutting edge research and innovative businesses. As part of the Innovation Zone, ITI-CERTH promotes research and innovation, and builds technology transfer partnerships to help turn research results into commercial products.[131]

2.15 Ireland – Eastern and Midlands Region

According to the latest data from the Central Statistics Office (CSO), the Eastern and Midlands Region generated over 50% of Irish GDP in 2014. In 2017, the region had an employment rate of 73%, which was just above the EU28 average (72%). In 2016, the unemployment rate of 12.4% (2016) was marginally better than the national average (12.9%), but considerably higher than the EU28 average (7.6%).[132] Tertiary educational attainment in the Eastern and Midlands Region as a percentage of the population aged 30-34 was 58% in 2017, well above the EU average (40%).[133]

The economy is diverse and includes sectors such as ICT, entertainment, financial and business services, bio-pharma, medical and clean technologies, industrial products and chemicals. Although the services sector (ICT, retail, finance and business) dominates the landscape of the national and regional economy, the region also has an abundance of natural assets, as well as renewable energy, tourism and maritime potential.[134]

The region's R&D infrastructure brings together a cluster of universities, institutes and research centres, both public and private, that help to support innovation across the region. There is a robust enterprise base made up of traditional and emerging sectors. This extends from the horticultural heartland of north Dublin, agri-business in the Midland and Eastern sub-regions, with special emphasis on the bloodstock industry in the Eastern sub region, to ICT and financial services in Dublin.[135]

Despite the presence of several internationally recognised clusters, such as medical devices and software, technology and life sciences, a study commissioned by the Border Midland and Western (former region) operational programme (OP) 2014-20 has highlighted the low level of overall R&D activities currently taking place in the region.[136]
The region hosts third-level institutions that include 10 universities and 10 technology institutes. These institutions have created links and synergies with industry by offering extensive research capabilities.[137]

Currently, there are 12 Irish DIHs registered in the Digital Innovation Hubs (DIH) Catalogue,

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for participation in the DIH Network preparatory action.

[131] Ibid

[132] European Commission, Regional Innovation Monitor, Eastern and Midlands, Ireland: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/eastern-and-midlands

[133] European Commission, Eurostat, Regions, Statistics Illustrated: https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

[134] European Commission, Regional Innovation Monitor, Eastern and Midlands, Ireland: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/eastern-and-midlands

[135] Ibid

[136] Ibid

[137] Ibid

of which 6 are fully operational and 6 are in the preparatory stage. Overall, five of these hubs list Artificial Intelligence and Cognitive Systems among their technical competencies. At regional level, the Eastern and Midlands Region hosts 5 DIHs, of which 3 are fully operational and 2 are in the preparatory stage. The majority of these hubs (i.e. 3 out of 5) declare to cover the field of Artificial Intelligence.[138]

Regional or national initiatives to support DIH cooperation are not yet in place in Ireland. Nonetheless, the DIHs tend to cooperate as common practice with their respective ecosystems. For example, **CeADAR**, as the National Technology Centre for Applied Data Analytics and Artificial Intelligence, has developed links with some of the other Technology Centres to combine their domain knowledge in specific areas with CeADAR's expertise on different fields of AI. The CeADAR centre DIH has over 80-member companies, equally comprising multinationals and SMEs, and it plans to double their industry member base. The hub runs a demonstrator programme twice a year that generates a lot of engagement from industry, with upwards of 45 companies actively participating in the programme. In addition, CeADAR undertakes translational AI applied research which in 2018 alone saw the centre work on 20 separate high-TRL (technology readiness level) projects with companies.[139]
CeADAR is a main plank in Ireland's Smart Specialisation Strategy. The centre is directly funded by the Department of Business, Enterprise and Innovation through its two main industry agencies, Enterprise Ireland (EI) and the Industrial Development Authority (IDA) which are in charge of the S3 R&I strategies and priorities for Ireland. Members of these bodies sit in CeADAR's steering committee and employ CeADAR as the instrument to get the pulse of industry, in terms of Data Analytics and AI for a large range of verticals. Indeed, last year, CeADAR has been going through an international review process where it has been referred as a key contributor to the digital transformation of Ireland's industry. As part of this review, the centre has recently received funding from the State Agencies of EUR 12 million for the 2019-2023 period to drive its Data Analytics and Artificial Intelligence agenda.[140]

2.16 Italy - Friuli Venezia Giulia

According to the latest Eurostat data (2018), the region of Friuli Venezia Giulia generated 2.2% of Italian GDP in 2016. In 2016, the region had an employment rate of 66%, which was above the national average (58%) but below the EU28 average (72%). In 2016, the region's unemployment rate of 6.8% was below the EU28 average (7.6%) and considerably below the national average (11.4%). Tertiary educational attainment in Friuli Venezia Giulia as a percentage of the population aged 30-34 was 29% in 2017, which was well below the EU average (40%).[141]

The regional economy has historically been driven by industrial clusters of SMEs working in traditional sectors such as furniture, electrical appliances and agri-food. More recently, commerce, retail, banking and services have become the most important drivers of growth,

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138 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

139 National Centre for Applied Data Analytics and Artificial Intelligence (CeADAR). Information provided by CeADAR in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

140 Ibid

141 European Commission, Regional Innovation Monitor, Friuli Venezia Giulia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/friuli-venezia-giulia

in part due to the strategic position of the region.[142]

The region's manufacturing sectors include furniture (wood), metal products, machinery and equipment, electrical and non-electric household appliances, food and beverage, other non-metallic mineral processing products, metallurgy and shipbuilding. Some of these sectors converge in supply chains with a high capacity for growth and innovation, e.g. such as agri-food, domestic appliances (home system) and metalworking.[143]

The regional innovation system comprises a broad range of public and private education providers, research institutes and organisations. The higher-education system includes the universities of Udine and Trieste, and the International School for Advanced Studies (SISSA), which carries out research in mathematics, physics and in new cutting-edge disciplines, such as cognitive neuroscience and neurobiology. In Trieste, the Area Science Park is one of the most relevant Italian S&T Parks. It is a research-driven multi-disciplinary cluster that specialises in life sciences and bio-medicine, physics, materials and nanotechnology, electronics and ICT, environment and energy. Other relevant regional innovation actors include the Technology Pole of Pordenone (which hosts over 40 innovative enterprises) and the Technology District of Molecular Bio-medicine (which is co-funded by the Ministry of Research).[144]

Currently, there are 54 Italian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 38 are fully operational and 16 are in the preparatory stage. Overall, 39 of these hubs list Artificial Intelligence and Cognitive Systems among their technical competences. At regional level, Friuli Venezia Giulia hosts 4 DIHs, of which 3 are fully operational and 1 is in the preparatory stage. Most of these hubs (i.e. 3 out of 4) include Artificial Intelligence among their fields of specialisation.[145]

Area Science Park coordinates the regional DIH **IP4FVG**. EUR 4 million of government funding is being provided to support the work of the regional platform over a three-year period, and by extension, to help develop and implement the national Impresa 4.0 network. More funding will be made available to ensure the DIH and its regional platform are sustainable.[146]
As an advisory partner to the regional government and a participant in two national technology clusters (Ambient Assisted Living, and Energy), Area Science Park is also closely involved in the evolution of the National S3 Strategy.[147]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. A Protocol Agreement was signed on the 1st of March 2018 by the Regional Government of Friuli Venezia Giulia, the Italian Ministry of Research and the Italian Ministry for Economic Development. The Agreement supports the Strategic Plan developed by Area Science Park to unite, coordinate and finance different DIHs under the DIH IP4FVG (Regional Platform for the Digital Transformation of Friuli Venezia Giulia).[148]

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142 European Commission, Regional Innovation Monitor, Friuli Venezia Giulia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/friuli-venezia-giulia
143 Ibid
144 Ibid
145 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool
146 Information provided by Area Science Park IP4FVG in their application form (Expression of Interest) for participation in the DIH Network preparatory action.
147 Ibid
148 Information provided by Area Science Park IP4FVG in their application form (Expression of Interest) for

2.17 Italy - Lombardy

According to the latest Eurostat data (2018), the region of Lombardy generated 20% of Italian GDP in 2016. In the same year, the region had an employment rate of 65%, which was above the national average (64%) but below the EU28 average (73%). The region's unemployment rate of 6.5% (2016) was below the EU28 average (7.8%) and well below the national average (11.4%). Tertiary educational attainment in Lombardy as a percentage of the population aged 30-34 was 34% in 2017, which was above the national average (27%), but below the EU average (40%).[149]

The region's business demography is dominated by SMEs, in addition to a few very large firms. In 2017, almost 40% of the total number of firms in the region were based in Milan and its province. In the same year, 67% of the regional workforce were employed in services, 32% in industry and 1% in agriculture.[150]

The regional economy of Lombardy features a wide variety of industries, from traditional sectors, such as agriculture and livestock, to heavy and light industries. The service industry has also grown in recent decades. Lombardy's production system is still one of the most developed in Italy and Europe. At the end of 2012, there were 71.2 enterprises per 1,000 inhabitants, one of the highest rates of entrepreneurship in Europe (43,8 enterprises per 1,000 inhabitants), of which more than 99% were SMEs.[151]

Lombardy's main sectors include mechanical engineering, electronics, metallurgy, textiles, chemicals and petrochemicals, pharmaceuticals, food, publishing, footwear and furniture. The service sector is also well established and is mainly focused on international trade and financial services. The Italian Stock Exchange, one of the main European stock markets, is based in Milan, and the Milan Trade Fair is the largest exhibition space in Europe. Tourism is also an important sector.[152]

The regional R&D infrastructure comprises 13 public and private education and research institutes (six public universities, one technical university and six private universities), as well as the university high school (IUSS of Pavia), all of which support regional innovation system. In 2017, Lombardy also had more than 90 university spin-offs, representing 7% of all Italian spin-offs (Netval – Network for the enhancement of university research - Database, 2018[153]). By the second quarter of 2018, there were 2,286 start-ups in Lombardy (the highest number in Italy), representing 24% of the total number of start-ups in Italy. In addition, approximately three quarters of the member companies of the Italian Private Equity and Venture Capital Association (AIFI) are located in Lombardy.[154]

At regional level, Lombardy hosts 6 fully operational DIHs. Most of these hubs (i.e. 5 out of

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participation in the DIH Network preparatory action.

149 European Commission, Regional Innovation Monitor, Lombardy: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/lombardy

150 Ibid

151 Ibid

152 Ibid

153 Netval – Network for the enhancement of university research: https://netval.it/ https://netval.it/database-brevetti-spinoff/database-brevetti-spin-off/ https://www.spinoffitalia.it/

154 European Commission, Regional Innovation Monitor, Lombardy: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/lombardy

6) declare to have technical competences in the field of Artificial Intelligence.[155]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. The Lombardy Region is part of the EU Strategy for the Alpine Region (EUSALP). EUSALP adopts a long-term macro-regional strategy designed to improve cross-border cooperation between Alpine States and regions.[156]
Part of the EUSALP Strategy is to develop and support synergies in existing initiatives, such as the Digitising European Industry Strategy (DEI) and Digital Innovation Hubs, as well as initiatives at regional or national level (e.g. Italy's National Industry 4.0. Plan).[157]

DIH Lombardia was established by the Italian National Manufacturing Association Confindustria in the context of the Italian National Industry 4.0 Plan and it is the regional DIH for the territory of Lombardy. Key partners of the DIH include the local Manufacturing Associations operating in the region as well as technical university Politecnico Milano (Polimi), one of the other five DIHs operating in Lombardy which plays a central role in the research and scientific innovation system of the region. The mission of DIH Lombardy is to facilitate and create new connections between research and industry and to support companies, in particular SMEs, with regards to their digital strategies. The Industry 4.0 Plan itself is one of the initiatives recognised by the DEI Strategy. Cooperation activities that are relevant to DIH Lombardy include EUSALP, Regiotex, EEN (Enterprise Europe Network), EIT Manufacturing and Vanguard.[158]

2.18 Italy - Tuscany

According to the latest Eurostat data (2018), the region of Tuscany generated 6.7% of Italian GDP in 2016. In 2017, the region had an employment rate of 71%, which is only one percentage point below the EU28 average (72%). The Tuscan unemployment rate of 8.8% (2017) was above the EU28 average (7.6%). Tertiary educational attainment in Tuscany as a percentage of the population aged 30-34 was 28% in 2017, which was above the national average (27%), but below the EU average (40%).[159]

In 2015, there were approximately 414,324 active businesses in Tuscany (Unioncamere Toscana, 2018[160]). Three quarters of those companies operate within service sectors such as trade, transport and hospitality (e.g. hotels). The other significant sectors for regional businesses are industry (12%) and construction (11%). In industry, regional firms specialise in textiles, leather, footwear and clothing, agri-food, stone and marble, chemistry and oil, and mechanics. New specialisations are also emerging, such as the growing software industry around Pisa. In contrast, manufacturing sectors continue to experience falls in sales and

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155 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

156 Information provided by DIH Lombardy in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

157 Ibid

158 Ibid

159 European Commission, Regional Innovation Monitor, Tuscany: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/tuscany

160 Unioncamere Toscana, 2018: http://www.tos.camcom.it/

production levels.[161]

R&D expenditure in Tuscany is close to the national average but is considerably below the EU average. Low levels of private sector investment in R&D is negatively affecting regional performance, which is lower than in more advanced Italian regions. In 2015, private sector R&D expenditure equated to just 0.73% of GDP. In the same year, public R&D expenditure equated to 0.57% of GDP, the majority of which was accounted for by local universities. The predominance of small businesses working in traditional sectors and the lack of large enterprises and multinationals in the region provide some explanation for the lack of private sector investment in R&D within the region.[162]

At regional level, Tuscany hosts 3 DIHs, of which 2 are fully operational and 1 is in the preparatory stage. All three hubs declare to have technical competencies in the field of Artificial Intelligence.[163]

The ECHORD++ Project helped create three DIHs located in different European countries, i.e. the **RIF BioRobotics Institute** DIH in Tuscany, Italy, the Interactive Robotics Laboratory of CEA LIST DIH in France and the Bristol Robotics Laboratory's RIF DIH in the UK. Their activities were coordinated by the Technical University of Munich in Germany. Following up on the experience of the ECHORD++ project, **ARTES4.0** was established as a new DIH in the framework of the National Industry 4.0 Plan. ARTES4.0 comprises 13 Macro-Nodes and 40 Nodes from all over Italy and collaborates with 127 partners including academic and industrial entities. The RIF BioRobotics Institute DIH, together with the University of Sant'Anna, operates as one of the Macro-Nodes of ARTES4.0, with a focus in the field of collaborative robotics.[164]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. At regional level, the Tuscan government is supporting both the Regional Digital Innovation Hub model and the development of the 'Tuscan Industry 4.0 Platform', both of which fit within the framework of the region's Research and Innovation Strategy for Smart Specialisation (RIS3).[165]

Cross-border cooperation opportunities are primarily through the networks established under the ECHORD++ Project and the ARTES4.0 Competence Centre.

2.19 Latvia – Latvia Region

According to the latest Eurostat data (2018), Latvia achieved a GDP of EUR 25.04 billion in 2016.[166] In 2017, Latvia had an employment rate of 75%, above the EU28 average (72%),

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161 European Commission, Regional Innovation Monitor, Tuscany: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/tuscany

162 Ibid

163 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

164 Robotics Innovation Facility (RIF), BioRobotics Institute. Information provided by RIF in the questionnaire on their Business and Operating Model filled in the context of the AI DIH Network project

165 Robotics Innovation Facility (RIF), BioRobotics Institute. Information provided by RIF in their application form (Expression of Interest) for participation in the DIH Network preparatory action

166 Eurostat, National accounts, GDP and main components: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_gdp&lang=en

and an unemployment rate of 8.7% (2017), also above the EU28 average (7.6%). Tertiary educational attainment in Latvia, as a percentage of the population aged 30-34, was 44% in 2017, above the EU average (40%).[167]

Latvia's core sectors include timber and wood, metalworking and mechanical engineering, transport and logistics, ICT and related business services, chemical and pharma, electronics, green tech, healthcare, life sciences and food processing.[168] Latvia's research infrastructure features 21 public research institutions that are funded from the State budget and 48 private research institutions.[169]

Currently, there are 4 Latvian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 3 are fully operational and 1 is in the preparatory stage. All of these hubs list Artificial Intelligence and Cognitive Systems among their fields of specialisation. At regional level, the Region of Riga hosts 3 DIHs, of which 2 are fully operational and 1 is in the preparatory stage.[170]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. In addition to support opportunities provided at EU level, such as COSME, Interreg BSR and Horizon 2020, there exist some national initiatives that focus on DIHs and industry digitalisation. A recent example was launched in early 2019 in cooperation with key IT companies in Latvia. The 'Building a digital country' initiative provides support to DIH affiliates in the regions to help them to grow, it supports digital skills for the ecosystem and innovation. Potential partners include local and international NGOs, IT and tech companies (start-ups, scale-ups, SMEs, mid-caps and large), vendors, influencers, media, universities, research centres and government bodies.[171]

The **Latvian IT Cluster** DIH is helping to implement the national Smart Specialisation Strategy to support economic transformation and move towards the production of higher value-added goods and services, as well as a more efficient use of resources, with ICT as a core specialisation. The activities of the DIH are also aligned with Latvian National Industrial Policy Guidelines 2014 -2020 which aims to promote structural changes in the economy by increasing the role of industry, to support innovation, build an innovation and export culture, and develop more modern industry and service sectors. The DIH is also aligned with RIS3 strategies to promote a smart, sustainable and inclusive economy, particularly in relation to industrial modernisation, agri-food and digital transformation.[172] In addition, the Latvian IT Cluster DIH is currently working with the Ministry of Economics and the Ministry of Environmental Protection and Regional Development to draft a National Digitalisation and DIH policy for Latvia.[173]

The ecosystem of the Latvian IT Cluster DIH includes a wide range of public and private sector

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167 European Commission, Eurostat, Regions, Statistics Illustrated: https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

168 Latvian Investment and Development Agency, Sectors and Industries: http://www.liaa.gov.lv/en/invest-latvia/sectors-and-industries

169 Latvian Ministry of Education and Science, Research institutions: https://www.izm.gov.lv/en/research-institutions

170 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

171 Information provided by the Latvian IT Cluster DIH in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

172 Ibid

173 Ibid

organisations. In the public sector component includes government ministries, the Latvian Investment and Development Agency, and a range of education providers and research institutes. The private sector component involves about 1,000 companies (700 industry and 300 ICT companies), as well as a range of industry associations.[174]

2.20 Lithuania – Capital Region (Vilnius)

According to the latest Eurostat data (2018), the Capital Region generated 41% of Lithuanian GDP in 2016.[175] In 2017, the region had an employment rate of 81%, well above the EU28 average (72%), and an unemployment rate of 4.8%, well below the EU28 average (7.6%). Tertiary educational attainment in the Capital Region, as a percentage of the population aged 30-34, was 72% in 2017, which was well above the EU average (40%).[176]

Lithuania's core sectors include business services (for finance, ICT and manufacturing sectors), ICT technologies (e.g. fintech, cybersecurity, gaming and data centres), and manufacturing (e.g. automotive components, industrial machinery and aircraft maintenance, repair and overhaul (MRO), mechanical engineering, chemicals), as well as woodworking, agri-food, construction and transport.[177]

Lithuania's research infrastructure features 22 universities (14 public and 8 private), 23 colleges (13 public and 10 private), 11 public research institutions, and 5 integrated science, study and business centres.[178]

Currently, there are 16 Lithuanian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 15 are fully operational and 1 is in the preparatory stage. Overall, eleven of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, the Capital Region (Vilnius) hosts 14 DIHs, of which 13 are fully operational and 1 is in the preparatory stage. 9 of these hubs include Artificial Intelligence among their fields of specialisation.[179]

Cooperation between DIHs and private and public sector stakeholders in the region is growing. At present, cooperation is mainly limited to publicly-funded collaborative project work (e.g. Interreg projects) or private initiatives. There are no formal support instruments in place in Lithuania to reinforce DIH cooperation. However, the Ministry of Economy operates an informal working group to which all DIHs are invited to participate in three or four times a year. The working group get together periodically to debate and decide on relevant policies and policy measures. Cooperation is based on trust and opportunities such as upcoming

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174 Ibid

175 Eurostat, Regional statistics by NUTS classification, Regional economic accounts, GDP indicators, GDP at current market prices by NUTS 2 regions:
https://ec.europa.eu/eurostat/web/regions/data/database
https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_2gdp&lang=en

176 European Commission, Eurostat, Regions, Statistics Illustrated:
https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

177 Invest Lithuania, Key sectors:
https://investlithuania.com/key-sectors/

178 Planipolis, Higher Education and Research Reform in Lithuania, 2011:
https://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/lithuania_he_research_reform_2011.pdf

179 European Commission, Smart Specialisation Platform, DIH Catalogue:
https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

events, international missions and foreign delegation activities.[180]

The **Lithuanian Robotics DIH (LTroboticsDIH)** is currently focused on the manufacturing industry. Of the 6,948 manufacturing companies in Lithuania (potential end-users) and 2,361 ICT-related companies (potential solution providers), the DIH considers there are about 200 companies ready to receive DIH services and a further 1,000 that will be ready in the future. In the long term, the DIH also intends to focus on areas such as healthcare and agriculture.[181]

2.21 Netherlands – North Brabant

According to the latest Eurostat data (2018), the region of North Brabant generated 15% of Dutch GDP in 2016.[182] In 2017, the region had an employment rate of 80%, which was above the EU28 average (72%). In the same year, the region's unemployment rate of 4.2% was below the national average (4.9%) and well below the EU28 average (7.6%). Tertiary educational attainment in North Brabant as a percentage of the population aged 30-34 was 45.5% in 2017, above the EU average (40%).[183]

Industry, wholesale and transport are the region's main exporting sectors. The economy of Noord-Brabant is rather cyclical sensitive. The economy was hit harder than the rest of the Netherlands by dotcom and the recent credit-crunch crisis, although it recovered faster. The GDP per inhabitant of the region (38800 PPS) is slightly above the Dutch average, which is above EU28 average, but below leading regions in Europe (Eurostat, 2018).[184]

Almost half of regional employment is provided by public services (25.4%) and wholesale trade (18.8%). Industry (14.6%) and professional services sectors (11.5%) also employ a significant proportion of the population. The top sectors – High Tech Systems and Materials (25% of total production), Lifesciences & Health (51%) and Agri-Food (19%) – are relatively large in North Brabant compared to the rest of the Netherlands. Except for logistics and distribution services, the service sector is less well developed.[185]

The city of Eindhoven and its surroundings are also known as 'Brainport' because of the strength of important high-tech companies that are in the area. Examples include Philips; the world leading wafer stepper manufacturer, ASML (machines for making chips); the machine industry conglomerate, VDL Group; the medium-sized chip manufacturer (NXP); and the leading truck manufacturer, DAF Trucks. The Brainport region is the most R&D intensive region of the Netherlands, mostly driven by private sector R&D investment.[186]

Noord-Brabant has two universities (Eindhoven University of Technology (TU/e) and Tilburg University) and three universities of applied sciences (Avans University of Applied Sciences, NHTV Breda and HAS Den Bosch), as well as the Design Academy Eindhoven. Important public

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180 Information provided by the Lithuanian Robotics DIH in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

181 Ibid

182 European Commission, Regional Innovation Monitor, North Brabant: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/north-brabant

183 European Commission, Eurostat, Regions, Statistics Illustrated: https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

184 European Commission, Regional Innovation Monitor, North Brabant: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/north-brabant

185 Ibid

186 Ibid

research institutes are TNO Industry & Technology, Holst Centre (a public-private research institute on electronics) and several research institutes with strong academic relations (e.g. Dutch Polymer Institute (DPI), Centre for Translational Molecular Medicine (CTMM)).[187]

The most important private research location is the High-tech campus in Eindhoven, with 163 high tech companies, including Philips Research. The Automotive Campus of Helmond, also part of the Brainport region, is the national and international hotspot for automotive and smart mobility, including 500 engineers and researchers, 30 companies and 25 testing facilities. The Brainport Region is the number 1 region regarding patents in Europe.[188]

Currently, there are 41 Dutch DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 23 are fully operational and 18 are in the preparatory stage. Overall, twenty-three of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, North Brabant hosts 9 DIHs, of which 7 are fully operational and 2 are in the preparatory stage. Five of these hubs list Artificial Intelligence among their fields of specialisation.[189]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. The **Smart Industry Hub South Netherlands** DIH (Smart Connected Suppliers Network) is part of a wider network of Hubs being established under the Smart Industry Hub initiative in five regions in the Netherlands to improve knowledge sharing and to make Dutch industry more competitive. Through its services the DIH supports the growth of a smart supplier ecosystem that integrates AI solutions and technologies to foster and facilitate data management. The Ministry of Economic Affairs and Climate and the provinces contribute financially to the initiative. In South Netherlands, the Brabant Development Agency is responsible for coordination.[190]

Concerning cross-border and cross-regional cooperation activities, the **Smart Industry Hub South Netherlands** DIH is actively involved at national and European level through different initiatives, including the Smart Industry Hub programme, a Memorandum of Understanding in place with its sister programme in Germany, Plattform Industrie 4.0, and leveraging on long standing links with the Belgian Flanders Make Programme.[191]

2.22 Norway[192]

According to the latest European Innovation Scoreboard (2019), Norway score has continued to improve over the last seven years relatively to the aggregated results of EU. Overall, the country economic indicators tend to be in line with to the EU average, with some exceptions. In particular, the country reports a significantly higher GDP per capita when compared to the

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187 European Commission, Regional Innovation Monitor, North Brabant: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/north-brabant

188 Ibid

189 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

190 Information provided by the Smart Industry Hub South Netherlands in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

191 Ibid

192 Since the Digital Innovation Hub SINTEF operates on a national scale, it was deemed as more relevant to focus the analysis of the regional context on Norway rather than on a specific NUTS 2 region

EU average.[193]

Norway's core sectors include oil and gas, maritime (e.g. shipbuilding), energy and clean-tech, manufacturing and process industries, metals and minerals (including mining), healthcare, electric mobility, bio-tech, finance and ICT, construction, data centres and seafood, amongst others.[194]

Approximately 30,000 Norwegian businesses have between 20 and 250 employees. This forms the backbone of financial activity in the region and approximately 5,200 of those businesses are active in the Industry, Power, Utilities, Construction and Mining.

Norway has a strong R&D infrastructure which features 7 universities, 9 specialised university institutions, 22 university colleges, 2 national colleges of the arts and several private higher education institutions.[195]

Currently, there are 8 Norwegian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 5 are fully operational and 3 are in the preparatory stage. Overall, five of these hubs list Artificial Intelligence and Cognitive Systems among their technical competencies. At regional level, Trondheim hosts 1 fully operational DIH. This hub declares to cover the field of Artificial Intelligence.[196]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. The Norwegian Ministry of Commerce has established a strategic working group called Digital21 to provide recommendations on digital transformation in Norway. The group has recommended the set-up of a national AI strategy, which the Government has committed to create by mid-2019. The Norwegian Open AI Lab is currently the most active and developed collaboration initiative in Norway on AI. SINTEF is one of the two research partners in this lab and together with NTNU, they are leading the strategic direction for AI and are defining focal areas of research.[197]

In Norway, **SINTEF** is working closely with DIH DigitalNorway to support both SME and large enterprises in digital initiatives. SINTEF AS is one of the owners of DigitalNorway. SINTEF is also a DIH in its own right, based in Trondheim in the Region of Trondelag. In partnership with the DigitalNorway DIH, SINTEF is building a competency sharing network on applied AI, for the B2B market segment in particular. SINTEF is the key research institute in the network. Partners include Telenor, DnB, DNVGL, Equinor, Yara, Aker, Jotun, Ruter, FERD and Schibsted.[198]

At present, AI related cross-border cooperation mainly takes place through the 'Building European AI' memorandum of understanding (MOU) that SINTEF has signed with institutions and research centre in countries such as Germany, France, Denmark and Finland, as well as

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193 European Commission, European Innovation Scoreboard 2019: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

194 Innovation Norway, Invest in Norway, Business Opportunities: https://www.innovasjonnorge.no/en/start-page/invest-in-norway/industries/

195 The Complete University Guide, Studying in Norway: https://www.thecompleteuniversityguide.co.uk/international/europe/norway/

196 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

197 Information provided by SINTEF in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

198 Information provided by SINTEF in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

others in Norway. The MOU is designed to increase European collaboration on AI.[199]

2.23 Poland – Mazovia

Mazovia is a central region of Poland, playing a key role in the economic and innovation life of the country, and it includes in its territory the city of Warsaw. According to the latest Eurostat data (2018), the region of Mazovia generated 59% of Polish GDP in 2016. In 2017, the region had an employment rate of 70%, which was below the EU28 average (72%).[200] In 2016, the region's unemployment rate of 6.4% (2017) was in line with the national average (6.2%) and below the EU28 averages (7.6%). Tertiary educational attainment in Mazovia as a percentage of the population aged 30-34 was 39.3% in 2017, which is in line with the EU average (40%).[201]

The region central location in the country, the transport and logistics infrastructure, and the large pool of qualified labour and students, especially with regards to the city of Warsaw, are regional strengths that have attracted a high share of foreign direct investment (FDI). Focusing solely on the sub-region of the city of Warsaw, strategic investors include, for example, LG, Samsung, General Electric (GE), Skanska, Stora Enso, ProLogis, IBM, Tesco and Ghelamco. Due to such FDI, Warsaw has the highest concentration of innovative companies in Poland, the highest levels of R&D expenditure, and the largest number of tertiary education institutions in Poland. Most of the headquarters of national financial institutions are also located in this sub-region. In mid-2018, for example, there were over 37,000 foreign firms active in the Warsaw capital region. That equated to nearly 23% of all companies in the region and about 39% of all foreign companies located in Poland.

The region of Mazovia can rely on a strong and active research and innovation ecosystem. The region hosts about 90 universities and colleges, accounting for 20% of students in the country, including top national research and education institutions the University of Warsaw and Warsaw University of technology. The region of Mazovia also hosts three science and technology parks, dedicated to technology and innovation development and to support business activities in the region.

Currently, there are 13 Polish DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 6 are fully operational and 7 are in the preparatory stage. Overall, ten of these hubs list Artificial Intelligence and Cognitive Systems among their technical competencies. At regional level, Mazovia Region hosts 5 DIHs, of which 3 are fully operational and 2 in the preparatory stage. Most of these hubs (i.e. 4 out of 5) declare to cover the field of Artificial Intelligence.[202]

Cooperation between DIHs and private and public sector stakeholders in the region is growing. The Polish Industry 4.0 Initiative is the most important government level initiative. It is developing the Polish Industry 4.0 Platform to bring together all stakeholders interested in

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199 Ibid

200 European Commission, Eurostat, Regions, Statistics Illustrated: https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

201 European Commission, Regional Innovation Monitor, Warsaw Capital Region: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/warsaw-capital-region

202 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

Industry 4.0 and accelerate the digital transformation of Polish Industry. The Industrial Transformation Team, in charge of implementing the Platform, includes representatives of ministries, private companies, agencies, chambers of commerce and experts from leading ICT companies.[203]

PIAP HUB is one of the DIHs located in the region and an active member of the Industry 4.0 Platform. PIAP HUB is involved in the main activities of the initiative, including collaboration to Industry 4.0 policy-making for Poland with a focus on DIH cooperation (common initiatives and the sharing of knowledge, experiences, best practices, etc.). PIAP provides support to SMEs in technological and non-technological fields, together with access to specialised facilities.[204]

At present, DIH cooperation is mainly limited to publicly-funded collaborative project work. PIAP Hub, for example, is active in R&D support programmes (>70 clients per year) at regional level (e.g. Mazovian programmes) and European level (e.g. Horizon 2020, Interreg Central Europe, Multiannual Development Cooperation Programme for 2016-2020).[205]

2.24 Poland – Wielkopolska Region

According to the latest Eurostat data (2018), the region of Wielkopolska generated almost 10% of Polish GDP in 2016. In 2017, the region had an employment rate of 74%, which was above the EU28 average (72%). The region's unemployment rate of 3.1% (2017) was one of the lowest in Poland, well below the national (4.9%) and the EU28 averages (7.6%). Tertiary educational attainment in Wielkopolska as a percentage of the population aged 30-34 was 41% in 2017, which was just above the EU average (40%).[206]

Wielkopolska has a strong service sector and it is one of the most important industrial centres in Poland. In 2015, the industry sector contributed 30% of the region's Gross Value Added (GVA), ahead of the national average of 27%. In the same year, the service sector generated 59% of regional GVA. In 2016, 414,800 enterprises were registered in Wielkopolska, which was about 10% of all enterprises registered in Poland.[207]
Wielkopolska features many large investors in the automotive sector, such as Volkswagen AG, MAN, Solaris Bus and Coach. The region produces about 7% of Poland's car manufacturing output, 40% of public transport vehicle manufacturing output and 80% of truck and tractor manufacturing output. The region is also known for its business process outsourcing and logistics sectors.[208] In 2017, there were over 7,700 foreign companies in the region. They accounted for 8% of all foreign companies in Poland and made up 14% of the total number of companies in the region.[209]

The regional R&D infrastructure features over 30 education and research institutions. Adam

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203 Information provided by PIAP Hub in their application form (Expression of Interest) for participation in the DIH Network preparatory action.
204 Ibid
205 Ibid
206 European Commission, Regional Innovation Monitor, Wielkopolska Region, Poland: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/wielkopolska
207 Ibid
208 Ibid
209 Central Polish Statistical Office, 2018, Structural changes in national economy REGON register, Tab 16: https://stat.gov.pl/download/gfx/portalinformacyjny/pl/defaultaktualnosci/5504/1/22/1/zmiany_strukturalne_grup_podmiotow_gospodarki_narodowej_1_polrocze_2018.pdf

Mickiewicz University in Poznań is one of the largest academic centres in Poland and it supports science-industry cooperation through the University's Innovation and Technology Transfer Centre (UCITT). Poznań University of Technology is another important institution with technology transfer being managed by the Centre of Innovation, Development and Technology Transfer (CIRITT). Poznań University of Medical Sciences is well equipped for research in basic medical sciences, clinical investigations, diagnosis and treatment, based on active co-operation with 5 Clinical Hospitals in Poznań. Poznań University of Economics and Business is one of the oldest and most prestigious schools of economics in Poland. In addition, the Poznań Science and Technology Park (founded in 1995) was the first of its kind in Poland. It specialises in chemistry, physics, biotechnology and IT. It hosts 80 innovative companies and 60 research labs.[210]

Wielkopolska also hosts non-academic R&D Institutes in many different areas such as agriculture, genetics, wood, food, logistics, chemistry, biochemistry and advanced manufacturing. The 'Poznań Supercomputing and Networking Center' located in the capital city of the Wielkopolska Region is an example of a highly innovative centre whose mission is to integrate and develop the information infrastructure for science.[211]

At regional level, Wielkopoloska hosts 1 fully operational DIH, which declares to cover the field of Artificial Intelligence.[212]

Cooperation between DIHs and private and public sector stakeholders in the region is growing. DIH cooperation is supported nationally by the Polish Ministry of Development. The Ministry hosted the 2018 edition of the Digital Innovation Hubs annual event in Warsaw, together with the European Commission and the EU-funded initiative I4MS. In cooperation with FundingBox, the Ministry also organised workshops for current and aspiring Polish DIHs. The Ministry also drafted a law on the Future Industry Platform Foundation, which was adopted by the Polish parliament in 2018. One of the goals of the Future Industry Platform Foundation will be to coordinate Polish DIHs and related standardisation activities.[213]

In the Wielkopoloska Region, the **HPC4Poland** DIH and its partners are engaged in collaborative digital innovation activities at all levels (regional, national and international). They play a significant role in supporting governments and shaping relevant strategies (e.g. National and Regional Smart Specialisation Strategies, Future Polish Industry Platform, Strategy for Responsible Development in Poland). HPC4Poland co-created the Research and Innovation Strategy (RIS) for the Wielkopolska Region and the Development Strategy for the city of Poznan to 2030, including the Digital Poznan Strategic Programme. DIH representatives are also involved in the Poznan City Think Tank, which sets the development objectives for the city, in particular on the use of digital technologies.[214]
In 2017, two key partners of the HPC4Poland DIH, PUT and PSNC, signed a consortium agreement with 4 other Competence Centres from the region of north-western Poland (Lubuskie, Pomorskie, Wielkopolskie and Zachodniopomorskie Voivodeships) to build infrastructure for the Industry of the Future – POL-IT (Polish Technology Incubator for the

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210 European Commission, Regional Innovation Monitor, Wielkopolska Region, Poland: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/wielkopolska
211 Ibid
212 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool
213 Information provided by HPC4Poland in their application form (Expression of Interest) for participation in the DIH Network preparatory action.
214 Ibid

Industry of the Future). The POL-IT consortium brings together regional universities and research institutes and centres and the goal is to improve access to distributed R&D facilities (e.g. labs).[215]

Some cross-border cooperation initiatives have already been initiated. Examples include the Technical University of Munich (TUM) - coordinator of the HORSE project - that is establishing four digital innovation hubs (HUB-4-MANUVAL, CROBOHUB, DIGIMAT and HUBTECS), and Luleå Tech University, participating in the MIDIH project.[216]

2.25 Portugal – Northern Region

According to the latest Eurostat data (2018), the Northern Region of Portugal generated 29% of Portuguese GDP in 2016. In 2017, the region had an employment rate of 71.5%, which was almost in line with the EU28 average (72%). The region's unemployment rate of 9.8% (2017) was above the EU28 average (7.6%). Tertiary educational attainment in Northern Portugal as a percentage of the population aged 30-34 was 31% in 2017, which was well below the EU average (40%).[217]

The regional economy of Northern Portugal is strongly export-orientated. In 2017, the region exported goods worth 40% (EUR 22.2 billion) of regional GDP, up two percentage points on the previous year. Northern Portugal specialises in main groups of products – textiles and clothing, automotive products, and electrical and mechanical machinery and materials. According to data for 2016, textiles and clothing are the region's major goods exported, accounting for about 20% of total goods exports. Automotive products are the second major regional export, accounting for 17% of total goods exports. Products include car tyres, car seats, steering and exhaust systems, and car radio/multimedia systems, as well as a range of other components and even buses. In fact, the four largest exporting businesses in the region are part of the automotive sector. Electrical and mechanical machinery and materials are the third biggest export, accounting for 14% of total goods exports. Together, these three major groups of export products made up over half of the region's total exports of goods in 2016.[218]
Other export sectors that are relevant to the economy of Northern Portugal include the wood and forest products industry (8.9%), footwear (8.7%) and common metals (8%). Although other high-tech sectors, such as pharmaceuticals and precision equipment, continue to gain importance in the regional economy, they do not yet contribute significantly to regional exports. Overall, traditional products accounted for 37% of regional goods exports (in 2016), compared to just a 4.5% contribution from high-tech products.[219]

R&D expenditure in the region is evenly split between the private and public sector. The R&D infrastructure features three main public universities (University of Porto, University of Minho

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215 Ibid
216 Ibid
217 European Commission, Regional Innovation Monitor, Northern Region of Portugal: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/north-region-portugal
218 European Commission, Regional Innovation Monitor, Northern Region of Portugal: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/north-region-portugal
219 Ibid

and University of Trás-os-Montes e Alto Douro), several private universities and four public polytechnic institutes. Portugal has also renowned research centres that specialise in fields such as life sciences, health, nanotechnology, textile, information and communication technologies, new materials, and automotive sector. Examples include the Institute for Health Research and Innovation (I3S) in Porto, which merges three R&D institutes (IBMC, INEB and IPATIMUP), the International Iberian Nanotechnology Laboratory (INL), a joint investment of the Portuguese and Spanish governments, and the European Excellence Institute for Tissue Engineering and Regenerative Medicine Research. The Fraunhofer Institute has also selected the Northern Region of Portugal as a location for its first venture outside of Germany.[220]

Currently, there are 7 Portuguese DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 5 are fully operational and 2 are in the preparatory stage. Overall, six of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, North of Portugal hosts 2 fully operational DIHs, both of which list Artificial Intelligence among their fields of specialisation.[221]

Cooperation between DIHs and private and public sector stakeholders in the region is growing. For example, the Northern Portuguese DIH, **PRODUTECH**, is a member of the executive board of the Partnership of Portugal Clusters, which brings together most of officially recognised Portuguese clusters. Strong industry representation within its membership means that the DIH's collaborative activities, scope and reach are broad and extend beyond its members to include hundreds of companies, municipalities, venture capitalists, regional authorities and national funding agencies. This scope enables the DIH to identify stakeholder needs, define policy priorities and achieve its goals.[222]
PRODUTECH's role in regional/national collaboration initiatives depends on the specific scope of the initiative. Roles can include (i) participation in working groups, (ii) R&D&I project implementation, (iii) ecosystem communication and awareness raising, and/or (iv) digital transformation service delivery.[223]

Although there is no specific DIH support programme in place at regional or national level in Portugal, some support for ecosystem cooperation and digital transformation is provided within several policy initiatives and instruments (e.g. Portugal 2020 programme and Indústria 4.0). Cross-border cooperation opportunities are also available through programmes such as Interreg. Another example is the joint cross-border Smart Specialization Strategy established between Portugal's Norte Region and Spain's Galicia region, which provides a framework for cross-border cooperation. One of its six strategic collaboration areas is "Industry 4.0", with priority given to initiatives that contribute to the digital transformation of Industry. Inter-regional and cross-border opportunities also exist within the pilot actions of the Vanguard initiative.[224]

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220 Ibid
221 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool
222 ProduTech Digital Innovation Hub National Platform. Information provided by ProduTech in their application form (Expression of Interest) for participation in the DIH Network preparatory action.
223 Ibid
224 Ibid

2.26 Slovenia – Western Slovenia

According to the latest Eurostat data (2018), the Western Slovenia generated 56% of Slovenian GDP in 2016.[225] In 2017, the region had an employment rate of 74%, above the EU28 average (72%), and an unemployment rate of 6.4%, below the EU28 average (7.6%). Tertiary educational attainment in Western Slovenia, as a percentage of the population aged 30-34, was 50% in 2017, which was well above the EU average (40%).[226]

Slovenia's core sectors include automotive, chemicals and pharma, electrical and electronics, ICT, logistics and distribution, machining and metalworking, wood/timber and paper, food and beverage.[227] Slovenia's R&D infrastructure features 4 universities and around 50 smaller independent higher education institutes.[228]

Currently, there are 9 Slovenian DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, all of which are fully operational. Overall, seven of these hubs list Artificial Intelligence and Cognitive Systems among their technical competencies. At regional level, the Region of Ljubljana hosts 4 fully operational, both of which declare to cover the field of Artificial Intelligence.[229]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. There are currently two important initiatives ongoing in Slovenia to support DIH cooperation. First, the Ministry of Economic Development and Technology is promoting collaboration through their digitalization programme. Secondly, the Slovenian Digital Coalition has been established to promote digital society and industry and connect representatives of all stakeholders (NGOs, business, governmental representatives, public bodies, etc.) on key topics.

The **Digital Innovation Hub Slovenia,** the only nation-wide DIH in Slovenia, was recently approved by the Ministry of Economic Development and Technology and has been granted funding over a 5-year period. Its main focus is to promote digital transformation and a digital culture within industry (especially SMEs), society and education, and to assess and build capacity building across all sectors. The aim is for the DIH to become a one-stop-shop for digital transformation and competence development. The DIH's ecosystem includes universities, research institutes, technology parks and private sector companies from across Slovenia. The goal is to reach at least 1,000 companies (mainly SMEs) with up to 100,000 end-users.

The Digital Innovation Hub Slovenia is well aligned with the objectives of the Digital Slovenia 2020 Development Strategy and the Slovenian Smart Specialization Strategy and is building

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225 Eurostat, Regional statistics by NUTS classification, Regional economic accounts, GDP indicators, GDP at current market prices by NUTS 2 regions:
https://ec.europa.eu/eurostat/web/regions/data/database
https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_2gdp&lang=en

226 European Commission, Eurostat, Regions, Statistics Illustrated:
https://ec.europa.eu/eurostat/web/regions/statistics-illustrated

227 Invest Slovenia, Industries:
https://www.investslovenia.org/industries/

228 Study in Slovenia:
http://studyinslovenia.si/study/universities-and-institutions/

229 European Commission, Smart Specialisation Platform, DIH Catalogue:
https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

on the recommendations in both.[230]

2.27 Spain – Region of Catalonia

According to the latest Eurostat data (2018), the region of Catalonia generated 19% of Spanish GDP in 2016.[231] In 2016, the region had an employment rate of 72%, which was in line with the EU28 average (72%). The Catalonian unemployment rate of 13.4% (2017) was below the national average (17%) but well above the EU28 average (7.6%). Tertiary educational attainment in Catalonia as a percentage of the population aged 30-34 was 45% in 2017, above the EU average (40%).[232]

The Catalonian regional economy is driven by the tertiary and secondary sectors.
The tertiary sector contributed 53.5% of regional GDP in 2016. It covers service sectors including real estate, commerce, transport, tourism and hospitality and associated activities.
The secondary sector contributed 45.5% of regional GDP in 2016. It encompasses a significant level of industrial activity in manufacturing sectors such as automotive and accessories, chemicals, food, electrical household appliances, and state-of-the-art computer and office IT equipment. The publishing industry and construction are also of crucial importance.
In contrast, the primary sector is relatively small, contributing just over 1% of regional GDP in 2016, although it has strong subsectors that compete throughout the world, such as cava, wine, livestock and sweet fruits.[233]

Catalonia is home to over 10,000 innovative businesses, 12 universities, 23 science and technology parks and 12 large-scale research infrastructures. The region also hosts a series of research centres, 39 of which are supported by the Government of Catalonia, forming the CERCA system of centres.[234]

Currently, there are 71 Spanish DIHs registered in the Digital Innovation Hubs (DIH) Catalogue, of which 51 are fully operational and 20 are in the preparatory stage. Overall, forty-six of these hubs declare to have technical competencies in the field of Artificial Intelligence and Cognitive Systems. At regional level, Catalonia hosts 19 DIHs, of which 13 are fully operational and 6 in the preparatory stage. Half of these hubs (i.e. 9 out of 18) list Artificial Intelligence among their field of specialisation.[235]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. One of the **Spanish DIH for HPC (esHPC)** partners, the Barcelona Supercomputing Centre (BSC),

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230 Information provided by the Digital Innovation Hub Slovenia in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

231 Eurostat, GDP and main components (output, expenditure and income): https://ec.europa.eu/eurostat/web/national-accounts/data/database
Eurostat, GDP at current market prices by NUTS 2 regions: https://ec.europa.eu/eurostat/web/regions/data/database

232 European Commission, Regional Innovation Monitor, Catalonia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/catalonia

233 Ibid

234 Government of Catalonia, Ministry of Innovation, Universities and Enterprise, CERCA – Research Centres of Catalonia: http://www.crm.cat/en/About/General/Documentation/Documents/CERCA_-Research-Centres-of-Catalonia.pdf

235 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

is taking part in some regional initiatives promoted by the Catalan Government. The Government is deploying the SmartCat strategy with the ambitious goal of expanding the Smart City concept to reach the entire region and convert it in a "Smart Country". This transformation leverages the use of digital technologies to innovate in public services, stimulate economic growth and greater impact on Catalan society. The strategy focuses on Smart Government (focus on Education, Health and Cybersecurity), Smart Territory (focus on Mobility, Environment and Rural Development) and Smart Economy (focus on Industry 4.0, Advanced Digital Technologies and Leisure).[236] To support the SmartCat strategy, the Catalan Government is developing several financial support instruments, one of which is called 'Digital Innovation Hub de Catalunya' (DIH-CAT).[237] BSC is going to take part in the Catalonian AI DIH which is being promoted by Catalan universities, technological centres and research centres, which will operate as a hub alongside the Spanish DIH for HPC (esHPC). The latter is led by the Spanish Supercomputing Network (RES) and coordinated by BSC.[238]

RES and esHPC members are all engaged in cross-border cooperation through their involvement in different European initiatives. Examples include the European Technology Platform for High Performance Computing (ETP4HPC), the Partnership for Advanced Computing in Europe (PRACE), the High Performance and Embedded Architecture and Compilation (HiPEAC) project, and the EuroLab4HPC project.[239]

2.28 Spain – Community of Madrid

According to the latest Eurostat data (2018), the Community of Madrid generated 19% of Spanish GDP in 2016.[240] In 2016, the region had an employment rate of 72%, which was in line with the EU28 average (72%). The region's unemployment rate of 13.4% (2017) was below the national average (17%) but well above the EU28 average (7.6%). Tertiary educational attainment in Catalonia as a percentage of the population aged 30-34 was 48% in 2017, which was above the EU average (40%).[241]

The Community of Madrid specialises in a wide range of sectors that include logistics, renewable energies, retail trade, aerospace and aeronautics, tourism and professional services (e.g. financial and banking sector, legal services, advertising and marketing, consulting, cleaning and security).[242]

The main component of the regional economy is the tertiary sector, which generated over three quarters (77%) of Madrid's total Gross Value Added (GVA) in 2016, followed by the

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236 Spanish Digital Innovation Hub for HPC (esHPC). Information provided by esHPC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

237 Generalitat de Catalunya, Digital Innovation Hub de Catalunya (DIH-CAT): http://catalunya2020.gencat.cat/ca/instruments/dih-cat/

238 Spanish Digital Innovation Hub for HPC (esHPC). Information provided by esHPC in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

239 Ibid

240 Eurostat, GDP and main components (output, expenditure and income): https://ec.europa.eu/eurostat/web/national-accounts/data/database
Eurostat, GDP at current market prices by NUTS 2 regions: https://ec.europa.eu/eurostat/web/regions/data/database

241 European Commission, Regional Innovation Monitor, Madrid: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/autonomous-community-madrid

242 Ibid

secondary sector (23% of GVA), of which construction accounts for 4.4%. Although the construction sector has been suffering from a lack of investment in public infrastructure projects, the broad service and industry sectors have grown at a faster pace than the national average. Financial and insurance activities, commerce, transport, tourism and hospitality were the strongest performers. The primary sector contributes less than 0.1% of total regional GVA.[243]

The Community of Madrid is an important centre for R&D in Spain, providing a favourable environment for academic, scientific and applied R&D and innovation at all levels. The region features a large university network that includes 6 public universities (Alcalá, Autónoma, Carlos III, Complutense, Politécnica y Rey Juan Carlos), 8 private universities (Alfonso X el Sabio, Antonio de Nebrija, Camilo José Cela, Europea de Madrid, Francisco de Vitoria, CEU San Pablo, UDIMA y una de la Iglesia Católica, Pontificia Comillas), and the headquarters of the National University of Distance Learning (UNED). The region has the highest concentration of students in Spain and one of the highest in Europe.[244]

The region is home to 43 research centres that operate under the direction of the National Scientific Research Council (CSIC), as well as important public and private organisations dedicated to innovation and science, almost 5,000 research groups and more than 11,000 research projects. Madrid also has one of the highest concentrations of science and technology parks in Spain, which support public and private collaboration and innovation.[245]

At regional level, the Community of Madrid hosts 5 DIHs, of which 4 are fully operational and 1 is in the preparatory stage. Most of these hubs (i.e. 3 out of 5) declare to cover the field of Artificial Intelligence.[246]

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present. There are support instruments available in the region and nationally, although the region intends to further assist the diverse actors in the regional ecosystem. The Community of Madrid plans to finance dynamic projects in line with RIS3 priorities to connect supply and demand and support innovation and technology transfer. Existing financial support schemes for digitalisation include Innovation Vouchers (Cheque Innovación), Support for projects of excellence complementary to H2020, SME Instrument (Línea de ayudas a proyectos de excelencia complementarias a H2020, Instrumento PYME), Support for the creation and growth of innovative start-ups (Apoyo y fomento a la creación y desarrollo de empresas jóvenes e innovadoras (start-ups)), Subsidies for business R+D+I projects (Subvención a proyectos empresariales de I+D+i) and Support for Industry 4.0 start-up projects (Apoyo a la Puesta en Marcha de Proyectos de Industria 4.0). These are regional support instruments

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243 European Commission, Regional Innovation Monitor, Madrid: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/autonomous-community-madrid

244 Comunidad de Madrid, Sistema universitario madrileño: http://www.comunidad.madrid/servicios/educacion/sistema-universitario-madrileno

245 Comunidad de Madrid, Estrategia regional de investigación e innovación para una especialización inteligente de la Comunidad de Madrid, page 16: http://www.madrid.org/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition&blobheadervalue1=filename%3DDocumento_Estrategia_RIS_3_Madrid_v21.2.pdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1352866431742&ssbinary=true

246 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

to enable organisations to use DIH services to achieve digital transformation. Additionally, the Spanish Ministry is fostering its actions through Connected Industry 4.0 (Industria Conectada 4.0) and it launched an expert group to define the Spanish DIH concept, to create a DIH catalogue and decide how DIH cooperation should be supported. FundingBox is a member of this expert group.[247]

The main AI DIH in the region is **AIR4S**. The DIH is fully involved in the MadrIDtech Strategy, which includes support to regional companies through the digitalisation process. It helps them to implement innovation services and access funding resources and innovation spaces. As part of the MadrIDtech ecosystem, the hub receives regular funding to work with companies in the search for digital solutions to address their needs. The DIH is also fully aligned with the Madrid Region RIS3 Strategy and is already providing the services that the Strategy recommends.[248]

2.29 Spain – Community of Valencia

According to the latest Eurostat data (2018), the Community of Valencia generated 9.4% (EUR 104.6 billion) of Spanish GDP in 2016. In 2017, the region had an employment rate of 65%, which was below the EU28 average (72%). The Valencian unemployment rate of 17.2% (2017) was in line the national average (17%) but well above the EU28 average (7.6%). Tertiary educational attainment in Community of Valencia as a percentage of the population aged 30-34 was 39% in 2017, which was just below the EU average (40%).[249]

The regional economy is dominated by the tertiary sector, with services accounting for 65% of regional GDP and 55.5% of regional Gross Value Added (GVA) in 2016, followed by the secondary sector, which accounted for about 24% (industry at 18% and construction at 6%) of regional GDP and 42% of region GVA. The agricultural sector contributed just 2.2% of regional GDP and 2.5% of regional GVA. The share of regional GDP across these sectors is similar to the national distribution of GDP – services at 75%, industry at 14%, construction at 6% and agriculture at 5% (INE, 2018).[250]

Valencia's RIS3 priorities are: Industry, Health, Tourism, Agrifood, Habitat and Cities, Transport and Energy. On top of the RIS3 priorities, some specific strategic sectors include ceramics and tiles, footwear and leather goods, games and toys, wood and furniture, and textiles and clothing. Automotive is another strategic sector, due in large part to the presence of a multinational OEM (Original Equipment Manufacturer) in the region, at the head of an automotive supply chain that involves a large number of SME suppliers.[251]

Valencia region is also one of the pioneering regions in Spain that defined a specific SDG Action Plan (UN Sustainable Development Goals) in 2015 and its being implemented to

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[247] Artificial Intelligence and Robotics for Sustainable Development Goals (AIR4S). Information provided by AIR4S in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[248] Artificial Intelligence and Robotics for Sustainable Development Goals (AIR4S). Information provided by AIR4S in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

[249] European Commission, Regional Innovation Monitor, Valencia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/valencian-community

[250] European Commission, Regional Innovation Monitor, Valencia: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/valencian-community

[251] Ibid

monitor the advances of the SDG in the region.

Regional R&D expenditure in 2015 was split between higher education institutions (46.6%), private sector companies and non-profit institutions (40.8%), and the public sector (12.6%). Private sector R&D expenditure in Valencia (40.8%) was below the Spanish average (52.75%), whereas R&D expenditure by higher education institutions was well above the Spanish average (28.12%) by about 18%. Lower private sector expenditure was due to the high concentration of SMEs in the region that have limited resources to invest. The higher level of expenditure from higher education institutes, on the other hand, was due to the presence and activity of a strong regional education system that features seven universities and a large network of research centres (INE, 2018).[252]

The Valencian Network of Technology Institutes (REDIT) brings together 11 associated centres that offer a broad range of advanced business orientated R&D and innovation services. Its mission is to provide and promote an effective organisational model for technology centres and an innovation support model for the regional science, technology and business ecosystem. In addition to REDIT, innovation support is also provided by Technology Transfer Offices (OTRIs), University-Enterprise Foundations, Science and Technology Parks, Business Incubation Centres (BICs) and the Network of Valencian Universities for the Advancement of Research, Development and Innovation (RUVID).[253]

At regional level, the Community of Valencia hosts 4 fully operational DIHs, all of which declare to have technical competencies in the field of Artificial Intelligence[254] but with different maturity levels and organisational profiles.

Cooperation between DIHs and private and public sector stakeholders in the region is growing, although it is mainly limited to publicly-funded collaborative project work at present, as well as strategy development activities. For example, the Valencian DIH, **ITI Data Cycle Hub**, and its partners are working closely in the context of collaborative initiatives at regional, national and European level. The DIH and its partner, the Valencian Institute for Business Competitiveness (IVACE), have been involved in the design of the Valencian RIS3 Strategy and the Industry 4.0 Agenda for the region since their conception. The DIH is also a member of the Spanish ICT Platform, Planetic, and is participating on behalf of IVACE in the Cotec Foundation to help define data sharing best practices in Spain. The DIH is also contributing to the Spanish Government's effort to define the Spanish DIH concept.[255]

At European level, ITI Data Cycle Hub is recognised as a European IoT and CPS Competence Centre by the I4MS Programme and is participating in the S3 Platform for SME Modernisation. Its partner, IVACE, is also a member of the Board of Directors for the S3 Platform on Industrial Modernisation and is co-leading Industry 4.0 working groups.[256]

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252 Ibid

253 Ibid

254 European Commission, Smart Specialisation Platform, DIH Catalogue: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

255 Information provided by ITI Data Cycle Hub in their application form (Expression of Interest) for participation in the DIH Network preparatory action.

256 Ibid

Overview of the members of the AI DIH Network

3 Overview of the members of the AI DIH Network

The preparatory action was designed to develop and test cooperation schemes with a limited number of Digital Innovation Hubs, spreading the findings to a larger audience. For this reason, the project involved an initial group of 30 DIHs. The outcomes and the materials developed within the project were periodically published on the project website. Additionally, the Framework Cooperation Agreement foresees the possibility that other DIHs join the network a few months after its establishment.

3.1 DIHs involved

The DIHs taking part in AI DIH Network are very diversified in terms of size, organisational structure, services offered, experience in the field of AI and technological focus: the programme involved organisations with more than 500 employees and others with less than 20; newly-established DIHs and organisations that have been operating for more than 20 years, etc.

Most DIHs involved in the action are part of a public organisation, with few exceptions of hybrid and private entities. In terms of financing models, the vast majority of DIHs employ a mixed-funding structure, relying on both public and private resources. However, public funding at European, national and regional level plays a fundamental role in the financing of almost all DIHs.

The table below reports a brief description of each DIH taking part in the AI DIH Network programme.

DIH	Short profile
www.upm.es/dih-air4s	**AIR4S** (Spain) is a one-stop-shop DIH in Madrid Region, led by the Universidad Politécnica de Madrid, that provides innovative services to Industry, specially SMEs and Start-ups, and Public Administrations on AI & Robotics based technologies. AIR4S bets for the accomplishment of Sustainable Development Goals as a way to leverage growth in a sustainable way and to effectively return the investment to the society.
www.icent.hr/en/crobohub/	**CROBOHUB** (Croatia) acts as one-stop-shop, helping Croatian companies to digitalise their business through efficient orchestrating of various stakeholders in robotic innovation ecosystem such as research institutions, business support institutions and businesses operating in the field of robotics. CROBOHUB also provides connections with investors, facilitates access to financing for digital transformations, helps connect users and suppliers of robotic innovations across the value chain and foster synergies between digital and other key enabling technologies.

http://www.digihall.fr/	**DIGIHALL** (France) is the official Digital Innovation Hub for the Ile-de-France Region (Paris-Region). The DIH seeks to federate the Region's innovation ecosystem, answering the needs of industry more efficiently and contributing to the creation of a European innovation market. DIGIHALL is led by an RTO (CEA LIST) and an industry cluster (SYSTEMATIC), who federate the different actors in the hub, spanning academia and education providers, venture capital, incubators, and testbeds / affiliate programmes aimed at accelerating the pace of technology adoption and value creation.
www.ip4fvg.it	**IP4FVG** (Italy) – Industry platform for Friuli Venezia Giulia is the digital innovation hub of the Italian region Friuli Venezia Giulia which supports local businesses innovating business processes and business models through digital transformation. It is a public-private partnership (currently 26 partners) which brings together entities, skills and excellences that are active in SME support and digital technologies: sector clusters, Tech Parks, and RTOs, reference players, training institutions/entities, public bodies, industrial associations – Confindustria.
www.ciirc.cvut.cz	**CIIRC** (Czech Republic) is providing research potential and know-how transfer to the Czech industry, mainly to SMEs, in the field of manufacturing. The DIH is an open platform connecting actors from industry, academia and other sectors. It offers modern means to test advanced technologies and offers particular activities, such as education of companies with emphasis on SMEs, implementation of Industry 4.0 principles into industry, and digital maturity level evaluation.
www.dfki.de	The **German Research Center for Artificial Intelligence** GmbH (DFKI - Germany) was founded in 1988 as a non-profit public-private partnership. The Innovative Factory Systems (IFS) research department at DFKI deals with issues surrounding Industrie 4.0 and the factory of the future. In many cases, the research results are transferred for implementation by SmartFactoryKL and its members from industry. Both were appointed Mittelstand 4.0-Kompetenzzentrum Kaiserslautern (SME 4.0 Competence Center).
www.4pdih.com	**4PDIH** (Slovenia) provides, connects and support knowledge, business and technology expertise, technologies, experimental and pilot environments, best practices, methodologies and other activities necessary to fully enable Slovene industry, public administration and communities in building digital competencies, innovation models and processes and support their digital transformation.

www.dti.dk/robot	The **Danish Technological Institute** (DTI - Germany) develops, applies and transfers technology to industry and society. It provides individual consultancy, actual working industrial solutions, courses for both blue- and white-collar workers covering various aspects of robotics, and networking opportunities, as well as performing applied research and development. DTI's main activities in AI & robotics are located in Odense in the Centre for Robot Technology where we are actively involved in many robotics projects in primarily manufacturing, service, construction, food, health and agricultural robotics.
www.know-center.tugraz.at	**Know-Center** (Austria) is Austria's hub for data-driven business, big data analytics and artificial intelligence. It works on the exploitation of data value chains and provide a broad spectrum of services, including research, educational programs to overcome the shortage of data skills, consulting, and prototyping. Its research delivers customised solutions for managing, securing, analysing and commercializing data in heterogeneous regulatory and economic environments, while its data-driven tools and services enable small companies and research organizations to participate in the data economy.
www.fortiss.org/en/about-fortiss/ai-center/munich-innovation-hub-for-applied-ai	The **Munich Innovation Hub for Applied AI** (Germany) is an open platform to accommodate diverse needs of local companies in a diverse set of industries like manufacturing, high-tech, healthcare, mobility. It has modern instrumentation, methodologies, frameworks and resources available for companies to test and experiment with advanced technologies and coordinates particular activities, including support to education and recruitment of companies, interconnect companies with experts and start-ups, and consult companies individually from research to implementation.
https://smarthome.iti.gr/	The **nZEB Smart Home** (Greece) DIH was established in early 2017, consisting the first DIH in the region of Central Macedonia and is coordinated by the Information Technologies Institute (ITI). The DIH's technological orientation focuses on Robotics (commercial or prototype units available for use, integration with devices and sensors, advanced manipulation and control features added), Artificial Intelligence (e.g. intuitive perception and cognition for robotic systems), Cyber physical systems (e.g. embedded systems), Internet of Things (e.g. connected devices, sensors and actuators networks), Simulation and modelling, Big Data, Blockchain, Visual Analytics, High Performance Computing, AR/VR and more.
http://hub.piap.pl/	**PIAP** (Poland) acts ad facilitator of early adoption of technological breakthroughs by high growing industries, including agile manufacturing, infrastructure inspection and maintenance as well as agri-food and healthcare. The DIH engages more than 30 clusters and sectoral organisations, regional and national authorities and agencies, scientific

	consortia and consulting companies in an informal, flexible, project-oriented all-sectors structure and provides provide research, demonstration, prototyping and test facilities of PIAP and its partners.
www.iti.es/en/data-cycle-hub/	The **Data Cycle Hub** (Spain) is a Digital Innovation Hub composed of a consortium of organizations with complementary experience that supports companies and Public Sector in the Valencia Region in their digital transformation. The Data Cycle Hub has a non-for-profit aim and is coordinated and led by ITI, also a non-for-profit Research Centre and a reference on Big Data and Artificial Intelligence in the Valencia region. The DIH's objective is to close the gap between research and the industry, specifically SMEs, as well as the Public Administration, providing innovative solutions and services that require advanced data analysis, machine learning and artificial intelligence.
https://smartconnected.semantic-treehouse.nl/#/Home	**Brainport Industries Smart Connected Supplier Network** (The Netherlands) aims to foster digital collaboration in supply chain by sharing data such as product, design-, quotation- and order data safely, reliably and quickly without being hindered by the various systems used (interoperability). Among its key AI expertise, there are: industrial data collection using standards as OPC-UA, data storage and sharing with keeping sovereignty, modelling of industrial & logistic processes, simulation and visualisation of models & data, and data analysis and processing using AI.
www.iff.fraunhofer.de	The **VDTC of the Fraunhofer IFF** (Germany) is promoting a holistic perspective on digitalization for SME, focusing on AI, digital business models, networking technologies and standardisation, safety and security, and user acceptance. The DIH acts as a platform to bring together different national and regional initiatives and promote their activities on the European level, striving for European added value. It supports regional SME to better leverage digital technologies in their business. The DIH relies on state-of-the-art infrastructure of its members, with the VDTC of the Fraunhofer IFF representing a regional anchor point for digitalization in Saxony-Anhalt.
www.teralab-datascience.fr/fr/	**TeraLab** (France) is an AI and big data innovation platform for education, research, and innovation. Its mission is to foster technology transfer from IMT research labs towards enterprises, especially SMEs, and public sector. TeraLab is a fully owned subsidiary of IMT (Institut Mines-Télécom) and has supported over 60 projects in many fields, with focus on industry, healthcare, and cybersecurity. It contributed to these projects with its secure, neutral, and trusted infrastructure for experimenting with data and AI tools, as well as with technology, business, and ecosystem expertise.

https://artes4.it/	The DIH **ARTES4.0** (Italy) stems from the DIH RIF (Robotics and Innovation Facility) BioRobotics Institute, established in the framework of the EU Project Echord++ to explore technological innovation in "smart small towns" (Peccioli, Pisa, Italy), proving them as relevant for Europe as "smart cities". The DIH ARTES4.0 includes 127 partners in 7 Italian Regions and aims at offering companies (particularly SMEs) services in robotics, augmented and virtual reality, and AI to bridge the gap between research and commercialisation.
https://fcai.fi/	**FCAI** (Finland) is a Finnish Academy funded long-term project aiming to increase the Finnish AI technological advance and adoption among companies and public sector. It also has a goal to increase the awareness among public about the benefits and risks of AI as a technology and directing young people to study AI related technologies. FCAI is combining long term fundamental AI research and application to various domains, such as health, energy, industry, smart cities.
www.itbaltic.com	**Latvian IT Cluster** (Latvia) is an international focus cluster – located in Riga, Latvia – which stands for a technology and market-oriented cooperation and networking of Latvian ICT companies. Latvian IT Cluster is a contact point for interested parties who intend to expand their own technical and economic potential in international markets. Latvian IT Cluster vision is to create a value network of Latvian companies, providing reliable IS development and application services for export.
www.superiotai.dih.fi	**SuperIoT** (Finland) is fully operational DIH and established in 2016. It collects together world class innovative IoT and AI companies and research institutes to digitalize European industry. DIH utilizes deep network and platform economies to deliver complete solutions from sensors and wireless communications to data analytics and data-intensive services seamlessly and cyber secured, integrated into existing processes, tools and platforms. DIH helps to overcome the lack of expertise and resources to develop AI enabled, scalable, complete IoT solutions for the European industry's digitalisation needs.
http://www.hpc4poland.pl/en/	**HPC4Poland** (Poland) aims to create and provide advanced high-performance computing tools, addressing the real-life demand of Polish manufacturing companies. The DIH believes that access to the right HPC tools raises competitiveness by shorter time-to-market, new personalized products in offer, lower costs of new product roll-out, and testing products against extreme conditions. It specialises in IoT, HPC and VR/AR.

http://www.dihlombardia.com/	**DIH Lombardia** (Italy) is a regional hub providing services related to Digitization and AI, thanks to high-level expertise provided by the regional innovation and digital ecosystem. DIH Lombardia is part of DIH Confindustria Network, created by Confindustria, the largest Italian manufacturing organization. Our main objective is understanding the needs of the companies and guiding them in the complexity of the market and technologies, regardless their sector or size. Our vison is to be a regional bridge between the companies (SMEs in particular) and the different stakeholders which are part of the innovation ecosystem.
www.res.es/es/aidih	**Spanish Digital Innovation Hub for High Performance Computing** (esHPC - Spain) is an arm of Spanish Supercomputing Network (RES) to become the ecosystem enabling access, resources, training, projects, and information about Artificial Intelligence to Spanish industry and especially to SMEs. The RES is a Unique Scientific and Technical Infrastructure in Spain, so the esHPC hub will benefit of its main capacities: a consolidated network of high-quality data and computing infrastructure and expert support staff.
www.ceadar.ie	**CeADAR** (Ireland) is Ireland's award-winning National Centre for Applied Data Analytics and Machine Intelligence. It is a market-driven technology centre for the development, and deployment of data analytics and AI technology and innovation. CeADAR is funded by Enterprise Ireland, IDA Ireland and by translational research. The Centre is hosted in University College Dublin in partnership with the Technological University of Dublin.
www.imec-int.com	**IMEC** (Belgium) combines longstanding leadership in microchip technology with in-depth expertise in software and ICT to lay the foundation of a more personalized healthcare, smarter cities, cleaner energy and more efficient mobility, logistics and manufacturing solutions. It acts as a single point of contact for innovators and entrepreneurs who want to explore the potential of advanced technologies in several domains, including Smart Mobility, Smart Health, Smart Industries, Smart Energy, Smart Cities and Smart Education. It offers both R&D solutions to create new technologies as well as innovation services applicable to both products and services.
http://smartic.ee/	**Smart Industry Centre** (SmartIC – Estonia) was created to coordinate research activities and to manage infrastructure labs to support the industry in digitalisation. The mission of the SmartIC DIH is to ensure that Estonian manufacturing SMEs, big or small, can benefit in innovations in the field of robotics, smart manufacturing, IoT and AI and thus improve their business and production processes and adapt business models to the digital change to be globally competitive.

www.images-et-reseaux.com	**Images & Réseaux** (I&R – France) cluster is a non-profit association of technology companies and research institutions based in the Brittany and Pays de la Loire regions of France. Images et Reseaux operates **Digiwest** (DIH AI). The main objectives of I&R is to initiate and facilitate cooperation and other technology exchanges between enterprises and academic institutions with the goal of creating a world recognized ecosystem of innovation and research. I&R provides expertise and set-up projects on 6 cores digital technologies (Network & digital infrastructure, big data and AI, immersive & interactive content, digital trust and cyber, SW & HW, and photonics).
http://www.produtech.org/produtech-dih-platform	**PRODUTECH Digital Innovation Hub Platform** (Portugal) specialises in the domains of digitalisation, manufacturing and production technologies, towards the modernization of the manufacturing industry. The DIH offers a comprehensive set of services, such as visioning, strategy development, deployment of large-scale initiatives in R&D and Innovation, awareness action, matchmaking, and access to funding and financing.
www.sintef.no	**SINTEF** (Norway) is a broad, multidisciplinary research organisation with international top-level expertise in the fields of technology, the natural sciences, medicine and the social sciences. It conducts contract R&D as a partner for the private and public sectors, and it is one of the largest contract research institutions in Europe. It offers world-leading laboratory and test facilities in a wide range of technological fields (e.g. microelectronics, nanoscale technologies, etc.).
www.ltrobotics.eu/en/digital-innovation-hub/	**Lithuanian robotics** (Lithuania) DIH unites Lithuanian robotics sector and strives to make it visible on an international level. It promotes cooperation in Lithuania, helping to organize work in a cluster and in a joint value chain. It strives to make robotics a priority sector in Lithuania. The overall mission of Lithuanian robotics DIH is to bring together local robotics stakeholders, establishment of a robotics eco-system in Lithuania and increase the competitiveness of Lithuanian manufacturing sector.

3.2 Characteristics of the selected DIHs

The characteristics of the 30 hubs involved in the AI DIH Network project have been analysed with the aim of understanding the potential for cooperation among them. To this aim, the analysis focussed on:

- The service offerings, to both identify opportunities for providing complementing and joint services and the level of experience in the field of Artificial Intelligence, to determine the potential for knowledge-exchange, and
- Experience in previous cooperation.

The outcomes of the analysis which are here presented, served as inputs for the definition of

the cooperation scenarios.

3.2.1 Service offerings

Understanding the service offered by DIHs involved in the AI DIH Network is considered the first step to understand the potential cooperation areas for DIHs, as it enables to identify which services are offered by all DIHs – and may offer opportunities for partnership and joint efforts – and which are the complementing services provided within the network.

The following paragraphs provide an overview of the services offered by DIHs involved in the programme with real examples of services delivered to SME and public administrations.

3.2.1.1 Ecosystem services

Members of the AI DIH Network are particularly active in providing ecosystem-support services. Most of them provide a range of communication and networking services that are designed to construct, inform, connect, guide, support and manage an SME ecosystem. Communication activities carried out by the DIHs include the organisation of conferences, demonstration days and roadshows, periodic newsletters, collaboration to scientific publications and maintaining an active presence on social medias. With regards to the organisation of larger events and roadshows, some of the DIHs report to collaborate with partners from the ecosystem, in a virtuous cycle where DIHs are able over time to improve their communication activities thanks to the increasing engagement and involvement of the different stakeholders.

Many DIHs involved in the Network (more than 80%) are operating in creating awareness about AI and supporting SMEs and users in determining their AI maturity. However, the type of service offered vary depending also on the level of maturity reached by the DIH in the field. Offered services range from industry-wide surveys to raise awareness through self-assessment exercises, to broader digital maturity assessment services also covering the field of AI and to in-depth AI maturity assessments carried out by a dedicated team of experts collaborating with the target company and online collaborative maturity assessment tools.

Examples of ecosystem services provided by the selected DIHs

SuperIoT (Finland) – AI Maturity Assessment Tool
SuperIoT AI DIH, together with Finnish Center for Artificial Intelligence AI DIH (FCAI) have developed a Digital Maturity Assessment tool available for all industrial organizations to assess their understanding on the level of AI. Already tens of SMEs have used this free-of-charge self-assessment web tool, producing a basic visualization of AI maturity in six dimensions: Strategy and Management, Products and Services, Competence and Cooperation, Processes, Data and Technology. https://ai.digimaturity.vtt.fi/?lang=en
IP4FVG (Italy) – Manufacturing lighthouses to raise awareness on digitalisation
In 2019 IP4FVG launched an assessment campaign that allowed to assess the digital readiness of 89 manufacturing companies and to select the 10 most digitally advanced companies defined "Manufacturing lighthouses" (http://www.ip4fvg.it/premiazione-fari-

manifatturieri-fvg/) that are now playing a model role for the others.

In 2019 and 2020, building on the assessment results and on strategic visioning, the companies identified have been developing their digital transformation projects with the support of IP4FVG specialized services.

Smart Industries (The Netherlands) – Training on data collection and cybersecurity issues

Smart industries organised and delivered a one-day training course on data collection using the OPC-UA standard and the inherent cybersecurity issues. One of the main issues in daily industrial cases is connected to the fact that the vast majority of data is not digital available or not cleaned/complete. Operational technology people should learn data collection technologies, especially for what concerns the use of open source hardware (Raspberry Pi), open source software (OPC-UA python) and open source tools (Python programming) to collect data in a secure way.

The main message of the training workshop was to both make clear how cost-effective open source environments are and highlight the importance of investing in the acquisition of digital skills.

3.2.1.2 Business services

Members of the AI DIH Network are also largely involved in the provision of business-support oriented services. Under this cluster of services, DIHs support start-ups and SMEs in the design and implementation of AI business strategies. The majority of members of the Network (almost 90%) provide connections to funding sources, support the development of proposals and play an active role in the creation of consortia. In addition to connection to regional, national and European funding, some of the DIHs support SMEs and start-ups in identifying suitable private financing solutions, directly introducing them to potential financial partners or collaborating with other organisations in the context of regional and national initiatives.

Concerning the creation of consortia, members of the AI DIH Network appear to follow two main strategies: on one side DIHs support the creation of consortia based on the identification of the customer's specific needs, following a case by case approach, on the other side some DIHs include among their services the organisation of periodic events to facilitate the creation of partnerships and disseminate information regarding eventual opportunities.

A substantial share of members of the AI DIH Network (70%) also provides access to specialised facilities. Proposed solutions vary greatly according to the alternatives available in the ecosystem and to the structure of each DIH and their field of technical specialisation. Among other facilities, members of the AI DIH Network provide access to high and supercomputing facilities, large data sets and prototyping laboratories.

Examples of business services provided by the selected DIHs

AIR4S (Spain) – Advanced analytics techniques for informed business strategies

Recently selected by Bloomberg as one of the 50 most promising start-ups in the world, Geoblink is a SaaS-based Location Intelligence solution that helps professionals from the retail, real estate, and FMCG industries make informed decisions about their business strategies. It combines traditional and non-traditional advanced analytics techniques over big and small data, together with a rich map-based UI to display multiple types of statistics in a way that is simple to use and easy to understand. Geoblink, launched in March 2015, has raised more than $8 million in funding.

AIR4S, through UPM entrepreneurship program, "actúaupm", supported Geoblink by:

- providing consulting services in business ideas validation;
- providing promotional services;
- providing advanced education and skill development to the staff (UPM alumni) in innovation and entrepreneurship.

nZEB Smart Home (Greece) – Supporting an SME in the development of a proposal for shop floor and logistics digital upgrade

nZEB Smart Home supported Pragma-IoT (a spin-off of CERTH/ITI) and a brewery towards applying successfully in the Open Call of the L4MS project in order to improve its logistics procedures. The challenges include the automation of malt transportation, the compliance with the new legislation for breweries and the elimination of the downtime due to the manual handling of water management and other brewery procedures. The solutions offered included a complete automation of the malt transportation within the brewery, a deployment of an IoT infrastructure & platform to handle dynamically and automatically all logs and remotely the brewery assets. The proposal submitted successfully passed the first stage, and now its supported for the next steps.

3.2.1.3 Technology services

Members of the AI DIH Network are also active in the provision of technology-support services. Almost all members support customers in specific R&D projects and the vast of majority of DIHs (around 80%) offer support in feasibility studies, providing access to infrastructure and technological platforms and in the development of Proof of Concepts of AI related technological solutions. With regards to involvement in specific R&D projects, some members of the AI DIH Network offer an agile and lateral support to their customers whereas other are available to provide further structured support. This partly depends on the private or public nature of the services offered and reflects the different missions and specific capabilities of the DIHs. In the case of particularly technological-oriented DIHs, feasibility studies and pre-competitive R&D activities represent the contact point of a longer journey concluding in the development of a new technological solution. Whereas for other members of the Network, it is a crucial service in relation to ecosystem and business services, being directly connected to communication activities and to the identification of business

opportunities.

Examples of technology services provided by the selected DIHs

Machine Learning
Know-center (Austria) – Enhancing software with AI functionalities
Reval Austria GmbH's aim was to enhance their software with AI-based functionalities. However, initially it lacked concrete and well-founded ideas. Know-Center supported Reval using a two-step approach: first, a data value check was conducted in order to systematically generate and evaluate data-driven AI use cases. The data value check identifies opportunities based on the given data, core company activities and stakeholder needs. After selecting the most auspicious use cases, Know-Center developed suitable machine learning models, which were consequently implemented in the latest release of Reval's software product.
DIGIHALL (France) – AI solution for quality control
The SME – a parts' supplier for the automotive sector - was put in touch with the DIGIHALL robotics competence centre, through a broker in a different region. They had heard about the potential of AI for quality control but did not know how it could be applied to their factory. The competence centre interacted with the SME and defined a proof-of-concept demonstrator using a testbed connected to the DIH that allowed them to see, at low cost (<10K€), the potential of applying machine learning in their production line. The SME was then put in touch with an independent start-up that offered an industrial solution.
Teralab (France) - Leveraging data to accurately identify fraudulent claims
Santéclair is a subsidiary of several health insurance companies, helping to cover optical, dental, and aural expenses as well as dietetic and orthopaedic services and serving over 10 million patients. Santéclair found out that fraudulent reimbursements came both from opticians and from patients, but it did not have a system to analyse the right data and to adapt to the increasingly sophisticated fraudsters. With the increase of reimbursement volume, Santéclair had to improve its fraud procession efficiency. TeraLab initiated a POC, with the objective to identify more fraud by feeding algorithms cases of a high likelihood of fraudulence, and run it together with a technology provider, Dataiku, then a young French startup, and Eulidia, a data consultancy. Outcome and impact: • The POC enabled Santéclair fraud detection teams to target actual fraud cases 3x more effectively. • Reduced time-to-market for similar projects by industrialising the POC. • Saved time with a model automatically updated and monitored along the way to prevent drifting of performance.
ITI Data Cycle Hub (Spain) – Anticipating the failure of a critical machine in a process through predictive models
Development of predictive models based on Machine learning and multi variant analysis to anticipate the failure of a critical machine in a process. Data is gathered by specific and

standard sensors in the plant and is left in a data lake. Some data curation techniques are needed to improve the quality of that historical data. AI techniques are applied to the data to create working models. Real time data are processed using the models and an estimation of the failure is given. Prognostic Maintenance techniques applied to critical components will categorize the predictions into 3-time intervals. The availability to know the breakdown probability will allow the customer to schedule the appropriate resources inside the planned maintenance window. This will reduce significantly the cost of the maintenance intervention.

Image and video recognition and natural language processing

Munich Innovation Hub for applied AI (Germany) – Supporting the development of an AI solution for detecting Diabetic Retinopathy

Within the DIH, fortiss has supported Ubotica Technologies Limited, an Irish SME formed in 2016. Ubotica has expertise in the areas of Computer Vision and Machine Learning. Ubotica is developing a unique portfolio of Machine Learning Algorithms which will target different application areas. Fortiss provided technical support to Ubotica to integrate technology to validate AI components in their development of an AI solution for detecting Diabetic Retinopathy (DR) indicators in retinal images taken by specialist Fundus cameras. The In-line Diabetic Retinopathy Detection (IDRD) applies a Convolutional Neural Network (CNN) to assess the image for DR indicators. A major challenge in deploying AI-based solutions is in supervising the decisions of the CNN. Ubotica received technical coaching from the Munich DIH to integrate fortiss' NN Dependability Kit (NNDK) into IDRD. NNDK is a toolbox to support safety engineering of NNs. Thus, a new level of confidence is added to IDRD, giving Ubotica a credible verifiable AI element to their offering.

DFKI (Germany) - Using AI for knowledge transfer to wooden furniture manufacturing sector

DFKI assisted a Small Enterprise working in the wooding craft sector in managing and valuating their know-how, with the support of AI driven solutions. Carpentry Kasper has 30 years of experience in wood selection and handling and the two old carpenter masters combine most of the knowledge of the company. The video recording of their daily activities, supported by interviews and collaborative workshops with the employees, were automatically indexed using AI applications to build an interactive knowledge database to be used by current and future employees. A software to speech AI solution was used to have an automatic transcription of the videos while a second AI tool allowed to tag the videos along the process diagrams developed during the workshops, which mapped the different manufacturing processes and steps. The solution enabled the employees of the company to quickly and easily find the right video sequence and interview and the database ensures specialised and niche knowledge is transferred to future generations.

HP4C Poland (Poland) – AI solutions for media monitoring

HPC4Poland supported a company in the uptake of AI driven solutions to enhance their offering of media monitoring solutions. The company offers a variety of services based on media monitoring, including among others brand monitoring, advanced impact analysis,

sponsorship efficiency, competitor watching and customer satisfaction. The adoption of AI solutions has strengthened these services, guaranteeing faster and more accurate analysis thanks to automatic speech, image and text recognition and analysis, further enriched by the possibility to roll out sentiment analyses.

nZEB Smart Home (Greece) – Integrating and testing an Intelligent Assistant (AI Agent)

There was a need to deploy and test the Intelligent Assistant in real smart domestic environment and enrich its features with added-value services for Smart Homes. After the integration with the existing BMS of the nZEB Smart Home DIH, the Assistant had access, among others, to the lighting, HVAC, plugs, smart appliances, microgrid assets (i.e. PVs, Batteries, etc.), electric vehicles and medical devices. The integration is currently under rigorous development, evaluation and validation of the envisioned final outcomes. Through the Smart Home infrastructure AI Agent will learn and evolve into a future-proof smart home intelligent assistant.

Robotics

nZEB Smart Home (Greece) – Digital upgrade for added value services through IoT and Robotics

At the nZEB Smart Home premises was tested the integration of a cutting-edge elevation control systems with innovative solutions that would allow the unobtrusive integration with smart buildings and their management systems, including also a robotic system. The robot was able to interact with the elevator without any assistance in order to be able to navigate between floors. Furthermore, human behaviour analysis equipment has been installed to analyse everyday use and then present AI-driven solutions that will provide suggestions for both optimal routing and preventive maintenance.

CROBOHUB (Croatia) – Fostering automation through solutions for compliant motion of robotic manipulator

Enikon Aerospace Ltd. is the leading company in the world within the niche market of outsourcing of preparation and final painting of moulded interior parts for commercial and business aircraft. Enikon is now making inroads into automation introducing robots to perform certain grinding and finishing functions, allowing it to produce even more consistent quality with a fraction of the labour cost. Through joint project ENDORSE CROBOHUB helped Enikon on their road to automation, by offering solutions for compliant motion of the whole robotic manipulator which will allow the Enikon to increase the amount of surface of the products that can be treated with the robotic manipulator. At the same time, this will increase the performance and efficiency as well as overall safety of workers in the production line.

AR/VR

CIIRC (Czech Republic) – Creating environmental models through AR/VR

Fata Morgana, a system developed by the start-up company Pocket Virtuality, is used to create environmental models available at any location, based on the sensing technology provided by the Microsoft HoloLens AR headset. It allows connecting a remote site manned by an operator with a HoloLens AR headset, and a supervisor site equipped with a virtual reality system. Operators share the environment scanned by the AR headset, whereas the supervising operator may navigate and command the in-field operator through the VR environment. Pocket Virtuality cooperates with CIIRC on connecting other industrial systems such as robots into the AR/VR environment to demonstrate various use cases suitable for industrial applications.

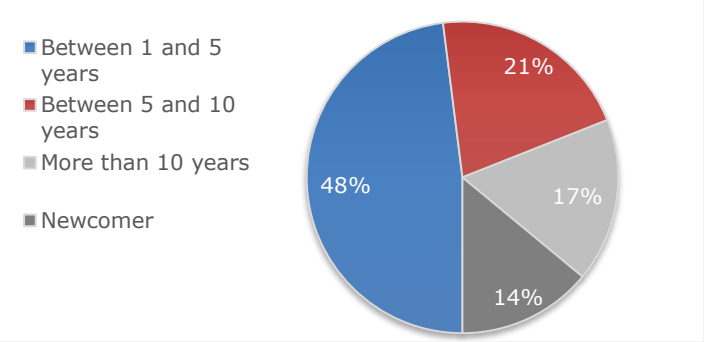
Given the technological focus of the network, a specific analysis has been performed on the experience and the activities of DIHs in the field of Artificial Intelligence, reported in the box below.

Experience level of selected DIHs in the AI field

The DIHs involved in the Network present different level of experience in the field of AI.

The 38% of them that have been active in the field for more than 5 years are expected to provide support to the selected DIHs, which have approached artificial intelligence only in the last 12 months (14%). Finally, nearly half of participating hubs have been active in the field for a time-length between 1 and 5 years, reflecting the increasing importance that Artificial Intelligence has been gaining over the last years.

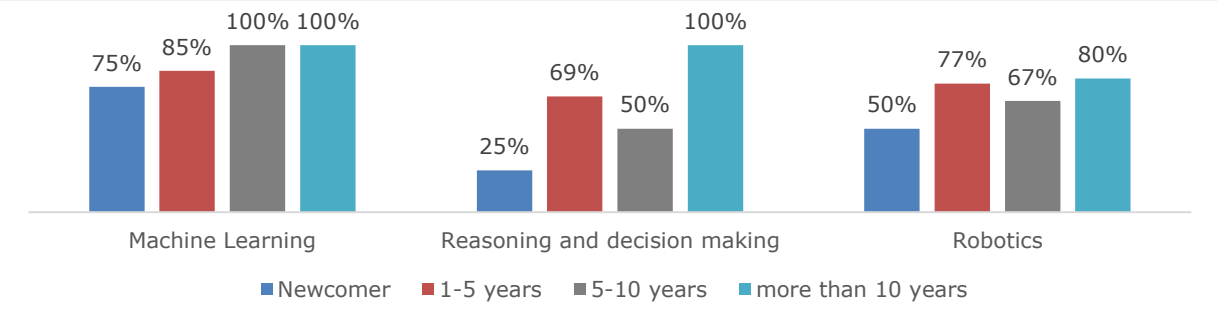
Figure 2 - Experience in the AI field of participating DIHs



Source: Own elaboration on data from the application forms

By considering the AI sub-disciplines covered and the years of experience in the field of AI, it results that more experienced DIHs tend to operate in different fields (see **Error! Reference source not found.**). All DIHs operating in AI work both in machine learning and reasoning and decision-making and most of them (80%) have also competences in robotics. On the other hand, newcomers tend to concentrate on machine learning (75%) and, to a lesser degree, on robotics (covered by 50% of newcomers).

Figure 3 - AI subdisciplines covered by members of the AI DIH Network per years of experience in AI



Source: Own elaboration on data from the introductory questionnaire

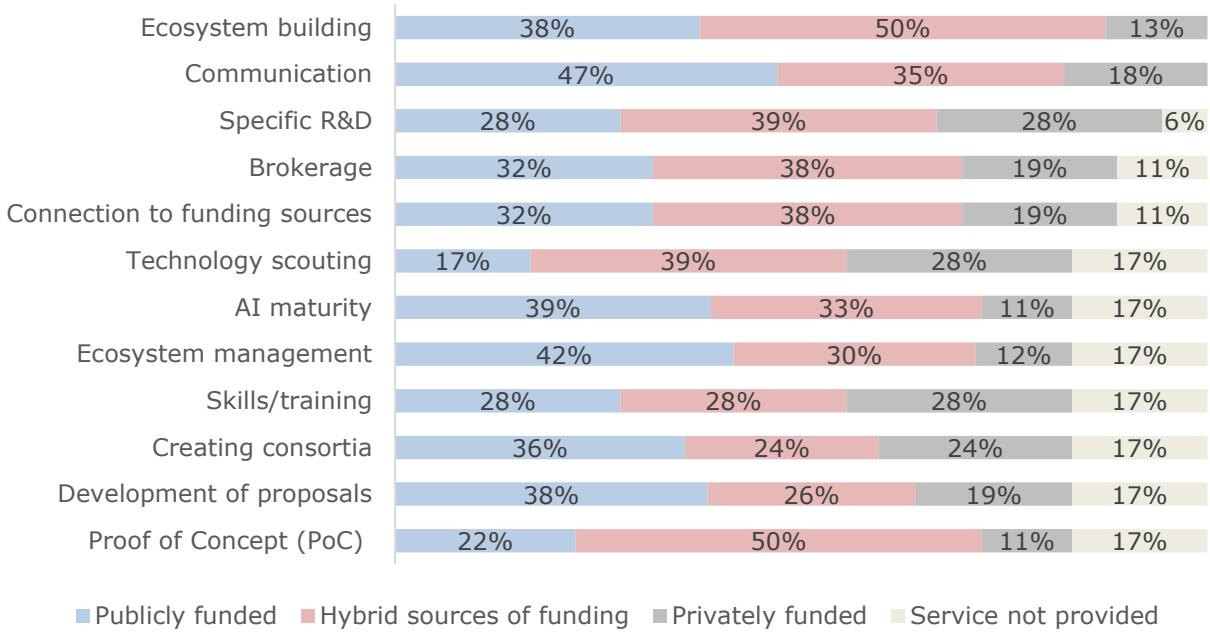
3.2.1.4 Service delivery: types of funding and main sectors covered

The services provided have been analysed in terms of sources used to cover cost connected to the service delivery. This was functional to identify which type of financier (e.g. a public entity funding the DIH, a private customer, etc.) would be charged with additional costs in case the costs of cooperation were charged to the paying entity.

The analysis shows that the situation among the different DIHs is usually varied. Depending on the national and regional context where DIHs are located, they receive public funds for delivering their services, a direct payment from the clients or get a mixed form of payment (e.g. public funds are used to cover a part of the costs, while the remaining part is charged to the client).

In general, a larger share of DIHs tends to receive public funds for services connected to ecosystem support (e.g. ecosystem management and building, communication). The closer a service is to addressing the specific needs of a DIH client, the greater the involvement of private and hybrid sources of funding, meaning that clients are more likely to invest their own resources in a particular service when they can visualise the value it will provide them, in terms of solving a problem or winning new business.

Figure 4 - Most popular DIH services and the types of funding used to cover the cost



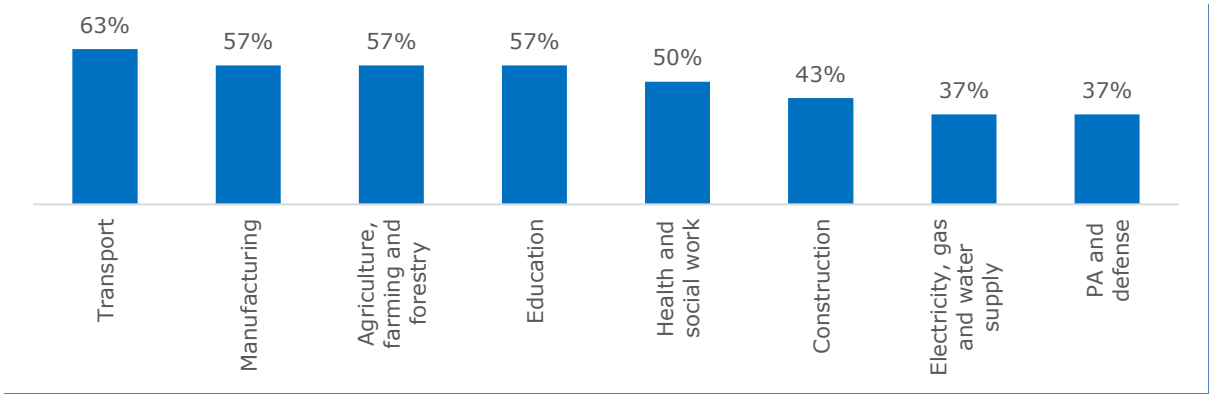
Source: Own elaboration on data provided by AI DIH Network members

Among public funding sources, public funding, channelled through competitive calls at European, national and regional level, is currently the most important source of funding for AI DIHs. Other sources of public funding, such as from the ERDF, also play a significant role, albeit less used than direct funding programmes, probably because of their limited availability.

Finally, in terms of sectors supported, DIHs involved in the project show a certain level of diversification. As shown in the figure below, main targeted sectors vary from Transport (63%) and Manufacturing (57%) to Agriculture and Education (both at 57%). Other sectors

supported include Construction (43%), Electricity, gas and water supply (37%) and Public administration and defence (37%).

Figure 5 – Main sectors supported by DIHs involved in the project



Source: Own elaboration on data from the application forms

Digital Innovation Hubs and Public Administrations

According to the Digital Europe Programme, a share of European Digital Innovation Hubs should target Public Sector organisations among their potential customers. For instance, EDIHs should support PA bodies in the adoption of interoperability solutions, European Digital Service Infrastructures and building blocks (e.g. eID, eInvoicing, eDelivery, eSignature) as well as by ensuring them access to testing and experimentation facilities and equipment.

Based on our experience, such support can happen under three different forms:

- **DIHs support PA in preparing for the implementation of AI solutions.** Before adopting AI solutions, organisations need to fulfil technical and non-technical requirements (e.g. availability of well-structured data but also awareness of benefits of AI solutions, digital skills). DIHs can help Public Administration in this preparatory phase, e.g. by supporting the improvement of data governance.

  AIR4S (Spain) – Connecting and integrating data for the creation of an open data portal

  The Spanish National Library, based in Madrid Region, requested AIR4S for an on-demand technological service based on creating an open data portal (datos.bne.es) based on semantic technologies that integrate all the data coming from the above heterogeneous sources and connect the Spanish library data with other data from relevant international libraries, allowing the general public and librarians to access the catalogue using advanced features for searching over different types of entities or using advanced features for data indexing, ranking, retrieval and visualisation.

  Services provided by AIR4S were a combination of:

  - Specific technical service provision to develop the required solution from expert developers in AI domain;
  - Assessment on software licensing procedures;
  - Customized training delivery to the client in order to create qualified professionals in charge of managing the developed tool use and maintenance.

- **DIHs design or develop AI solutions for public administrations.** In this case. The DIH acts as direct provider of the public sector. This means that, apart from projects with limited financial values, the DIH should have the skills needed to take part in public tenders. Here below an example of service developed by a DIH to a central public organisation in France.

  DIGIHALL (France) – Using AI to design a workstation of the investigator of tomorrow

  In 2019, French government launched a call for projects for the modernization of French administration (https://www.modernisation.gouv.fr/action-publique-2022/fonds-pour-la-transformation-de-laction-publique/les-projets-laureats-du-ftap). The Directorate-General for Competition, Consumer Affairs and Fraud Control (DGCCRF) and DIGIHALL (CEA - RTO leader of DIH) proposal has been selected for funding.

  The final goal of the project is to design a workstation of the investigator of tomorrow. Making use of artificial intelligence, the work implemented in this project will give access to public agents to company data and to consumer feedback in an easy manner, thus making possible to feedback economic data and make controls more effective. In the framework of this project, DIGIHALL will develop a platform for collecting and analysing structured and unstructured data. For example, by bringing together and analysing unstructured data sources, this platform will allow: i) to collect data around companies; ii) to structure this data by company or by sector of activity, facilitating the access to that kind of information for public agents.

- **DIHs assist companies providing services to the Public Administration.** In this scheme DIHs are indirect supplier for the public sector, as they work with SMEs or tech-gov companies who are actually liaising the public organisation. Examples gathered in the AI DIH Network refer to the health sector (see Ubotica case presented above) and to the smart city.

  AIR4S (Spain) – Computer visioning for the development of a social network for smart city

  The Graffter is an SME whose initial aim was to develop a social network for the smart city. They wanted to change the way people interact within a social network using the city as supporting element. They required advanced computer vision and graphics technology to offer augmented reality in mobile devices, access to public R&D&I funding to support the development, and education and skills development for their workforce.

  AIR4S supported the Graffter in:

  - providing consulting services in computer vision;
  - hosting the company at the UPM business incubator;
  - partnering the company in successful public competitive funding calls;
  - providing advanced education and skill development to the staff in Artificial Intelligence.

It is worth mentioning that, despite the cases identified, DIHs reported to be not particularly active in the support to public sector (as reported also in **Error! Reference source not found.**). T hey would need to both develop additional skills (e.g. public procurement) and dedicated services (which take into consideration any limits on potential competition with private providers) as well as activate collaborations (e.g. by creating consortia) with relevant actors already working in the

field of public sector innovation to extend their activity in this sector.

3.2.2 Cooperation activities

The experience in cooperation activities as well as the willingness to participate in a DIH network are two of the most relevant aspects considered for the selection of the AI DIH Network members. Coherently, the selected DIHs show to have experience in cooperation with other hubs. Most of them have been involved in "soft" forms of cooperation, e.g. entailing exchange of information and best practices or sharing ideas and position in international debates. Involvement in structured cooperation activities, requiring shared investments and resources is less frequent.

In most cases, cooperation has taken place to share best practices and create synergies in the field of R&D. Also, cooperation seems to be an opportunity-based activity rather than a regular behaviour, often taking place in the framework of funding opportunities available at EU level.

Involvement in EU projects

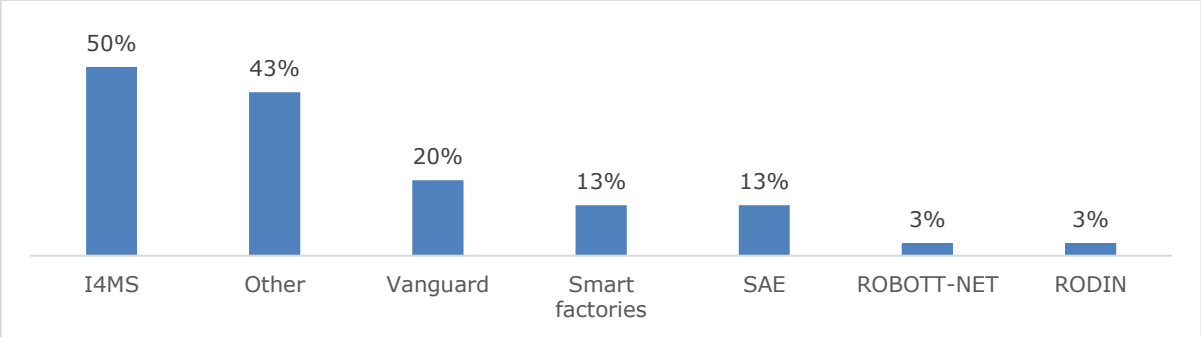
The members of the AI DIH Network have been selected to provide inputs relevant to the definition of cross-border cooperation schemes and contribute to the discussion of incentives and barriers characterising cooperation. Since cross-border cooperation is mainly happening in the context of Horizon 2020, most of the DIHs selected show significant experience in Horizon 2020 projects.

Half of the selected DIHs, for example, have been involved in the I4MS Initiative, aiming aimed to promote and expand digital innovation in European manufacturing SMEs[257]. The second most participated initiative by the selected hubs has a political background in as far as it is a network of European regions. The initiative, named Vanguard, aims to develop a pan-European innovation infrastructure for enterprises. Further projects participated by members of the AI DIH Network include Smart Factories - an EU project aiming at establishing Digital Innovation Hubs across EU13 Member States - and Smart Anything Everywhere, aiming at reinforcing the digital transformation of products and services of SMEs, start-ups and mid-caps of the European industry through DIHs[258].

Many DIHs are also involved in collaborative projects focussed on specific technological fields connected to AI, such as **robotics** (e.g. RIMA, ROBOTT-NET and RODIN) and **Big data** (e.g. BDVA (Big Data Value Association).

[257] https://i4ms.eu/
[258] https://smartanythingeverywhere.eu

Figure 6 - Programmes/Initiatives in which members of the AI DIH Network took part



Source: Own elaboration on data from the application form

The cooperation activities performed by selected DIHs do not limit to other hubs but involve other players of operating in the development and dissemination of Artificial Intelligence in Europe, such as AI competence centres, research centres, etc.

Specifically, members of the AI DIH Network reported that collaboration with such organisations is usually functional to the **participation in R&D projects**, **develop specific AI solutions** required specific clients and is also useful to **enrich the DIHs competencies** in the field.

The profile of a DIH working in the field of Artificial Intelligence

4 The profile of a DIH working in the field of Artificial Intelligence

Based on the analysis of the business and operating models of the Digital Innovation Hubs involved in the AI DIH Network, on the inputs gathered during interactions with DIH representatives as well as on the Consortium's internal expertise, we have defined the characteristics of a DIH working in the field of AI.

The profile of an AI DIH has been firstly defined in terms of service offerings and competences. The latter have been identified referring to the ESCO framework, to ensure the use of a common European terminology.

> ESCO is the European classification of skills/abilities, qualifications and jobs. It represents a Europe-wide taxonomy, describing and classifying professional occupations, skills, and qualifications relevant for the EU labour market and education and training.
>
> ESCO provides descriptions of 2942 occupations and 13.485 skills linked to these occupations, translated into 27 languages. Over time, in connection with the renewed Europass, it will also display the qualifications awarded in the education and training systems from Member States, as well as qualifications issued by private awarding bodies.
>
> ESCO is linked to relevant international classifications and frameworks, such as NACE, ISCO and EQF. For the development of the ESCO sector related to ICT services, for both skills and occupations, the sectoral group has extensively taken into consideration the European e-Competence Framework (e-CF), that classifies 40 competences for the ICT professionals.[259]

Following the identification of the services and competences characterising an AI DIH, we have defined the features of an operating model that enables to perform these activities.

The results of the analysis are reported in the following sections.

4.1 Competences and service offerings

The definition of the profile of an AI DIH started with the identification of the services it may be able to offer and the competences it should be able to leverage to perform these activities. Such competences do not need to be internal to the DIH. On the contrary, it is essential that the DIH has the capability to take advantage of the skills of other DIHs and other players of the innovation ecosystem by using collaboration.

The competences identified include:

- **Transversal competences**, i.e. those needed to perform all the activities included in the service offerings.
- **Technical skills related to AI:** skills and knowledge which underlie the possibility to perform AI-related services

[259] ESCO - ESCOpedia

- **Competences deemed particularly relevant for a specific service**, which are reported in tables below (in some cases, transversal competences and technical skills related to AI are reported within the tables to highlight their importance for a specific activity).

4.1.1 Transversal competences

In addition to specific knowledge, skills and competences necessary for the delivery of the DIH services, AI DIHs also rely on a set of transversal skills throughout their activities. Among others, in their day to day work Hubs need to show their capability to manage projects, efficiently communicate in different contexts, assess quality and risk issues, as well as to demonstrate emotional intelligence and sound ethical behaviour. In addition, providing advice to SMEs and Public Sector organisations in the field of AI requires a transversal knowledge of the principles and disciplines behind Artificial Intelligence.

The study on *Skills for Smart Industrial Specialisation and Digital Transformation*[260] clusters the transversal skills relevant to digital transformation in six categories: quality risk & safety, management & entrepreneurship, communication, innovation, emotional intelligence and ethics. Drawing from this study, it is possible to identify a set of the most relevant transversal skills for an AI Digital Innovation Hub.

Quality, risk & safety

Quality management is a key transversal skill across different services offered by a DIH. Hubs need to ensure the quality of the services delivered and need to support their customers to establish, monitor and improve their quality control systems. The need for adequate quality management competences is very evident in relation to the services connected to the development and certification of new products; but it is also true in the case of services to support the search for investments and partners. **Risk assessment** competences are needed, among others, for all services connected to the identification of a technological solution and provider.

Management & entrepreneurship

Planning of activities, management of projects, and the coordination of an ecosystem all require sound entrepreneurship and operational management skills. Hubs need to **facilitate** and **negotiate** agreements between actors in the ecosystem, to engage new organizations and demonstrate to be **customer-focussed**. **Teamwork**, **project management**, **coaching and developing**, **monitoring**, **management of personnel and financial resources** are all operational management skills that any DIH will need in the deployment of most if not all of their services.

[260] The study was published in 2019 in the context of EASME's 'Skills for Smart Industrial Specialisation and Digital Transformation (SIS&DT)' project, a two years long project commissioned by the European Commission's DG Grow

Communication

DIHs act at the centre of their ecosystem, facilitating connections among different actors and translating technological research into concrete opportunities for growth. To cover this role, Hubs need to rely on their **interpersonal skills** to take care of customer relationships and on their **verbal, written and public communication** skills to successfully envoy their messages. In addition, knowledge of **virtual collaboration** tools enhances and facilitates their operations.

Artificial Intelligence has attracted a lot of interest over the last years, with the risk of becoming a buzzword. Hubs working in this field need to be able to clarify complex concepts while ensuring actors in the ecosystem speak the same language. Communication skills are transversal to all services offered by a DIH, and they are particularly needed in relation to activities in support to the ecosystem and in the provision of skills & training related services.

Innovation

Integrating new technologies and adapting them to the needs of a specific organization requires continuous innovation. **Creativity, system thinking, complex problem solving, continuous experimentation** and a **design mind-set** are paramount transversal skills for DIHs, enabling them to find innovative solutions and to foster digital transformation in their ecosystem. Moreover, the potential of Artificial Intelligence is also linked to its cross-sectoral nature and the possibility to apply it to a wide range of topics. AI Hubs are therefore asked to address different needs drawing from a vast technological field, requiring a strong **attitude towards innovation**.

Emotional intelligence

Self-management and social skills are particularly relevant in any support and advise activity DIHs perform, enabling them to better understand the needs of their customers. In particular, **proactivity, adaptability, active learning and judgment** and **decision making** are all relevant to the work of Hubs whose first task is to reach and listen to their customers. **Leadership** and **cooperation** are also valuable social skills especially in relation to the management of the ecosystem and of the relationship with other DIHs.

Ethics

The adoption of new digital technologies might entail ethical risks which are inherent risks of the design of the new solutions and of the impact these technologies have on society and citizens. Under this category, we find skills such as **perspective taking, moral behaviour, cognition** and **judgment**. In the field of Artificial Intelligence Hubs need to closely consider the risks for biases, ensure transparency and privacy in the use of data and analyse the ethical issues linked to the decisions and actions that will be performed either by humans with the support of these solutions or by the machine in complete autonomy. Indeed, beyond these transversal skills common to all Hubs, an AI DIH will need a deeper knowledge in the field of ethics to deliver some specific services such as legal and ethical AI support.

4.1.2 Technical skills related to AI

Working in the field of Artificial Intelligence requires a set of technical skills which are employed to deliver a number of services, from training to the development of algorithms.

Although not all Digital Innovation Hubs working in the field of AI are expected to be highly specialised in this area, they are required to have, in-house or within their ecosystems, some basic AI knowledge and competences. Among them, the knowledge of **AI principles**[261] and skills to **utilise machine learning,** but also all the competences that underlie the development of AI solutions and algorithms, such as **computer science**[262], **software design**[263], mathematics, statistics, etc.

Additionally, specific competencies are required to ensure appropriate **governance, management, protection** and **storage of data** which are at the basis of the development and test of AI solutions.

4.1.3 Service offerings and connected skills

The services potentially offered by an AI DIH have been clustered into the four functions that should be performed by a DIH according to the Digital Europe Programme, i.e. Test before invest, Support to find investments, Innovation ecosystems and networking and Skills and Training and are reported in the following tables. The complete list of ESCO skills/knowledge required to provide each specific service is included in Annex F.

It has to be noted that a DIH does not need to offer all the services identified to be considered an AI DIH. The DIH offerings has to be adapted and tailored to respond to the needs of its specific ecosystem and users. This general principle applies also to the area of Artificial Intelligence. Nonetheless, the list elaborated may provide guidance for DIH willing to widen their offerings in the field of AI and for institutions that support them.

[261] http://data.europa.eu/esco/skill/e465a154-93f7-4973-9ce1-31659fe16dd2
[262] http://data.europa.eu/esco/skill/7b5cce4d-c7fe-4119-b48f-70aa05391787
[263] http://data.europa.eu/esco/skill/89f6560b-2194-45c9-9ece-d33049a73eef

4.1.3.1 Test before invest

Service	Activity	Definition	Skills/knowledge (ESCO)
Strategic support to RDI	**Feasibility study, joint, pre-competitive R&D**	*Organisation of meetings/ workshops/ events to promote the identification and feasibility of PoCs and strategic fields and topics for R&D*	Apply strategic thinking Carry out strategic research Collaborate with stakeholders Identify needs and technological responses Creatively use digital technologies Assess the feasibility of implementing developments
Contract research	**Specific R&D**	*Applying technological innovation to develop new products/services or improving existing ones*	Manage research and development projects Seek innovation in current practices Analytical thinking Develop new product Deep technical knowledge (e.g. data mining, principles of artificial intelligence, etc.) Assess the feasibility of implementing developments
	Technology concept development/ Proof of Concept (PoC)	*Planning and defining new business services solutions as well as demonstrating the feasibility of an idea or project through its temporary or provisional realisation*	
Technical support on scale up	**Concept validation**	*Developing minimum viable products that can be validated with real customers and/ or in an industrially relevant setting*	Develop new product Design prototypes Create prototypes Perform market research Calculate production costs
	Prototyping	*Designing prototypes to explore ideas and emerging technologies before going into production by also considering potential opportunities offered by small series production*	
Testing and validation	**Product qualification**	*Support in certifying that the product has passed performance and quality assurance tests*	Manage product testing Oversee quality control Quality assurance methodologies Verify formal ICT specifications
	Certification	*Provision of a formal certification stating that a model or simulation is acceptable to meet a specific purpose*	Perform quality audits Quality assurance methodologies Ensure compliance with legal requirements Manage product testing Verify formal ICT specifications
	Ethical AI Certification	*Assessment and certification of AI applications and internal procedures to be compliant to ethical frameworks and principles*	Data protection Data quality assessment Quality assurance methodologies Adhere to national and European professional code of ethics Principles of artificial intelligence Verify formal ICT specifications Audit techniques

Service	Activity	Definition	Skills/knowledge (ESCO)
	Product demonstration	*Promotion in which a product is demonstrated in front of clients*	Demonstrate products' features Implement marketing strategies Demonstrate functionality of software products
Provision of infrastructure	**Support in technology infrastructure usage**	*Provision of services to support testing within shared lab facilities and equipment by the supervision and assistance of highly trained personnel.*	Use laboratory equipment Perform laboratory investigations Supervise laboratory operations Apply safety procedures in laboratory
	Data platform services	*Data sharing services to provide useful, significant, robust information and data for training AI models. Different models could be implemented (e.g. data platform as a service, data from the DIH network, data feeding from ecosystem organisations, etc)*	Data administration Implement data quality processes Data protection Information governance compliance Data mining methods Perform data cleansing Manage data Manage standards for data exchange

4.1.3.2 Support to find investments

Service	Activity	Definition	Skills/Knowledge (ESCO)
Strategic and business development	**Visioning and strategy development**	*Supporting both start-ups and SMEs in shaping their vision and strategies as well as large corporations that require fresh thinking to remain relevant and competitive in the marketplace.*	Strategic planning Perform business analysis Perform market research Monitor technology trends
	AI maturity assessment	*Assessment of company readiness for AI (technical, organizational, and ecosystem readiness).*	Assessment processes Identify needs and technological response Principles of artificial intelligence
	AI service impact assessment	*Assessment the effectiveness of delivered AI services.*	Perform business analysis Assessment processes Perform market research
	Business development	*Coaches and mentors, entrepreneurs in loco, dedicated programmes to assist entrepreneurs in the process of business development (e.g. business modelling and planning, strategic advice, organizational model, etc.).*	Strategic planning Develop business plans Coaching clients Create business process models Develop an organisational structure
Support facilities /Incubator and accelerator support	**Access to basic infrastructures and house offering**	*Providing access to physical logistic support and office spaces with amenities infrastructure (offices, café, meeting rooms, laboratories, co-working areas, libraries, telecommunication infrastructure, video conferencing, etc.)*	Manage facilities services Maintain relationship with customers Implement marketing strategies Data administration Data protection
	Access to infrastructure and technological platforms	*Granting access to equipment, providing platform technology infrastructure, lab facilities as well as support to low rate production. For example,* ***high powered computing, highly specialised measurement equipment, etc.***	
	Innovation spaces	*Offering innovation spaces to encourage innovators and other ecosystem members to interact and share ideas as well as spaces for experimentation and pilot manufacturing* ***(including data ecosystem and spaces).***	
Funding lifecycle management support	**Funding mapping and matching**	*Scouting and mapping of all funding sources and opportunities and facilitation to access to different funding sources (EU, national, regional, and private) aiming at achieving an effective mix of funds (conversation, lobbying, projects).*	Advise on investment Advise on government funding Identify clients' needs Funding methods Financial analysis Apply for government funding Manage government-funded programmes Create a financial plan Funding methods
	Support to funding application and management	*Providing support in drafting the funding request (e.g. compliance with specific guidance and methods), administrative support in the*	

Service	Activity	Definition	Skills/Knowledge (ESCO)
		application process and operational funding management (e.g. reporting and budgeting).	
	Financial engineering	*Providing support in addressing financial issues and/or advising on innovative financial products.*	
Legal and ethical AI support	**Fiscal and Legal Guidance**	*Offering fiscal and legal advice where necessary, and regulatory assistance*	Advise on tax policy Provide legal advice Intellectual property law Disseminate information on tax legislation
	Ethical AI Committee as a service and support	*Consulting and supporting activities related to the ethical issues of AI by:* • *Establishing an Ethical Committee on AI with members of the local community and experts, to support those companies that cannot afford (either the costs or internal; competences) a proprietary one;* • *Helping groups of organizations to constitute a shared Ethical Committee on AI;* • *Supporting a single organisation in the creation of an Ethical Committee on AI.*	Establish collaborative relations Adhere to national and European professional code of ethics

4.1.3.3 Innovation ecosystems and networking

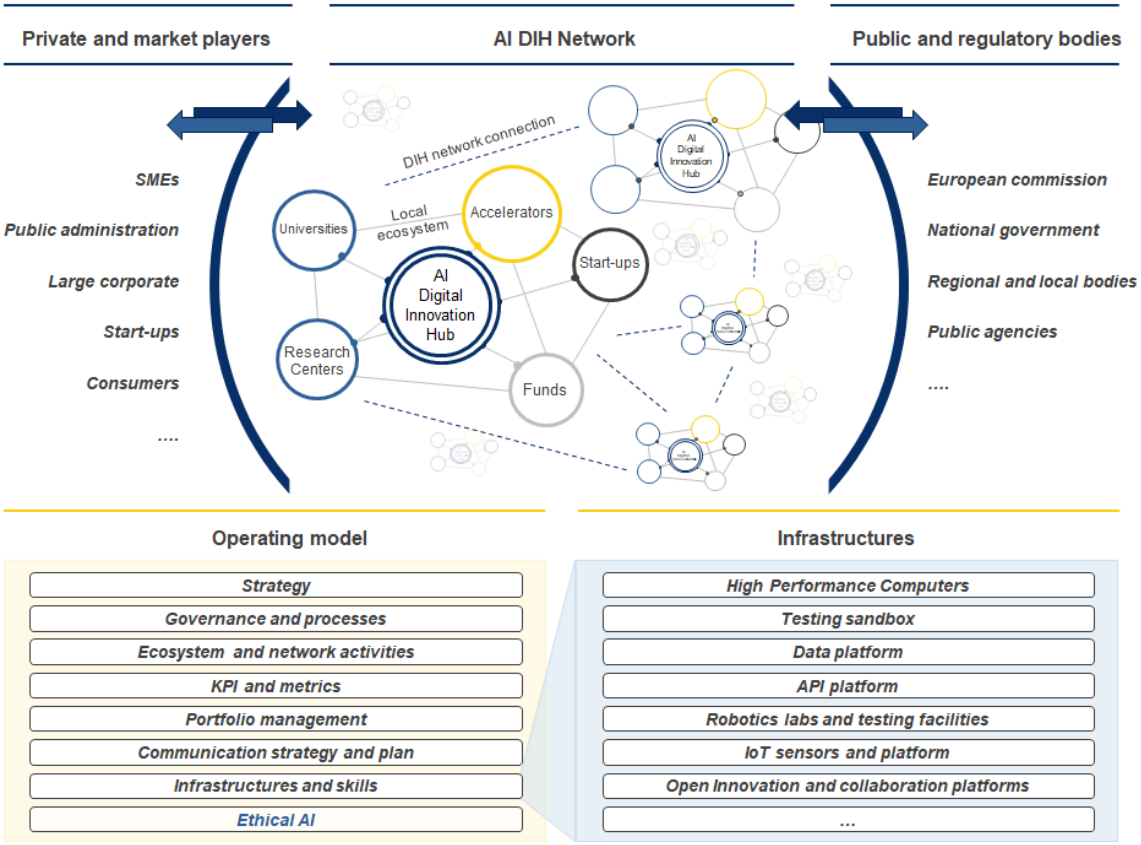
Service	Activity	Definition	Skills/Knowledge (ESCO)
Ecosystem scouting, engagement and management	**Trend watching**	*Providing up to date information on the tech and market trends (e.g. emerging techs, market dynamics and growth, new business models, etc.)*	Monitor technology trends Analyse economic trends Present reports Identify needs and technological responses Perform market research Creatively use digital technologies
	Technology and third-party scouting	*Scouting of innovative technologies and solutions and third parties that might match companies needs or in line with market or tech trends.*	
	Ecosystem mapping	*Creating a catalogue of innovative third parties around the DIH, that can be used to ease the scouting process and that can map the competences also through the implementation of a dedicated digital platform.*	
	Ecosystem management	*Lead generation and relationship management both within the DIHs ecosystems and between DIHs of the network. Management of the engagement process and of the follow-ups also through digital tools*	Build business relationships Develop membership strategies
	Networking, events and initiatives	• *Events and communications to raise the awareness on the presence and role of the DIH* • *Events and communications to raise awareness about the presence of skills, innovative actors and their best practices within the DIH network and ecosystem.* • *Workshops and presentations of experts in business and entrepreneurship, or industry sectors.* • *Launching and managing Open Innovation Activities (e.g. hackathons, call4ideas, etc.)*	Develop communications strategies Use different communication channels Coordinate events Monitor technology trends Perform market research
Ecosystem coordination for projects	**Identification of opportunities**	*Support in the identification of new market/business opportunities through strategic analysis of the ecosystem and trend watching*	Monitor technology trends Perform market research Perform risk analysis Identify clients' needs
	Creating consortia	*Encouraging cooperation and collaboration among organisations for exploiting common opportunities and proposing new partners to establish consortia.*	Build business relationships Create cooperation modalities
	Development of proposals	*Providing technical assistance and project management in the proposal development process in order to comply with specific proposal requirements*	Project management principles Present detailed design proposals Interpret technical requirements Manage ICT project

4.1.3.4 Skills and training

Service	Activity	Definition	Skills/Knowledge (ESCO)
Training	**Executive courses**	*Training on AI and innovation for executive and management (e.g. new AI enabled business models, tech applications use cases, strategic business development through AI solutions, ethical and legal aspects, new collaboration methods and systems)*	Identify digital competence gaps Use learning strategies Strategic planning Emergent technologies Market analysis Identify training needs Training subject expertise Perform business analysis Learning management systems
	Lectures	*Training provided to employees/workers on digital and AI topics through frontal lectures provided by selected SME or in partnership with other shareholders of ecosystem (e.g. AI and tech, methods, ethical implications and implementation techniques)*	
	On-site company tailored training / Boot-camps	*Courses tailored on companies needs and provided directly on-site after specific requests on AI related subjects; including also "train the trainer" type of course.*	
	E-learning	*Lifelong training on technical and soft skills focused on AI (e.g. AI business models, deep learning programming, IPR management, etc.)*	
Talent and skills match making	**Stage and talent acquisition**	*Talent scouting initiatives and facilitation to match skills demand*	Identify customer's needs Carry out recruiting services Develop communications strategies Use different communication channels Build business relationships Provide legal advice
	Secondment	*Facilitating the exchange of personnel (e.g. researchers) and core competencies among organisations, **including IPR***	
Awareness raising	**Organisation of awareness raising campaigns**	*Organising activities for raising awareness on AI (workshops, dissemination events, etc.) on specific topic and for a specific audience*	Develop communications strategies Use different communication channels Monitor technology trends Perform market research

4.2 Operating model

Figure 7 – Operating model of an AI DIH



Source: Own elaboration

4.2.1 DIH role

A Digital Innovation Hub (DIH) is an organisation or a coordinated group of organisations with complementary expertise, with a not-for-profit objective that supports companies – especially SMEs and mid-caps – and/or the public sector in their digital transformation.

Digital innovation hubs play a key role in the **coordination of the innovation ecosystem** (*i.e.* research centres, universities, start-ups, private investment funds, etc.) and should work as the **local focal point of international systems** and networks to support market players in their innovation process as well as public and regulatory bodies to achieve their goals within local ecosystems.

On the market side, DIHs should promote and ease the **development and testing of innovative solutions** activating skills sets that could support the exploitation of new technological advancement and connecting companies with the needed resources that might be found within the innovation ecosystems (local, national and international).

DIHs close relationships with universities and research centres should be exploited to scout

required skills and technologies and to **encourage technology and knowledge transfer** towards the market for the benefit of the companies as well as of the public. DIHs should make the most out of their proximity to public and regulatory bodies to **ease market alignment with new directives, public interest and funding opportunities** as well as to **recommend institutions**, regional and local bodies on upcoming market and societal needs.

4.2.2 Strategy

To perform their challenging tasks effectively, DIHs should equip themselves with a structured operating model. This includes a **strategy** defining the DIH mission and key intervention areas to support a clear positioning within the local, national, and international context as well as to ease activities prioritization.

Strategy definition is a paramount activity and should be carefully performed as it permeates the whole operating model. On the one hand, the DIH strategy should be **aligned with public administrations' and regulatory bodies' guidelines and priorities**; on the other, DIHs should **address the market needs and trends** with key strategic views and assets, the main objectives being to strengthen local economy by supporting the digital transformation of the local industry and public sector.

The latter driver for strategy definition is particularly relevant because it informs different building blocks of the operating model as, for example, the DIH's specialisation and service definition according to the four categories *Test before invest, Skills and training, Support to find investments, Innovation ecosystem and networking*. Indeed, every hub should have or develop a dedicated focus with corresponding expertise, services and partnerships based on the local strengths available, on the future needs of the local industry or public sector, and also on the complementarity to existing commercial services or other local hubs.

The strategy should also include **funding mechanisms**. A complete alignment between the two is fundamental to define a sustainable business plan to be effectively delivered. This aspect has a primary relevance because of the not-for-profit nature of the DIHs which should find the suitable balance between necessary revenue streams, (private, local, national and European) funding and free-of-charge services in order to remain compliant to the relevant regulations.

DIHs should set out priorities and accordingly outline an implementation roadmap for the defined strategy so as to effectively deliver services, efficiently use the funding and achieve their own objectives. In the case of DIHs composed by different organizations, alignment on a clear and shared strategy and on its implementation roadmap is fundamental to ensure efficient operations and the achievement of common objectives.

4.2.3 Governance and processes

As the draft DEP regulation mentions "European Digital Innovation Hubs shall have substantial overall autonomy to define their organisation, composition, and working methods" and they should be able to provide technology and business development with effective outreach. This results in the need of a well-established, far-reaching and heterogeneous network but also of

fast and impactful decision-making paired with lean processes and clear responsibilities. The benefits are twofold: create an internal fruitful environment and strengthen external collaborations.

Clear **governance** should be defined together with detailed **processes** for the most relevant **activities** allowing smooth and transparent operations as well as providing a clear point of reference within the network. Governance regulates how DIH's activities, such as ecosystem scouting, match making, idea to market initiatives, project selection, etc., are performed including, for example, ideas' and partners' evaluation and selection criteria, roles involved and their responsibilities. Indeed, if all the services and initiatives are framed within a structured process, both already established clients and prospects can effectively understand the DIH's way of operating and can easily access its services. This is even more important when dealing with SMEs because the final outcome is a wider and incisive impact on the local environment.

Structured approaches guided by clear governance and easy to understand processes, of course should not be established at the expenses of **flexibility** which in fact critical when dealing with innovative topics and with small and dynamic reality.

4.2.4 Ecosystem and networking activities

The interactions with the local, national and international **ecosystem and networking activities** (including those with other DIHs) should be in scope with the strategic implant and managed in a structured manner to limit inefficiencies and market induce trust in the DIH.

A structured approach to map, engage and manage relationships with third parties is of paramount importance to provide access and to coordinate the use of core skills that are key for innovation to occur.

Within the ecosystem, different players should be identified to support initiatives and projects accordingly to their profiles:

- **Universities and research centres** can give access to a broad knowledge base through the structured engagement of specialized research groups. Talents can be scouted and trained to be recruited for highly specialized jobs supporting innovative solution development within private and public organizations. Moreover, universities and research centres usually own very advanced facilities that could be used to test advanced solutions relieving companies from the necessity of investing in expensive instrumentation that might turn-out underutilized if not even useless relieving companies from the necessity of investing in expensive instrumentation that might turn-out underutilized if not even useless
- **Start-ups** and **university spin-offs** can provide support in adopting vertical and innovative technologies enabling new businesses and opening opportunities in new markets. Business agility of new and smaller sized ventures contributes to the ecosystem vitality, creativity and attractiveness.
- More **established companies** do provide a solid and broad market and industry experience that can be leveraged as a first testing ground for innovative solutions. Their presence could also provide additional private funding to collaborations ignited by network interactions.

- DIHs should engage **investors and financiers** to provide them with a clear outlook of the opportunities that can be found within the DIH ecosystem. This should enable more private capital to support the development and spread of innovative solutions.
- **Public bodies** play a pivotal role. Beside benefiting directly from potential digitisation projects, they should be followed/consulted by the DIH to design the most appropriate strategy, while they can also get inputs by the DIH experience of market needs.

4.2.5 KPI, metrics and Portfolio management

A clear, transparent and consistent framework of KPI and metrics should be put in place to **monitor effectiveness and track results**. Initiatives and activiti**es portfolio** should be managed to ensure constant **alignment between overall strategy, market needs and trends, and institutions expectations**.

All Digital Innovation Hubs will be required to produce activity reports and advancement on specific KPIs by European institutions and other financing public/private organisations. Additional KPIs, specific to local hubs and to their ecosystem can be put in place.

KPI should also be leveraged to monitor the effectiveness and sustainability of the provided services. This allows to find the right balance services that ensure productivity with those at the forefront that might imply more investments - and those ensuring less concrete results but with a longer-term scope.

The digitization of the processes and of the governance together with a clear and simple service portfolio might help in keeping track of selected KPIs and identify potential bottlenecks and inefficiencies of the DIH's operating model.

4.2.6 Communication strategy and plan

To effectively support private and public stakeholders and to be perceived as a key player within the digital innovation landscape, a clear **communication strategy** should be implemented to convey all the above-mentioned aspects.

Communication channels should be established to provide other players a clear ground to set their expectations and to leverage on DIH's actual **capabilities and services**.

Often communications fail to convey the actual value that stands behind DIHs when the operating model of the specific DIH and its actual capabilities are mixed with its development ambitions and with generic view of what a DIH should ideally deliver. In this innovative and dynamic context, it is important to structure few and clear messages on what a player interacting with the DIH could really obtain.

To ensure the correct audience is reached effectively, proper **communication channels** including both a well-structured website as well as social networks, networking events and conferences need to be defined.

With regards, to physical touchpoints such as networking events and conferences, they are usually very time consuming both for attendees and organizers. These events should be standardised to well identified and recognizable formats, leaving more frequent and light communications to other means such as feeds on websites, social network posts or

communications within digital platforms. Physical touchpoints should be prioritised to more important objectives, such as highly relevant topics or addressing specific needs highlighted by key players of the ecosystem, including idea generation and collaboration design sessions.

Reports on the **impact produced by the hub** should be published regularly also to share best practices and lessons learnt that stakeholder of the innovation ecosystem can take advantage from. While the impact of digital communication (e.g. social network posting, website etc.) might be useful for internal monitoring purposes, the impact of physical events (e.g. networking events, conferencing, etc.) should also guide the audience to select those that are more relevant to their scope.

4.2.7 Infrastructures and skills

Infrastructures and skills constitute a fundamental factor for the fulfilment of DIHs' mission and to foster the achievement of the Specific Objectives of the Digital Europe Programme (i.e. High Performing Computing, Artificial Intelligence, Cybersecurity and Trust, Advanced Digital Skills, Deployment, best use of digital capacity and interoperability).[264]

In particular, through the services falling under the category *Test before invest,* DIHs should favour the access to both **physical and virtual specialised AI infrastructures** that – by the activation of collaborations – could help the market to rapidly test and improve innovative solutions without the burden of investing for proprietary and potentially redundant infrastructures.

According to the DIH's focus, this could include HPCs, virtual environments, developing platforms and models / algorithms libraries, testing sandboxes, IoT sensors and platforms, as well as datasets to enable the experimentation and the development of new business models. In fact, data in AI acquires a predominant role because they represent the fuel to every solution, especially when dealing with learning techniques. The DIHs could take advantage of their central role within their network to build **data sharing platforms** engaging with local, national and European partners. In this way, also SMEs, local activities and public administrations could access meaningful and significant datasets that allow the development of valuable AI solutions. DIHs could thus foster the scaling-up of Business-to-Government data sharing in line with the new Final report by the *High-Level Expert Group on Business-to-Government Data Sharing*[265].

More basic infrastructure is also needed to provide **incubator and accelerator support**: this entails logistic support, office spaces, meeting rooms, co-working areas, libraries, telecommunication infrastructure, video conferencing, etc.

As underlined by Specific Objective 4 of the Digital Europe Programme, skills are another precious resource due to their high demand but significant shortage. In order for the DIHs to spread digital and AI-related capabilities and deliver the whole set of services described in section 5.1, they should equip themselves with a broad set of skills spanning from the areas of software programming and IT infrastructure to more business-oriented and mathematical

[264] European Commission, 2018, Proposal for a Regulation of the European Parliament and of the Council establishing the Digital Europe programme for the period 2021-2027
[265] European Commission, 2018, Proposal for a Regulation of the European Parliament and of the Council establishing the Digital Europe programme for the period 2021-2027

competences.

It is not required that all the skill, competences and infrastructures are internal at the DIH. On the contrary, DIHs should leverage on their network to complement less critical, less strategic, or highly specialised components with those of other partners.

The operating model should regulate the intake, management, development and access of those resources to enable their sharing across the network and spark innovation and ecosystem initiatives.

As DIHs are working as coordinators of a heterogeneous set of actors striving for developing new concepts, product and services from novel ideas, another key infrastructure consists of an **open innovation and collaboration platform** that can reduce physical distances, support idea collection, selection and refinement as well as coordinate collaboration process and steer the community towards common and shared goals.

4.2.8 Ethical AI

Although *Ethical AI* cannot be considered as a proper building block of the operating model, the relevance of regulatory and ethical aspects of artificial intelligence justifies a special focus on these topics. DIHs should be a **point of reference** for the whole network by providing these specific competences, expertise, support and - potentially - services. As explained in the previous block, all this could be provided through the DIH ecosystem network, even borrowed from external institutional players.

The ethical AI component of a DIH introduces a key element within the more technical development of innovative solutions. For this reason, DIH should host a **permanent working group**, if not a Committee, on Ethical AI with members from the research community (both from the technical, ethical and legal fields), from the local business and administrative communities, and citizens. This *authority* could assume different roles depending on its outreach; some possible configurations are described here.

- **DIH internal level** - An internal role with the objective of introducing in every AI-related activity ethical considerations. This entails that the DIH strategy is informed by the ethical AI view of the DIH as well as governance, processes and all the other building blocks of the operating model. Moreover, every AI development performed within the DIH should take into account the ethical AI principles and considerations, to ensure that the solutions have a positive social impact and are compliant with defined ethical frameworks.
- **Ecosystem level** - A supporting role for ecosystem players including, big and small, private or public, organizations. Services could span from "Ethical Committee-as-a-Service" kind of support; to providing expertise and consultancy for the establishment of committees within single or groups of organisations; to research / development projects to make specific AI solutions more ethical in terms of transparency, fairness and security; to AI solution assessments and certifications of their "ethical performances".
- **Societal level** - A role similar to a **citizen jury** that deliberate on specific issues related to AI solutions and applications and can discriminate and manage ethical issues at a societal level. As an example, in February 2019, the NIHR Greater Manchester

Patient Safety Translational Research Centre (NIHR Greater Manchester PSTRC) and the Information Commissioner's Office (ICO) co-funded two Citizens' Juries - the first in Coventry and the second in Manchester - focused on the use of AI to make decisions, across a number of different situations.[266]

The proposed roles could be alternative but are not exclusive. A mature DIH could have different organisms assuming the different roles and acting in a coordinated manner, while a less mature DIH could start with the internal organism, build competences and expertise to later provide them also at its ecosystem level.

[266] http://www.patientsafety.manchester.ac.uk/research/themes/safety-informatics/citizens-juries/

Potential schemes for cooperation within the AI DIH Network

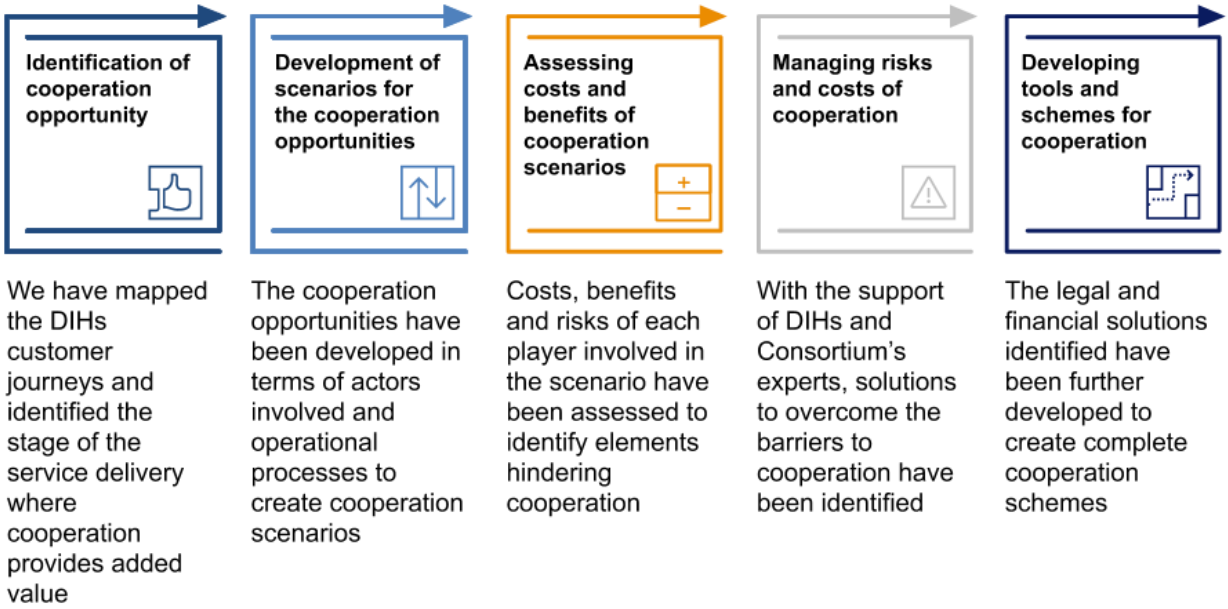
5 Potential schemes for cooperation within the AI DIH Network

5.1 Methodological approach

One of the main objectives of the training and development programme that is involving the members of the AI DIH Network is the definition of possible schemes to enable cross-border cooperation among DIHs working in the field of AI.

This task has been performed following a **participatory approach**, with representatives of the DIHs discussing about added value of cooperation and providing inputs and feedback on how cross-border cooperation can happen.

The figure below presents the main steps of the co-development process, which are outlined in detail in the paragraph below.



1. Identification of cooperation opportunity

The first step in the definition of the cooperation scheme has been the identification of the situations where collaborating at cross-border level brings benefits to the DIHs and to other potentially involved shareholders, with the idea that, if cooperation does not provide relevant benefits, it is not going to happen on a regular basis. Specifically, given the nature and mandate of DIHs, cooperation is considered beneficial if it is functional to the delivery of a better service to the DIH's ecosystem.

To assess the situations when this happens, services delivered by the DIHs were analysed from the users' perspective, adopting a **user centric mindset**. A similar approach is usually adopted to design or redefine a **service** to be offered by an organisation (and could prove useful also for DIHs). This methodology was considered functional to the definition of

cooperation models as it enables to **focus on the users' needs that can be addressed by working together with other DIHs.** Therefore, in preparation of the collaborative workshops with participants in the project, the ecosystem needs to which DIHs are expected to respond were identified with the support of innovation experts from the Consortium. For each of these needs, a **persona** - i.e. a fictional yet realistic example of the target users of the AI DIHs – and its **customer journey** were developed, helping to represent and visualise the needs of a DIH customer in practice.

Adopting a customer centric approach: mapping the customer journey

Mapping the customer journey is a technique to get an overview of the customers' experience and understand how it can be enhanced. The customer journey mapping visually illustrates the needs of an individual customer, the series of interactions and touchpoints that are necessary to fulfil these needs, and the resulting emotional states that a customer experiences throughout the process.

Specifically, the customer journey:

- Breaks a customer's experience down into individual interactions;
- Enables stakeholders to collectively discuss opportunities for improving the experience;
- Conveys quickly, yet effectively the experience of customers and helps tell and analyse their story.

The customer journeys were reviewed together with DIH representatives taking part in the collaborative workshops *Definition of cooperation strategies,* with the aim of identifying the stages of the customers journey (and the corresponding service delivered by the DIHs) that could have been enhanced (or enabled) by cooperating with partners at a cross-regional level.

To this aim, the standard PwC's customer journey mapping approach has been adapted to support the identification of the added value of cross-border cooperation and connected opportunities in the AI DIH's service delivery.

2. Development of scenarios for the cooperation opportunities

Once the situations in which cooperation is beneficial to the service delivery - and to respond to the ecosystem needs - were identified; it was defined how cooperation should work in each of these situations.

In the context of the same collaborative workshops, Definition of cooperation strategies workshop, members of the AI DIH Network identified several "use-cases" of cooperation connected to the different stages of the service delivery, which have then been developed in detail, leading to the definition of many cooperation scenarios.

3. Assessing costs and benefits of cooperation scenarios

Identifying cooperation scenarios starting from the review of the customer's journey gave DIHs the possibility to discuss and reflect about the benefits that cooperation provides to the final users and increase their awareness of cooperation value. Yet to develop the connected cooperation models, it was also necessary to focus on the processes entailed in the scenarios. The analysis of the mechanisms envisaged in the cooperation scenarios co-created with DIHs shows that many

of them entailed similar processes. Therefore, starting from the original scenarios, a few models representing the possible processes that can take place when DIHs cooperate among each other where identified. These final cooperation scenarios were then discussed again with DIHs to understand the benefits, costs and risks of each player involved in the scheme and identify the possible elements that could prevent cooperation, with the idea that if a DIH faces risks or costs considered significantly relevant and not balanced by benefits, it will not undertake the cooperation activities envisaged in the scenario.

4. Managing risks and costs of cooperation

After identifying the most relevant risks and costs hindering the accomplishment of cross-border cooperation, possible measures to mitigate them have been identified, with the support of DIHs' representatives and experts from the Consortium. The solutions identified are presented in a dedicated section for each scenario.

5. Developing tools and schemes for cooperation

The last step of the process consisted in the definition of the legal and financial solutions identified to overcome costs and risks of cooperation and provide complete cooperation schemes.

5.2 Customers' journeys and opportunities for cooperation

In this section, the results of the customer journey mapping and the cooperation opportunities identified are presented.

5.2.1 The customer journey mapping

Customer journey mapping has been used to analyse the DIH customers' experience and the DIHs' service delivery and identify in which stages cross-border cooperation can be used to enhance the service offered.

To achieve this objective, the standard customer journey approach was adapted, to be able to represent the ecosystem needs and to include in the analysis the identification of the cooperation opportunities.

The first step in the mapping exercise consisted in the definition of the ecosystem needs DIHs are expected to respond and to create the personas that could represent those needs.

According to the customer journey mapping methodology, personas are not created to represent the whole audience of the DIHs, but to exemplify target users' objectives and facilitate the understanding of their needs. Six personas representing the needs that DIHs are expected to respond to have been identified, taking into consideration DIH current and future mandate (i.e. in line with the DEP, public administrations have been included among the target users).

The personas identified include SMEs, start-ups and public administrations and carry along the innovation needs reported in the table below. The table also includes the main characteristics attributed to the personas to make them more realistic and increase DIHs' engagement.

Persona	Type of business	Reference Market	Sector	Need	Objectives
TomatoX	SME	Regional	Food	Process innovation solution	Cost reduction or revenues increases through process optimisation
eSens	SME	International and B2B	Sensor and detection	Product innovation solution	Upgrade product and keep leading position
AI-rhythm	Start-up	International	AI algorithm for melody composition	Technological solution validation	Market entry, product development and
AiMAGE	Start-up	International	Machine vision	Technological solution scale-up	Growth and business development, market entry
Municipality of Elsewhere	PA body	Local administrative level	Traffic vision	Service innovation	Service provision improvement, information gathering
Region of Wonderland	PA body	Regional administrative level	AI digital skills empowerme nt	AI awareness campaign	Awareness raising

For each persona, a customer journey map has been created, representing the whole customer experience when dealing with the DIH, from the moment they get in touch to the completion of the service.

Precisely, the journey maps consider the point of view of customers, as well as the perspective of the DIHs, and, for each phase of the journey, involve the following elements:

- The activities undertaken by the user, e.g. the SME participates in an event to find out more about AI
- The motivations of the customer to engage in such activities, e.g. explore opportunities opened by innovation
- The love points of the activities, i.e. elements that can increase the client's satisfaction
- The pain points of the activities, i.e. elements and conditions which, if met, can end the journey
- The service offered by the DIH in the corresponding phase of the customer journey, e.g. organisation of the dissemination event attended by the SME
- The opportunity for the DIH to cooperate with other DIH(s) in delivering the service

- The concrete application of such collaboration, e.g. sharing of experts to take part in communication events
- The expected outcomes of such collaboration, e.g. greater number of SMEs engaged in the network of the DIH.

A couple of examples of the customer journeys developed is reported below. The complete customer journey maps are included in Annex H – The customer journeys.

TomatoX customer journey

TomatoX is a manufacturing SME seeking for a solution to reduce its maintenance costs, that have been rising significantly over the last year, with great concern of the CFO. He is therefore looking for an innovative solution to keep these costs under control and reduce potential financial risks. Nonetheless, TomatoX is characterised by a low digital maturity level and prefers to opt for the adoption of incremental solutions rather than developing a new, disruptive technology. On the market, a solution to solve TomatoX issues with maintenance processes is already available, so that the SME only needs to identify and buy this solution.

The journey of TomatoX starts by getting in **contact** with the DIH. For instance, the SME participates in an event organised by the hub during which it has the chance to learn about the services offered by the DIH. After the event, the SME decides to directly contact the hub with the aim of further exploring opportunities opened by innovation responding to its specific need. The key services offered by the DIH in this phase are: communication/dissemination activities, participation in sectoral fairs, visit to SMEs and organisation of networking events.

The second phase of TomatoX's journey is represented by the **scoping**. The SME meets the DIH to present its need and understand what kind of support can be provided by the DIH. Within the scoping phase, the DIH helps TomatoX to define its specific needs and suggest potential solutions, making use of relevant references, case studies and best practices from the industry. The services provided in this stage may entail consulting services, organisation of one-to-one visits to understand the context of the SME and its production systems, and initial solution scouting.

Once the problem to be tackled has been identified, the SME goes through a phase of **use case definition**. It is about the identification of the most adequate solution to the identified need among the main applicable solutions. In this phase of the journey, the DIH performs a comprehensive analysis of the SME (e.g. performing analysis of process & value chain, digital assessment, etc.), identifies the possible solutions that can be applied and evaluates the one that best matches the SME need. The service provided may also encompass the definition of KPIs that can be achieved with the implementation of the solution identified.

After the use case definition, TomatoX needs to define and validate the **proof-of-concept (PoC)** by testing the identified solution on the SME processes. The ultimate goal is to verify the feasibility of the solution and identify short-term benefits. In this regard, the DIH can support the SME via the provision of testbed facilities or by providing expert in charge of managing the solution testing and implementation. The support provided can also regard the identification of financing sources to cover the testing phase or matchmaking with potential solution provider.

Supposing that the PoC results in a positive outcome, the last phase of the journey of TomatoX is the **scale-up**, i.e. the finding of resources to scale up and implement the identified solution to observe the benefits on a large scale. To support the SME in achieving this goal, the DIH can provide a number of services, such as finding financing sources, talent scouting and technical support.

Municipality of Elsewhere customer journey

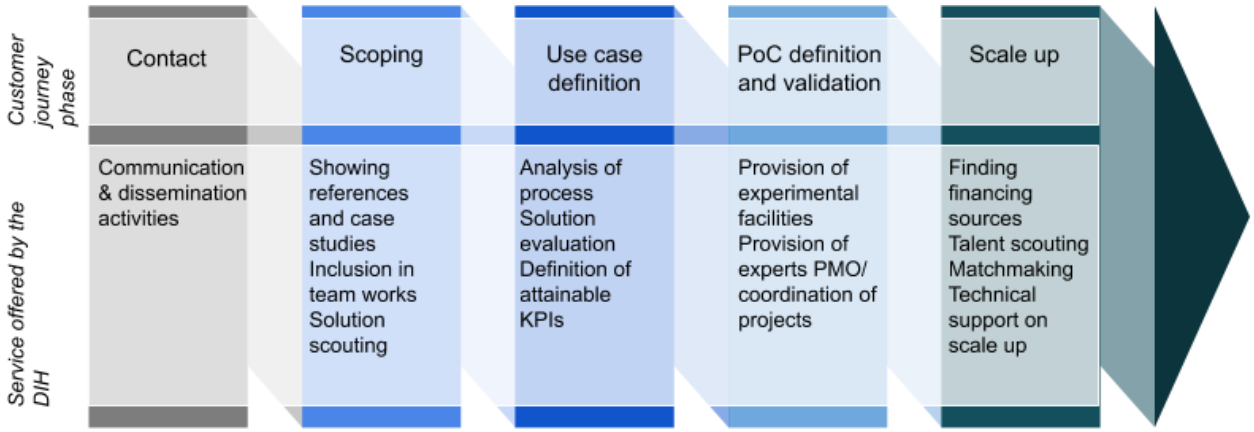
The Municipality of Elsewhere is a PA body seeking for an innovative solution to solve the daily problem of traffic jams in the territory in which it operates. More specifically, the Municipality is looking for efficient solutions for traffic vision and monitoring, as the ones successfully implemented by other cities facing the same issue. The ultimate goal is to improve the provision of services to citizens by following experience of other 'front-runners'. Indeed, on the market, relevant solutions that may potentially solve the issues of the Municipality of Elsewhere with traffic jams are already available, so that it only needs to identify the most suitable one.

Overall, the journey of the Municipality of Elsewhere starts when contacted by the DIH. For example, the PA receives an invitation to participate in an event/workshop organised by the hub - covering the areas of interest for the PA - during which the latter will present the main opportunities offered by the latest innovative technologies. The PA decides to take part in the event/workshop, and after it, it schedules a meeting with the hub to further investigate existing solutions to traffic congestions. In this phase, the key services offered by the DIH relate to the **organisation of dissemination/communication activities**, such as awareness campaigns and open days.

Afterwards, the **scoping** represents the second phase of the journey. The PA meets the DIH to present its specific need and define together the scope of the problem with the aim of identifying what kind of support the hub can provide. At this stage, the DIH provides support to the PA in assessing its actual need, also through the exploration of similar cases. The services it offers in this phase include the **presentation of key references and use cases** as well as a **preliminary solution scouting**.

The identification of the issue to be addresses leads to the third phase of customer journey, represented by the **use case definition**. The key objective for the PA is to identify potential solutions available in the market to be applied in its territory. Within this phase, the DIH carries out an accurate mapping and analysis of the processes characterising the functioning of the Municipality with the aim of identifying the most suitable solution responding to its specific need. In addition to this, the DIH may also define attainable KPIs to be achieved through the implementation of the proposed solution.

Once defined the use case, the last phase of the journey is represented by the **implementation and scale-up of the identified solution**. This entails the identification of the requirements necessary for the procurement of the solution as well as the testing of the identified solution on the PA processes/facilities in order to evaluate its feasibility and applicability and identify short-term benefits. To this end, the DIH can provide support to the PA in the development of the tender for the selection of a supplier, especially in relation to the technical section, and provide specialised facilities for testing the solution.



5.2.2 Analysis of collaboration opportunities within the customers' journeys

The analysis of the customers' journeys was functional to identify the different services that the DIH provides to support its users and customers and, at the same time, to identify how cooperation can improve these services.

Despite each customer journey is different from another, key phases were identified. Each of these could be neglected or modified depending on the customer needs. As outlined in the following paragraphs, the discussion with the members of the AI DIH Network highlighted that cooperation among DIHs brings benefits in each of these phases of the customer journey.

In the first stage of the customer journey - when the DIH is engaged in raising awareness and attracting potential clients - the services offered by the DIH mainly relate to communication and dissemination activities. By cooperating with other hubs, the DIH has the possibility to increase the effectiveness and efficiency of these activities. For instance, the relevance of dissemination events could be enhanced by inviting experts from other DIHs. Further, if dissemination and communication activities are carried in cooperation, e.g. by agreeing on the joint participation in fairs or events, savings in the communication and operational costs can be encountered. In terms of communication and promotion, it has also been highlighted that being part of international networks and cooperating at EU level increase DIH visibility at EU and local level, reinforce its position and increase its attractiveness for potential local customers.

In the second phase of the customer journey, namely the scoping phase – allowing for the identification and definition of the perimeter of the customer's needs – the DIH supports the client in identifying and understanding the issues it is facing and designing preliminary approaches to their solution. In doing so, the DIH may leverage references for similar cases and best practices from the reference market. Collaboration with other DIHs can be beneficial in case the DIH does not have a deep knowledge of the sector in which the client operates, as the DIH could ask for support of sectoral experts from other hubs. In case the direct involvement of an expert was not necessary, the DIH could address its network of hubs to widening its knowledge on the sector of the client or collect relevant experiences and cases that can support the discussion with the client.

Use case definition represents the third phase of the typical customer journey. In this phase, the DIH presents to the client possible solutions identified to fulfil its need. If the DIH decides to collaborate with other hubs in the identification of the most adequate solution to the client's

needs, it will have the possibility to widen the range of solutions proposed. The DIH could simply ask for suggestions and advice within its network or launch matchmaking request, asking other DIHs if they are in contact with solution provider or developer that can meet the client's needs. Extending the range of solutions proposed to the client, the DIH can avoid some typical risks of this stage, such as proposing solutions that do not fit the client's needs because they are too expensive, too difficult to apply or not specific to the client's sector.

The analysis of customers' journeys confirms that also the service provided in the phase of implementation of the solution developed (i.e. in the case of TomatoX this corresponds to the phases of PoC definition and validation and scale up) can benefit from cooperation. In this stage of the journey, the services offered vary depending on the type of support the DIH is providing. While the phases of contact, scoping and use case definition entail similar processes for clients with different needs (e.g. seeking for product innovation or support in organising awareness-raising activities), in the implementation phase the services provided the DIH differ in connection with the request it is answering to (e.g. it can support testing and validation experiments, organise events, support the search for partners and providers, etc.). Nonetheless, the analysis of the journeys of customers with different needs performed together with the members of the AI DIH Network showed that cooperation supports the implementation of a number of different services.

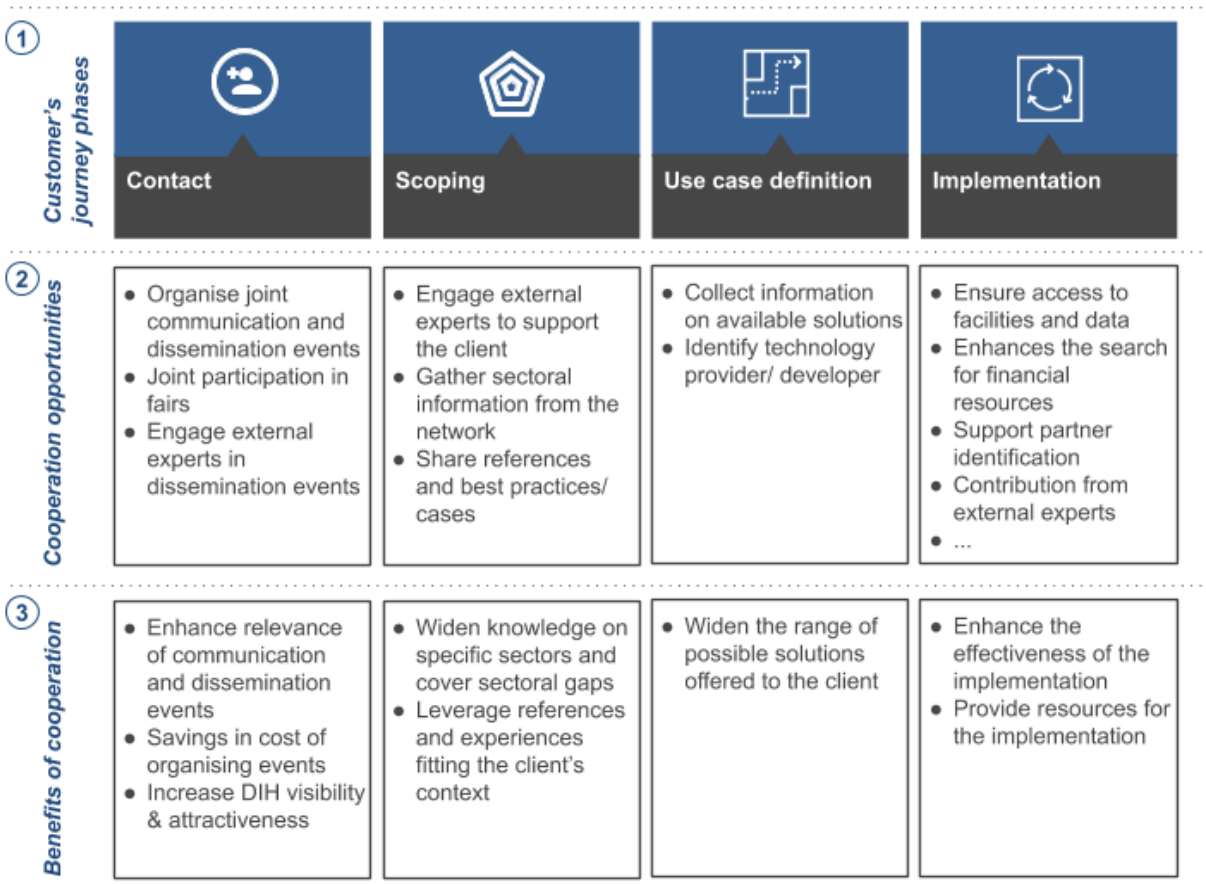
For instance, it may be the case that after having identified the solution to the client's needs, the DIH has to engage in testing, i.e. verify the applicability of the solution developed. In this case, cross-border collaboration can ensure access to the most advanced facilities and enhance access to data through the sharing of facilities or databases, respectively, contributing to enhance the testing phase. Overall, the DIH can decide to start collaborating with hubs located in different ecosystems to boost its capacity in delivering the service to the customer, e.g. through the sharing of facilities, experts for testing or sharing of potential customers for market testing.

The scale-up phase – i.e. start implementing the tested solution – also can be part of the implementation process, depending on the client's needs. In this specific case, cross-border collaboration can be activated by the DIH in order to widen the financing opportunities for the project (e.g. private channels, investors, etc.) and find the resources needed for supporting the digital transformation. This would entail, for example, the sharing of knowledge on funding opportunities and/or the support in getting in contact with investors and financiers from other regions operating in the client's sector.

The implementation phase can entail the brokerage services, e.g. supporting the client in entering into contact with potential partners to facilitate access to market. In this phase, the DIH can be interested in collaborating with other hubs, for example, to fill in gaps in partner identification. Indeed, collaboration could allow for the identification of the best partners available on the national/EU market, e.g. through the sharing of ecosystems/experts and/or the provision of support in matchmaking.

Finally, the implementation can also regard the delivery of an awareness campaign conceived based on a specific need of the client or of a community. As an example, in the delivery of the campaign, the DIH can collaborate with other hubs to make it more effective, e.g. involving experts from other hubs in delivering some sessions or supporting the delivery with providing experiences of similar cases as well as best practices. Overall, this collaboration will contribute to foster the participation to the awareness campaign and increase its success rate.

The figure below outlines the main cooperation opportunities identified in each phase of the customer journey and the connected benefits.



5.3 The scenarios for cross-border cooperation

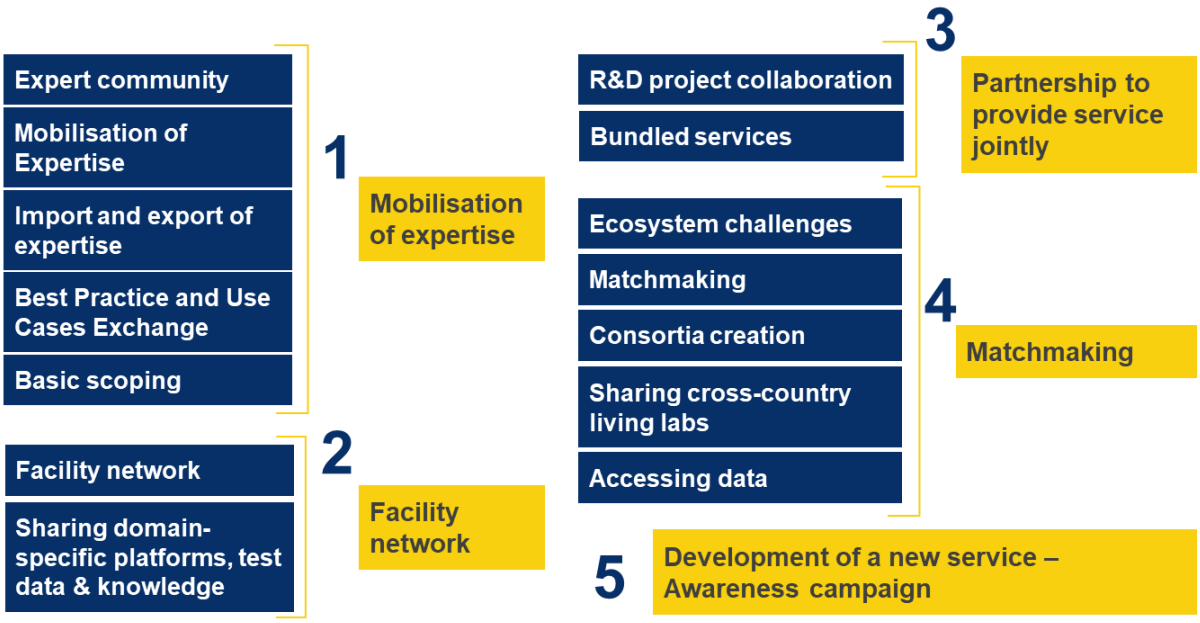
The opportunities of cooperation identified analysing the customer journey have been expanded to build cooperation scenarios. The process has been performed jointly with the AI DIH Network members in the context of the collaborative workshops set up in the TP3 – *Cooperation strategies*.

Starting from the most relevant cooperation opportunities identified along the customer's journeys of the six personas presented above, participants have been asked to define as many cooperation scenarios as deemed appropriate, by identifying:

- The name of the cooperation scenario;
- The actors involved;
- The key enablers;
- The main barriers;
- The resources needed;
- The process (i.e. cooperation mechanisms), and
- (Eventually) similar existing cases.

This approach led to the co-creation of more than **20 cooperation scenarios**, making clear that cooperation brings benefits to DIHs and their clients in many different situations. The next steps in designing potential cooperation models was to focus on the processes that these scenarios entailed, with the aim of defining roles, responsibilities, risks and benefits of each player. Therefore, the processes envisaged in the 20 cooperation scenarios co-created with DIHs were analysed to identify those presenting similar mechanisms and objectives (an example of consolidation is presented in the figure below).

Figure 8 - Consolidation of cooperation scenarios



The analysis of the processes and objectives of the co-created cooperation scenarios led to the definition of the final scenarios, entailing the general processes and mechanisms that are then customised to be applied to the different customer's journeys.

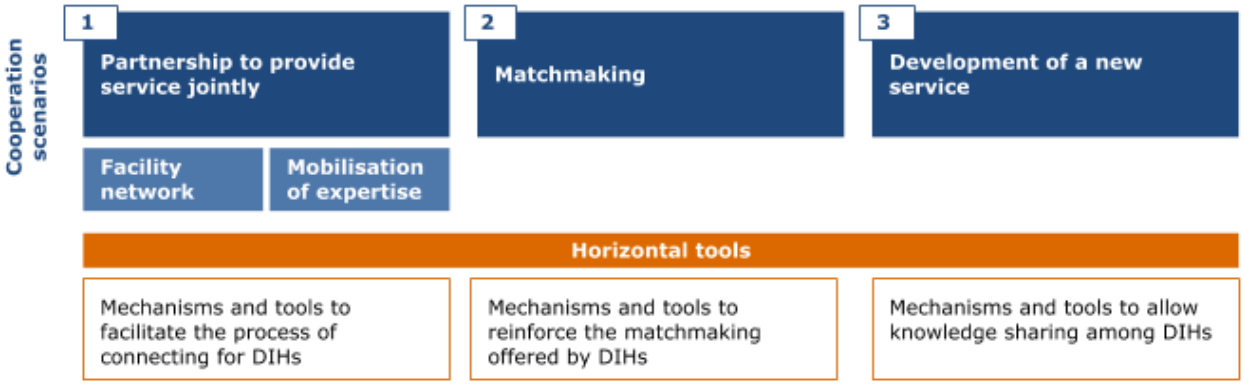
Specifically, the cooperation scenarios identified after TP3 working groups refer to:

- Specific cooperation mechanisms (e.g. for exchanging experts, developing joint projects, etc)
- Tools and initiatives aiming to create a common knowledge base among the members of the AI DIH Network, enabling DIHs to get to know each other and share useful materials and information.

While the formers are used in case of a specific need arises (i.e. the cooperation mechanism is used it the DIH has to deliver a service required by one of its clients and needs a partner with complementary competences/ facilities), the latter support cooperation in general, facilitating exchanges of best practices and use-cases and of information on the AI DIH network members and their competencies.

These tools and initiatives, named **Horizontal tools**, are described in the following paragraphs. While, in section 5.3.2, the **3 final cooperation scenarios** referring to specific cooperation schemes are outlined, including a description of the horizontal tools that would be needed to facilitate them.

Figure 9 - Consolidated cooperation scenarios and horizontal support tools



5.3.1 Horizontal tools

To ease and encourage the implementation of the identified collaboration scenarios, the DIHs representatives have indicated some activities and support tools, which serve three main purposes:

1. Facilitate the process of connecting for DIHs;
2. Reinforce the networking service of DIHs;
3. Allow knowledge sharing among DIHs.

The paragraph below reports an overview of the potential tools and mechanisms destined to achieve these objectives and the suggestions provided by the DIH representatives to achieve their effectiveness.

Horizontal tools to facilitate the process of connecting for DIHs

It is a matter of fact that cooperation is fostered by mutual knowledge of the partners' skills and competencies. If DIHs do not know each other, they will not be able to start working together, also because they will not know who the potential partners having the competences they look for are.

Virtual tools as digital platforms, as the one currently in use for the project, are considered an effective solution to gather and share information about DIHs. Specifically, the discussion with the members of the AI DIH Network outlined that it would be useful to share information on:

- Services offered by the DIH - to understand what partners could provide complementing and similar services and can be involved in different types of cooperation (e.g. developing a new service together, joint delivery of services, etc.). In this regard, it was suggested to increase the harmonisation in the taxonomy of the services offered by DIHs, as this would facilitate a clear and agile understanding of the capabilities of each DIH;
- Competences and skills - knowledge about the competencies and skills of other DIHs is key to assess the fitness of a potential partner for a specific client's need;
- AI testing facilities - to understand the facilities that can be leveraged to respond to specific client's needs.

A similar set of information would be a good starting point to enhance DIHs mutual knowledge, something which has been frequently mentioned among the key enablers to cooperation. Nevertheless, DIHs representatives acknowledged the fact that the use of a platform may not be enough to enable a comprehensive understanding of the activities undertaken by another DIH and/or its key skills and competencies. In addition, virtual exchange of information offers limited possibilities to build mutual trust, which is a key element for successful cooperation. Therefore, DIHs representatives have expressed the need for face-to-face meetings, allowing for direct interaction. Such meetings would offer the opportunity to discuss any doubt, deepen a specific topic of interest and build mutual trust. It was recommended to involve operational staff or researchers in similar meetings, to facilitate and optimise discussions concerning specific technical topics and to give the opportunity to know each other. Also, it was proposed to facilitate DIH contact by organising "speed dates" among representatives of a number of hubs operating in different ecosystems. Such short meetings would allow DIHs representatives to quickly gather additional information about the technological focus of other hubs, reducing the cost in terms of effort and time to acquire details needed to assess the interest in/feasibility of cooperation.

The table ahead provides a quick summary of the tools and enablers suggested to support DIHs in getting to know each other.

Objective	Support DIHs in knowing each other
Potential tools	• Platform to share information on services, competencies, skills and AI testing facilities • Regular face to face to face meetings/ working groups/ speed dates among DIHs
Enablers	• Make available virtual platforms mapping services offered by DIHs, competencies and skills and AI testing facilities • Harmonise the vocabulary used and the nomenclature of services • Complement virtual tools with working face-to-face meetings, involving researchers and operational staff to give them the opportunity to work together and know each other

Horizontal tools to ease networking and matchmaking

Among the tasks that DIH are expected to perform according to the Digital Europe Programme, the creation of networking and growth opportunities is one of those that can be enhanced by cross-border cooperation. Indeed, this service is also considered among the cooperation scenarios presented in the next section.

By sharing information about the needs of their ecosystem, DIHs will be able to provide more opportunities for matchmaking between technology-providers and users, technological or financial partners, etc.

To carry out similar tasks, DIHs needs tools enabling them to share information about opportunities and request for matchmaking and networking.

Also, in this case, representatives from the AI DIH Network suggested that virtual tools can be put in place to support this type of cooperation. Digital tools can be used to gather and share requests for matchmaking presented by DIHs on behalf of their clients. To this end,

specific templates should be used by all the DIHs. Further, it was recommended to use an AI-empowered and proactive tool, sending an alert to the DIH when opportunities that it may be interested in are published and suggesting potential partners for its ecosystem.

An overview of the tools and enablers suggested to support matchmaking is provided in the table below.

Objective	Support the matchmaking offered by DIHs
Potential tools	• Digital platform/ mechanisms to facilitate matchmaking activities
Enablers	• AI-supported platform (suggesting interesting matches based on algorithms)

Horizontal tools to enhance knowledge sharing

One of the benefits of being of a network is the possibility to share and leverage knowledge available at the different DIHs. Knowledge sharing could encompass the exchange of useful inputs about best practices and past experiences, use cases and references. One of the suggestions gathered from DIH is to share not only good practices, but also less successful cases. This would enrich the peer learning process in terms of lessons learnt and approaches and solutions to be adopted.

Further, representatives of the DIHs highlighted the benefits that would arise from sharing data within the network, given the difficulties encountered in their collection. In this case, however, issues connected to IPR may arise due to the ownership or confidentiality level of the information shared. One of the possible solutions suggested by DIHs representatives in this regard is to share information on reliable data provider or sources rather than the actual dataset. To this end, it would be also valuable to share information about the availability of living-labs within the DIHs ecosystem.

The tools used to support knowledge may entail dedicated repositories and digital tools provided that an adequate security level is provided.

The table below provides a quick overview of the tools and enablers suggested to support knowledge sharing.

Objective	Support the sharing of knowledge among DIHs
Potential tools	• Platform/Repository to share information on available data sources, recommended providers • Platform/Repository to share use cases, good practices and lessons learnt
Enablers	• Create templates for a structured mapping/sharing of use cases, good practices and lessons learnt

5.3.2 Cooperation scenarios

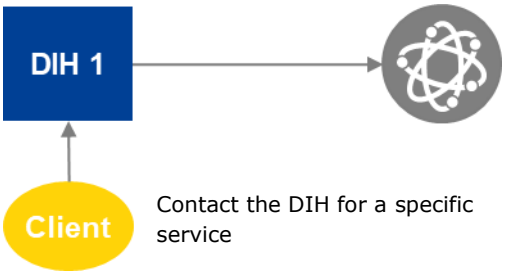
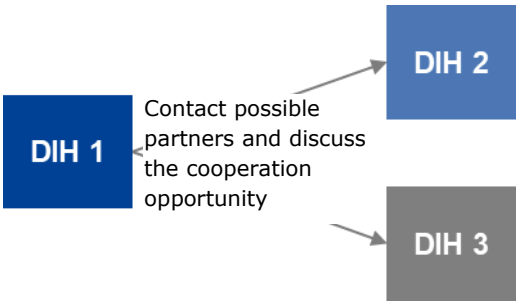
5.3.2.1 Partnership to provide service jointly

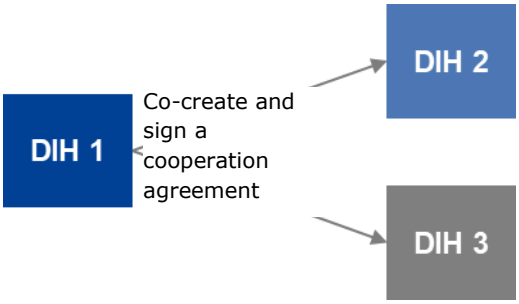
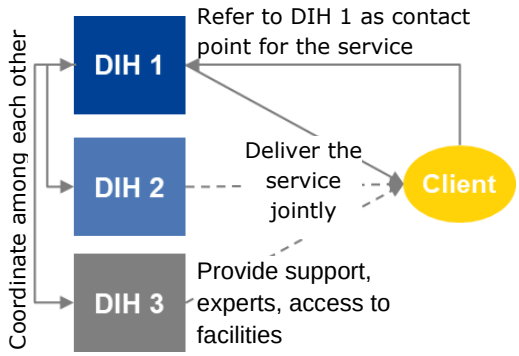
When and why this scenario is used

This scenario enables DIHs to deliver services in cooperation with other partners with complementing competences.

This form of cooperation can be activated when, after assessing the client's problem (therefore after scoping of the client's request) and the internal capabilities to meet it, DIH (referred to as DIH_1 in this section) realises that additional, complementing competences are needed to deliver the service requested. Specifically, to provide services jointly the DIHs may need to exchange experts/expertise and/or share existing facilities.

How it works

1 Identification of a partner for the service delivery	
Look for a partner in the Network with complementing skills to deliver the service  	The Client asks for support to its local DIH (DIH_1). After analysing its request, DIH_1 realises it will not be able to deliver the service by its own and needs to identify a partner having some of the competences required to deliver the service. Being part of the AI DIH Network, DIH1 looks for the other hubs belonging to the network that owns the necessary competences. This research is enabled and facilitated by a map of the competencies, services and experiences of the other DIHs part of the Network.
2 Assessment of the cooperation opportunity	
 	DIH1 identifies possible partners having the competences sought and contacts them to propose a possible cooperation. The contacted DIH(s) (i.e. DIH2 and DIH3) analyse the proposal and decide whether to discuss the opportunity with DIH1. If they are interested in the opportunity, they will also explore a potential cooperation.

3 Co-define and sign cooperation agreement	
	If the DIHs agree on the possibility to cooperate, a cooperation agreement ruling the relationship among them is co-defined and signed. The partnership is built to fit the specific needs of individual projects/solutions – and is aligned with the requirements of specific funding programmes (if public financing is involved). The Cooperation agreement should define, *inter alia*: • Roles and responsibilities in the delivery of the joint service; • KPIs of the cooperation, to ensure that the results achieved can be evaluated at a later stage.
4 Joint service delivery	
	The two or three DIHs jointly deliver their bundled services to SMEs, coordinating among each other. DIH1 remains the contact point for the client. Trial periods could be proposed to enable SMEs (and DIHs) to assess the viability and value of bundled services. The results achieved are measured against KPIs.

The joint delivery of the service envisaged in the scenario may require the DIH to share physical assets (e.g. **providing access to specific AI testing facilities**), skills (e.g. involving an **expert that goes to the partner's venue and supports some tasks of the project**) or both.

These specific cases do not entail significant differences in the process outlined, as they are a specific example of contribution that partners can provide in the service delivery phase. Clearly, these aspects need to be addressed in the cooperation agreement among the DIHs. It has also to be noted that the mobilisation of experts should be considered for a limited amount of time to avoid possible obstacles related to the presence of different labour laws in different EU Countries.

Costs, risks and benefits of the players involved

Costs, benefits and risks of the DIHs potentially involved in the scenario are presented below. DIH_2 and DIH_3 are considered jointly as they cover the same roles.

The cooperation is beneficial for DIH_1 for three main reasons:

1. if DIH_1 succeeds in identifying the right partner, it will be able to meet the request of a customer/user located in its area that it would not be able to satisfy otherwise (this is also the reason why it decides to start the search for a partner);

2. DIH_1 has the possibility to get in touch with other DIHs and create a relationship that can last in the future and can provide other opportunities. Although less relevant than satisfying the client's needs, this benefit has been highlighted by members of the AI DIH Network as it reinforces the network of the DIHs and enhances the possibilities to be engaged in cross-border cooperation;
3. By adding up to its skills those of the partner, the DIH has the possibility to develop and deliver new and innovative services, increasing its capacity to attract new clients.

All these benefits resulted to be highly relevant in the discussion with DIHs. Yet, they correspond to significant risks and costs. Among costs, DIHs highlighted the effort required to identify the partner and establish cooperation. However, these costs may be reduced once the process happens on a regular basis and if appropriate support tools are in place (e.g. DIH can easily identify the other DIHs with the skills needed). Further, the cost for delivering the service is impacted significantly by the effort and time required to coordinate with the partners, which is one of the most relevant cost items pointed out by DIHs.

In terms of risks, the risk related to the sharing of strategic assets with the partner, such as the relationship with the client, is perceived as low. For instance, considering that the two DIHs are in different EU regions, it would be difficult for the contacted DIH to reach out for the client of the DIH_1. The risks deriving from the reduced possibility of controlling the service delivery is considered manageable as well. While the most important risk that may significantly jeopardise the willingness of the DIH to start the process is the **reputational risk** connected with the possibility that the partner does not comply with its same quality standards, damaging the relationship between the DIH and its customers.

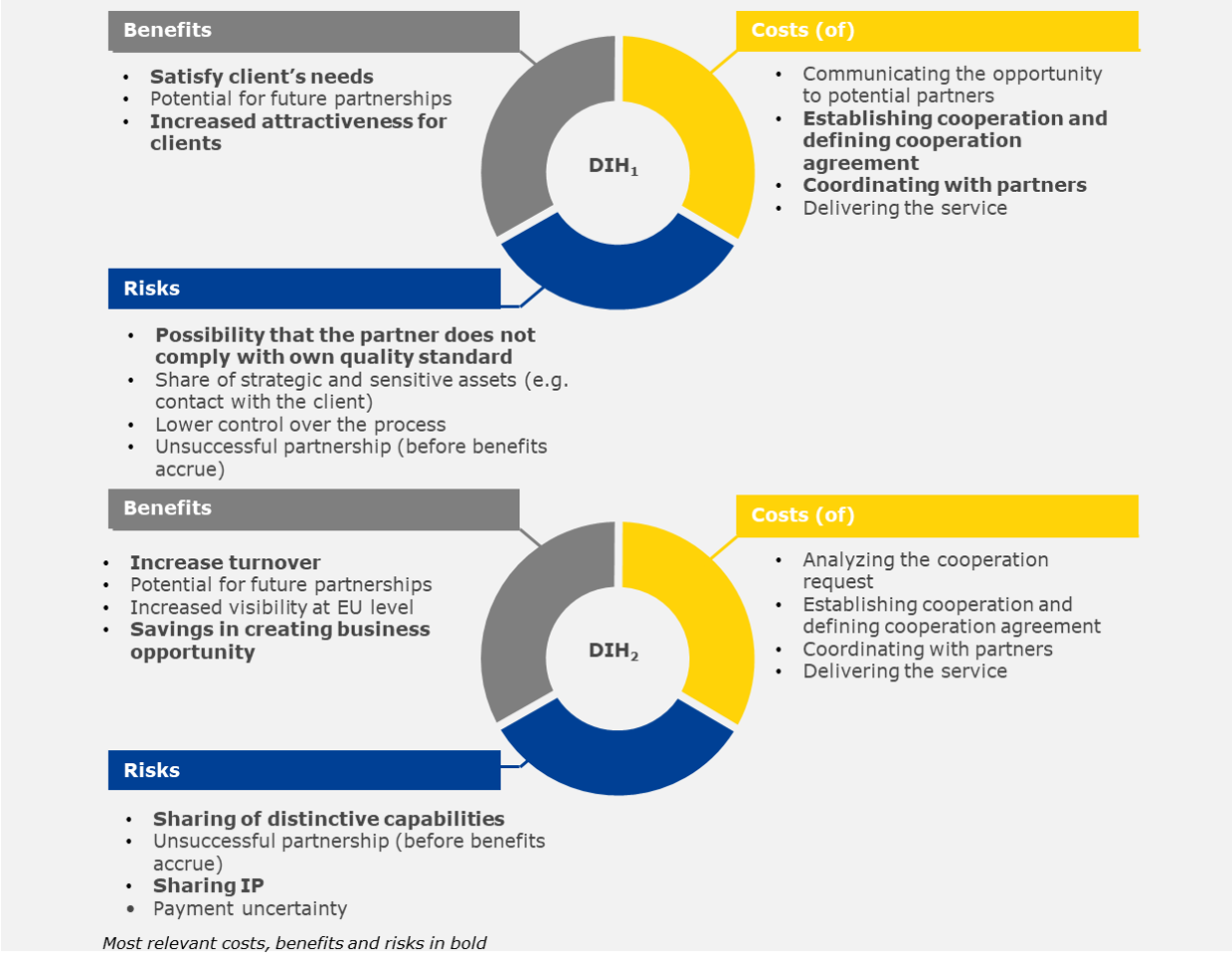
In brief, DIH_1 would be interested in establishing the cooperation as it would enable it to respond to the request of its customers, enriching its service offering and its network. However, it may decide not to start the process due to:

- The additional costs that it has to sustain, particularly for establishing the cooperation and coordinating during the service delivery;
- The reputational risks that can occur in case the partner does not meet the expectations/ quality standards of the client.

The balance for the DIH that is contacted to join the cooperation scheme (DIH_2 or DIH_3) is considered more positive. Indeed, the benefit of increasing its volume of activities (and turnover) without sustaining the effort and costs connected to the creation of the business opportunity outweigh the costs sustained for establishing the cooperation and for coordinating with partners. Other costs incurred correspond to those sustained for the usual service delivery. Among the risks it may face, the most relevant ones are related to the sharing of capabilities, skills and IP with the partner. It may occur that, after few collaborations, the partner acquires some of these competencies and starts delivering the service itself. A possible risk pointed out is also related to the necessity to rely on a third party (the DIH_1 client) for the payment of its services.

The figure below summarizes the analysis performed and the possible solutions identified.

Figure 10- Costs, benefits and risks: Partnerships to provide service jointly



Source: Own elaboration

Useful solutions and tools

Based on the analysis of the costs, benefits and risks of the players involved, it resulted that this scheme may be enhanced by solutions to tackle:

- The reputational risk of DIH_1. Solutions to be introduced may include **liabilities of the parties**. The agreement shall expressly provide that DIH_1 is responsible before its client, while DIH2 is liable before DIH1 as to the service offered to DIH_1.
- The risk for DIH_1 to share strategic assets with DIH_2, such as the relationship with the client. Despite being perceived as low, a **non-compete clause** might be provided in the agreement between DIH_1 and DIH_2 which prevents DIH_2 to compete with DIH_1 in the region in which DIH_1 operates and as to DIH_1's clients. This clause shall be limited as to duration and shall expressly set material and territorial scope.
- The risk for DIH_2 to share its capabilities, skills and IP. The introduction and use of template for **IP protection** help to mitigate this risk. IP issues shall be expressly addressed in advance within the service agreement between the two DIHs. Furthermore, a specific clause within the service agreement between DIH_1 and DIH_2 shall be provided that expressly addresses the issues relevant to **confidentiality of information**.

- The additional costs that DIH_1 has to sustain to start and manage the cooperation process. Indeed, the revenues/ payment received for the service may not be sufficient to cover the costs of the external collaboration and the DIH does not benefit of the savings in the creation of the business opportunity that apply to DIH_2. Financial support to incentivise DIH_1 to sustain this cost and start the cooperation initiative may be necessary.

Horizontal tools needed

- Horizontal tools to ease networking and matchmaking
  - Platform to share information on services, competencies, skills and AI testing facilities
  - Regular face-to-face meetings/working groups

5.3.2.2 Development of a new service

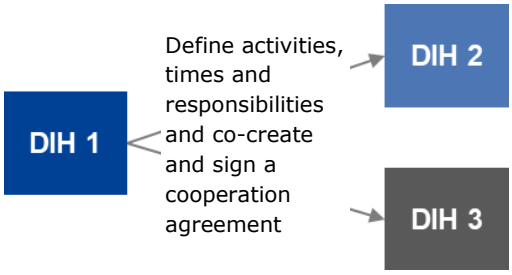
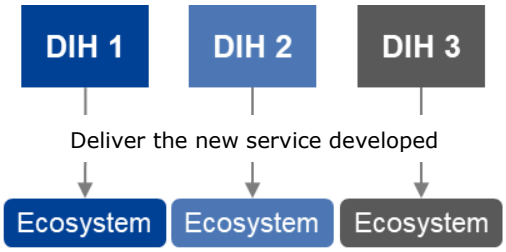
When and why this scenario is used

This scenario is used in case a DIH decides to enlarge its offerings by developing a new service to respond to the ecosystem needs and wishes to leverage skills and capabilities available within the network to design the service together.

Considering the AI field, new services - that have been discussed by the AI DIH Network members - may encompass the development of a comprehensive awareness campaign focussed on AI for a determined category of users (e.g. local public administrations) or the design of a common AI Maturity Assessment tool.

How it works

1 Identification of a partner for the service delivery	
Look for a partner in the Network DIH 1 →	DIH_1 intending to include a new service in its service offerings looks for partners with complementary or similar competencies willing to take part in the development of the service. This phase can be implemented starting from a platform mapping DIHs' competencies or simply contacting DIHs located in the same/different ecosystem.
2 Assess and discuss the cooperation opportunity	
DIH 1 → Contact possible partners and discuss the cooperation opportunity → DIH 2, DIH 3	Once interested DIHs respond to DIH1 invitation, DIH1 discusses together with them (DIH_2 and DIH_3) the potential cooperation opportunity and the features of the services that should be developed. In the example of the awareness campaign, the discussions may cover: ● the main topics of the campaign (e.g. main challenges that AI can help to solve in the fields of health, transport, etc.). Industry associations may provide useful information in this regard; ● the definition of a common strategy to raise

	awareness in their respective ecosystems. The strategy should include the definition of the activities and the tools that will be used, the timeline of the preparation and implementation phases and the allocation of responsibilities among the DIHs involved.
3 Co-define and sign cooperation agreement	
	The three DIHs co-create and sign a cooperation agreement, reflecting the strategy and covering related legal and financial issues (e.g. IPR of the service and contents developed).
4 Implement the strategy	
	The three DIHs implement the strategy and activities agreed. In the case of the development of the awareness campaign, each DIH delivers the campaign to its ecosystem, as shown in the figure on the side.

Costs, risks and benefits of the players involved

The scenario is functional to the development of new service by different DIHs that operate together. The creation of the service is promoted by a DIH that contacts other hubs willing to develop a similar service to join effort and carry out the task together.

By cooperating with other DIHs, DIH_1 would be able to develop a new service to meet the needs detected in its ecosystem, increasing its capabilities and service offering. Further, it will reinforce its international positioning, establishing basis for future partnerships and having the opportunity to increase its reputation at EU level. The costs for developing the new service in cooperation with other hubs would not change substantially, exception made for the additional effort and costs related to the coordination with other partners and costs to eventually customise the service for the different local ecosystems. However, a number of risks may occur. For instance, the contribution provided by the partner may not meet the expectations DIH_1. Further, there is a risk that the service developed in cooperation does not match exactly the original need identified leading to an impact different from expected.

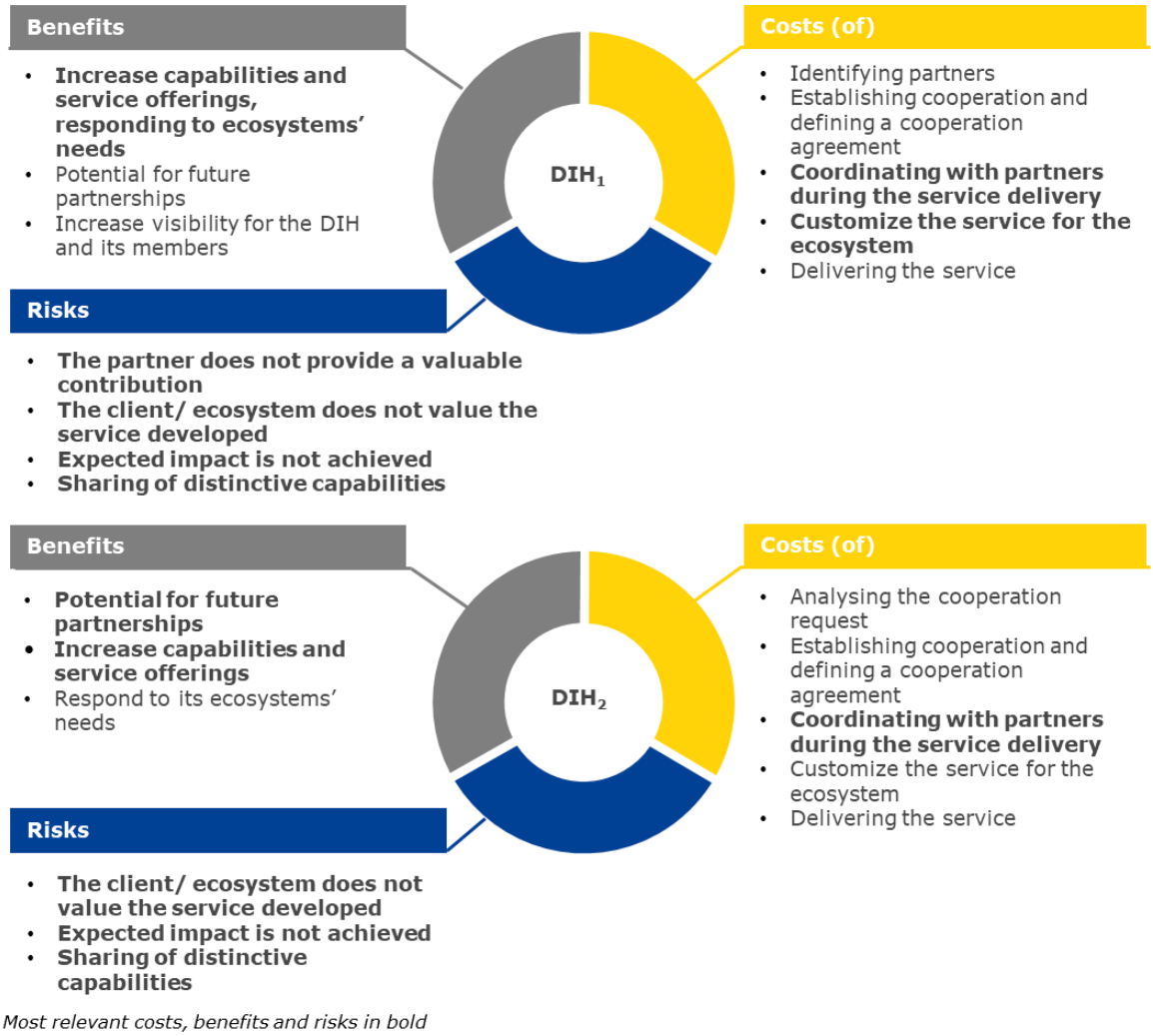
In this case, the balance of costs and benefits of DIH_2 is not different from that of DIH_1. This player receives similar benefits, increasing its service offering and strengthening its international position while responding to a need detected in the ecosystem. The costs sustained depend on the types of activities performed. For instance, in case DIH_2 needs to carry out a dedicated market assessment to identify the needs of the market and decide whether to take part in the service development or not, this would imply a significant cost of

the cooperation. On the other hand, in case a similar need has already been detected in the local ecosystem, the costs for assessing whether to cooperate would be significantly reduced. Similarly to DIH_1, DIH_2 may incur additional costs for developing the service in cooperation with others due to the necessity to tailor the general content created to the local ecosystem. Further, DIH_2 shares the risks of DIH_1 in terms of quality of the contribution provided by the partner and recognition of the services by the local ecosystem.

Overall, DIHs representatives have highlighted that the propensity of both DIH_1 and DIH_2 to collaborate in this scenario strongly depends on the size of the DIH. For instance, if DIH_1 is a large-sized hub, it may have a lower willingness to start a new collaboration compared to a small-medium-sized hub as it already has the experience, resources and reputation needed for the development of a new service. Conversely, in case DIH_1 is a small-medium-sized DIH, it may exhibit a higher willingness to collaborate than a large-sized DIH as it could be motivated to collaborate with other hubs with specific expertise, service offering and infrastructures. Likewise, if DIH_2 is a large-sized hub, it may have a lower willingness to engage in collaboration with another hub than a small-medium-sized hub. In any case, the willingness to collaborate of DIH_2 depends on how the request matches its core needs and on the amount of effort needed from its side.

The figure ahead summarises the analysis performed and the possible solutions identified.

Figure 11 - Costs, benefits and risks: Development of a new service



Source: Own elaboration

Useful solutions and tools

The analysis of costs, benefits and risks highlighted that the main risks for the DIHs entail:

- The risks to spend resources in co-developing a service that is not in line with their ecosystem needs and requests, and
- Legal issues related to the IP of the services and the contents developed.

DIHs involved in the AI DIH Network agreed that the first risk may be mitigated by a deeper knowledge of the EU markets and ecosystems, enabling to identify common needs and challenges more easily. Ideally, targeted studies and analysis should be developed at EU level to support this knowledge. Understanding the challenges and needs shared by different ecosystems would encourage DIHs there located to get in contact and develop common services to tackle them.

Regarding legal and IP issues, it would be useful to introduce standard legal templates for governing the development of new services. This will protect hubs from the risk that the partner is not committed and protect the IPR of the solutions developed. As an example, the

parts can sign an agreement that shall expressly set the rules concerning the **liabilities of each hub involved**, before the client and the other hubs that take part in the development of the new service. On the other hand, **IP issues** shall be addressed in advance on the basis of the relationship between the hubs involved. For example, the DIHs involved might joint-hold the solution created or, as an example, DIH_1 might license the right use of the solution created to the other hubs involved.

Horizontal tools needed

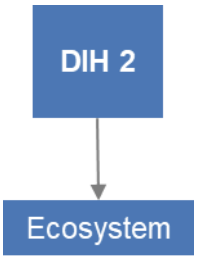
- Horizontal tools to enhance knowledge sharing
  - Platform/catalogue to share information on available data sources, recommended providers
  - Platform/catalogue to share use cases, good practices and lessons learnt
  - Regular face-to-face meetings/working groups

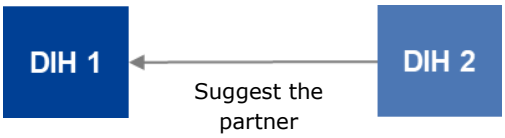
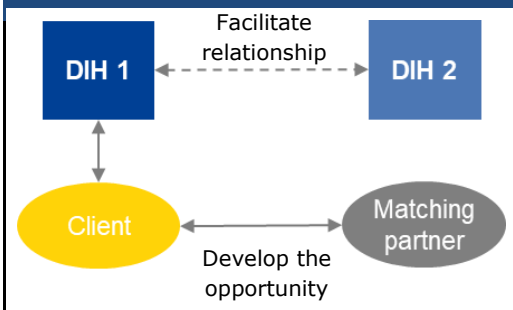
5.3.2.3 Matchmaking

When and why this scenario is used

This scenario facilitates the DIH in identifying possible partners for its clients. The matchmaking request may regard technological, business or financial partners (e.g. identification of solution providers, clients, investors or financiers, industrial partners, etc.). By involving other hubs in the search, the DIH will have the possibility to consider more possible partners for its clients and, together with the DIH Network, will support the creation of business opportunities across different ecosystems.

How it works

1 Identification of a partner to support the matchmaking activity	
Send the matchmaking request to the network  	The client contacts the local DIH (DIH_1) to identify a partner for its AI project, product or investment. The DIH_1 decides to extend the request to the Network either because the kind of partner sought is not available in the local ecosystem or to simply widen the range of possible partners (in agreement with the client). DIH_1 launches a "partner request" to the Network.
2 Assess the cooperation opportunity and identify potential matches	
 Receive the request and look for potential matches within its ecosystem	DIH_2 receives the DIH_1 request and searches within its ecosystem for a potential partner to be put in contact with the client of DIH_1. Partner searched may include industrial or financial partner, data providers, solution developers, buyers, etc. accordingly to the need expressed by the client.

3 Identification of the potential matchmaking partner	
	Once the potential matching partner is identified, DIH2 suggests it to the DIH1.
4 Facilitate the relationship between initial client and matching partner	
	DIH_1 and DIH_2 cooperate and act as facilitators between the initial client and the identified partner. This may include: • aligning the requirements of the two actors, • organising an initial meeting to find an agreement on cooperation, • providing support to overcome linguistic and cultural barriers

Costs, risks and benefits of the players involved

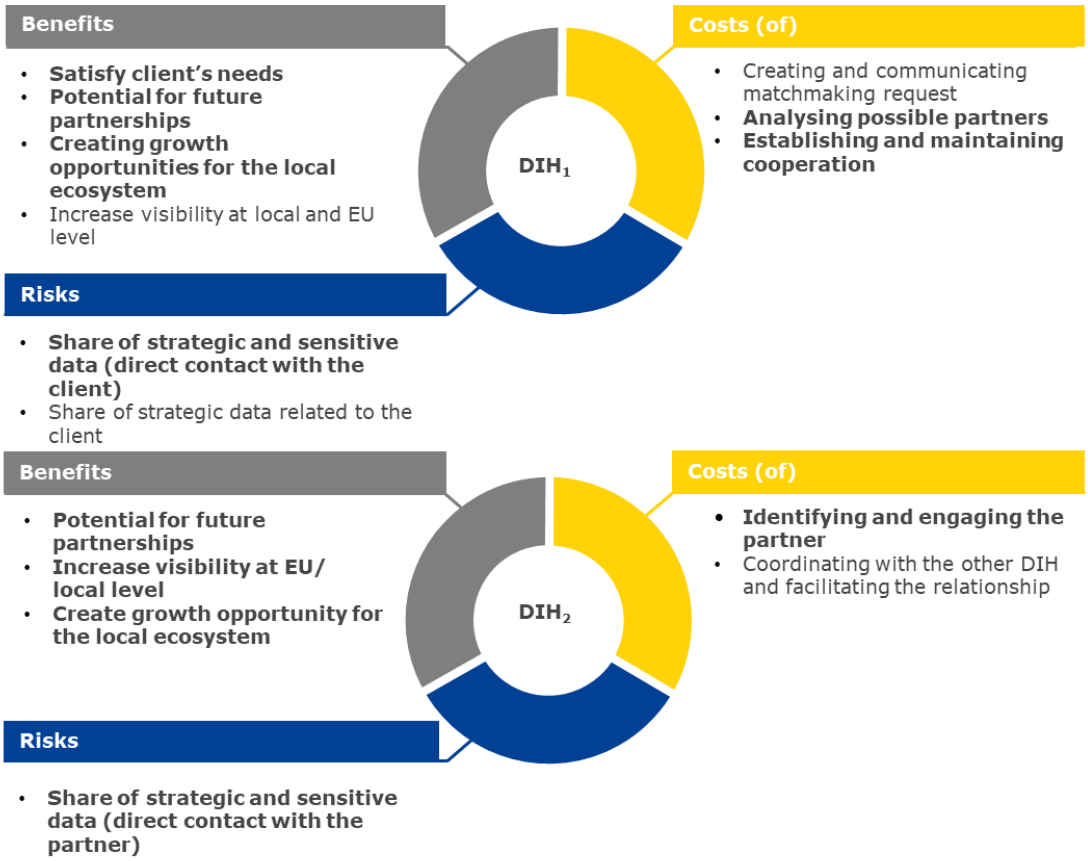
This scenario applies when a DIH (DIH_1) undertakes a matchmaking activity and support its client in connecting to one or multiple actors belonging to different ecosystems.

By collaborating with another hub, DIH_1 benefits from the possibility to satisfy the client's needs and strengthen the potential for future partnerships. Moreover, it has the possibility to create growth opportunity for the local ecosystem. However, a certain amount of effort is required to DIH_1 for establishing and sustaining cooperation with DIH_2. Therefore, it will only undertake this activity if the service is coherent with its business model and it is recognised (and paid) by client (or, in case the DIH is publicly funded, this service is envisaged in its mandate). No particular risks have been highlighted by the DIH representatives, except for the possibility that the client contacts directly DIH_2 for future services.

On the other hand, DIH_2 would also benefit from this kind of cross-border collaboration, especially in terms of potential for future partnerships and increased visibility at EU/local level. It will also contribute to develop market opportunities for its ecosystem. Nonetheless, some costs will also accrue for DIH_2. In particular, these costs are represented by the effort for identifying and engaging the matching partner and for coordinating with DIH_1. Further, DIH_2 may perceive the same risk of sharing with DIH_1 strategic assets (i.e. the direct contact with the client).

The figure ahead summarizes the analysis performed and the main costs, risks and benefits identified.

Figure 12 - Costs, benefits and risks: Matchmaking



Most relevant costs, benefits and risks in bold

Useful solutions and tools

Regarding costs sustained by the DIHs to support networking and matchmaking, the risk is that since the service is not part of the activities performed by all DIHs, some of them have difficulties in including it in their business models (e.g. they do not have human resources that can be dedicated to the specific activity). While the success of this kind of cooperation is ensured by a large participation from DIHs across the EU. For this reason, incentives to support DIHs in starting to deliver this service may result useful as well as providing common tools that ease the process and reduce effort and costs (e.g. common templates for matchmaking request, shared platform/ portal to gather the opportunities available, etc.).

As for the perceived risk of competition among DIHs, its severity is expected to change depending on the geographical distance occurring between the DIH involved (i.e. small companies are not expected to easily change their reference DIH with another one located in a different country). Nonetheless, based on the severity and probability of the risk, non-compete clause, preventing one DIHs to take advantage from the matchmaking against other, may be included.

Horizontal tools needed

- Horizontal tools to ease networking and matchmaking
    - Digital platform/mechanisms to facilitate matchmaking activities
    - Regular face-to-face meetings/working groups

The Framework Collaboration Agreement

6 The Framework Collaboration Agreement

The analysis of the current level of cross-border collaboration among DIHs[267] suggested that most of the initiatives for transnational cooperation derive from EU-funded projects, aiming to reinforce EU positioning in digitalisation. Moreover, it turned out that there are no pre-defined solutions for regulating transnational collaboration initiatives. Rather, the solutions adopted vary depending on the nature of the initiative and the members involved. Overall, this evidence suggested that EU cross-border collaboration usually happens in a not-structured way.

Based on that, as well as on the inputs gathered from representatives of the DIHs involved in the coaching and mentoring programme, the Consortium defined a high-level Framework Cooperation Agreement, which establishes the creation of a Network of Digital Innovation Hubs with focus on Artificial Intelligence.

The Agreement provides a high-level legal framework for future collaboration among DIHs. It lays the foundation for fostering cross-border cooperation and, more in general, provides the preliminary elements necessary for launching future ad-hoc collaboration agreements among Hubs.

By endorsing it, the parties committed to cooperate, in spirit of good faith, by setting up a Network, based on common rules.

The Framework Cooperation Agreement has been released in October 2019, after incorporating comments and suggestions from the potential signers (i.e. the DIHs taking part in the coaching and mentoring programme).

As of February 2020, 25 out of the 30 DIHs involved in the programme have decided to enter the Agreement.

6.1 Structure of the Agreement

Overall, the Agreement describes the governance structure of the Network and provides a general legal framework for Hubs willing to collaborate. The Agreement covers the key aspects presented in the following paragraphs.

Network governance

In terms of Network governance, the Agreement foresees the establishment of a rotating Presidency in charge of coordinating the activities of the network and ensuring their continuity.

The Presidency will rotate among the Pioneers (i.e. those DIHs that entered into the Agreement before the final workshop occurred in Madrid or eventually within three months thereafter) on a voluntary basis, changing every twelve months. The Hub taking this role shall ensure the correct functioning of the Network. This includes checking that Hubs asking to join the Network meet the necessary requirements and keeping updated the list of contact details of Hubs part to the Network. The President will also have the power to propose to the other

[267] Cross-border collaboration was analysed by taking into consideration relevant examples of transnational initiatives involving cooperation and networking among DIHs, such as Vanguard, ECHORD++, I4MS, MIDIH and ROBOT-NETT.

Hubs the topics and the issues on which the Network shall focus its activities during its mandate and to solve deadlock situations by casting his vote.

Until the end of the project activities, the presidency of the Network is held ad interim by the Consortium.

After the end of the project, a new president will be identified, based on members' preference, and the Network will be open for further accessions. Specifically, the Agreement will be open to any DIH fulfilling the necessary requirements:

- Being located in one of the 28 EU Member States or in a country associated to Horizon 2020,
- Being included in the European catalogue of Digital Innovation Hubs,
- Covering "Artificial intelligence and cognitive systems" among their technological focus area on the EU catalogue.

DIHs willing to join the Network will need to formally show their interest by sending a Notice of Accession to the parties to the agreement. A template for the Notices of Accession has been drafted by the legal team of the Consortium and included among the Annexes to the Agreement.

Relationships with the clients

The Agreement includes a clause that regulates the relationships with the clients, to mitigate the risk of client's loss that some DIH may perceive when collaborating among each other. Indeed, it might be the case that a DIH receives from one of its clients a service request and decides to forward it to the Network in order to ask for support in answering to the client's needs. In this case, the Agreement explicitly points out that the DIH which forwarded the request to the Network – in addition to being responsible for the project management of the activities put in place by the Network with reference to the request received - remains the sole contact point for the client. Moreover, the DIHs involved in the provision of the service shall include a non-compete clause in the Service Agreement or Jointly Developed Service (JDS). Alternatively, each DIH shall undertake not to intentionally act in the harm of the DIH asking for the support.

IP rights and know-how

When it comes to collaborate, it is necessary to clarify how to deal with issues related to both IPRs, i.e. rights protected by intellectual property law and equivalent rights, and know-how, such as technology, trade secret, information, and documentation.

The Agreement foresees that, in the context of a Service or a JDS, one of the involved DIH may make available its background know-how to the other involved Hubs, if relevant for the implementation of the project activities. Nonetheless, this happens only under specific conditions to be evaluated on a case-by-case basis and should be provided in the specific Service/JDS agreement or in a separate agreement. Under any circumstances, involved DIHs are obliged to disclose/transfer their background information.

By the same token, on a case-by-case basis, involved DIHs shall negotiate how rights, title and interest in and to foreground know-how and/or foreground IPRs developed by one or more Hubs under a specific Service/JDS should be assigned, conferred or licensed. It should be noted that in the context of the Service or JDS in which the foreground know-how and/or the foreground IPRs have been developed, any involved DIH shall be free to use them.

Distinctive signs

In relation to distinctive signs (e.g. trademarks, trade names, company names, logos, domains, etc.), the Agreement specifies that no DIH shall acquire any right on them, unless otherwise agreed upon on a case-by-case basis. Accordingly, any DIH is prevented from making use of the distinctive signs of another DIH, its clients or any other third party, in any form and for whatever purpose, unless the prior authorization in writing from the relevant rightsholder is obtained.

Confidentiality

The Agreement also regulates the handling of confidential information, i.e. information in respect of the business of a DIH and/or their respective clients that, at the

time of disclosure, the disclosing party has expressly defined in writing or orally identified as confidential. Confidential information (e.g. relating to business method and model, finance, customer list, etc.), if disclosed, will cause harm to the disclosing party, and/or to its clients, or more in general, to the cooperation and/or a service or a JDS.

Accordingly, the Agreement establishes that all confidential information disclosed by each DIH shall be maintained as strictly confidential during a service or a JDS in which the disclosure occurred and for five (5) years thereafter (and, for Personal Data, as long as GDPR requires so) by any other DIH. Indeed, confidential information shall be used by each party only for the purposes of the cooperation.

Non-compete

To mitigate the risk that cooperation may harm the ordinary business of involved DIHs (e.g. client's losses, etc.), the Agreement states that, in the context of a specific service agreement or JDS agreement, the parties might decide to include a non-compete clause. The latter should prevent each DIH to intentionally take advantage of other party's clients known during that service or JDS, or in the context of the cooperation, in a manner that results in a harm for that party or, in any case, contrary to the general spirit of good faith governing the Network.

Data protection

In terms of data protection, the Agreement defines that the DIHs undertake to process all personal data come to know in the context of the cooperation, through the platform or in order to perform a service or a JDS, in accordance with principles and provisions as set forth by the GDPR, and the applicable national data protection legislation, including but not limited to, guidelines, opinions and decisions which might have been issued by the European Data Protection Board (the "EDPB") or any competent Data Protection Supervisory Authority (the "EU Data Protection Law").

Liability of the parties

In order to determine the liability of the parties collaborating in the context of a specific service or JDS, i.e. the maximum amount one DIH should pay to the other in case of loss, the Agreement establishes that, the service agreement or the JDS agreement shall specify, at least, that the DIH asking to the Network for support shall remain liable in front of the client for the implementation of the service and that each involved party shall be responsible before the afore-mentioned DIH and, if the case be, the other involved parties for any harm they might have suffered because of its fraudulent behavior, misconduct, negligence or omission in performing the activities/services it should have offered in the context of the service.

The core articles of the Agreement are dedicated to providing a high-level framework concerning the regulation of cross-border collaboration between DIHs (relationships with the clients, IP rights and know how, confidentiality and so on and so forth). Hubs willing to cooperate in specific projects will be able to refer to these articles when drafting the ad hoc agreements regulating into detail their relationship. To facilitate the drafting of these specific agreements, the legal team of the Consortium has drafted a template covering the case of the joint development of a service. This template has been included among the Annexes to the Agreement.

The Framework Cooperation Agreement and its Annexes can be consulted in Annex I.

6.2 Definition process

The first preliminary version of the Framework Cooperation Agreement has been designed by taking into consideration the feedback provided by participants who took part in the collaborative workshops carried out throughout the project. Specifically, the Agreement includes clauses connected to the legal risks (e.g. data protection, ownership of the new solution developed, loss of clients, etc.) identified during the analysis of the cooperation scenarios (see section 5).

In this context, the preliminary version of the Agreement was designed by our legal team and made available for one month on a dedicated section of the collaborative platform.

By reviewing the document on the platform, participants in the project had the opportunity to comment on it, discuss the changes proposed by other participants, cast their votes and/or reply with further amendments. This iterative process led to the collection of over 150 comments. After carefully analysing them, the legal experts presented the most relevant comments to the participants in a dedicated webinar, also providing further clarifications on the review process of the document. Afterwards, all comments have been consolidated into a final version of the Framework Cooperation Agreement, which was then presented during the parallel session dedicated to the AI DIH Network project held at the DEI Stakeholder Forum 2019 in Madrid.

6.3 Key issues encountered

The co-drafting process of the Framework Cooperation Agreement highlighted some key issues that should be also considered in future collaboration initiatives.

It should be noted that all the issues encountered stem from the comprehensive definition of Digital Innovation Hub. The absence of legal requirements for qualifying as DIHs led to significant differences among DIHs in terms of legal status, governance model, business models, etc.

These divergences limit the possibility of identifying rules that apply to all DIHs on certain aspects. Specifically, this happens in the case of topics connected to the statutes of the organisations involved and to the financial structure of the DIH, as described in the paragraphs below.

6.3.1 Non-compete clause

The introduction of a limit to competition among DIHs involved in a collaboration was suggested by those DIHs acting more as private entities. These DIHs depend at least partially on the revenues collected through the provision of their services. Accordingly, some of them considered it necessary to include clauses that protect the relationships they have built over the years with clients in their ecosystem.

For DIHs managed by universities, RTOs or research centres the opposite is true. Entities like universities or RTOs might have restrictions to enter into non-compete agreements or to sign contracts including clauses with similar effects due to their mission and statute. Freedom of research is a pillar of the European education system and it is deeply entrenched in the working culture of these organisations. This principle might come into conflict with non-compete clauses, which limit for a few years the possibility for universities, RTOs or research centres to collaborate with the clients of the other DIHs after the end of the collaboration. As a result, non-competition clauses may be not acceptable for DIHs managed by similar organisations, but also for DIHs which include universities and research centres among their partners.

To balance these opposite needs, the Framework Cooperation Agreement foresees the possibility to include a non-compete clause in the specific agreements among parties. Therefore, the possibility to adopt or not a similar clause is left to the DIHs involved in a joint developed service agreement or other agreements connected to specific collaborations.

6.3.2 Statutory limits to the liability of parties

Agreements connected to services usually entail limit to the amount one party should pay to the other in case of loss connected to contract between them. Such limitation of liability is often connected to the value of the contract.

In the discussion of the Framework Cooperation Agreement some DIHs highlighted the existence specific caps for their liability within their statutes, which, depending on the acts and the characteristics of the hub, can be quite low (e.g. up to EUR 10,000).

Such limitations had to be considered in the Framework Cooperation Agreement, which, leaves the definition of the limitation of liability to the DIHs involved in specific agreements and foresees the possibility that liability is limited according to applicable statutory provisions.

However, it should be noted that excessive restrictions to liability may hamper the possibility of a DIH to enter agreements, especially at international level.

6.3.3 Payment of the service exchanged

The Framework Cooperation Agreement does not provide indications on how to manage payments among the DIHs involved in collaborations, which are left to specific contracts among the parties.

However, this aspect has been addressed in the development of the template of the agreement for partnerships to provide service jointly.

The template includes different possibilities that DIHs can choose to settle payments among the parties, taking into consideration that some DIHs do not have the possibility to accept payments due to their public nature. Such limit is usually overcome by signing agreements that involve other organisations of the DIH, which do not have issues in accepting payments, yet it should be taken into duly consideration to ensure a smooth definition of collaborations across Europe.

6.3.4 Identification of the signing party

Most of DIHs taking part in the coaching and mentoring programme enter the Framework Cooperation Agreement. However, some of them encountered difficulties in identifying the legal representative responsible for the signature. This applied to DIHs structured as networks of multiple legal entities, where no overarching legal entity with sufficient autonomy has been established or identified and no consortium has been established.

A horizontal governance model, with shared responsibilities across different partners, may represent an obstacle in relation to the signature and the kick-off of collaboration activities. Indeed, in these cases, it was necessary to align the different partners and to collect the signatures of all organisations that are part of the Hub.

Results of feasibility checks for the cooperation schemes among DIHs

7 Results of feasibility checks for the cooperation schemes among DIHs

In the final phases of the coaching and mentoring programme, on-site visits with Hubs' representatives have been organised to evaluate the feasibility of the three cooperation scenarios. These visits have been carried out by the tutors at the DIHs' premises, whenever possible, and all relevant information were collected through an *ad-hoc* questionnaire. The latter consisted in a list of questions aimed at investigating both general aspects related to inter-hub collaboration for the DIHs and the feasibility of the cooperation scenarios in the specific context of the DIHs involved in the project.

DIHs provided a concrete use case for each scenario and analysed its feasibility considering, *inter alia,* if their organisation was ready to implement it and if they would need to identify additional human or financial resources to use the scheme, reflecting on the economic sustainability of the scenario within their business model.

Overall, the analysis of the feedback gathered during the on-site visits shows that the three collaboration scenarios are considered to be feasible and realistic. The main results that emerged from the feasibility checks carried out as well as the potential use cases identified by DIHs are presented in the paragraphs below..

7.1 Results of the feasibility checks

7.1.1 Readiness of the organisation

One of the main aspects considered in the feasibility checks is the possibility for the DIH to implement the cooperation scenarios immediately (or at least in the short term). This means:

- DIHs do not have specific limits to enter into cooperation with other DIHs (regardless they are public or private entities, they are located in a different regions/ country, etc) and they are already in contact with potential partners;
- DIHs can easily and quickly follow the internal procedures connected to a new collaboration;
- DIHs do not need to change dramatically their internal structure to collaboration activities.

The results of the onsite visits show that in general DIHs do not need to respect any obligation when establishing cross-border collaborations. Limitations may arise only if they work in specific sectors such as military or when the external collaborator might be perceived as a competitor.

At the moment, DIHs representatives have already pre-identified potential partners from the AI DIH Network mainly to develop new services (14 DIHs), to provide a service jointly (11 DIHs) and to identify partners for matchmaking services (9 DIHs).

The key drivers and criteria allowing for the identification of potential partners are similar for each investigated scenario and include:

- Reputation;
- Experience/knowledge based on reference projects and publications;
- Key expertise;
- Competencies;
- Complementarity;
- Rates;
- Geographical proximity;
- Market similarities.

Regarding the channels and tools to be used to identify potential partners, the process indicated by DIHs is the same for the three scenarios and can be summarised as follows:

1. First, DIHs look into previous successful collaborations;

2. Secondly, they reach out to their network to get recommendations for a potential partner;

3. In case the previous steps were not successful, they look in the AI DIH network, the DIHs catalogue and marketplaces developed in the framework of European projects (like matchmaking tools) to narrow down the initial search;

4. Finally, they organise face-two-face meetings to tune up the partners selection.

In terms of **procedures**, most DIHs do not have a standard process to establish collaborations with other entities in the context of cross-border collaborations, beyond that followed for the participation in EU funded R&D EU projects. Yet, this was not highlighted as a relevant limit to collaborations. DIHs have usually experience to collaborate with other entities and they consider they would be able to extend their collaboration practices to cross-border collaborations quite easily, with the support of their legal department/legal experts.

The **time** required to establish collaborations with other entities might vary greatly depending on the topic/scope of the collaboration, its complexity and specific requirements as well as on the number and type of partners involved. While for large projects, DIHs can deal on a case by case basis, for smaller projects the whole process can become more agile with framework agreements and template documents, lasting from one to a few weeks.

In order to engage in cross-border collaboration, the vast majority of DIHs do not need any specific adjustments to their current **organisational structure** nor to their collaboration procedures. However, some DIHs would need to work with external legal experts.

In general, the analysis suggests that:

- DIHs have already experience in partnerships to provide services jointly under the framework of European funded projects and have, therefore, the capacity to do it outside European projects with minimum efforts and adjustments;
- Developing new services is part of DIH usual activities, therefore, the structure and processes are already in place;
- Similarly, for matchmaking service, adjustments are kept to the minimum as DIHs usually undertake this service in an informal manner.

The adjustments identified for each scenario are reported in detail in the table below.

Table 2 - Organisational adjustments for the implementation of the cooperation scenarios

Partnerships to provide services jointly	Development of a new service	Matchmaking
• Improvement of communication among partners; • Improvement/ adoption of quality check; • Adaptation of standards and procedure to work at international level (e.g. updated the procedure for data sharing); • Training the personnel involved on the detailed procedures to follow, setting an online collaboration workspace, coordination and monitoring mechanisms.	• Increase effort for project management/human resources; • Improvement/ development of skills for managing data governance, ethics and privacy; • Development/ adoption of a data sharing framework, with the support of legal experts.	• Development of indicators/ templates for matchmaking; • Monitoring demand and opportunities for matchmaking; • Introduction of procedures to provide active support to the specific technical requests delivered to the DIH.

7.1.2 Resources needed for engaging in the scenarios

The availability of the resources needed is a crucial factor for successful collaborations. On the one hand, without resources dedicated to the identification and building of opportunities, cooperation is not expected to happen. On the other hand, once a DIH commits to support another organisation within a cooperation agreement, it is essential it has the capacity needed to fulfil its role, avoiding the risk of jeopardising the partnership and, in worst case scenarios, damaging the partner or the client.

In most cases, DIHs consider their current **staff** is sufficient for the **initial implementation** of all the scenarios. Additional people would be needed to scale-up collaborations. These would include both employees dedicated to project management, coordination, liaison with other partners and researchers and technical staff.

The **financial resources** required for the implementation of the scenarios can be split into two main categories: funds needed for establishing and coordinating the collaboration and those necessary to operate the service included in the collaboration (e.g. resources needed for delivering the service co-developed by the DIHs).

As for the latter, most of DIHs did not encounter difficulties in identifying how services developed or delivered in partnership could be sustained, using public resources or payments from the client (e.g. through membership fees) depending on the type of service. The same applies to matchmaking service which can be delivered for free or in charge of a small initial fee (with eventual success fee), depending on the complexity of the request.

While the delivery of the services does not present issues in terms of economic sustainability, difficulties are encountered in covering costs connected to the collaboration.

Establishing a cooperation requires additional expenses compared to the normal service

delivery, connected to:

- Run the scouting of potential partners;
- Negotiating and drafting the cooperation agreement – activities which may also require external legal support;
- Coordinate among partners (including travel costs for face-to-face meetings).

Some of these costs decrease over time, once collaborations are repeated. This is the case of the scouting for partners which become faster and easier after the DIHs has established its network of partners.

However, besides expenses for specific partnerships, general costs for facilitating knowledge sharing and supporting DIHs in getting in contact with each other (e.g. presenting the capabilities and offerings in their ecosystems, presenting solutions available, etc.). Most of DIHs considered **funding** necessary for promoting these horizontal activities and to sustain the costs connected to the establishment of collaborations.

Nine DIHs identified potential sources of funding for collaboration, however most of them are available within EU funds (including direct and structural funds): Interreg programme, COST calls, ESF (European Social Fund), Vanguard Initiative and ERDF (European Regional Development Fund).

7.1.3 Legal aspects of the cooperation scenarios

The cooperation scenarios do not present particular issues in terms of legal aspects. However, DIHs consider a specific collaboration agreement is needed to implement the scenarios *partnerships to provide services jointly* and *development of a new service scenarios*. As for matchmaking, the need for an agreement depends on the type of partnership sought.

<u>Provide services jointly and development of a new service</u>

The most relevant aspects to be settled within agreements are liability of the parties, IPR management, non-competition and data protection management.

Nonetheless, DIHs also identified some other key aspects that need to be clearly determined under the provide services jointly and development of a new service scenarios, which are:

- Objectives, role and responsibilities;
- Risk management measures;
- Interface with the customer;
- Usage of facility;
- Resources/costs and assets to be used – cost implication sharing;
- Revenue share;
- Service maintenance obligations clarification at both levels among DIHs and DIH and client depending on the service nature;
- Payment guarantees to cover payment uncertainty and specific SLAs (Service Level Agreements) for the external services.

In particular, in case of development of a new service, the cooperation agreement should also cover aspects related to:

- "Rules" for the marketing implementation and sales in terms of location;
- Joint governance;

- Joint pricing-cost structures.

Matchmaking

Legal aspects to be considered in the matchmaking scenario depend on the type of partnership considered. If the DIH acts as a broker/facilitator between two entities (and not necessarily with another DIH), DIHs indicated that there are no specific legal aspects to be regulated in an ad-hoc cooperation agreement. While, in case a DIH puts its client in contact with another DIH, then, the following aspects need to be regulated:

- Definition of the service;
- Roles and responsibilities, e.g. limit the responsibility of one DIH if it acts only as facilitator;
- Risk management measures;
- Resources/costs and assets to be used – cost implications/sharing;
- Financial support and payment plan – including third party involvement (service supply);
- Data protection aspects, as well as those regulating joint governance and joint (eventual) pricing-cost structures, related to the support to be delivered in the eventual phases that come after initial scouting of partners (business partners, testing partners, etc.) and setting of initial contacts;
- Non-competition clause.

7.2 Potential use cases for the implementation of the scenarios

The onsite visit were also functional to identify relevant topics for in which cooperation is considered to be particularly useful.

It resulted that collaboration would be useful to harmonise the approach toward specific aspects of AI - including **ethics**, **data standardisation and secure transfer** - at European level. Further, potential for developing cross-border collaboration is envisaged especially in connection to the following market sectors, such as:

- **Health**, including hospitals of the future and biotechnologies;
- **Manufacturing**, including automation, predictive maintenance, data processing and exploitation;
- **Energy**, including automation, smart grids, cloud services, data processing and exploitation;
- **Mobility**, including fully and partially autonomous vehicles, driving system monitoring, forecasting, predictive maintenance and infotainment.

The discussions also led to the identification of potential use cases for implementing the collaboration scenarios, which are presented below.

7.2.1 Partnership to provide service jointly

For what concerns partnerships to provide services jointly, DIHs confirmed their willingness to look for partners to complement their competences, to improve knowledge on specific topics and sectors in order to better support SMEs from their regional ecosystem. For instance, this could be done by exchanging experts/expertise and/or sharing existing facilities. Accordingly, the AI-related services DIHs indicated to be interested to provide jointly with other hubs are the following ones:

- **Training** on specific topics. The service could entail:
    - the organisation of an international summer school on a topic for which there is a growing demand (e.g. machine learning, data sharing, interoperability, etc.);
    - the creation of a massive open online course (MOOC) with blended learning paths jointly developed by several DIHs, with a common online part and practical workshops, as well as a project-based training delivered by each partner in their own region;
    - the organisation of a training for an SME where two DIHs bring together their expertise.
- **Providing advanced AI data and computational infrastructures and expertise for application experiments**: DIHs could join forces to support SMEs and start-ups testing their solutions, providing access to specific facilities not available in their ecosystem. Mentioned examples include testing of underwater robots, HPC facilities and smart manufacturing testing facilities.
- **Supporting RDI projects in the field of AI with complementing skills and knowledge:** specific expertise and a technological base might be needed to support RDI projects. Examples of application areas emerging from the feasibility checks include image recognition and analysis and virtual augmented reality.

7.2.2 Develop a new service

DIHs confirmed the potential use of cooperation to conceive new service they can integrate into their service offerings and provide to their local ecosystem.

Examples of services that can be developed jointly include:

- **AI maturity assessment models and tools:** common tools and methodologies could be developed at European level to provide organisations with more robust benchmarking data regarding their AI maturity level;
- **AI trend watching and observatories:** shared methodologies and centres to monitor AI in different business sectors could provide useful information on trends across Europe and enhance the quality of the service;
- **Cross-border standardization, certifications and labels:** shared methodologies could be developed for certifying technical due diligence of innovative SMEs and start-

ups. An international label would allow a stronger brand recognition and support DIH's customers to get access to financing opportunities.

7.2.3 Matchmaking

The implementation of the matchmaking scenario is considered a useful solution that enables DIHs to join forces to collaborate and exploit synergies.

In particular, DIHs highlighted that the matchmaking requests may be of technological, business and/or financial nature, depending on clients' needs. As an example, the request may relate to the need for a partner to provide on-demand solutions for production automatization in the plastic industry or a partner for the development of AI medical devices.

Other forms of matchmaking might include:

- **Matchmaking for sharing data for AI:** a Digital Innovation Hub might engage in cross-border collaboration with another hub in order to support its client – who, for example, need to train specific AI algorithms – to get access to the required data. This might entail sharing information with the other DIH on sector-specific open datasets or gaining access to organisations interested to act as living labs;
- **Matchmaking for the creation of EU consortia in the field of AI:** DIHs may activate collaborations to support a client in the identification of the right partner(s) with unique expertise to establish effective consortia for applying to European projects/calls and hence developing together successful project proposals;
- **Matchmaking for AI job vacancies:** DIHs support a client in promoting cross-region/cross-country job opportunities in the field of AI available within its ecosystem in order to find potential suitable candidates with the desired skills, competences and experience to cover the job vacancies needed to be filled.

AI maturity assessment collaboration pilot

8 AI maturity assessment collaboration pilot

A collaboration pilot was launched on January 2020 to experiment concrete cooperation among Hubs of the Network and to support the preliminary development of a shared AI maturity assessment. The choice to focus on this service was based on the inputs collected from Hubs' representatives throughout the project and taking into consideration key strengths of the Network and the services currently offered by its members.

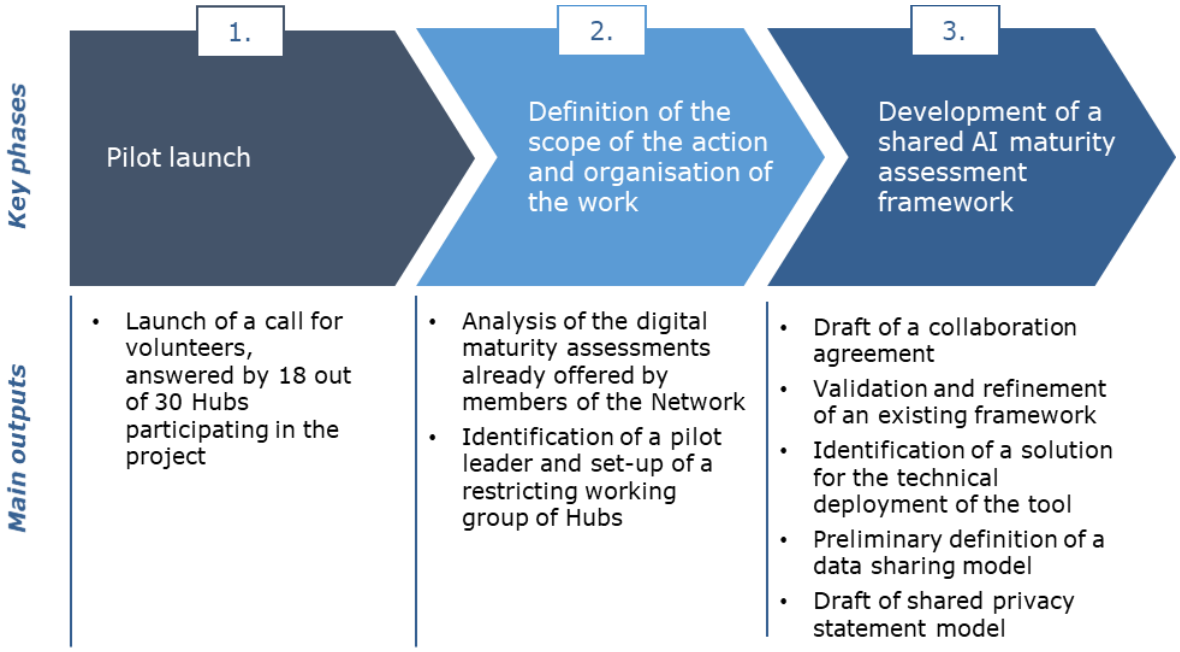
The participants' interest in AI and digital maturity assessments first emerged in the context of the seventh training package of the Coaching and Mentoring programme, dedicated to sharing knowledge and good practices in the field of AI services. A cycle of webinars was organised to implement peer-to-peer learning and Hubs' representatives demonstrated a strong interest in AI and digital maturity assessments, with three webinars being held on this topic between June and September 2019.

Furthermore, the potential for collaboration in this field also emerged in the feasibility checks of the cooperation scenarios. The definition of a shared AI maturity assessment at the European level was mentioned by Hubs' representatives as an interesting and potential case for collaboration when discussing the cooperation scenario regarding the development of a new service (see section 7.2.2).

Lastly, it should be noted that the majority of Hubs already declares to offer services related to AI and digital maturity assessments (see section **Error! Reference source not found.**). H owever, these services vary greatly in depth and scope, according also to the maturity of the DIH in the field of artificial intelligence. The development of a shared maturity assessment specific to AI would enable DIHs to enhance their service portfolio while building upon their current expertise.

The following graphic presents an overview of the key phases of the pilot and of the outputs achieved.

Figure 13 – Overview of the AI maturity assessment collaboration pilot process



8.1 Key phases of the pilot

The pilot can be summarised in three key phases, consisting in its launch open to all members of the Network, in a preliminary definition of the scope of the initiative together with Hubs that answered the call, and finally in the activities carried out by a restricting working group of DIHs for the development of a shared AI maturity assessment.

8.1.1 Pilot launch and role of the Consortium

The pilot was launched on January 10, 2020, with a call clarifying the voluntary nature of the initiative - which did not foresee any direct grant – and explaining how the Consortium would have supported involved Hubs. In particular, the Consortium offered to facilitate the activities of this pilot by:

- Supporting DIHs to define the scope of the action and to identify a pilot leader among involved Hubs
- Supporting the leading DIH in the identification of the required activities and through the different phases of the initiative
- Organising and moderating online meetings
- Providing spaces for co-working and discussion on the AI DIH Network platform

In the call for volunteers, in order to leverage the Hubs expertise, DIHs were asked to share their experience in the field of AI maturity assessments. In total, 18 out of 30 Hubs answered the call, confirming the DIHs interest in this topic.

8.1.2 Definition of the scope of the action, identification of a pilot leader and of a restricting working group of DIHs

In order to facilitate the definition of the scope, the Consortium analysed and presented an overview of the AI and digital maturity assessments already offered by members of the Network. This analysis and the following discussion helped to define alternative high-level approaches and to understand the needs of the involved Hubs.

Furthermore, to effectively organise the work and to exploit the Network's strengths, the Consortium identified two volunteering Hubs, FCAI (Finland) and the Munich Innovation Hub for applied AI (Germany), available to act as pilot leaders and willing to share their tools as a starting point for the development of a shared AI maturity assessment.

To support participants assessing which of the two approaches best fitted their needs, the two tools were compared into detail and additional materials were made available on a dedicated section of the AI DIH Network platform. The decision to move forward with the framework developed by the Munich Innovation Hub for applied AI was based on a majority principle, accordingly to the votes casted by participating Hubs. This process also allowed to identify a restricting working group of 7 DIHs willing to actively support the pilot leader.

Table 3 – Examples of Digital and AI maturity assessments offered by members of the Network

A set of webinars were organised in the context of the seventh training package of the Coaching and Mentoring programme to give DIHs the opportunity to learn more about digital and AI maturity assessments offered by other Hubs. In addition, the at the launch of the pilot, interested DIHs were asked to indicate their experience in this field. The table below presents the most relevant examples of Digital and AI Maturity assessments offered by members of the Network.

FCAI (Finland) - AI maturity self-assessment tool

The tool aims to assess the current AI readiness and performance of the organisation thru a short online survey followed by a face to face workshop to discuss the results. The online self-assessment questionnaire was launched in 2019 and it's based on 5 different categories. Once respondents submit their answers, they are engaged by the Hub to discuss and review the results and to potentially identify project opportunities.

Munich Innovation Hub for applied AI – AI maturity assessment framework

This survey aims to measure a company's AI maturity collecting data in ten different dimensions (from AI vision to execution). It allows to reveal key areas to be addressed and to provide recommendations for action when aiming towards a higher AI maturity level. The survey is provided by the Hub to companies requesting the assessment and it is followed by face to face discussion of results.

IMEC (Belgium) – AI-barometer

The AI-barometer is a yearly online questionnaire targeted at Flemish enterprises & end-users. The questionnaire aims to gain insights in their competencies, in the potential of AI, and in how enterprises deal with privacy and transparency and end-users feel about these topics. Based on the Survey results, the Hub also publishes a

yearly report on the AI maturity landscape.

ITI Data Cycle Hub (Spain) - AI & Digital Assessment Service

This digital assessment aims to analyse the current state in the implementation of AI and digital technologies, to identify actions to improve weaknesses detected and to maintain strengths, allowing to prioritize the identified actions and to establish an action plan. It entails face-to-face meetings with the customer as well as office work.

SmartIC (Estonia) - Digital Maturity Assessment

Starting from the industry's needs of its ecosystem, SmartIC has developed a digital maturity assessment with the aim of identifying necessary future industry 4.0 capabilities. Specifically, 6 focus area for digital maturity by 2025 have been identified, which are: self-driving cars, 3D printing, industrial robotics, digital twin and VR/AR, smart grid solutions, predictive maintenance & monitoring.

DFKI (Germany) - The Digitalisation Readiness-Check

This online tool is designed to discuss the digital maturity of a company and it serves as a basis for further cooperation between the organization and the Hub. The tool is built around five different dimensions that allow to rate the digital maturity of the SME. These could be tailored to AI.

VDTC of the Fraunhofer IFF (Germany) - Industrie 4.0 Check-Up

The Hub has developed a standardised approach (including workshops, experts' interviews, roadmap development) to provides companies with a realistic maturity assessment within the Industrie 4.0 paradigm. This assessment has been already been implemented with SMEs as well as with large OEM located in Germany, Spain, Thailand, China and Kazakhstan.

8.1.3 Activities of the restricting working group of DIHs

In the following weeks, the Consortium supported the pilot leader in the definition of the activities and organised online meetings with the restricting working group to move forward with the development of a shared tool. During these calls, DIHs' representatives discussed open points and agreed on common decisions. Specific sub-tasks were delegated to volunteering DIHs and additional information and feedback were collected in between the calls to support the definition of more detailed proposals by the pilot leader. Once the restricted working group had reached an agreement on particular topics, if necessary, materials were shared on the collaborative platform to collect comments from the larger group of DIHs and to take a final decision. The following paragraph provides an overview of the stream of activities carried out and of the key outputs of the pilot.

8.2 Outcomes of the pilot

The pilot leader and the restricting working group, with the support of the Consortium, identified five key challenges and areas of activities for the development of a shared AI

maturity assessment. The points to be addressed mainly regarded:

- Defining an agreement to settle IPRs and to allow DIHs to share data
- Refining and integrating the existing framework
- Ensuring the technical deployment of the tool by the different DIHs
- Outlining a shared data model to ensure meaningful benchmarking
- Ensuring full compliance with privacy and data protection regulations

In addition, Hubs' representatives also started to discuss a shared approach to reporting and opportunities for collaboration to brand and market the tool. However, it was decided to postpone this discussion to a later stage of the initiative.

Settlement of IPRs and draft of a collaboration agreement

The pilot leader confirmed its willingness to share the tool for free, by providing Hubs with an unrestricted grant for its deployment. On the other hand, DIHs agreed to share the information collected from their customers in an anonymised format, to create a pool of data for benchmarking purposes. After collecting the feedback from the restricting working group, the pilot leader took ownership of this task and offered to draft a short collaboration agreement.

Validation of a shared framework

The second stream of activities focused on refining the demographic questions, on reviewing the existing survey and discussing a shared methodology to deliver the assessment. Once a first set of demographic questions was identified, they were published on the collaborative platform to collect final feedback from the participants and to reach a shared agreement. Similarly, the pilot leader made available on the platform the assessment roll-out methodology that had already been used to deliver the service to open a discussion on possible open points. Conversely, the review of the survey was kept confidential and limited to DIHs collaborating with the pilot leader.

Technical deployment of the tool

The restricting working group agreed on a shared approach for the technical deployment of the tool. Hubs agreed each DIH would use its preferred survey provider at the condition that the information collected could have been extracted and analysed according to a commonly developed data pipeline. This solution allowed Hubs to maintain ownership of the data collected while sharing it only once processed and anonymised.

Data sharing model

DIH's representatives also started a conversation on how to share the data collected through the assessment. The restricting working group identified a common data hosting solution and agreed on the frequency on which Hubs committed to upload the anonymised and processed data. Once the validation of the survey will be concluded, it will be possible to move forward with the definition and testing of a data sharing model. The shared data will allow Hubs to offer customers a more robust benchmark, providing an added value to the AI maturity assessments.

Compliance with data protection and privacy regulation

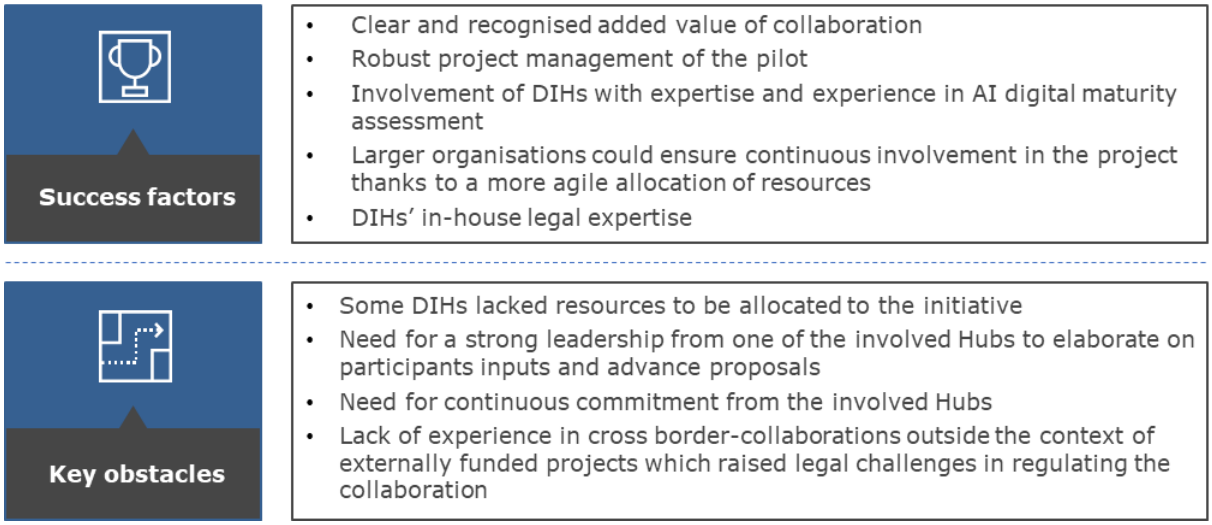
The development of a shared service such as an AI maturity assessment required DIHs to take into consideration data and privacy protections regulations. In order to simplify the data management model, it was decided that each Hub would maintain ownership of the information collected and would anonymise data before sharing it with other Hubs. To

facilitate the collection of data consent, a standard template for a privacy statement was drafted by one of the Hubs participating in the restricted working group and later shared on the online platform for feedback.

8.3 Lessons learned

The pilot allowed to experiment a concrete case of cross-border collaboration among Digital Innovation Hubs in the development of a shared AI service. Despite the time and resources constraints, the initiative highlighted both the potential and some key challenges of collaboration. The graphic below summarises the success factors that enabled the pilot to achieve its outputs and key obstacles encountered in the process.

Figure 14 – Success factors and key obstacles encountered in collaboration pilot



Success factors, key obstacles and lessons learned

Hubs' representatives recognised the added value behind collaborating, demonstrating a high interest in the initiative and volunteering for participating in the action. In particular, with regards to the development of a shared AI maturity assessment, participants were interesting in expanding and enhancing their service portfolio building upon the Network strengths, in acquiring sound and wider benchmarking data, and in improving the visibility of the service and of their Hub thru common branding and marketing actions.

However, collaboration requires an organisational and resource effort and the initiative highlighted different levels of cooperation readiness among involved Digital Innovation Hubs. In terms of resources allocation, larger organisations proved more flexible than smaller ones, being able to ensure continuous involvement and participation in the project. In-house legal expertise and previous experience in similar initiatives also proved to be an important asset. Indeed, some Digital Innovation Hubs were able to quickly address some of the raised challenges relying on strong internal legal competencies, whereas other organisations faced more difficulties when confronted by similar issues.

Overall, the total number of involved Digital Innovation Hubs decreased significantly throughout the different phases of the pilot. The result was twofold: on the one hand, this

created a more agile and efficient working group of Hubs' representatives and allowed to build trust more easily. On the other hand, the decreasing number of involved DIHs confirmed there are still significant obstacles to cross-border collaboration which would need to be further addressed in order to make cooperation possible on a business as usual basis. In particular, the lack of resources for cross-border collaboration was confirmed to represent a key challenge for Digital Innovation Hubs when operating outside the context of externally funded projects.

Finally, the pilot required a strong project management function, which in this case was played by the Consortium, as well as a continuous commitment from the pilot leader and a more restricted number of DIHs. Collaboration entails the need for coordination, and robust project management emerged as a crucial ingredient for success. Similar initiatives lacking this kind of support might faces great challenges, especially without a clear leadership from one of the Hubs and when involving a large number of Digital Innovation Hubs.

Conclusions and recommendations

9 Conclusions and Recommendations for the improvement of cooperation and networking schemes of the DIHs in EU Member States

The activities performed within the preparatory action and the continued interactions with Digital Innovation Hubs provided relevant inputs on how to promote collaboration among them.

Digital Innovation Hubs confirmed their interest in networking and collaborating, with most of the participants in the programme deciding to sign a Framework Collaboration Agreement to foster future collaboration among them.

However, a number of support measures are needed to ensure collaboration will be established on a regular basis. On the one hand, there is need to support Digital Innovation Hubs in knowing each other, which would help to build trust – an essential requisite for cooperating –, to identify common interest and opportunities for cooperation inside and outside European funded projects. To achieve this, a number of actions are required, encompassing a mix of virtual and physical meetings - enabled by appropriate tools - but also a simplification and standardisation of the source of information and tools currently available.

On the other hand, support is needed to overcome risks and obstacles that may prevent DIHS in involving into collaboration activities. It is necessary to help DIHs in adopting appropriate legal solutions that would mitigate most of the risks perceived in collaboration. Further, financial incentives may contribute to foster DIHs involvement in collaboration opportunities, both as partners and as promoters of the relationship.

The detailed recommendations on how to foster cross-border collaboration among DIHs are reported below. This set of suggestions has been developed considering the current landscape of DIHs as well as the future developments foreseen in the upcoming Digital Europe Programme. In addition, proposals on how to continue to reinforce the role of Digital Innovation Hubs and how to maximise their impact on the European ecosystems have been developed.

9.1 Supporting DIH collaboration in the Digital Europe Programme

9.1.1 Experiment and demonstrate the effectiveness and benefits of the cooperation scenarios within EU programmes and projects

Collaboration among European DIHs is one of the aspects that are expected to be supported by the Digital Europe Programme (DEP). The current version of the DEP reports different types of collaboration that will be supported, aiming to leverage DIH capabilities and infrastructure for serving other regions and creating connections among ecosystems.

The collaboration scenarios developed within the AI DIH Network can represent a starting point for implementing these use cases:

- the scenarios "Partnership to provide services jointly" and "Development of a new service" include schemes for the implementation of the "Exporting / Importing EDIH excellence" use case reported in the DEP;
- the scenario "Matchmaking" is a possible solution for applying the "Connecting ecosystems" use case identified in the DEP.

Using similar schemes within the DEP (and within other EU projects under Horizon 2020 and Horizon Europe) would help to reinforce these mechanisms and to make DIHs familiar with structured collaboration.

Further, other scenarios connected to the implementation of additional use cases presented in the DEP or related to the collaborations in other specific technological domains could be developed, to spread the use of structured collaboration among DIHs.

In the definition of additional cooperation schemes, it is recommended to adopt a bottom-up approach, starting from the needs of the ecosystems and of the DIHs potentially involved.

Recommended actions:

- Encourage the definition of additional cooperation scenarios, corresponding to other collaboration use cases or to specific needs of technological fields different from AI
- Promote the use of the cooperation scenarios for the projects to be launched under Horizon2020, to test and refine them in the view of the Digital Europe Programme
- Foster the use of the scenarios (of other schemes developed with the contribution of DIHs) to implement the collaboration use cases of the DEP.

9.1.2 Define additional cooperation mechanisms for European DIHs and other DIHs

The Digital Europe Programme will introduce a new classification among DIHs, by selecting European DIHs from a list of candidates prepared by Member States.

EDIHs will receive funding for strengthening their capacity - by investing in equipment, facilities and employees to provide services for their ecosystems - and for establishing collaborations, especially at cross-regional level, as they will receive travel grants to work with other hubs.

The other DIHs, which have been receiving funding under Horizon 2020 and in the context of regional and national programmes, will continue to operate in parallel.

Defining mechanisms for structured collaboration among EDIHs and DIHs would reinforce their impact on the European ecosystem. DIHs are higher in number compared to EDIHs and have already established connections with their ecosystems that can be exploited to transfer EDIHs capabilities.

To define these schemes, benefits and costs of collaboration between EDIHs and other DIHs should be analysed. The analysis should start from the existing collaborations, refining the schemes in place by taking into consideration feedback gathered directly by the potential involved partners. This would lead to the identification of factors that may prevent cooperation

and of incentives and measures that can support cooperation, within the Digital Europe Programme and in other contexts.

Recommended actions:

- Define potential schemes for collaboration between EDIHs and DIHs and assess benefits and costs of the parties involved by adopting a bottom-up approach
- Identify suitable measures to overcome eventual barriers and obstacles for cooperation

9.1.3 Incentivise collaboration until it becomes a well-established mechanism

The analysis of costs and benefits of cooperation scenarios highlighted that working together requires DIHs an effort in terms of time and resources.

DIHs willing to cooperate should dedicate resources to ensure knowledge sharing and to build their networks and should sustain an effort to establish specific collaborations, e.g. scouting for the appropriate partner, monitoring cooperation opportunities, negotiating the collaboration agreement, coordinating among each other, etc.

Similar activities represent relevant, additional costs, that DIH may not be able to cover, as their users and regions are not necessarily available to pay more or provide more funding for services performed by collaborating with other DIHs.

On the other hand, the effort required may be reduced once some of the tasks and processes needed to establish cooperation (e.g. search for suitable partners, definition of cooperation agreements, etc) become consolidated and well-functioning. Further, it can be expected that when collaboration happens on a regular basis its benefits for the DIHs will become more relevant and have a positive impact on the sustainability of the whole process.

Providing financial incentives for DIHs to undertake cooperation may help them in covering the additional costs they sustain and could represent the motivation needed for making collaborations happening regularly in the future.

Recommended actions:

- Assess in detail the financing needs of the DIHs involved in cooperation in terms of most relevant cost items and entity of the costs that should be sustained by the DIH
- Identify the most suitable support that can be offered, the adequate amount of aid to be provided and the mechanism for its distribution

9.1.4 Ensure support to settle legal aspects of collaboration

The analysis performed showed that legal solutions are often needed to facilitate collaboration happening on a regular basis as they mitigate some of the main risks perceived by DIHs in being involved in the different collaboration scenarios.

Most DIHs have experience in cooperating within EU projects and initiatives (e.g. 50% of the DIHs taking part in the AI DIH Network are involved in I4MS; 20% of them are linked to Vanguard and 13% have also participated in Smart Everything Else). Such collaborations are

usually regulated by standard grant agreements and consortium agreements, not presenting particular legal issues.

Collaborating outside the EU framework requires the development of ad-hoc agreements, including clauses to agree on responsibilities and rights of the partners especially for what concerns their relationships with the clients. Not all DIHs can count on a legal department responsible for managing such aspects and defining appropriate agreements. This may prevent DIHs to undertake collaboration activities or, at least, create administrative barriers and lead to longer times required for establishing cooperation.

A first, cost-effective solution to avoid such barriers is to make available to DIHs standard templates for the different cooperation scenarios (as the one developed in connection with the Framework Cooperation Agreement) which they can adapt based on their needs. To facilitate the use of these templates and to support the development of additional agreements, a legal helpdesk could be set up. Such support should answer to DIH doubts in terms of collaboration and share best practices in terms of agreements for collaborations.

Recommended actions:

- Develop and make available example of agreements DIHs can use to settle legal aspects of collaboration and engage into collaborations without incurring into administrative barriers
- Set up a legal helpdesk, supporting DIHs in resolving their doubts on legal aspects of collaboration

9.1.5 Reinforce thematic communities within the Digital Transformation Accelerator

Cooperating in a small community with a common technological focus is less complicated than doing it in a wider group, as building trust requires less effort and shared interest is more likely to be identified.

This was confirmed in the development of the pilot on AI Maturity Assessment Model, where smooth and agile collaboration was experimented with a restricted number of DIHs with a common background.

A similar approach is recommended for the creation of communities within the Digital Transformation Accelerator, with the establishment of a large DIH community and smaller thematic groups based on DIH competencies and focus, which carry out coordinated initiatives in specific fields, as AI.

Such communities could also be involved in the definition of activities for specific stream of work within the Digital Europe Programme, identifying priorities and activities that can be developed jointly by DIHs.

Recommended actions:

- In the definition of the operating model of the Digital Transformation Accelerator, consider the opportunity of creating thematic communities focusing on specific aspects and/or technologies

- Define the criteria to allocate DIHs to the thematic communities and assign task to them.

9.1.6 Define the competency framework of European Digital Innovation Hubs

The delivery of a wide set of services - from ecosystem management to specialised technological support - requires leveraging a variety of skills, both soft and technical ones. This applies to DIHs working in the field of Artificial Intelligence but also to all European DIHs that should support the adoption of disruptive technologies (AI, HPC, Cyber security).

The definition of a minimum set of competences that are needed to operate as European Digital Innovation Hubs would help DIHs in understanding how to improve their internal structure and which specialised competences they need to access for performing their role.

The development of a reference competence framework would also be beneficial to support the selection process of EDIHs, as it would provide criteria in terms of access to skills and competences that DIHs should comply with.

Recommended actions:

- Identify the competences, knowledge and skills required for providing services expected by European Digital Innovation Hubs (including specialized technological services)
- Develop a competence framework to be used by EDIHs and stakeholders involved in the implementation of the DEP.

9.1.7 Reinforce independent assessment in the selection of European Digital Innovation Hubs to create a cohesive community

The analysis of the costs, benefits and risks of the cooperation scenarios highlighted that one of the major risks perceived by Digital Innovation Hub is connected with the possibility that the partner does not provide a service with a sufficient level of quality.

Building trust among DIHs would help to overcome this uncertainty and promote collaboration. It requires an effort along multiple directions - including the promotion of reciprocal knowledge, the exchange of information on experience and expertise, etc. – with the aim of providing sufficient knowledge about what DIHs can do and which services they can provide.

An independent assessment of DIH capabilities would contribute to this objective, providing clarity on DIH capabilities and competencies.

Currently, in the appraisal of applications for EU networks (such as the AI DIH Network), evaluators can count on information provided within the applications and information available on-line, which, as in the case of the DIH catalogue, is often based on DIH self-declaration.

A thorough evaluation would require adding to this set of information an onsite inspection of the DIH infrastructure and organisational structure as well as an assessment of the quantity and quality of the services provided by the DIH.

Applying such mechanism would benefit:

- The DIH, as it would receive precise and independent feedback on areas for improvement;
- The DIH community, as members would have further assurance on the capabilities of their colleagues and would perceive lower risks in collaborating with them.

Specifically, similar mechanisms could be implemented in the selection of European DIHs, given they will be lower in number compared to the DIHs already operating across Europe.

To contain the resources required for the onsite assessments, these could be performed only on the DIHs designated by Member States and/ or with the support of Member States (i.e. with local, independent evaluators applying an assessment methodology common at EU level).

Recommended actions:

- Define common European criteria for assessing DIH capabilities, technical and infrastructural endowment during onsite inspections
- Define a set of indicators to assess the quality and quantity of services provided by DIHs
- Introduce the onsite inspections within the evaluation mechanism foreseen for the selection of EDIHs
- Define the most cost-effective option for performing onsite inspections, e.g. limiting the target to the DIH designated by Member States (or a sample of them) and involving local, independent evaluators

9.2 Horizontal actions to support networking and cooperation

9.2.1 Develop and promote a standard classification for DIH services and skills

The state of the art in terms of mapping of DIHs and their services is characterised by the presence of different sources of information and different classifications in use.

The main source of information is the JRC Catalogue, including data on 528 Digital Innovation Hubs, based on their self-declaration. However, information on DIHs is replicated within other sources, internal to specific projects, e.g. I4MS website, AI DIH Network platform, etc.

The description of the services and skills reported in these databases can be different and often does not provide immediate and unique understanding of the activities and competencies entailed, as the labels used for the services can be rather generic, not enabling a clear identification of the meaning. To provide some examples, among the members of the AI DIH Network, the label *awareness creation (*included in the JRC catalogue) was applied to describe very different activities from the distribution of online surveys to in-depth AI maturity assessments carried out by dedicated teams of experts at the SMEs' premises. The same applies to the *access to specialised facilities*, which can include access to labs, virtual infrastructure or access to open space for star-ups, depending on how the label is used by the DIH.

The risk of misunderstanding may discourage the use of these catalogues for the identification of suitable partners. On the contrary, developing standard, specific names for the services offered by DIHs would facilitate them in identifying other hubs with similar/ complementing competencies.

Defining a common set of standard names DIHs can use to define their specific services would facilitate their networking, giving them the possibility to rapidly and precisely understand each other's competencies from the list of services they offer. At the same time, this would enhance their relationships with the ecosystem by clarifying the support they are able to provide.

In the development of the standard classification, the possibility to develop a proper ontology should be considered. This would enable to create different layers, grouping together similar services offered in different technological domains into super layers. An additional development could be a definition of basic set of services and skills for DIHs working in specific field, such Artificial Intelligence, which would facilitate the selection of European Digital Innovation Hubs and would provide guidance to DIHs on useful services and competences they can consider developing.

Recommended actions:

- Define a common set of services to be used by all DIHs (regardless of their specific technological focus) starting from the analysis of the activities currently performed by DIHs
- Determine whether additional services should be included or specific activities should be further detailed to reflect any specificity of technological domain/ focus
- Promote the use of the standard ontology developed in every project/programme and for mapping DIH competencies and services
- Using the ontology developed, determine minimum characteristics (services and competences) of DIHs working in specific fields, such Artificial Intelligence

9.2.2 Organize European workshops and demo-days for the participation of DIHs with competences in concrete technological disciplines

The need, awareness and willingness for cooperation among DIHs are understood to increase significantly when they can complement and offer each other punctual expertise/ resources/ facilities in very specific fields within other larger and wider technological disciplines (like Artificial Intelligence). The cooperation possibilities and therefore business opportunities are more likely to show up when a DIH feels that a potential partner has a proven experience within any field of a technological discipline where the former actually works rather than any other unknown discipline to be explored, whatever is the value proposition offered by such potential partner in there.

The organization of events at a European level under the form of technology-specific workshops and demo-days represents a meaningful opportunity for the demonstration of potentially sharable capabilities of DIHs. Those capabilities may be stressed by the presentation of recent regional projects, uses cases and best practices where examples of digital-wise solutions applied to solving companies' problems are addressed. Such events may also embrace networking options for the DIHs to maintain B2B discussions and more easily

identify niches for short-term cooperation based on their actual capabilities and gaps within the concrete technological discipline covered by the event.

Recommended actions:

- Organise periodical workshops and demo-days focusing on demonstrating experience and capabilities to promote DIH reciprocal knowledge and stimulate the identification of fields for cooperation

9.2.3 Develop a unique, proactive platform for supporting DIHs collaboration

Virtual tools and platforms are useful tools to support collaboration among organisations located in different regions. This applies also to DIHs which can use such tools to share materials, take part into discussions, learn about potential partners, etc in a cost-effective manner.

As many other European initiatives focussing on collaboration, the participants of the activities AI DIH Network have had the possibility to connect through a dedicated platform, designed for this purpose. Each participant has had the possibility to create his own profile, specifying his competencies and skills, and a page summarising the characteristics and services of his DIH. The platform has then been used during the coaching and mentoring programme to:

- perform exercises, such as the mapping of the DIH business model;
- share webinars and presentations developed for each training package;
- share other relevant material and documents;
- publish the draft cooperation agreement and gather comments from participants in the project;
- publish the draft recommendations and gather feedback from participants in the project.

The use of the platform has increased over the project, with the draft cooperation agreement receiving more than 150 comments from different users.

Yet, some participants were reluctant in using the platform, especially at the beginning of the project, as they had to provide information they had already provided for other tools and initiatives (e.g. profile, DIH profile and services, etc.).

It should also be considered that the effort spent for promoting the use of the platform will have a limited impact in the future, as the tool will remain accessible for the users only until the end of 2020. At the end of the year, users will no longer be able to leverage the platform, its functionalities and materials. Further, support in the use of the tool and in the coordination of activities and discussion will end with the contract between the Commission and the contractors, in April 2020.

During the workshops with DIHs, feedback on how to improve the uptake of the platform and similar existing tools have been gathered.

Besides the need for streamlining the number of existing platforms and the information required, it was suggested to develop a proactive tool, that encourages users' interaction and connection.

The platform should be able to send notifications and periodical activity feeds as well as to suggest interesting partners, discussions and materials based on the latest activities of the user. This would increase the possibility that the platform becomes a useful resource not only for knowledge sharing but also for creating business and connection opportunities.

In addition, the link between the platform and other existing tools should be ensured. One the one hand, users should have the possibility to import data from the different platforms in a seamless and easy-to-use manner (i.e. with DIHs being able to easily transfer the data from their platform to the general collaborative DIH platform). On the other hand, the general collaborative DIH platform should be automatically updated with the most recent information from the different platforms when these are changed, which would allow DIHs to use their own, smaller platforms while having the advantage of using the general collaborative platform as database, benchmarking and collaboration tools.

Recommended actions:

- Gather data on the use and access of the different platforms developed in the context of European initiatives and projects involving DIHs.
- Based on the analysis of the use of the existing platforms and on the needs it should respond to, define the set of functionalities of the platform. Among them, consider those ensuring the possibility to engage the user through notifications and suggestions and those enabling the connection with other existing platforms.
- Define the financing and operating model of the platform, ensuring it can be accessed by any DIH and it remains available to interested DIHs over time (i.e. its existence is not limited to a specific initiative or project)

9.2.4 Establish a sustainable independent back office function to animate and coordinate long-term DIH Network collaboration and growth

Discussions with the DIHs and analysis of the cooperation scenarios confirm their interest and commitment to mutually beneficial collaboration. In most cases, however, DIH-DIH collaboration tends to be limited to the scope of publicly funded projects (e.g. EU-funded). This is largely reflective of the public-funding tradition of many DIH partners – i.e. it is a form of collaboration that they are accustomed to and which they rely on as a source of revenue. Extending collaboration into other areas that they are less accustomed to – e.g. joint DIH service development or smart matchmaking in a cross-border context, with a fee-paying element – requires a cultural change within many DIH partners and collectively (across all DIH partners). To make that shift, DIHs require expert assistance and support.

To animate and coordinate long-term DIH Network collaboration and growth, some sort of back office function is required. A key observation from our discussions with the DIHs is that this type of network support function is not something that one or multiple DIHs can collectively provide. The DIHs each have limited financial and human resources. They also take the view that a network support function should have a significant degree of independence from the DIHs that its supports to ensure fairness and balance.

Clearly, a support function of that type will need to be funded. Finding an appropriate balance between DIH contributions (e.g. fees), at an acceptable level, and public funding sources is the key challenge.

Recommended actions:

- Define responsibilities and objectives of the back-office function for supporting DIH collaboration
- Determine the connected costs and suitable financing strategies
- Implement the back-office function

9.3 Future development of DIHs

9.3.1 Ensure consistency and coordination among the different initiatives connected to AI and DIHs

A number of initiatives are already in place or will be launched in the future for promoting uptake of AI and digital solutions by SMEs and public administrations, involving DIHs, competence centres, research centres and other stakeholders.

For instance, under AI4EU, the AI on-demand platform has recently been launched and a new call for its consolidation will be closed in April 2020. At the same time, other initiatives aiming to create a network of experts in AI, like CLAIRE, have been promoted.

The existence of multiple initiatives sharing similar objectives characterizes the world of DIHs. DIHNET project has gathered a large community of DIHs with the aim of creating a pan-European network of DIHs. While, other networks focusing on specific fields, such as the AI DIH Network, RODIN in robotics, DIH-HERO in healthcare have been created within EU projects and initiatives.

Synergies among these networks are observed, also because many DIHs are involved in more than one initiative. However, to reinforce coordination, coordination should be sought by design. It is therefore recommended to create a framework where all existing initiatives are included and define a plan for their coherent future development and organisation.

The strategy should entail also other connected investments, such as the Testing and Experimentation Facilities foreseen under the DEP, to ensure the optimization of effort and investments.

Recommended actions:

- Map the characteristics, objectives and members of the initiatives in place
- Define a framework, coherent with the relevant action plans and policy priorities, where future and current initiatives will enter

- Establish cooperation and coordination mechanisms between initiatives in place/ planned and the other connected investments.

9.3.2 Leverage DIHs to pursue EU priorities

DIHs are expected to play a relevant role in creating awareness on AI and promoting the uptake of AI solutions by SMEs and other stakeholders in their ecosystems, as stated in the White Paper on Artificial Intelligence by the European Commission. DIHs can count on geographical proximity to reach their stakeholders, which contributes to increase the effectiveness of dissemination and communication activities.

This strength can be exploited to further promote the implementation of AI and other EU priorities across Europe. For instance, DIHs could be involved in the definition of common European methodologies for the enforcement of the Ethics Guidelines for Trustworthy AI – developed by the AI High-Level Expert Group (AI HLEG). They could then assess whether projects and solutions developed within their ecosystem adhere with ethical guidelines or not and they could support practical operationalisation of AI ethical principles. This would help DIHs in reinforcing their role in the ecosystem and would promote the creation of a common European certificate/ label on trustworthy AI.

Recommended actions

- Identify policy priorities that would benefit for implementation at the regional level, thanks to EDIHs and DIHs
- Define a common action plan for involving EDIHs and DIHs across Europe in the context of the priorities identified

9.3.3 Prepare DIHs to work with the Public Sector

In the context of the DEP, EDIHs will support public administrations through a wide range of activities: promoting the adoption of interoperability solutions, European Digital Service Infrastructures and building blocks (e.g. eID, eInvoicing, eDelivery, eSignature); supporting them with specific services (e.g. providing testing facilities or developing AI solutions) as well as working with GovTech companies (e.g. SMEs, innovative start-ups, etc.) providing services to public administrations.

However, to reach this objective DIHs should improve their capacity of working with the public sector as well as their knowledge of e-government and interoperability solutions.

The discussions with the members of the AI DIH Network highlighted that only a limited number of DIHs have experience in working with public administrations, while most of them target SMEs as their main users.

Dealing with public sector organisations requires specific skills that European DIHs will need to develop, including both transversal (e.g. procurement, communication, etc.) and technical skills.

It is therefore recommended to map the services that European DIHs are expected to provide to public administrations, build a coherent framework in terms of skills and help DIHs in acquiring those skills.

Further, to ensure synergies are created with other organisations working in the sector, it would be beneficial to assess and understand how DIHs role can be combined with those organisations, avoiding the duplication of efforts and activities.

Recommended actions

- Define EDIH service portfolio for public sector organisations following a customer-centric approach to identify the needs of the final users (e.g. local governments and municipalities, regions, national public administrations) and avoiding competition with commercial services (in line with State Aid provisions)
- Identify the skills that EDIHs should acquire/ develop to deliver the service portfolio
- Determine the most appropriate methodologies to support EDIHs in acquiring/ developing the skills identified (e.g. setting up dedicate learning programmes, providing guidance for the recruitment process, etc.).

Annex A – Sources and references

As briefly mentioned in section 1, the present report builds on the analysis of several inputs, including:

- The answers provided by the applicants to the application forms received from the open call for Expression of Interest (EoI). As explained in section 2, the form had to goal to gather the information needed to evaluate the fit of the applicants to take part in the project. Specifically, the main topics investigated by the form were (i) the vision, mission and value proposition, (ii) the business model and networking potential, (iii) collaboration model and activities (in place or planned) and (iv) the ecosystem in which the DIH operates.
- The answers provided by the selected DIHs to an initial questionnaire submitted to gather key information about their relevant characteristics with the aim of tailoring the training and development programme to their needs and according to their suggestions. The questionnaire investigated (i) the positioning of selected DIHs in the AI landscape, (ii) the attitude of selected DIHs towards collaboration, (iii) the maturity level of selected DIHs and (iv) the expectations of selected DIHs with respect to the training and development programme.
- The output of the self-mapping exercise submitted to the selected DIHs in the framework of TP2 – AS IS Analysis. Such exercise had the goal of understanding the various dimensions of business and operational models of the selected hubs, so to characterize and map the AI DIHs participating in this project and gain insights on potential areas for cooperation. The exercise consisted of 4 sections, investigating (i) the characteristics of the governance model, (ii) the position the operating model of each selected DIH in the existing landscape of DIHs' operating models, (iii) the business enablers of the DIH and (iv) the cooperation activities of the DIHs.
- The outputs of the collaborative workshops held under TP3 – and TP 4 – with the selected DIHs. As explained in section 5, the cooperation scenarios have been developed together with the selected DIHs following a user-centric approach. This process has been divided in two steps, each implemented in one training package. The collaborative workshops in TP3 had the goal of validating the profile of the proposed personas, their journeys and the stemming collaboration opportunities. As such, TP3 also allowed to co-create cooperation scenarios. The collaborative workshops of TP4 had the goal of validating and integrating the consolidated collaboration scenarios, investigating deterrents and incentives for each scenario.
- The outputs of interviews with relevant stakeholders. Specifically, the team has interviewed representatives from DIHs[268] and collaboration initiatives[269]. In case a DIH was interviewed, the goal was to understand its operating model, its governance structure and the cooperation mechanisms it adopted, including funding, legal and managerial aspects. In case an initiative was interviewed, the aim was to investigate the methods adopted to incentivise and manage cooperation among its members as well as the governance structure adopted. This activity allowed to gain useful insights about possible

[268] Namely DTI, DIGIHALL, LTroboticsDIH, DIH Lombardia, Smart factory and HPC5
[269] Namely EIT Digital, ECHORD++, I4MS, ROBOTT-NET, MIDIH and Vanguard

cooperation mechanisms that would work at the cross-regional level. The DIHs interviewed have been selected based on their positioning in the landscape of cooperation initiatives at the EU level, while the initiatives investigated have shown relevant and lasting experience in the field of cooperation among DIHs.

These sources have been complemented by a thorough desk research aiming to retrieve additional and detailed information on DIHs, their involvement in collaboration initiatives, their service offerings, their regional contexts, etc.

Annex B – The selection process and key characteristics of the applicants

The selection process

One of the first activities of the preparatory action leading to the establishment of the AI DIH Network has been the identification of the Digital Innovation Hubs to be involved in a coaching and mentoring programme focussing on collaboration.

The selection was carried out via an open call for Expression of Interest (EoI), aiming to identify DIHs with experience in collaboration activities and focussing in the field of Artificial Intelligence. The open call for EoI[270] has been participated by 150 applicants from 30 European countries.

The preparatory action was designed to develop and test cooperation schemes with a limited number of Digital Innovation Hubs, spreading the findings to a larger audience. For this reason, the project involved an initial group of 30 DIHs. The outcomes and the materials developed within the project were periodically published on the project website. Additionally, the Framework Cooperation Agreement foresees the possibility that other DIHs join the network a few months after its establishment.

The process to select the 30 DIHs to be involved in the AI DIH Network started after the closure of the call for EoI, in January 2019, and included:

- the eligibility checks[271];
- the assessment[272] of each application by experts from two partners of the Consortium. The assessment was carried out by the experts in parallel and independently;
- a consensus meeting[273] internal to the Consortium to review the applications and agree upon a preliminary selection;
- the DIHs' collaborative governance scheme meeting[274] where the final selection was determined and validated by the Steering Committee of the project, encompassing five independent experts in the field of Artificial Intelligence and Digital Innovation Hubs.

Each step is described in detail in the sections below.

Eligibility checks

The eligibility checks refer to the compliance of applicants with the following criteria:

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[270] The open call for EoI has been published on EU Survey on November 7th, 2018. The DIHs interested in taking part in the project had the possibility to apply until December 21st, 2018.

[271] The eligibility check has been carried out between January 3rd and January 11th, 2019
[272] The assessment has been carried out between January 14th and February 7th, 2019
[273] The meeting took place on February 8th, 2019
[274] The meeting took place on February 27th, 2019 at EC premises in Luxembourg

- being located in one of the 28 EU Members States or Horizon 2020 associated countries;
- being included in the European catalogue of Digital Innovation Hubs (or having required to be included by the Call deadline);
- having selected "Artificial Intelligence and cognitive systems" as technological focus on the European DIH catalogue. Other technologies that can prove a future interaction with AI, e.g. Robotics, Cyber-Physical-Systems (CPS), Internet of Things (IoT), Digital Art & Design, Modelling and Simulation, Medical Technologies, Digital Manufacturing, etc., were considered as an asset;
- the application had to be presented by the coordinator of the DIH.

The eligibility checks were carried out by the Consortium with the support of the representatives of the Commission responsible for managing the DIHs catalogue.

Assessment of the applications

Eligible applications have been assessed from two experts of two different members of the Consortium in parallel to ensure each applicant received two objective, independent assessments.

The evaluations took into consideration the following criteria:

1. Vision, mission and value proposition (25%)
2. Business model and networking potential (35%)
3. Collaboration (30%)
4. Ecosystem (10%)

The table below reports the complete list of questions used for each evaluation criterion.

Each application has been rated on a 100-point scale where the overall score of the application depends on the score (ranging from 0 to 4) received for each assessment criterion.

Table 4 – Evaluation criteria

#	QUESTION	Assessment Criterion	Weight	Purpose of criterion
	Vision, mission and value proposition		**25%**	
1	What is the vision for the DIH?	Vision	5%	Assess the vision
2	What are the challenges that the DIH is helping to overcome? What is the plan of the DIH to strengthen industry capacity?			
3	What is the value proposition for the DIH?	Motivation	5%	Assess the motivations for being involved in the project
4	Please briefly motivate the interest of the DIH in participating to the project			
5	Please tick max 5 technologies, including AI, the DIH is focused on (list)	Technology and sectoral focus	10%	Assesses the overall focus of the DIH, measured against the Technology Readiness Level criteria (major focus on AI)
6	In case you flagged AI as technology on which the DIH focuses, provide examples of AI-related services the DIH offers, including the type of final users to which they are addressed			
7	In case you did not flag AI, is the DIH planning to expand the sectoral focus on AI? How would the DIH embed this technology in the services' delivery plan?			
8	What type of competences would the DIH deem fundamental so to offer AI-oriented services?			
9	Which specific services does/will the DIH provide? (list of services)	Services	5%	Evaluates what are the services the DIH will make available to users
10	Does the DIH focus on providing support for specific sectors? If so, please tick the supported sectors			
	Business model and networking potential		**35%**	
11	How is the DIH financed? (list) Please specify	Business model	17%	Understanding of the business model Assessment of the sustainability of the business model To what extent collaboration is embedded in the business model
12	Has the DIH received any of the following funds? (list)			
13	Has the DIH embedded collaboration and networking in its strategy plan? If so, how does the DIH plan to cover related costs?			
14	What are the criteria on which you prioritize specific initiatives?			
15	Describe what organizational model the DIHs. Also mention how roles and responsibilities are distributed within the DIH.			
16	Please present the efforts the DIH has made/planned to establish linkages with other hubs and digital initiatives or existing networks	Networking potential	18%	Qualitative assessment of the potential for future collaboration

#	QUESTION	Assessment Criterion	Weight	Purpose of criterion
17	Does the DIH take part to joint research actions with other hubs? If yes, please specify. If no, are you planning to engage in any type of experimentations with other hubs? Please specify			
	Collaboration		**30%**	
18	Tick all those organisations that have been approached to participate or are currently involved in the running of the DIH. (list)	Partner	10%	Level of collaboration maturity with major local stakeholders
19	If your DIH is not fully operational, how far have discussions with these partners progressed? (multiple choice)			
20	Does the DIH collaborate with other DIHs? If so, detail the fields in which the DIH cooperates and the collaboration structure	Established collaboration	20%	Level of collaboration maturity with other hubs
21	Can you provide an example of partnership with another DIH? Please describe			
22	Is the DIH part of one of the following programmes/initiatives? (list of initiatives)			
23	Is the DIH engaged in a collaboration agreement with other Hubs? Please explain specifying the type of collaboration (bilateral or multilateral), the geographical scope, the objectives and the relevant stakeholders engaged			
24	If the DIH collaborates with other hubs, what activities does it undertake? Please select one or more options (list of initiatives)			
	Ecosystem		**10%**	
25	Please provide information to estimate the relevance of the local Ecosystem (e.g. in terms of N. of SMEs in the area, main sectors, innovation organizations, University and Research Centres, N. of Researchers, etc.)	Market demand	4%	Evidence that there is a critical mass of end users that could be beneficiaries of the DIH
26	What is the total number of end users/clients engaged in average annually?			DIH fully operational or in preparation
27	Does your region/country in which the DIH operates promote a collaboration initiative among DIHs or with other regions/countries aiming at digitising the European industry? If so, please explain specifying the type of initiative, the actors involved, any supporting measure foreseen by the collaboration initiative (financial or not financial)	Local collaboration initiatives and supporting measures	3%	Assess the territory fertility potential for collaboration
28	How does the DIH link with the National/Regional Smart Specialisation strategy and/or national initiatives for digitising the European industry?			Test strategic alignment with national and regional smart specialisation and digitising industry strategies
29	What role does the DIH play in the collaboration initiative (if applicable)? Please explain			
30	Please specify if and what cross-border cooperation opportunities exist in the region of the DIH	Location and ecosystem-based attributes	3%	Identify the context in which the DIH is operating in

Consortium consensus meeting

The Consortium discussed the results of the evaluations in a dedicated consensus meeting. During the meeting, the Consortium members were informed about the average score of each application, resulting from the two evaluations, and discussed the list of applicants to be presented at the DIHs collaboration governance scheme meeting.

This preliminary selection was carried out, following a methodological approach designed to ensure that the selection:

- reflected the quality, the completeness and the contents of the application;
- ensured a wide geographical coverage;
- ensured a balanced representation of the two clusters of DIHs identified during the evaluation process:
    - Cluster I – AI-focused DIHs, including DIHs characterised by:
        - the involvement of a university or research centre in the running of the DIH
        - a strong focus on AI
        - the development of several research activities in the domain of AI
    - Cluster II - Robust DIHs. DIHs classified under this cluster II were characterised by:
        - consolidated relations between universities and enterprises
        - a robust and diversified ecosystem engaged
        - a diversified and developed service offering
        - a solid structure, even if not specifically focussed on AI

Accordingly, the pre-selection process included the following steps:

1. Identifying a minimum threshold: the score achieved by the 70th DIH was considered as minimum threshold for the preselection of the 30 DIHs proposed to the Steering Committee.
2. Ensuring a wide geographical coverage: among the DIHs exceeding the minimum score, the Consortium selected one DIH for each country represented and more than one DIH for those countries that were most represented in the short-list:
    a. 2 DIHs for countries with more than 3 DIHs among the top 70 applications;
    b. 3 DIHs for countries with more than 10 DIHs among the top 70 applications.
3. Ensuring a balanced coverage of the clusters, to provide the network with both the AI-knowledge and the experience in engaging the ecosystem considered necessary for its development.

DIHs collaborative governance scheme meeting

As a last step of the selection process, the Consortium presented the pre-selected candidates to the European Commission and the Steering Committee during the DIHs' collaborative governance scheme meeting.

During the meeting, the Consortium presented the main characteristics of all applicants at the aggregate level, as well as the key elements of each shortlisted candidate. Hence, the members of the Steering Committee discussed the applicants having received the highest scores on a country-by-country basis and agreed on the final list of selected DIHs. The process was supervised by representatives of the Commission.

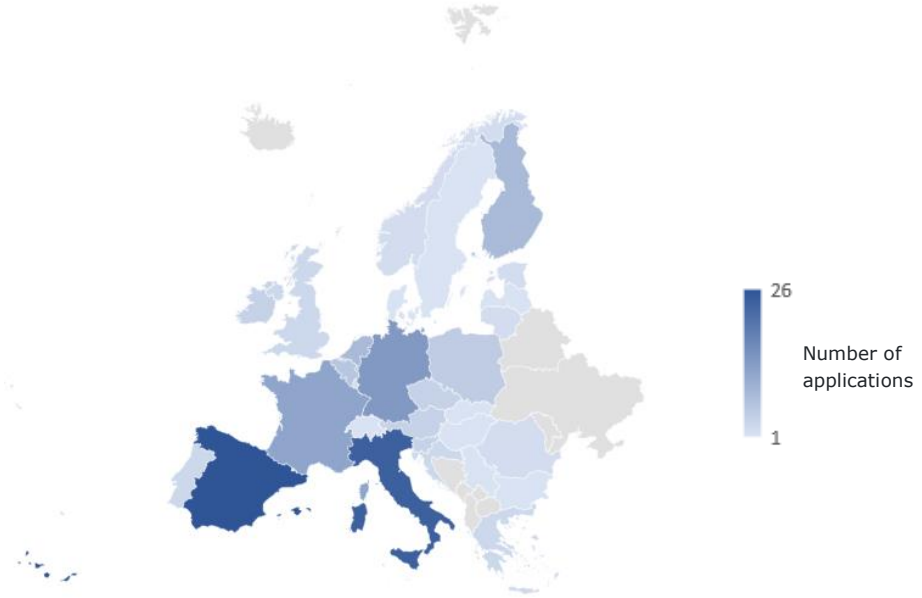
The final list was defined to ensure a wide geographical coverage, with DIHs from 20 different countries, and to enable the development of peer learning activities among hubs involved, i.e. involving DIHs with strong technical expertise on AI that were able to share their knowledge and competencies with other DIHs that were less specialised in the field.

Characteristics of the Applicants

The Consortium received 150 applications of DIHs responding to an open call for Expression of Interest (EoI). Digital innovation hubs from all EU Member States were represented, except for Malta. In fact, no DIH focusing on Artificial Intelligence located in Malta was registered on the JRC Catalogue at the date of the Call for EoI[275]. Also, DIHs located in 3 Horizon 2020 associated countries (Serbia, Switzerland and Norway) applied to the Call for EoI. The figure below provides an overview of the geographical coverage of the applications received.

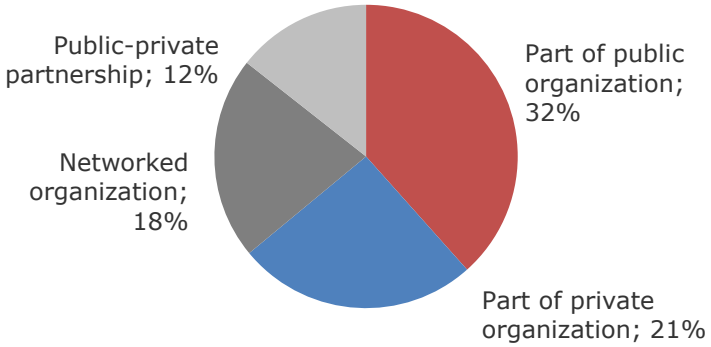
[275] Information retrieved from the DIH Catalogue (http://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool), accessed on February 19, 2019

Figure 15 - Geographical coverage of the call for EoI



As shown in the figure below, the Call for EoI was participated by DIHs adopting different legal forms. Most of them are part of public organisations (universities or RTO) and private organisations; about 20% are network organisations, without formal structure, and 12% of them are public-private partnerships.

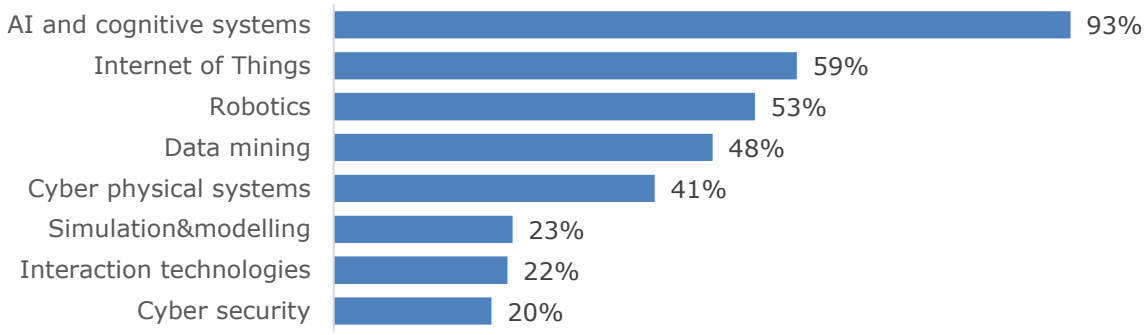
Figure 16 - Legal status of applicants



The call for EoI targeted primarily DIHs operating in the field of AI and connected technologies. The responses were in line with the expectations. The majority of participating DIHs include Artificial Intelligence and Cognitive Systems among the technologies they are focussed on[276] and most of DIHs work in technological domains that strongly relate to AI (e.g. IoT, Robotics, etc.).

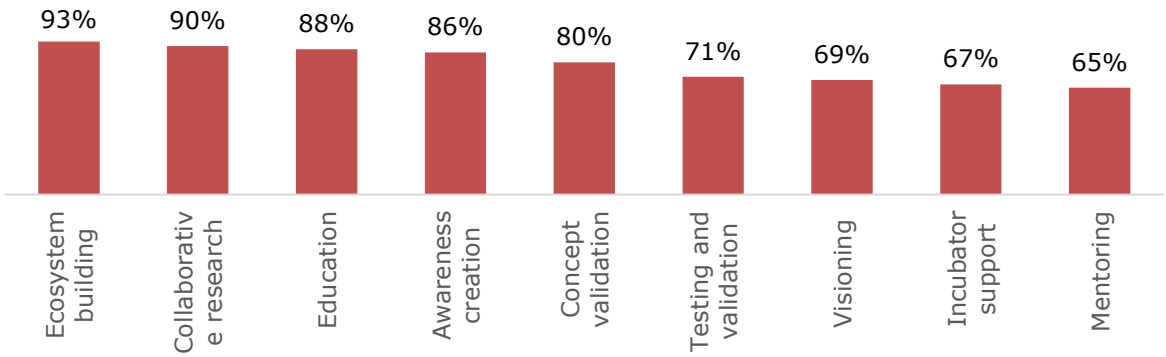
[276] It has to be noted that having flagged AI as technological focus in the DIH JRC Catalogue was included among the eligibility criteria.

Figure 17 - Technological focus of applicants



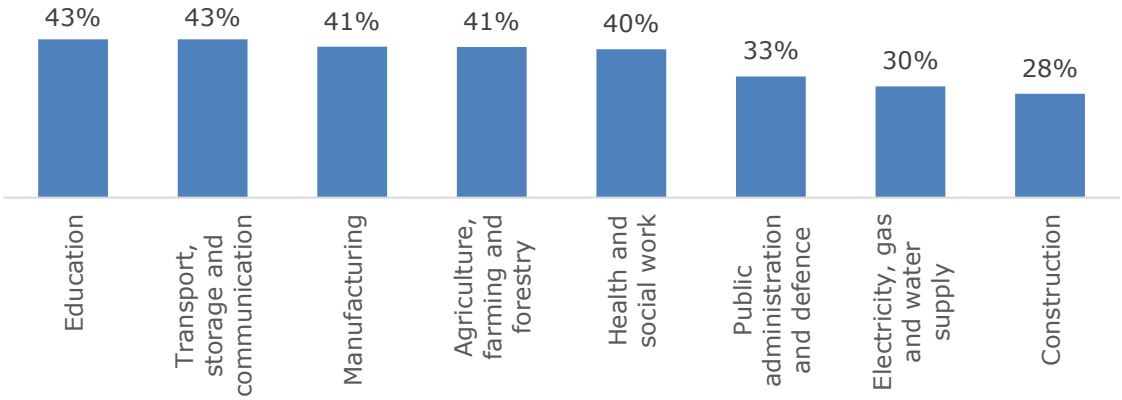
About the service offering, the participating DIHs cover all the value chain of innovation, from research and concept validation to testing and prototyping. Specifically, the large majority of them offer services connected with ecosystem building (scouting, brokerage, networking services), collaborative research, education and skills development, awareness creation, concept validation and prototyping.

Figure 18 - Specific services provided by participating DIHs



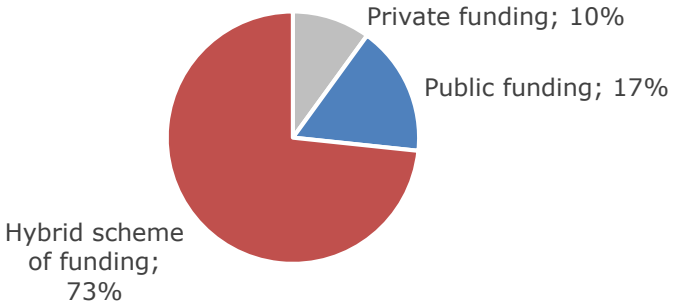
Overall, participating DIHs focus on providing support at sectorial level. Only 24% of them stated that their services are not sector specific. The targeted sectors vary significantly, from education to transport, storage and communication, from manufacturing to agriculture, farming and forestry and they mostly relate to the private market. Only one third of participating DIHs provide support to public sector organisations, working in the sector of public administration and defence, and about 40% of them operate in the field of health and social work, usually encompassing private and public organisations.

Figure 19 - Main sectors supported by participating DIHs



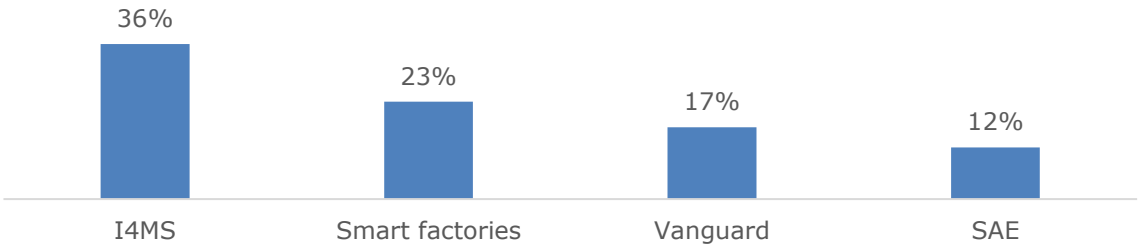
The analysis of the sources of funding used by participating DIHs outlines how many of them has adopted a hybrid scheme of funding, encompassing private and public sources. The capacity to adopting similar funding scheme is considered a signal of the maturity of the DIHs that are moving towards economic self-sustainability.

Figure 20- Applicants' funding scheme



The presence of public funding is deemed positive as well, also because it is often represented by European funds provided under EU-wide collaborative projects. Indeed, 65% of participants received funds under Horizon 2020, which supported projects fostering cooperation among DIHs, such as ECHORD, ECHORD ++, I4MS, L4MS, etc. Specifically, more than 35% of applicants declared to be involved in I4MS and nearly 25% of them took part in Smart Factories.

Figure 21 - Applicants' participation to main EU initiatives/programme



Annex C – Template used to map DIH services

A specific template co-developed during the kick-off meeting has been used to map the services offered by Hubs participating in the project . The template encompasses the services commonly offered by a DIH - as identified in the model created under I4Ms programme – enriched with services characterising the offerings of AI DIHs, distinguishing among ecosystem services, business-support services and technology services[277].

The complete list of services and their short description is reported in the table below.

Table 5 - Description of AI DIH services

Ecosystem services

Community building	**Technology scouting**	*For companies seeking innovative technologies to incorporate into their portfolio*
	Brokerage	*Connecting suppliers with customers, business support services, collaborators, capital providers and others (Academic institutions, HR)*
	Ecosystem building	*Creating a community at the core of which is the DIH, which connects all members of the innovation ecosystem*
	Communication	*a. Raising awareness about DIH's activities and innovative technologies across the community including the organisation of events to disseminate information and knowledge* *b. Sharing best practices experiences* *c. Inviting experts in business and entrepreneurship, or industry sectors to give talks and interact with (potential) customers and partners (study visits and roadshows)*
Strategy development	**Trend watching**	*Providing up to date information on the trends in the market, assessment of market potential (business model)*
	Visioning and strategy development	*Supporting both start-ups and SMEs in shaping their vision and strategies as well as large corporates that require fresh thinking to remain relevant and competitive in the marketplace*
	Services Impact assessment	*Assessment of performed AI services*
	AI maturity	*Assessment of company readiness for AI (tech, organizational, and ecosystem readiness)*
Ecosystem management	**Ecosystem management**	*Facilitation of relationships both within the DIHs ecosystems and between DIHs of the network.*
	Skills/training	*Life-long training on technical and soft skills focused on AI*

[277] This first list of services is based on the inputs gathered from DIHs and it has then been further developed to define the AI DIH profile.

Business services

Incubator/accelerator support	**Basic services**	*Providing access to physical infrastructure (offices, café, meeting rooms, laboratories, co-working areas, libraries, etc.)*
	Specialised facilities	*Providing access to telecommunication infrastructure, high powered computing, video conferencing, labs and data ecosystem*
	Business development	*Coaches and mentors, entrepreneurs in residence, dedicated programmes to assist entrepreneurs in the process of business development (funnel, use case communication and assessment of SMEs)*
	Guidance	*Offering technical, fiscal and legal advice where necessary, and regulatory assistance*
Access to finance	**Financial engineering**	*Providing support in addressing financial issues and/or advise on innovative financial products, value of AI legislation*
	Connection to funding sources	*Facilitating access to different funding sources (EU, national, regional, and private) aiming at achieving an effective mix of funds (conversation, lobbying, projects)*
Offering housing	**Innovation spaces**	*Offering innovation spaces to encourage innovators and other ecosystem members to interact and share ideas as well as spaces for experimentation and pilot manufacturing (including data ecosystem and spaces)*
Skills and education	**Training**	*Providing training and development in business skills and entrepreneurship (e.g. formal courses, workshops, seminars) and influence academia*
	Secondment	*Facilitating the exchange of personnel (e.g. researchers) and core competences among organisations, including IPR*
Project development	**Identification of opportunities**	*Support in the identification of new market/business opportunities through strategic analysis of the ecosystem and trend watching*
	Creating consortia	*Encouraging cooperation and collaboration among organisations for exploiting common opportunities (e.g. business, research, funding, matchmaking, open innovation)*
	Development of proposals	*Providing technical assistance in the proposal development process to comply with specific proposal requirements (e.g. for project funding)*

Technology services

Strategic support to R&D&I	Feasibility study, joint, pre-competitive R&D	*Strategic perspective: collaborative R&D projects in which DIHs create a platform for collaboration and contract R&D to support the translation of innovative ideas into demonstrable concepts*
	Readiness assessment	*Systematic analysis of an organisational capacity to undertake and adapt to change. In some cases, DIHs conduct Technology Readiness assessments on products developed by start-ups and SMEs*
Contract research	Specific R&D	*Applying technological innovation to develop new products/services or improving existing ones*
	Technology concept development/ Proof of Concept (PoC)	*Planning and defining new business services solutions as well as demonstrating the feasibility of an idea or project through its temporary or provisional realisation*
Provision of tech. infra.	Access to infrastructure and technological platforms	*Provision of a large range of services such as renting equipment, providing platform technology infrastructure, lab facilities as well as support to low rate production*
Technical support on scale up	Concept validation	*Developing minimum viable products that can be validated with real customers and/ or in an industrially relevant setting*
	Prototyping	*Designing prototypes to explore ideas and emerging technologies before going into production by also considering potential opportunities offered by small series production*
Testing and validation	Product qualification	*Support in certifying that the product has passed performance and quality assurance tests*
	Certification	*Provision of a formal certification stating that a model or simulation is acceptable to meet a specific purpose*
	Product demonstration	*Promotion in which a product is demonstrated in front of clients*

Source: Own elaboration based on I4MS DIH service model and outcomes of the kick-off meeting

The table below presents an overview of the services offered by the members of the Network, according to the classification above. The information has been collected in the context of the coaching and mentoring programme and the mapping of services is based on self-declaration by the participants.

Table 6 – Self-declared mapping of services offered by members of the Network

	Ecosystem support										Business support												Technological support									
	Technology scouting	Brokerage	Ecosystem building	Communication	Trend watching	Visioning and strategy development	Services Impact assessment	AI maturity	Ecosystem management	Skills/training	Basic services	Specialised facilities	Business development	Guidance	Financial engineering	Connection to funding sources	Innovation spaces	Training	Secondment	Identification of opportunities	Creating consortia	Development of proposals	Feasibility study, joint, pre-competitive R&D	Readiness assessment	Specific R&D	Technology concept development	Access to infrastructure and platforms	Concept validation	Prototyping	Product qualification	Certification	Product demonstration
FCAI		√	√	√				√	√	√						√			√	√	√	√			√	√						
Ltrobotics DIH	√	√	√	√	√			√	√							√					√	√	√	√	√			√	√			√
ITI Data Cycle Hub	√	√	√	√	√	√		√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√	√	√		√
SINTEF	√	√	√	√	√				√	√						√				√	√	√	√	√	√	√	√	√	√	√		
Munich Innovation HUB for applied AI	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√
VDTC of the Fraunhofer IFF	√		√	√		√		√	√	√		√	√			√	√	√		√	√	√	√	√	√	√	√	√	√	√		√
DIGIHALL	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√
DFKI	√		√	√	√	√	√	√	√	√	√		√	√			√	√		√	√	√	√	√	√	√	√	√	√			√
SmartIC	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
IP4FVG	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√		√	√		√	√	√	√	√					
CeADAR	√	√	√	√	√	√	√	√		√	√		√	√		√	√		√	√	√	√	√	√	√	√		√	√			√
CROBOHUB	√	√	√	√				√	√	√	√	√	√	√			√	√	√		√			√	√	√	√					
Images et Réseaux - DIGIWEST	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
DIH Lombardia	√	√	√	√	√	√	√	√	√	√			√			√		√		√	√	√		√				√				
EsHPC			√	√	√	√		√		√	√	√						√		√	√	√	√		√	√	√	√				
Know-Center GmbH	√	√	√	√		√	√	√	√	√		√		√		√	√	√	√		√	√	√		√	√	√	√	√			
nZEB Smart Home	√	√	√	√	√	√	√		√	√	√	√		√		√		√	√	√	√	√	√		√	√	√	√	√	√		√
RIF BioRobotics Institute (ARTES 4.0)	√	√	√	√		√		√	√	√	√	√	√	√	√	√		√		√	√	√	√	√	√	√	√	√	√	√		√
TeraLab	√	√	√	√		√	√	√		√		√	√	√				√		√		√	√	√	√	√	√	√	√	√		√
AIR4S		√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√		√	√	√	√	√	√	√		√
SuperIoT	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
IMEC	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√
PRODUTECH	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√
CIIRC	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√
Latvian IT Cluster DIH	√	√	√	√			√		√				√	√	√	√					√	√										√
PIAP HUB			√	√							√					√					√	√	√		√				√			√
Smart Industry Hub South Netherlands	√		√	√		√		√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√				√

Annex D - Preparatory questionnaire

About this questionnaire

You have been invited to take this questionnaire as your DIH was selected to participate in our coaching and mentoring programme for DIHs working on AI.

With this questionnaire you have the opportunity to start telling us more about yourself, how your DIH positions in the AI landscape, its attitude towards collaboration, its maturity level, and what are your expectation for the programme and the new AI DIH network.

Your answers will help us to refine our programme to your specific needs, starting from the first sessions scheduled during the Kick-Off meeting, to be held in Rome on 19th and 20th of March.

Thank you in advance for your time and collaboration.

Questionnaire instructions

The questionnaire is divided into sections, in order to move to the next group of questions you will have to answer all precedent questions. Once you complete one section, your answers will be saved. You can modify them at any moment moving back and forwards between sections. You will find a progress bar on top of each section to help you navigate through the questionnaire. When you answer to all questions, the questionnaire will be automatically submitted and a confirmation message will be displayed.

Section 1: General information

Contact person

- ○ Name _____
- ○ Surname _____
- ○ Role in the DIH _____
- ○ Email _____
- ○ Phone number _____

How many representatives from your organisation will take part in the Kick-off meeting to be held in Rome on 19 – 20 March?

- ○ 1
- ○ 2

Contact details of the second participant

- ○ Name _____
- ○ Surname _____
- ○ Role in the DIH _____

Section 2: DIH positioning in the AI landscape

How long has your DIH been working in the AI field?

- ○ Newcomer
- ○ Between 1 and 5 years
- ○ Between 5 and 10 years
- ○ More than 10 years

Which of the following AI-related techniques and sub-disciplines does your DIH cover?

- ☐ Machine Learning
- ☐ i. Deep learning
- ☐ ii. Reinforced learning
- ☐ Reasoning and decision making
- ☐ i. Knowledge representation
- ☐ ii. Reasoning
- ☐ iii. Planning/Scheduling
- ☐ iv. Search/Optimisation
- ☐ Robotics
- ☐ i. Control
- ☐ ii. Perception
- ☐ iii. Sensors and actuators
- ☐ iv. Integration in cyber-physical systems
- ☐ Other (please specify) _____

Which of the following services does your DIH offer in the AI field?

- ☐ Consulting services
- ☐ Training services
- ☐ i. Delivery of (individual and/or group) classes
- ☐ ii. Delivery of webinars
- ☐ iii. Development of serious games
- ☐ Services related to experimentation
- ☐ i. Offering testing and validation tools
- ☐ ii. Offering testing and validation infrastructure
- ☐ iii. Provision of datasets
- ☐ Services related to technology
- ☐ i. Provision of algorithms
- ☐ ii. Provision of IT tools
- ☐ iii. Provision of AI solutions
- ☐ Services related to interaction with the ecosystem
- ☐ i. Dissemination activities
- ☐ ii. Support in fundraising
- ☐ iii. Support in brokerage and identification of suitable partners for collaboration
- ☐ Other (please specify) _____

Does your DIH include testing facilities for AI?

- ○ Yes
- ○ No

If yes, please provide a brief description (max 300 characters)

_____

If not, does your DIHs provide access to testing facilities for AI? If yes, please specify (max 300 characters)

_____

Which of the following organisations does your DIH support in the AI field?

- ☐ Public sector organisations
- ☐ Large companies (providers and users of AI)
- ☐ SMEs (providers and users of AI)
- ☐ Education centres/ institutions
- ☐ Start-ups and Business Accelerators
- ☐ Research Centres and Academia
- ☐ Other (please specify) _____

Does you DIH collaborate with AI competence centres outside your DIH?

- ☐ Yes
- ☐ No

If yes, please specify the objectives of collaboration

- ☐ Activities linked to R&D&I
- ☐ i. Develop common projects (e.g. H2020 framework)
- ☐ ii. Engage in joint research actions
- ☐ iii. Enhance/Integrate DIH service portfolio (through research)
- ☐ Activities not linked to R&D&I
- ☐ i. Expand expertise and competences in the AI field
- ☐ ii. Engage in ad-hoc activities (e.g. awareness creation, sharing of the same position in international debates...)
- ☐ iii. Deliver services jointly through ad-hoc collaboration
- ☐ Other (please specify) _____

Section 3: DIH attitude towards collaboration

What does collaboration mean to your DIH? (max 300 characters)

_____

What objectives your DIH aim to achieve by cooperating with other DIHs? (Please rank your

answers in descending order of relevance by dragging and dropping)

_____ Taking part in EU projects and/or national events

_____ Start students/experts exchange programmes

_____ Set up cross-border experiments and pilots (Proof of Concept)

_____ Develop/seize new business opportunities

_____ Share best practices and success stories

_____ Achieve cross-regional visibility and support dissemination (fairs, exhibitions, events)

_____ Receive technical support from other DIHs

What benefits does your DIH expect from participating in the network of AI-focused DIHs? (max 300 characters)

_____

What are the main reasons why your DIH would cooperate with other organisations working in the AI field? (Please rank your answers in descending order of relevance by dragging and dropping)

_____ Develop new skills/competences

_____ Make available to your clients advanced structures for testing/ validation/ research and vice versa

_____ Take part into research and/or innovation projects

_____ Develop AI technology solutions

_____ Other (please specify)

What are the main reasons why your DIH engaged in collaboration activities so far?

- ☐ Respond to market needs/needs of a specific client
- ☐ Create synergies for R&D&I
- ☐ Apply to H2020 projects/other projects
- ☐ Exchange of best practices
- ☐ Other (please specify) _____

What are the main benefits your DIH encountered while establishing collaboration with other DIHs outside R&D&I projects?

- ☐ Stronger ecosystem engagement
- ☐ Wider geographical scope
- ☐ Economies of scale (lower costs, greater productivity…)
- ☐ Knowledge gain
- ☐ Other (please specify) _____

What are the main constraints your DIH encountered while establishing collaboration with other DIHs outside R&D&I projects?

- ☐ Planning of the activities and division of tasks (duplication of efforts…)
- ☐ Communication (including language barriers)
- ☐ Financial constraints
- ☐ Legal formalisation
- ☐ Others (please specify) _____

What do you deem to be the strengths of your DIH in relation to structured cooperation initiatives?

- ☐ Solid knowledge of opportunities for (cross-border) cooperation
- ☐ Proven experience in collaboration activities
- ☐ Involvement in an established network
- ☐ Strong relation with representatives of private companies
- ☐ Other (please specify) _____

What do you deem to be the weaknesses of your DIH in relation to structured cooperation initiatives?

- ☐ Lack of knowledge of opportunities for (cross-border) cooperation
- ☐ Weak experience in cooperation activities
- ☐ Inefficient mechanisms to cover collaboration costs
- ☐ Insufficient knowledge of legal and financial aspects of collaboration
- ☐ Other (please specify) _____

Section 4: Your expectations on the coaching and mentoring programme

What expectations does your DIH have with respect to the coaching and mentoring programme?

_____

Please list below three outcomes your DIH would like to achieve through the coaching and mentoring programme

_____

How would the engagement of your DIH in structured cooperation initiatives improve its competitiveness?

- ☐ Access a European wide network of DIHs
- ☐ Widen the portfolio of best practices and success stories
- ☐ Explore new and/or complementary AI concepts and approaches through peer learning
- ☐ Gain knowledge of existing business and funding opportunities through knowledge sharing
- ☐ Other (please specify) _____

Which of the following aspects of a model for structured cross-DIH collaboration would you like to focus on more? (Please rank your answers in descending order of relevance by dragging and dropping)

_____ Identification of the most suitable partners/suppliers

_____ Knowledge sharing and IPR protection mechanisms

_____ Financial coverage of cooperation costs

_____ Legal aspects of structured collaboration

_____ Identification of win-win collaboration schemes

_____ Incentives and barriers to cooperate

Annex E - Questionnaire for the AS IS mapping

About this self-mapping exercise

Building on the information provided during the training session, the Self-mapping Exercise has been specially designed to understand the various dimensions of Business and Operational Models of your hubs, in order to characterize and map the AI DIHs participating in this project. The aim is to define potential collaboration schemes, potential synergies and potential areas for cooperation amongst AI DIHs. The assessment exercise consists of 4 sections, each designed to achieve a specific purpose. They can be summarized as follows:

- Understand the characteristics of the governance model;
- Position the operating model of the DIH in the existing landscape of DIH's operating model;
- Understand what your business enablers are
- Explore your cooperation activities

As mentioned, this assessment is a tool to help advance your DIH. In order to complete all answers, several people with specific roles from your AI DIH may be needed. Please, get in contact with them in order to provide complete answers. Once completed, please send a message to your assigned coach indicating it. Your coach will then contact you to organize a dedicated individual session, during which results will be revised (if needed) and discussed.

Your DIH

Name of the DIH

_____

Section I - Governance and organisation

Outline the structure of the governing body/bodies of your DIH

○ Structure (e.g. Management board, Steering Committee, DIH Coordinator, etc.) (1)

_____

○ Members List the members of the structure (3)

_____

○ Responsibilities Describe the main responsibilities of the governing body taking decisions on the strategy and execution of the DIH (6)

_____

○ Decision making process Describe: How are the main decisions taken by the governing body (e.g.: how does the DIH decide to promote a service rather than another?)? How often do the body meet to take decisions? (7)

_____

○ Responsibilities in case of collaboration Describe the responsibilities of the governing body in case of cooperation with one or more DIHs (11)

_____

Considering your current state of governance structure, what are, in your opinion, the strengths and the weaknesses?

_____

Please specify which of the following sources of funds are used for each of the support services provided by the DIH

	Covering costs of business support (1)	Covering costs of technology support (2)	Covering costs of ecosystem support (3)	Covering costs of cooperation with other DIHs at national/ regional level (7)	Covering costs of cooperation with other DIHs at cross-border level (8)
Horizon 2020 funding (1)	☐	☐	☐	☐	☐
European Social Fund (2)	☐	☐	☐	☐	☐
COSME (3)	☐	☐	☐	☐	☐
European Regional Development Fund (4)	☐	☐	☐	☐	☐
National basic research funding (5)	☐	☐	☐	☐	☐
National specific innovation funding (6)	☐	☐	☐	☐	☐
Regional funding (7)	☐	☐	☐	☐	☐
Private funding (8)	☐	☐	☐	☐	☐
Partner resources (9)	☐	☐	☐	☐	☐
Memberships (10)	☐	☐	☐	☐	☐
Other (11)	☐	☐	☐	☐	☐

How does the DIH interact with its ecosystem?

- ☐ Attending events/conferences at regional, national and/or international level (1)
- ☐ Networking events (2)
- ☐ Publishing newsletters (3)

- ☐ Hosting insight events (4)
- ☐ Webinars (5)
- ☐ Partnerships with other DIHs, businesses or stakeholders (6)
- ☐ Active in policy- making e.g. participation in Expert Groups, Committees, Steering Committees, providing policy advice (7)
- ☐ Other (8)

Section II - Operating model

Service portfolio

Which are the new services that your DIH provides in comparison to those provided by each of its members (if any)?

Please specify who are the actual/intended beneficiaries/users of the services the DIH provides?

- ☐ Affiliated partners (1)
- ☐ Universities (2)
- ☐ Research & Technology organizations (3)
- ☐ Start-up companies (offering digital technologies) (4)
- ☐ SMEs and Midcap (offering digital technologies) (5)
- ☐ Large enterprises (offering digital technologies) (6)
- ☐ Technology cooperatives (7)
- ☐ Industry associations (8)
- ☐ Innovation brokers (9)
- ☐ Economic development agencies (10)
- ☐ Business incubators and accelerators (11)
- ☐ Private investors (12)
- ☐ Vendors (13)
- ☐ User communities or associations (14)
- ☐ Other (15) _____

Please specify the geographical scope of your DIH

- ○ Regional (1)
- ○ National (2)
- ○ European (3)
- ○ International (4)
- ○ Global (5)

What are the most demanded services within your offer? Please specify up to 5 services for each stakeholder category addressed by the DIH

- ○ Public sector organisations (1)

- ○ Large companies (providers and users of AI) (2)
- ○ SMEs (providers and users of AI) (3)
- ○ Education centres/ institutions (4)
- ○ Start-ups and Business Accelerators (5)
- ○ Research Centres and Academia (6)
- ○ Other (7) _____
- ○

Please outline the resources (suppliers, funds) used to provide the services

	Involvement of third parties		Types of third parties involved
	(Y)	(N)	
Technology scouting (1)	☐	☐	
Brokerage (2)	☐	☐	
Ecosystem building (3)	☐	☐	
Communication (4)	☐	☐	
Trend watching (5)	☐	☐	
Visioning and strategy development (6)	☐	☐	
Services Impact assessment (7)	☐	☐	
AI maturity (8)	☐	☐	
Ecosystem management (9)	☐	☐	
Skills/training (10)	☐	☐	
Basic services (11)	☐	☐	
Specialised facilities (12)	☐	☐	
Business development (13)	☐	☐	
Guidance (14)	☐	☐	
Financial engineering (15)	☐	☐	
Connection to funding sources (16)	☐	☐	
Innovation spaces (17)	☐	☐	
Training (18)	☐	☐	

Secondment (19)	☐	☐	
Identification of opportunities (20)	☐	☐	
Creating consortia (21)	☐	☐	
Development of proposals (22)	☐	☐	
Feasibility study, joint, pre-competitive R&D (23)	☐	☐	
Readiness assessment (24)	☐	☐	
Specific R&D (25)	☐	☐	
Technology concept development/ Proof of Concept (PoC) (26)	☐	☐	
Access to infrastructure and technological platforms (27)	☐	☐	
Concept validation (28)	☐	☐	
Prototyping (29)	☐	☐	
Product qualification (30)	☐	☐	
Certification (31)	☐	☐	
Product demonstration (32)	☐	☐	

In case you envisage the involvement of third parties in the delivery of a service, how is the third party contracted? Are there SLAs or other types of contract? Please specify

_____

Is there an internal portfolio of capacities for each of the members of the DIH that helps identify how to deal with the client needs?

_____

Please describe the processes that are internally carried out from the moment a service request is received at the DIH until it is delivered to the client (information flows, decision making process…)

_____

List and briefly describe the services you would like to offer as a consequence of being involved in the future AI DIH Network?

_____

Organizational model

Outline your organisational structure. Are functions organised by:

- ☐ Area of activity (e.g. Marketing and promotion area, Service delivery area, etc.) (1)
- ☐ Sector/ competences (e.g. Robotics department, AI department, etc.) (2)
- ☐ Other (3)

Please specify your organisational structure

_____

Function 1

- ○ Name (1) _____
- ○ Responsibilities (2) _____
- ○ Number of persons involved (3) _____

Function 2

- ○ Name (1) _____
- ○ Responsibilities (2) _____
- ○ Number of persons involved (3) _____

Function 3

- ○ Name (1) _____
- ○ Responsibilities (2) _____
- ○ Number of persons involved (3) _____

Function 4

- ○ Name (1) _____
- ○ Responsibilities (2) _____
- ○ Number of persons involved (3) _____

Function 5

- ○ Name (1) _____
- ○ Responsibilities (2) _____
- ○ Number of persons involved (3) _____

Function 6

- ○ Name (1) _____
- ○ Responsibilities (2) _____
- ○ Number of persons involved (3) _____

Which are the main key performance indicators (KPIs) used to monitor and track progress and results?

_____

Section III - Enablers

Knowledge management

How does the AI DIH take advantage of existing knowledge, facilities, skills from its business ecosystem?

_____

Is there any particular knowledge, facilities or skills missing in the business ecosystem of the AI DIH?

What is the communication plan of the DIH for promoting its own activity within its area of influence?

Has the DIH adopted any IT platform or specific tools to support and enable processes and service delivery?

- ☐ Communication tools (1)
- ☐ Collaboration suites (2)
- ☐ Match- making engines (3)
- ☐ Other (4)

Section IV - Collaboration with other DIHs

How do you currently cooperate with other DIHs?

Why would your DIH want to collaborate with other DIHs?

- ☐ Common service provisioning approaches (1)
- ☐ Knowledge transfer and exchange of best practices (2)
- ☐ Exchange of personnel and other mobility programme (3)
- ☐ Collaborate in a project (4)
- ☐ Defined a business model for a client (5)
- ☐ Networking activities (6)
- ☐ Collaboration agreement (7)
- ☐ Co-investment on new initiatives (8)
- ☐ Spontaneous collaboration (9)
- ☐ Generate new Services (10)
- ☐ Train the trainer (11)
- ☐ Addressing local needs (12)
- ☐ Exchange knowledge (13)
- ☐ Other (14)

With whom is your DIH/would your DIH be most likely to collaborate with?

- ☐ DIHs in geographical proximity (1)
- ☐ DIHs from your country (2)
- ☐ DIHs from other EU countries (3)
- ☐ Other (4)

Do you hold any Service Level Agreement (SLA) or any other formal or informal agreement framing the collaboration with other DIHs?

- ○ Yes (1)
- ○ No (2)

Please indicate the DIH(s) your DIH is collaborating/has collaborated with. (Make sure to specify the name, the location, the sector and the type of collaboration)

Could you please sum up the main aspects of the collaboration?

What works and does not work or has unintended consequences?

What kind of IT tools have been adopted and used to enable such collaboration?

Have you already launched cross DIH services? Do specific rules exist to fund those services?

What lessons learned emerged from the demonstrated collaboration activities carried out?

What is/was the approximate average time-length of the collaboration?

- ○ 0- 6 months (1)
- ○ 6 months- 1 year (2)
- ○ 1 year- 2 years (3)
- ○ 2 years- 3 years (4)
- ○ 3 years or more (5)
- ○ Other (6)

In your opinion, what aspects are deemed most critical to the success or failure of a possible collaboration amongst AI DIHs?

What are the key hurdles, barriers or challenges to cooperate with AI DIHs?

Do you have any plans for collaboration with any DIHs in the future?

- ○ Yes (1)
- ○ No (2)

Please describe in detail your plans.

What support would you need/expect from the DIH Network project to foster DIHs collaboration?

In relation to the legal aspects of collaboration with other DIH, which are the main legal

barriers you find?

_____

In relation to the legal aspects of collaboration with other DIH, how do/would you manage IPR when collaborating with another DIH?

_____

In relation to the legal aspects of collaboration with other DIH, how do/would you treat issues such as clients, access to new knowledge, RoI, revenues, etc.?

_____

Annex F – List of ESCO skills/knowledge

ESCO skills/knowledge	Link
Adhere to national and European professional code of ethics	http://data.europa.eu/esco/skill/d2564da5-c21f-4c02-8887-c78a001bb183
Advise on government funding	http://data.europa.eu/esco/skill/e38cbdd2-cd6c-451a-a9bd-9bc6355dafe8
Advise on investment	http://data.europa.eu/esco/skill/58d8e348-8bbc-4827-9214-822b1ee0007a
Advise on tax policy	http://data.europa.eu/esco/skill/b5feaf25-3975-4e74-85fd-4470e344ba2e
Analyse economic trends	http://data.europa.eu/esco/skill/5f302d63-048e-451c-b150-97c124a5a26b
Analytical thinking	http://data.europa.eu/esco/skill/4707da90-9cfc-46ca-8de0-38a0b7bfb137
Apply for government funding	http://data.europa.eu/esco/skill/e38cbdd2-cd6c-451a-a9bd-9bc6355dafe8
Apply safety procedures in laboratory	http://data.europa.eu/esco/skill/6f571969-3640-4774-a9bc-fd2ef583fdec
Apply strategic thinking	http://data.europa.eu/esco/skill/6c870993-9341-438b-91c0-c7fe4f96d8f5
Assess the feasibility of implementing developments	http://data.europa.eu/esco/skill/21056f6a-8a85-4eb0-b709-468578b809e0
Assessment processes	http://data.europa.eu/esco/skill/31b67516-af16-4b97-8430-a8a8e0f84190
Audit techniques	http://data.europa.eu/esco/skill/6a536b36-c5c7-4d10-bf67-a4fb0f8549b2
Build business relationships	http://data.europa.eu/esco/skill/dc72ad0a-c5dc-4abd-bc0d-ca43e82162e1
Calculate production costs	http://data.europa.eu/esco/skill/6f8f86f8-0ef9-4dd6-8e29-7d790e65706b
Carry out recruiting services	http://data.europa.eu/esco/skill/5bb4e18e-4bee-428c-b8b6-7316e4704b92
Carry out strategic research	http://data.europa.eu/esco/skill/0aa02c52-077d-45f8-8c2d-7132c11ac16e
Coaching clients	http://data.europa.eu/esco/skill/fcd7dbd4-095d-448d-b605-89e8ac6a3d92
Collaborate with stakeholders	http://data.europa.eu/esco/skill/87de6e49-ca1c-42a4-8751-5ff0b991966
Coordinate events	http://data.europa.eu/esco/skill/2111dff8-f830-46ad-80ce-7885893b3134
Create a financial plan	http://data.europa.eu/esco/skill/56ff27ef-2565-45bf-a70c-f06d78d2a480
Create business process models	http://data.europa.eu/esco/skill/6a7792a9-888a-46ad-afc9-2c0d94c8fde6
Create cooperation modalities	http://data.europa.eu/esco/skill/6f9ac146-8bbd-4b9d-9514-d85586caf17a
Create prototypes	http://data.europa.eu/esco/skill/e921279a-1a7e-4900-9720-bde93ae3e70e
Creatively use digital technologies	http://data.europa.eu/esco/skill/1a4cc54f-1e53-442b-a6d2-1682dc8ef8f9
Data administration	http://data.europa.eu/esco/skill/9ff9db9d-d14b-426e-83f3-e7449af6c79f

Data mining	http://data.europa.eu/esco/skill/25f0ea33-b4a2-4f31-b7b4-7d20e827b180
Data mining methods	http://data.europa.eu/esco/skill/9effa3d7-c0c4-4583-ad94-b496ba5e5f2c
Data protection	http://data.europa.eu/esco/skill/a4346013-a967-4a58-a533-6b32ad1364c5
Data quality assessment	http://data.europa.eu/esco/skill/cc7370dd-69fa-4c67-a96f-d4d135d38700
Demonstrate functionality of software products	http://data.europa.eu/esco/skill/5c8aa481-9e7c-4f32-8197-a8b0fd7ca186
Demonstrate products' features	http://data.europa.eu/esco/skill/de7b8c6c-9ed4-4776-924c-4265dd1d9cde
Design prototypes	http://data.europa.eu/esco/skill/bacbfc27-4b5d-47de-8bfd-af5fa27562a2
Develop an organisational structure	http://data.europa.eu/esco/skill/8538c0e3-902f-4e6f-a60c-0e1fd7e3a956
Develop business plans	http://data.europa.eu/esco/skill/ead58f22-0af5-467c-ac1e-b750e4e1ac6a
Develop communications strategies	http://data.europa.eu/esco/skill/3c834f6e-523a-49ee-8ed1-e073e28ae6fe
Develop membership strategies	http://data.europa.eu/esco/skill/bcaf0265-4921-48f8-aa66-619c1ed99c80
Develop new product	http://data.europa.eu/esco/skill/63f224ea-d889-42ea-b3ef-730ef78c7176
Disseminate information on tax legislation	http://data.europa.eu/esco/skill/b8656b5c-e3f0-4418-82ff-87b5f677f9e8
Emergent technologies	http://data.europa.eu/esco/skill/42cb7669-c371-4903-9c0b-13db67b2e4bb
Ensure compliance with legal requirements	http://data.europa.eu/esco/skill/1dae8445-12e5-423a-bb26-824010e299b9
Establish collaborative relations	http://data.europa.eu/esco/skill/326809fc-238d-40c2-881e-40042f7f2f0d
Financial analysis	http://data.europa.eu/esco/skill/99571e68-801f-49af-a897-5f75996642e1
Funding methods	http://data.europa.eu/esco/skill/3556c075-eee0-4549-b730-48ae70cb5af9
Identify clients' needs	http://data.europa.eu/esco/skill/f43ee9cc-7284-406f-b23f-3eedb0581141
Identify customer's needs	http://data.europa.eu/esco/skill/68698869-c13c-4563-adc7-118b7644f45d
Identify digital competence gaps	http://data.europa.eu/esco/skill/238343b1-7b51-42b3-a9ed-cf24d3a236e7
Identify needs and technological responses	http://data.europa.eu/esco/skill/42fcf80d-7b45-40f3-bd2f-5411c4c0dfa0
Identify training needs	http://data.europa.eu/esco/skill/4dafe480-f2ae-46b5-bd5e-8d4e538f50c7
Implement data quality processes	http://data.europa.eu/esco/skill/713fb616-118e-40bc-9366-4a69879a49d5
Implement marketing strategies	http://data.europa.eu/esco/skill/13e2378e-0d10-450d-843a-b3592575826e
Information governance compliance	http://data.europa.eu/esco/skill/9a0d0abc-010d-440b-8242-7e31510471ba
Intellectual property law	http://data.europa.eu/esco/skill/2ad081e6-0a3f-4612-ac15-7ace75d39e26

Interpret technical requirements	http://data.europa.eu/esco/skill/be48353d-25c7-4f86-bea9-7b9e248fbc6e
Learning management systems	http://data.europa.eu/esco/skill/6c80d53c-d8c9-41fe-998f-091fca208834
Maintain relationship with customers	http://data.europa.eu/esco/skill/2239694b-771a-4586-8b54-2794e361a9ae
Manage data	http://data.europa.eu/esco/skill/9ff9db9d-d14b-426e-83f3-e7449af6c79f
Manage facilities services	http://data.europa.eu/esco/skill/f41d4cd2-58ed-4ad6-b9c1-a5175c88d392
Manage government-funded programmes	http://data.europa.eu/esco/skill/0761f325-13e7-49f4-a41a-ec64ba4e7b9d
Manage ICT project	http://data.europa.eu/esco/skill/3c76296d-4bbd-44ba-8eaa-95bf275f79b7
Manage product testing	http://data.europa.eu/esco/skill/b7a03115-41c9-4167-a0b6-7e40cf0fd607
Manage research and development projects	http://data.europa.eu/esco/skill/d5dbc342-8e39-4998-8237-ebbe05a381ce
Manage standards for data exchange	http://data.europa.eu/esco/skill/cb5cccc9-abe4-4b11-abe6-d27e5cd85fb1
Market analysis	http://data.europa.eu/esco/skill/b011c8b4-76e1-4bbc-8bb9-1d205e7b618a
Monitor technology trends	http://data.europa.eu/esco/skill/7a17d7ce-01a2-4746-bbcc-22ffe22fa16e
Oversee quality control	http://data.europa.eu/esco/skill/5d34adde-0b78-42b4-9d3d-69e9388d8398
Perform business analysis	http://data.europa.eu/esco/skill/27ed854c-15b8-4ba2-90e9-ae888a219703
Perform data cleansing	http://data.europa.eu/esco/skill/50b100ea-74fd-4706-99db-3e4ca55e51b8
Perform laboratory investigations	http://data.europa.eu/esco/skill/9e8863fc-e8de-4df1-9bc6-3d5dd85b8070
Perform market research	http://data.europa.eu/esco/skill/fe39d4db-4cb5-4299-bb9f-896c8fd6ab13
Perform quality audits	http://data.europa.eu/esco/skill/d83cba15-8511-4d07-b89a-9fde0d1d8241
Perform risk analysis	http://data.europa.eu/esco/skill/1dd23dba-dd00-45ab-abf4-642902538317
Present detailed design proposals	http://data.europa.eu/esco/skill/b87f6102-5bab-4e99-a5d8-11b6be1b99c2
Present reports	http://data.europa.eu/esco/skill/d0f2f8a7-d935-4a6d-8e54-dcc3e5e2cbeb
Principles of artificial intelligence	http://data.europa.eu/esco/skill/e465a154-93f7-4973-9ce1-31659fe16dd2
Project management principles	http://data.europa.eu/esco/skill/237db40b-4600-47c0-837f-4a2c4f3014ab
Provide legal advice	http://data.europa.eu/esco/skill/ea451251-71ab-4f89-8c0d-53344ef7004f
Quality assurance methodologies	http://data.europa.eu/esco/skill/c7cc6dc5-d56b-4323-8e5c-47c4022f615f
Seek innovation in current practices	http://data.europa.eu/esco/skill/f975091a-e5a5-4472-ac17-11680e53e98f
Strategic planning	http://data.europa.eu/esco/skill/949ced5f-7536-4614-ac60-563ffc91a2f2
Supervise laboratory operations	http://data.europa.eu/esco/skill/93261e82-8ffe-4a8b-b8b0-02265edbf562

Training subject expertise	http://data.europa.eu/esco/skill/4f6e68b2-85c8-446e-a96d-b306ec7e0091
Use different communication channels	http://data.europa.eu/esco/skill/415abd43-e8e5-4643-b5da-5f11307af57a
Use laboratory equipment	http://data.europa.eu/esco/skill/70bc4cfe-16c8-4433-a873-15ea8620453e
Use learning strategies	http://data.europa.eu/esco/skill/a44c0ed6-68b1-457a-9c6d-ea8487bdfeb2
Verify formal ICT specifications	http://data.europa.eu/esco/skill/ee3b1553-2dc5-434b-8dcf-4ae3a40b3a48

Annex G – The personas

This Annex presents the profiles of the proposed personas, representatives of the typical customers of a DIH, according to the user-centric approach used (see section Methodological approach)

TomatoX

TomatoX is a SME, which operates in the sector of food and beverages and refers to the regional market.

TomatoX is seeking for process innovation solutions to optimise its production process. The figure below summarises the key characteristics of the SME.

What are TomatoX objectives?	Achieve business goals (such as cost reduction or revenues increase) through the optimization of its processes
What is TomatoX likely to need?	• Innovative solutions to achieve its goals • Financial resources to implement the solutions • Competences and skills to take full advantage of the solutions
What is the digital maturity level of TomatoX?	• Low digital maturity level, characterized by an opportunistic adoption of innovative solutions • Incremental solutions preferred to disruptive technologies

eSense

eSense is a SME operating in the sector of sensor and detection. Its reference market is international and it usually engages in B2B transactions.

eSense is seeking for product innovation solutions to keep its competitiveness on the market. The figure below summarises the key characteristics of the SME

What are eSens objectives?	• Upgrade its products • Keep its leading position in its sector
What is eSens likely to need?	• Explore the latest solutions available under development • Financial support to develop new solutions to be applied to its products
What is the digital maturity level of eSens?	• High-level of digital maturity but limited to its sector

AI-rhythm

AI-rhythm is a start-up intending to operate internationally, applying AI algorithms for melody composition.

AI-rhythm is seeking for technological solution validation to enter the market. The figure below summarises the key characteristics of the start-up.

What are AI-rhythm objectives?	• Solution validation with relevant data • Product development
What is AI-rhythm likely to need?	• Data/ facilities necessary for validation • Collaboration with relevant partners • Financial support
What is the digital maturity level of AI-rhythm?	TRL 3/4 - need for validation in relevant environment

AiMAGE

AiMAGE is a start-up intending to operate internationally, acting in the technological field of machine vision.

AiMAGE is seeking for technological solution scale up to enter the market on a larger scale. The figure below summarises the key characteristics of the start-up.

What are AiMAGE objectives?	• Opportunities for growth and business development • Market entry
What is AiMAGE likely to need?	• Investor/partner support • Industrial partnership to ease the access to the market • Financial partnership to get the resources needed for the scale-up • Technological partnership to scale up the solution
What is the digital maturity level of AiMAGE?	TRL 7/8 ready for the market, needing for support to entry the market

The Municipality of Elsewhere

The Municipality of Elsewhere, which operates at a local administrative level, seeks to apply AI to traffic vision. Indeed, the Municipality is seeking for service innovation to improve the quality of the service provided to citizens. The figure below summarises the key characteristics of the Municipality.

What are Municipality of Elsewhere objectives?	• Improve the provision of services to citizens • Gather the information required for the procurement of the solution
What is Municipality of Elsewhere likely to need?	• Analysis of the state of play about the technologies available in the sector • Technological solutions and competences • Feasibility studies • Solutions for real-time policymaking
What is the digital maturity level of Municipality of Elsewhere?	• Low/ medium digital maturity level • Following experience of other "front-runners"

The Region of Wonderland

The Region of Wonderland, which operates at a regional administrative level, seeks to empower the AI digital skills in the region. Indeed, it seeks to implement AI-awareness campaigns to instruct the municipalities and the productive ecosystem about the opportunities offered by artificial intelligence. The figure below summarises the key characteristics of the Region.

What are Region of Wonderland objectives?	• Increase the digital skills of both local Public Administrations and SMEs in the field of Artificial
What is Region of Wonderland likely to need?	• Social assets offered by Digital Innovation Hubs • Specific training programme • Knowledge/best practices sharing
What is the digital maturity level of Region of Wonderland?	• Low / medium digital maturity

Annex H – The customer journeys

This annex presents the customer journeys of each of the personas presented above. Specifically, the journey maps consider the point of view of customers, as well as the perspective of a DIH. The journey maps involve the following elements for each phase of the journey:

1. The activities undertaken by the customer in each phase of the journey, e.g. the SME participate in an event to find out more about AI.
2. The motivation of the customer to engage in such activities, e.g. explore opportunities opened by innovation.
3. The love points of the activities, i.e. elements that can increase the client's satisfaction
4. The pain points of the activities, i.e. elements and conditions which, if met, can stop the journey
5. The service offered by the DIH in the corresponding phase of the customer journey, e.g. organisation of the dissemination event attended by the SME.
6. The opportunity for the DIH to cooperate with other DIH(s) in delivering the service
7. The concrete application of such collaboration, e.g. sharing of experts to take part in communication events.
8. The expected outcomes of such collaboration, e.g. greater number of SMEs engaged in the network of the DIH.

The journey of TomatoX

	Contact	Scoping	Use case definition	PoC definition and validation	Scale up
Activities	Participation in an event organised by the DIH Reception of an email	Investigation of similar cases and definition of the problem	Identification of possible applicable solutions	Testing of the identified solution on the SMEs processes	Finding of the resources to scale up and implement the solution
Motivations	Willingness to explore opportunities opened by innovation	Assessment and focus on the need	Find the most adequate solution to the need identified	Verify the feasibility of the solution and identify the short-term benefits	Observe the benefits on a large scale
Love points	Event useful for networking and for improving knowledge on the sector Solution-based event	Learning about practical experiences of similar SMEs	Suggestion of innovative and up-to-date affordable solutions	Smoothless validation	Smooth scale-up of the solution Identification of the required resources
Pain points	High costs in terms of time (e.g. excessive number of events)	References with scarce relevance/ gap of competences/ Scarce knowledge of the specificities of the process	Lack of competences to implement the solutions Proposal of a solution hardly applicable	Data issues (data not available, not adequate fear for misuse); Delays in the implementation (causing higher costs); Scalability issues	Lack of resources to scale up Difficulty of integrate the solution with the mechanisms in place
Service offered by the DIH	Communication/ dissemination activities; Participation in sectorial fairs; Visit to the SMEs; Organisation of networking events	Showing references, case studies and best practices (from the industry); consulting services; one-to-one visit; Solution scouting	Analysis of process & value chain; Digital Assessment, Solution evaluation; Definition of attainable KPIs	Provision of testbed facilities Provision of experts PMO/ coordination of projects Finding financing sources Matchmaking	Finding financing sources Talent scouting Technical support on scale up
Collaboration opportunity	Integration of knowledge and competences/ Economies of scale/ Systematization of communication strategies	Fill in sectoral gaps	Provide a wide range of possible solutions	Capacity to deliver the service	Widen the financing opportunities for the project (private channels, investors) Find resources for the digital transformation
Application of collaboration	Sharing of experts to take part in communication events Joint participation in fairs	Exchange of knowledge repository/ knowledge sharing/ Feedback on available solutions / Sharing of experts to tutor the SME	Connecting ecosystems Sharing a network of sectoral experts	Sharing of domain-specific platforms Sharing of experts on predictive maintenance, machine learning, etc Facilitate contact with other companies in the value chain	Knowledge sharing on funding opportunities Expert sharing
Expected outcomes	Greater number of SMEs engaged in the network	Better focus of the client's need via a wider network	Find more adequate solutions for the project	Service provision	Offer more adequate support Maximize the possibility of success of the project

The journey of eSens

	Contact	Scoping	Use case definition	Search for funding	Building opportunity	Project development	Testing	Support to scale up
Activities	Meet the hub during a roadshow	Contact with the hub to present the need and define the problem	Definition of the specific area of research	Research of funding sources for R&D	Research of partners for funding opportunities/ R&D activities	Development of the research project	Test of the developed solution on the product of the SME	Start production of the new product
Motivations	Be informed about the trends and the latest solutions available	Knowledge of the hub and trust it should be able to find solutions	Identify the area of action	Ensure the means to proceed with the research	Increase the chances of receiving financial support/ developing the solution	Develop the solution researched	Verify the applicability of the solution developed	Achieve the objective of introducing an upgraded product
Love points	Well-organised, focussed roadshow, covering the area of interest of the DIH	Punctual market landscaping/ DIH with experience in the sector	Target area and strategy clearly depicted	Resources needed are successfully identified and easily accessible	Identification of relevant partners eager to cooperate	Smooth project development in all phases	Target area and strategy clearly depicted	Recruitment of skilled experts, wanting to stay with eSens for a while
Pain points	High costs in terms of time Lack of sector-specific events	Market landscaping too generic DIH has no knowledge on the sector	Not clear strategy/ plan	Failure to identify resources needed	Adequate partners not identified/ development of unsuccessful proposals/ Business Plan	Delays/ difficulties in the realization of the project Increase of costs	Non-working prototype Lack of product validation	Lack of skills or financial resources to deploy the solutions on a large scale
Service offered by the DIH	Communication and dissemination activities	Presentation of the market perspectives, results of trend-watching	Assessment and support to use case definition	Scouting for financing/ funding opportunities or investors	Creating consortium Developing proposals/ business plan	Coordination /PMO Access to testing/ specialised facilities	Access to testing facilities/ Concept validation/ Prototyping/ Specific R&D AI testing	Searching funding opportunities/Talent scouting/Technical support on scale up
Collaboration opportunity	Widen communication opportunities/capacity Gather experts across EU	Widen knowledge on the sector of the SME	Widen knowledge on digital assessment techniques	Widen knowledge on funding/ financing opportunities	Increase the possibilities of success of the proposals/ BP	Provide delivery capacity	Provide delivery capacity	Improve support to scale up
Application of collaboration	Organisation of joint thematic roadshow/ events	Knowledge sharing/ sharing of repository on specific sector	Knowledge sharing/ sharing of digital assessment methodologies	Sharing of info on funding opportunities Matchmaking with investors	Connecting ecosystems/ sharing of experts and partners	Sharing of facilities Sharing of experts for testing/ for PMO	Sharing of facilities; Sharing of experts for testing; Sharing of potential customers for market testing	Sharing of knowledge on funding/financing opportunities/experts Talent scouting at EU level
Expected outcomes	Focussed communication/ events	Focussed presentation to respond to client requests	Improved use case definition	Present more opportunities to the SME	Strengthen the proposals/ BP	Obtain missing skills/ facilities	Obtain missing skills/ facilities	Provide better support to scale up

The journey of AI-rhythm

	Contact	Scoping	Testing	Training	Acceleration	Market development
Activities	Contact the university that in turn suggests contacting the hub	Meeting with the hub to present the solution devised	Find the resources needed for testing Validation in laboratory/simulation	Learning basic principles for business development	Developing the business idea Getting ready to enter the market	Enter the new market (e.g. find clients, partners, etc.)
Motivations	Search for support to solution validation and development	Expose the need	Proceed to testing	Get the right managerial skills for managing the target market entry strategy	Get prepared for entering the market	Launch the solution developed
Love points	Easy contact with skilled experts	Development of sound project plan, encompassing risks and mitigation measures	Innovative testing facilities available and easy access to relevant data	Pragmatic and effective training programme tailored on the needs of the start-up	Development of a winning business idea	Contact with large network of potential clients The solution is well-received
Pain points	Difficulty in the identification of the people/ organisations that could provide support	Lack of managerial skills Tight constraints in terms of time and resources Unrealistic expectations	Failure to identify resources needed/ Data inadequate or incomplete/ Test failure Inadequate infrastructure	Training not focused	Ineffective support to business idea development Lack of adequate entrepreneurial capacities	Difficulties in presenting the business idea/ approaching clients
Service offered by the DIH	N/A	Project planning	Provide access to data/ Tools for data testing	Training on managerial skills with business partner/universities	Innovation spaces Support in the development of the business idea	Networking and events Showcasing Talent scouting
Collaboration opportunity	Get the DIH to be well-known at local, national and EU level	Fill in gaps in project planning and management	Enhancing access to data Ensuring access to advanced facilities	Improving the learning experience	Fill in gap in entrepreneurial capacities	Increase the opportunities for product demonstration/ showcasing
Application of collaboration	Joint communication events/ publications	Experts sharing	Sharing of databases/ Sharing of facilities	Sharing of experts/ trainers	Sharing of experts Provision of knowledge inputs	Organisation of dissemination events in other regions/ support to matchmaking
Expected outcomes	Reinforce the image of the DIHs and get them known by the ecosystem	Definition of the project phases	Enhance the testing	Provide trainers with experience in the sector/ similar business experience	Gain competences in business idea development	Facilitate the entry into the market

The Journey of AiMAGE

	Contact	Scoping	Ecosystem analysis	Brokerage	Scale up
Activities	Contact the hub to present the need	Presentation of the start-up, the product, and ideas for development	Analysis of both the reference market and main players/partners	Contact with potential partners Identification of resources needed	Support in the definition of the partnership for the scale up
Motivations	The DIH is considered a good start-point to link with financial or industrial partners	Introduce the product and the main objectives	Identify scale-up opportunities and potential competitors/ partners	Establish partnerships with potential partners to facilitate access to market	Start operating in new market
Love points	The DIH has experience in the targeted market/ has good links with the ecosystem	Innovative and pragmatic vision	The DIH provides comprehensive ecosystem analysis	Access to advanced facilities and easy access to data	Right support in overcoming potential legal/ technical issues
Pain points	Lack of experience in the targeted sector resulting in market/trends too generic	Lack of understanding Vision unrealistic or not suitable for the start-up	Unsuccessful partners/ competitors identification Failure to identify reference market	Failure in the identification of right partners/funding resources	Legal barriers Failure to find the necessary human resources Time delays
Service offered by the DIH	Presentation of market prospects Trend-watching results	Support to visioning and strategy development	Ecosystem analysis/ mapping	Brokerage Connection to funding opportunities/ investors	Legal support Talent scouting PMO
Collaboration opportunity	Fill in the gaps in terms of knowledge of the sector	Support in vision and strategy development Support in project planning	Ensuring effective market analysis/mapping	Fill in the gaps in partners/funding resources identification	Overcome barriers (legal , HR, etc.) to market entry through specific support to scale up
Application of collaboration	Sharing of relevant documents/materials	Sharing of experts	Best practices exchange Sharing of successful ecosystem analysis techniques	Share of ecosystems/experts Support to matchmaking	Sharing of experts Sharing of best practices on scale-up techniques
Expected outcomes	Increased opportunities to attract the client	Increased strategy development capacities	Get competencies in market analysis/mapping	Identify the best partners for the start-up on the national/EU market	Enhance the possibilities to enter the target market

The journey of the Municipality of Elsewhere

	Contact	Scoping	Use case definition	Implemenetation and scale up – Eventual piloting
Activities	PA contacted by the hub: event/workshop invitation Sponsored by other PA in the board of the hub	Investigation of similar cases and definition of the problem	Identification of possible applicable solutions	Support to the definition of requirements for the procurement of the solution Testing of the identified solution on the PA processes/ facilities
Motivations	Willingness to explore opportunities offered by innovative technologies	Assessment and focus on the need	Find the most adequate solution to the need identified	Identify the requirements necessary for the procurement of the solution Verify the feasibility of the solution and identify the short-term benefits
Love points	The event covers the areas of interest of the PA	Wide repository of relevant cases	Identification of an innovative, easy-to-implement solution responding to Municipality needs	DIH with experience in the field of procurement Access to advanced facilities, benefits immediately identified Understanding of PA internal processes/ hierarchies
Pain points	Potential limits for PA to contact the hubs	References with scarce relevance/ gap of competences/ Scarce knowledge of the specificities of the process	Lack of competences to implement the solution Proposal of an inadequate solution	No experience in drafting procurement proposals Issues in data sharing/ Delays in the implementation (causing higher costs) Scalability issues/ Inadequate infrastructure
Service offered by the DIH	Communication/ dissemination activities, such as awareness campaigns and open days.	Showing references and case studies Solution scouting	Analysis of process Solution evaluation Definition of attainable KPIs	Support to the development of the proposal (in particular technical section) Provision of specialised facilities
Collaboration opportunity	Integration of knowledge and competences/ Economies of scale/ Systematisation of communication strategies	Fill in sectoral gaps	Provide a wider range of possible solutions	Fill-in competence gaps Improve service delivery capacity
Application of collaboration	Common communication activities Sharing of experts to take part in communication events	Exchange of knowledge repository/ knowledge sharing	Sharing of innovation ecosystems	Sharing of technical knowledge on innovative solutions Sharing of knowledge and experience on innovation procurement Facility sharing
Expected outcomes	Greater number of PAs engaged in the network.	Better focus of the client's need via a wider network	Find more adequate solutions for the project	Submission of the procurement proposal for the identified solution Enhanced service provision

The journey of the Region of Wonderland

	Contact	Co-definition	Validation & Dissemination	Delivery	Monitoring of take up
Activities	The region directly contacts the hub as it already collaborates with it and it is part of its board	Definition of the objectives, awareness target, timing	Contents and trainer validation Dissemination	Participation in the awareness activities	Evaluate the impact of the awareness programme on the target
Motivations	The DIH is expected to offer awareness activities on AI	Investigate together with the DIH the possible awareness solutions	Validate the proposed awareness programme and inform the target	Improve the digital and AI awareness of the target through specific events	Assess the efficiency of the awareness programme and its sustainability
Love points	The DIH has experience in awareness activities with PA	Experience on a range of sectors that could be interesting for the Region and the audience	Definition of interesting programme focused on the audience	The DIH runs the programme efficiently. Trainer with adequate technical and soft skills and knowledge of the audience needs	Identification of relevant monitoring indicators that can be easily verified
Pain points	Hub not perceived as a qualified entity	Unrealistic objectives/timing Failure in the identification of the training target	Failure in the identification of the relevant contents and in the roll out of digital assessments	Insufficient facilities and resources Low rate of participation.	Failure in the identification of the right KPIs
Service offered by the DIH	N/A	Development of training proposal	In-depth definition of the campaign contents based on digital assessment	Delivery of the awareness programme Innovation spaces	Assessment of the impact of the programme based on KPIs, such as application volume to follow up technical training programmes offered by local Universities.
Collaboration opportunity	Improving the reputation of the hub to attract the PA	Widen topics for training	Enhance the programme	Enhancing the possibilities to effectively deliver the awreness programme	Improving the quality of the assessment
Application of collaboration	Sharing of relevant lessons learned, co-drafting of reports and studies.	Knowledge sharing	Share of experts Share of materials and best practices *Ad-hoc* training for trainers	Exchange programmes (both for trainers and trainees) Sharing of experiences and best practices	Share of lessons learned
Expected outcomes	Improved client attraction and retention	Meet the need for training on specific areas	Improve quality of the programme contents, enhance trainers	Increase the programme participation and success rate	Effective monitoring of the take up of acquired awareness on AI opportunities

European Commission

Digititising European Industry Initiative