Roundtable on Digitising European Industry

Working Group 1

Digital Innovation Hubs: Mainstreaming Digital Innovation Across All Sectors

Final version

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Executive Summary

Digital Innovation Hubs within the DEI

DEI Working Group 1 focuses on Digital Innovation Hubs (DIHs) as a means of supporting businesses, and notably SMEs and non-tech industry, in their digital transformation under the Digitising European Industry (DEI) initiative. It brings together stakeholders with interests in running and operating Digital Innovation Hubs as well as potential beneficiaries in industry.

To date, the WG1 has held two meetings in Brussels, together with a series of phone conferences. A further meeting was organised within the context of the DEI Stakeholder Forum in Essen. The discussion at these workshops has focused on four key issues:

- What are the needs of industry with respect to digital transformation?
- What are the characteristics of a Digital Innovation Hub?
- How to develop a network of Digital Innovation Hubs in Europe that reflects these needs?
- Which investments are necessary to successfully build the network of DIHs?

The WG1 meetings have also showcased a number of ongoing initiatives and projects at EU and national level and facilitated networking between practitioners 'on the ground'.

The DEI Strategy aims to ensure that any business in Europe should have access to a Digital Innovation Hub at 'a working distance' (i.e. within a form and location convenient for their day-to-day business). Hubs should also play a key role in assessing skills needs and in skills delivery, and foster synergies between digital and other key enabling technologies.

What is a Digital Innovation Hub?

A Digital Innovation Hub (DIH) is a support facility that helps companies to become more competitive by improving their business/production processes as well as products and services by means of digital technology. DIHs act as a one-stop-shop, serving companies within their local region and beyond to digitalise their business. They help customers address their challenges in a business-focused way and with a common service model, offering services that would not be readily accessible elsewhere.

The services available through a DIH enable any business to access the latest knowledge, expertise and technology for testing and experimenting with digital innovations relevant to its products, processes or business models. DIHs also provide connections with investors, facilitate access to financing for digital transformations, help connect users and suppliers of digital innovations across the value chain, and foster synergies between digital and other key enabling technologies (such as biotech, advanced materials, etc.).

The Digital Innovation Hub Model

Digital Innovation Hubs as Tools for Digital Transformation

Digital Innovation Hubs hold significant potential to support and assist SMEs and start-ups and could become key actors in bringing digitisation within the reach of all industry sectors. The WG1 community strongly supports the proposed European network of Digital Innovation Hubs as a means of supporting businesses, and especially SMEs and non-technology intensive industry, in seizing the opportunities of digital transformation.

Key messages from the WG's discussions in terms of achieving this goal are:

- **Europe has a wealth of knowledge and experience in hub-type initiatives** on which to draw in implementing such a network. Solid examples are evident at European, national and regional levels and further instances are set to emerge as a result of policies designed to accelerate and give direction to digital transformation. At present, however, the available and emerging provision is not sufficiently visible either to industry or to other hubs and initiatives. Much greater transparency is required, so as to facilitate both access for companies and mutual learning between service providers.
- Digital Innovation Hubs must **cater for a wide spectrum of needs and as such will have multiple facets**. They must be agile and demand-led, and build sustainable innovation ecosystems, not just gateways to services. While there can be no one-fit-all approach, Hubs should be united by common values based on independence, a commitment to excellence and customer service, and a proactive, innovative approach.
- Digital Innovation Hubs should offer **a broad range of services accessible through multiple entry points**. Core services should include: awareness creation around the business potential of digital technologies; innovation scouting; visioning and strategy development; working with companies to assess their digital maturity and develop appropriate plans; brokering relationships with service providers; mentoring and training; and cost-effective access to specialist experimentation, testbeds and production facilities. The available services should complement rather than compete against existing public and private service offerings.
- **Digital Innovation Hubs have to pioneer a new and distinctive approach**. They must be evangelists for digitisation within their constituencies. They must be highly client-focused while having collaboration and networking as a defining characteristic. They must instil entrepreneurial thinking and embed a digital culture in companies while being firmly rooted in practical business solutions. They must have a strong physical presence while also operating effectively in the digital space. And they must have flexible business models that are able to adapt and evolve over time as circumstances and funding regimes change.

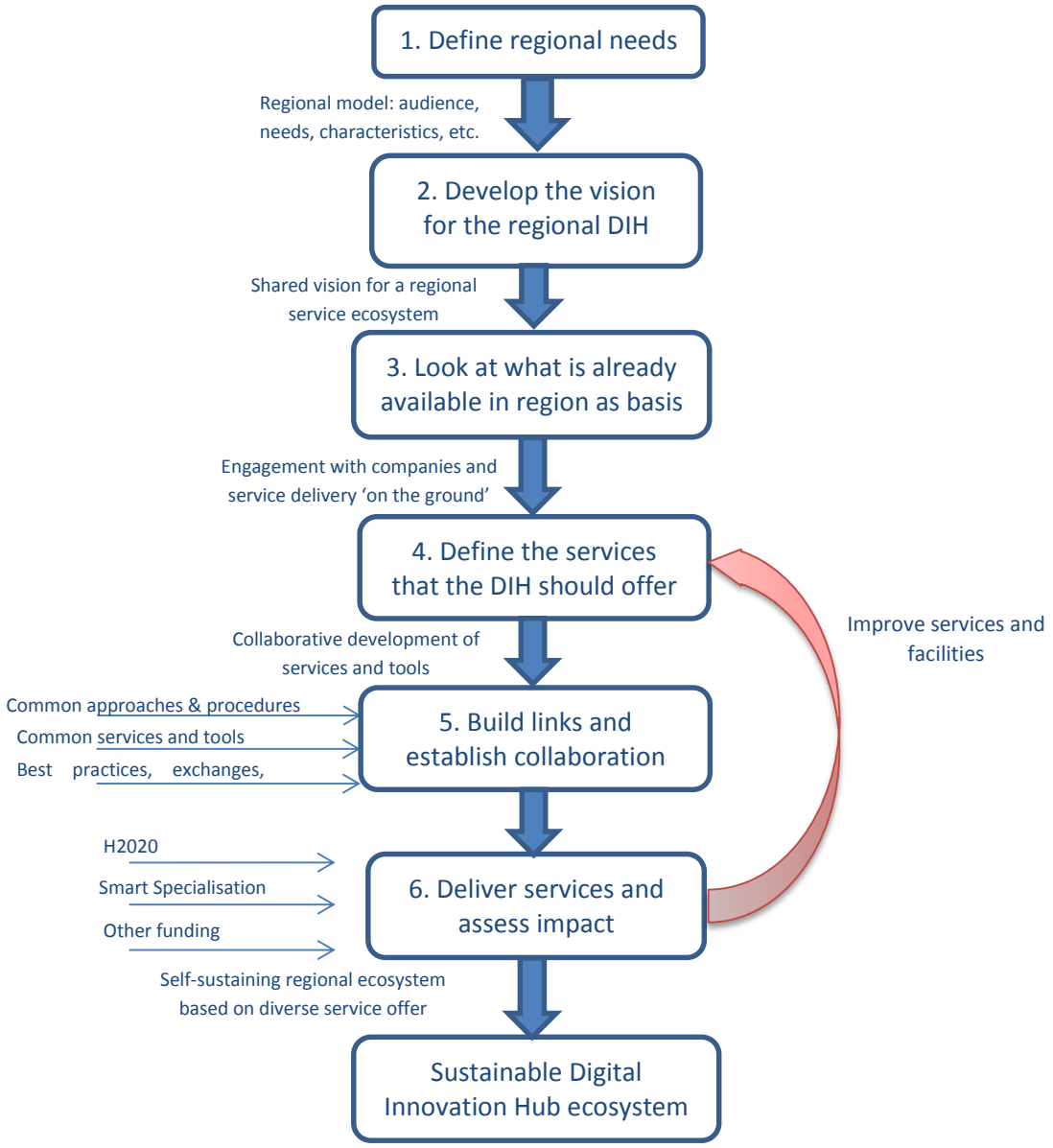
A Guide for Digital Innovation Hubs

Working Group 1 has developed a guide for operationalising Digital Innovation Hubs in Europe, offering 'a recipe' for any national or regional authority or innovation intermediary wishing to establish a DIH or expand an existing initiative. This is a five-step process based around:

1) Identifying **regional needs, characteristics and specialisms** and defining the model that best fits regional circumstances.
2) Developing **a vision for digital transformation** within the region and the role the Digital Innovation Hub will play, together with a viable business model.
3) Look at what is already available in the region as a basis for a Digital Innovation Hub
4) Define the services the hub should offer
5) **Building links with other Hubs** in order to access additional facilities, fill missing competences, and collaboratively develop new services and tools.
6) Start **engaging with companies and delivering services 'on the ground'**, using either dedicated funding or by bringing together existing initiatives or projects.

If followed and iterated over a period of time, this process should allow any region to establish on the long term a sustainable Digital Innovation Hub ecosystem.

A Guide for a Digital Innovation Hub



Activating the European Network

A Europe-wide network of Digital Innovation Hubs able to support any business at 'working distance' is an ambitious but thoroughly achievable goal.

- **Establishing and strengthening a European network of Digital Innovation Hubs** will require, among other measures: building consensus and a shared vision on how the network should operate and what it should achieve; building capacity and skills in both breadth and depth; building collaboration between digital and other high tech innovation hubs; and creating incentives for SMEs and others to engage with the network. A 'light touch' governance is foreseen with minimal central coordination. Recognition of hubs on the basis of recognition in the national/regional plans for the digitisation of industry and adherence to a lean and

flexible set of network guidelines are envisioned as the key elements of the quality assurance regime.

- **Mobilising the many investment tools and funding programmes available represents a major challenge.** The aim should be to create an 'investment triangle' between region-technology-funding, with the three elements being co-located. Specific attention is required on the roles of national/regional versus European funding, mechanisms for combining and scaling different funding sources, and investment approaches for regions with little or no existing infrastructure. In general, the approach should be **stay local where possible and go European where necessary**.

The Working Group 1 has identified eight priority actions necessary to take the initiative forward, listed below with the associated responsibilities. Certain actions are already underway or are planned, others require further elaboration:

	European Commission	Member States & regional authorities	Innovation intermediaries*	Industry
Rec 1: Develop the information base	⊙⊙⊙	⊙	⊙	⊙
Rec 2: Share experiences across MSs & regions	⊙⊙⊙	⊙⊙	⊙	⊙
Rec 3: Ensure high-level political support	⊙⊙⊙	⊙⊙		
Rec 4: Utilise H2020 funding		⊙⊙⊙	⊙⊙	⊙⊙
Rec 5: Launch pilot actions for collaboration and LSIs	⊙⊙	⊙⊙⊙	⊙⊙	⊙
Rec 6: Intensify outreach to regions		⊙⊙⊙	⊙⊙	⊙
Rec 7: Mobilise Member State investment		⊙⊙⊙	⊙⊙	⊙
Rec 8: Activate the European DIH network	⊙⊙	⊙⊙	⊙⊙⊙	⊙⊙

⊙⊙⊙ = Lead responsibility; ⊙⊙ = Major participant; ⊙ = Minor participant

* includes existing DIHs and CCs.

- **Recommendation 1: Develop the information base**: Continue to improve and grow the information base on and for DIHs beyond the initial Catalogue of Digital Innovation Hubs and plan for its evolution into a Central Information Portal for the whole European DIH network as well as for other hubs and technology centres.
- **Recommendation 2: Share experiences across Member States and regions**: Network stakeholders across Member States and regions, building on the WG1 and the annual DEI Stakeholder Forum.
  - Further dedicated events intended to publicise and promote the DIH concept should be organised, including in regions with current gaps.
  - An Annual Conference of DIH Practitioners should be held, possibly alongside or within the annual DEI Stakeholder Forum.

- **Recommendation 3: Ensure high-level political support within Member States and regions** for DIH investments through the DEI Roundtables, the Smart Specialisation Platform and other policy forums.
- **Recommendation 4: Utilise H2020 investments to enhance EU added value**. Horizon 2020 (together with COSME) will be a powerful catalyst in seeding and growing the DIH ecosystem. EU funds should be used to network EU, national and regional infrastructures; facilitate converge of EU-schemes under the DEI and broad innovation umbrella; promote trans-national experiments; make DIH business models more sustainable; and pool resources across programmes. By focusing on actions that enhance EU added value, H2020 (with contributions also from other EU programmes) will become the linking pin in the DIH and other high-tech hub initiatives.
- **Recommendation 5: Launch pilot actions aimed at developing synergies and building larger initiatives**. These pilot actions should be varied in their scope and intent, aiming to demonstrate mechanisms for: upgrading existing competence centres to Digital Innovation Hubs; facilitating knowledge transfer within the DIH network; combining different funding sources within scalable projects; creating synergies with hubs active in other advanced technologies; and federating existing projects funded by different agencies into larger initiatives.
- **Recommendation 6: Intensify outreach to regions with few DIHs**. Partnering/sponsorship programmes should be established, where regions work with others with successful Hubs to understand what they are and the benefits they can bring. New Hubs would draw on guidance and support from these other regions and might even set up formal relationships (i.e. become satellite hubs). Regions could use ESIF, EFSI or other sources of funding to set up DIHs and to generally foster collaboration between Hubs.
- **Recommendation 7: Mobilise investment by the Member States**. Continuing investment at national and regional level will be essential to realising a truly pan-European DIH network. As well as developing digitisation policies and providing investment for Digital Innovation Hubs, national and regional authorities must stimulate and animate their own local ecosystems and foster synergies with other enabling technologies. This should include, for example, showcasing how DIHs may be setup and run; engaging local/regional hubs and competence centres in the DIH concept; showcasing how European funding could be used to create DIHs; updating Digital Growth Plans and operational programmes to make support for Digital Innovation Hubs more explicit; and generally creating space for bottom-up initiatives by sharing strategic objectives, overall financing and foreseen timing.
- **Recommendation 8: Activate the European network of Digital Innovation Hubs**. Building on the solid foundations established through Working Group 1, European stakeholders should take immediate action to operationalise individual DIHs and start down the path towards a European network. This should include concerted effort in relation to: hub business models; common systems, methods and tools; and collaboration and governance structures. The hub business model should also look into incentives for collaboration among digital innovation hubs. How can hubs support companies coming from other regions or countries if they have the best expertise to help this company?

The message from industry is that speed is of the essence: the benefits for the European economy and society from digitisation are huge and our international competitors are already setting their own course. **Europe must act now to make Digital Innovation Hubs a reality**.

Next steps

The working group has developed together a set of recommendations for the development of a network of Digital Innovation Hubs in Europe. Now it is time that each member state, and in particular the responsibles for the digitisation of industry, reflects upon these recommendations and assesses whether their current offer of Digital Innovation Hubs is adequately addressing the needs of the industry they want to support. For that purpose, the European Commission has prepared a set of presentations for each member state, presenting information available in Commission databases about the country which could be useful to make decisions about Digital Innovation Hubs, see Section 6.4.

Every country is asked to reflect whether it offers sufficient opportunities for its industry to digitise, or whether more support is desirable. The following questions could guide this reflection:

- Is your current offer of Digital Innovation Hubs and the services they offer sufficiently targeted towards the industry you would like to support?
- Are your Digital Innovation Hubs clearly identified in your national/regional digitisation of industry plans, e.g. through a DIH implementation plan?
- How do you plan to develop further the network of Digital Innovation Hubs in your country?
- Which investments do you envisage in the next 5 years on Digital Innovation Hubs?
- Does your digitisation initiative reflect these investments?

In order to coordinate and network all digital innovation hubs the working group asks all countries to share these plans with the European Commission. They will ensure that all hubs supported by the member states will become part of the catalogue of hubs and they will also make an analysis as a basis for further networking of the hubs.

During the next high level meeting of the European digitisation of industry initiatives the DIH implementation plans may be the basis for a discussion on which issues still need further discussion in the working group. These could be:

- How to network the Digital Innovation Hubs. What could be possible business models for DIHs to offer support to companies outside their territory?
- What are the roles Digital Innovation Hubs can play to de-risk investments? Is there a need for a new investment fund at European level to facilitate the necessary investments (loans, equity, etc) to support European companies in their digital transformation?
- How can Digital Innovation Hubs address training and skills development?

1. Introduction

1.1 Background to DEI Working Group 1

Digital technologies are dramatically changing the way we design, produce and commercialise all types of goods and services. They will shape the markets of the future. To reap the potential of digital technologies across the European economy, industry in all sectors and everywhere in Europe needs to integrate digital innovations as an essential part of value creation in their business strategies.

Digitisation offers impressive new opportunities to strengthen the position of European industry. According to reports by PwC[1] and Boston Consulting Group[2], digitisation of industry would offer benefits that could generate for industry in Europe additional annual revenue of €110 billion. As opportunities of digitisation are recognized around the world, triggering a corresponding level of investments across the globe, digitisation can be either an opportunity or a threat, depending on the timeliness and the adequacy of one's response to it.

Against this background, the Digitising European Industry (DEI) initiative aims to ensure that any industry in Europe, large or small, wherever situated and in any sector can fully benefit from digital innovations to upgrade its products, improve its processes and adapt its business models to the digital age. This requires not only a dynamic digital sector in Europe but also the realisation of full access to digital innovations across all industrial sectors. This policy is set out in detail in a Communication adopted in April 2016.[3] The DEI initiative aims towards:

- Coordination of initiatives for digitising industry;
- Co-investing in Europe's digital innovation capacities;
- Providing the appropriate regulatory framework conditions;
- Providing human capital with the necessary skills for the digital transformation.

The DEI initiative requires ambitious collective effort involving public and private stakeholders across Europe at regional, national and EU level. A key element of the DEI is Digital Innovation Hubs (DIHs), which aims at supporting businesses, and notably SMEs and non-tech industry, in their digital transformation. The implementation of the DEI initiative is being supported by a Roundtable of High-Level Representatives of Member States' initiatives, industry leaders and social partners, which meets twice a year. The first Roundtable was held on 20 September 2016 in Brussels.

To support its work the Roundtable has set up two Working Groups (WGs) in order to make progress on aspects of the implementation of the DEI Action Plan. The focus of the two WGs is as follows:

- Working Group 1: Mainstreaming digital innovations across all sectors;
- Working Group 2: Strengthening leadership in digital technologies and in digital industrial platforms across value chains in all sectors of the economy.

Each WG has been asked to produce a report supporting the implementation of specific DEI actions. The WGs will perform fact finding, collect best practices and formulate recommendations, e.g. on policy matters and mobilisation and leveraging of investments, addressed to the High-Level Representatives attending the Roundtables. This report concerns the results of WG1.

[1] *Opportunities and Challenges of the Industrial Internet*, PwC (2015)
[2] *The Future of Productivity and Growth in Manufacturing Industries*, Boston Consulting Group (2015)
[3] Digitising European Industry (DEI): Reaping the full benefits of a Digital Single Market. Communication (COM(2016)/180)

1.2 Mandate of Working Group 1

The Roundtable has issued the Working Group 1: Mainstreaming Digital Innovation Across All Sectors with the following mandate:

- Describe current approaches and best practices and **elaborate in more detail the Digital Innovation Hub approach** and the plans for their further development.
- Reflect on how **Member States, regions and the private sector could fund the expansion of Digital Innovation Hubs** from sources such as the ESIF[4], EFSI, or other national and regional funds, mobilising at least €5bn from different financial sources.
- Reflect on how to best support the **proposed mapping of Digital Innovation Hubs in Europe**.
- Reflect on how to foster synergies and collaboration **between DIH and relevant competence centres**, such as KETs Technology Centres/Pilot Lines.
- Reflect on how **the objectives of Smart Specialisation and the Digital Innovation Hubs schemes** put forward in H2020, such as I4MS, could be mutually reinforcing, and in particular to reach out to less developed regions.
- Advise on specific actions needed to **mobilise all levels of policy and decision makers**, including investment by the private sector and connecting to the investment community.
- Identify areas where **wider use of public procurement of innovations** would support the further development and scaling up of digital technologies.

The WG was tasked to develop a report on approaches, best practices and plans for the roll-out of Digital Innovation Hubs according to the following schedule:

- A first draft of the report before the end of December 2016;
- Revised draft for the DEI Stakeholder Forum (end of January 2017);
- Final version for Hannover Fair, April 2017.

1.3 Methodology

WG1 held a first meeting in Brussels on 20 October 2016. Around 80 representatives from industry (including SMEs), Member States, regions, and social partners attended and addressed a series of questions related to the above mandate. The meeting included a series of scene-setter presentations and more focused discussions and exchanges within smaller discussion groups.

This first meeting focused on three key issues, each of which was broken down into a series of sub-questions:

- What are the needs of industry with respect to digital transformation?
- How to develop a network of Digital Innovation Hubs in Europe that reflects these needs?
- Which investments are necessary to successfully build the network of DIHs?

Following this meeting four phone conferences were held that explored specific topics in greater depth, namely: industry needs, investing in digital innovation hubs and networking digital innovation hubs. The discussions were recorded using the Groupmaps tool.

Building on the results of the first workshop and the phone conferences, a second meeting was held on 9 December 2016, also in Brussels.[5] The discussion there further elaborated on the characteristics of a digital innovation hub and showcased a number of ongoing initiatives and

[4] This includes for example the development of the required high-level master plan for Digital Innovation Hubs supported bottom-up through the ESIF programme (Structural Funds).

[5] Report available at https://ec.europa.eu/futurium/en/node/1750. Presentations available at: https://ec.europa.eu/futurium/en/content/dei-wg1-presentations-workshop-9-december-2016

projects at EU and national level. A further meeting was organised within the context of the DEI Stakeholder Forum in Essen on 1 February 2017, involving the wider stakeholder community.[6]

This report presents the final synthesis of WG1's activities. Section 2 summarises the digitisation challenge facing industry in Europe and the benefits to be gained from wide-scale digitisation. Section 3 describes how Digital Innovation Hubs address this challenge; setting out their positioning in relation to existing competence centres, as well as the DIH value proposition, service offering and operating characteristics. Section 4 sets out a practical guide for any national or regional authority wishing to set-up a Digital Innovation Hub or expand an existing initiative. Section 5 describes the key challenges in establishing an effective network of such hubs at European scale and specifies a series of targeted recommendations to realise such a network. Section 6 outlines the next steps for activating the European network of Digital Innovation Hubs. Annex 1 briefly reviews existing initiatives and policies being pursued at European, national and regional level, as well as by industry itself, and Annex 2 presents some further best practice examples.

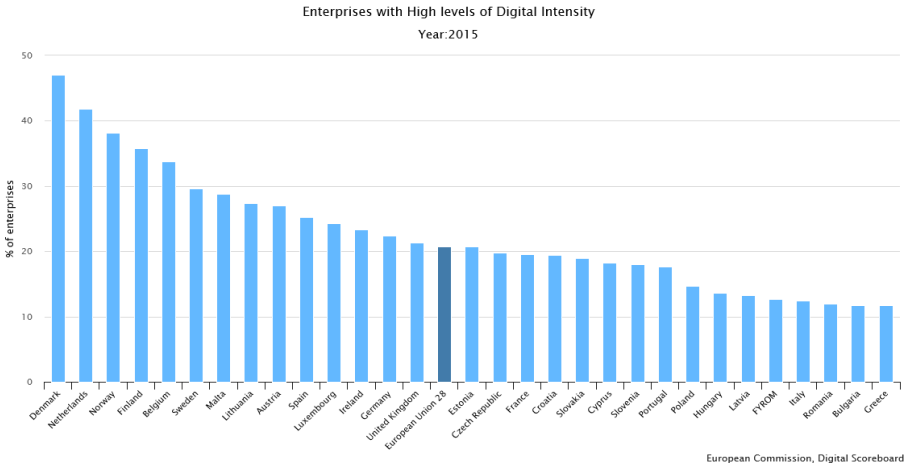
2. The Digitisation Challenge

2.1 Status of Digitisation in Europe

The use of digital technologies in industry varies across sectors and Member States, particularly between high-tech areas such as aerospace and more traditional areas such as construction. There are also significant disparities between large companies with the capacity to invest in innovations and SMEs that struggle to keep pace with fast technological development. With many countries lagging behind in the creation of favourable conditions for digital entrepreneurship, the progress among Member States also reveals a scattered picture.

The Digital Intensity Index (DII) is a micro-based index that measures the availability to firms of twelve digital technologies.[7] Only in five EU countries is the percentage of firms with a very high DII (i.e. possessing at least 10 out of the 12 monitored digital technologies) above 5%: DK, NL, FI, BE and LT. In the first four countries at least one third of firms also have a high or very high DII (i.e. firms have at least 7 out of the 12 monitored digital technologies). At the end of the tail (IT, RO, BG and EL), less than one firm out of eight has invested heavily in digital technologies (i.e. has a high DII).

Figure 1: Share of Enterprises with High Levels of Digital Intensity, by Country

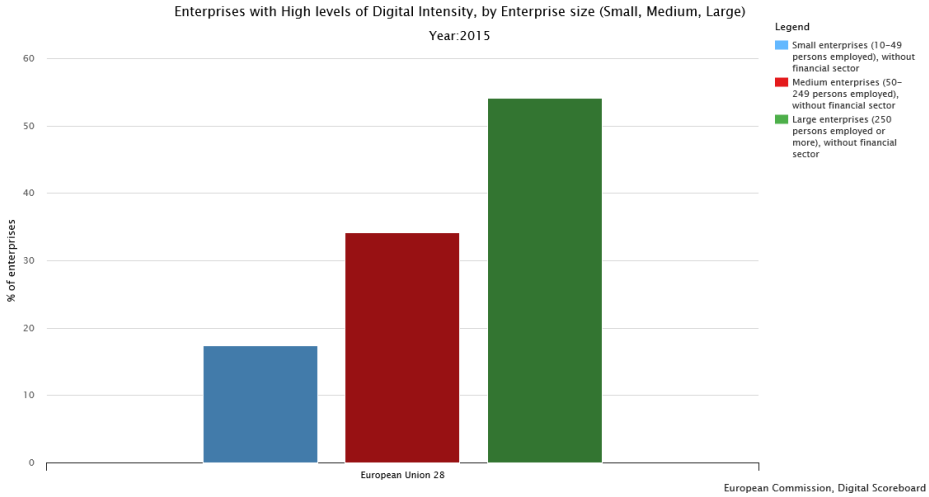


[6] Presentations available at https://ec.europa.eu/futurium/en/content/stakeholder-forum-essen-presentations-workshops

[7] For the Digital Intensity Index see the Digital Economy & Society Index (DESI). http://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

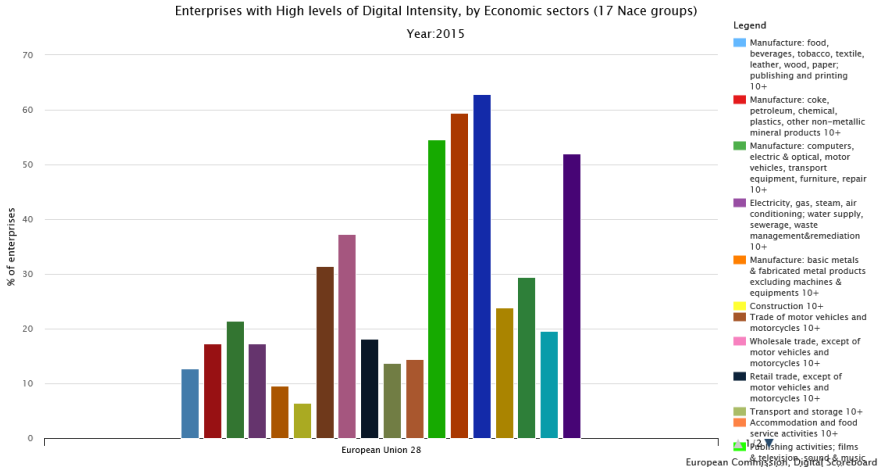
Looking at the breakdown per type of company, we see that 54% of large enterprises are highly digitised (i.e. use more than seven of the digital technologies mentioned above), whereas this is the case for only 17% of small enterprises.

Figure 2: Share of Enterprises with High Levels of Digital Intensity, by Size



The breakdown per sector shows that the most digitised sectors are computer programming, consultancy and related activities (63%), telecommunications (59%), and publishing (54%), whereas the least digitised sectors are construction (4%), basic metal manufacturing (9%), and food manufacturing (13%).

Figure 3: Share of Enterprises with High Levels of Digital Intensity, by Sector



In surveys, close to two-thirds of managers in industry say they:

- have difficulties in assessing the Return on Investment in digital innovations;
- have problems with trusting the technology;
- are not sure about the maturity of the latest technologies (Big Data, AI, robotics, …);
- are not clear about compatibility/interoperability with legacy systems;
- are afraid of being locked in with one vendor.

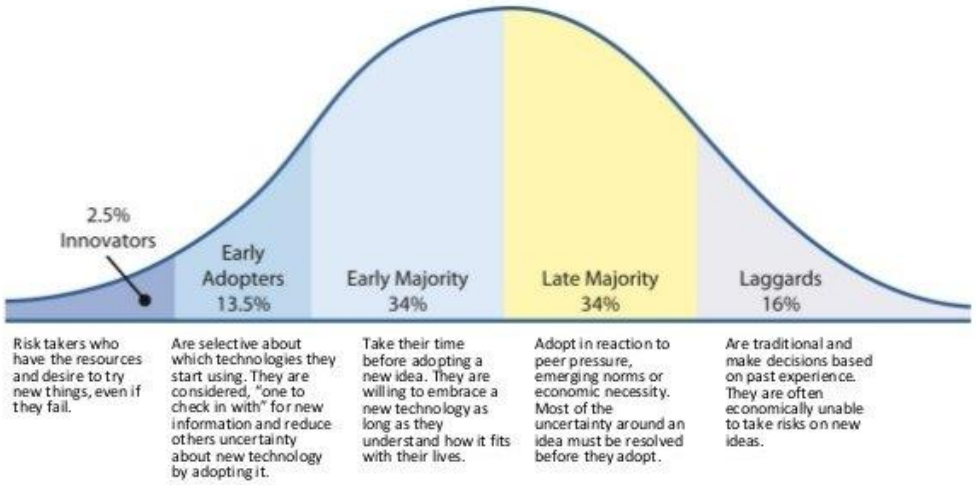
For SMEs, the proportion is even higher. Thus, there is a clear need from industry not just for information but also to be able to assess and understand the practical implications of digital innovation, and then to test and experiment before implementing it.

With economies in Europe ever more closely connected and industry building ever stronger cross-border value chains, the digitisation of industry needs to be comprehensive all across Europe. We have to do more, therefore, to focus efforts on helping those regions and economic sectors that have yet to fully engage with the digitisation agenda.

2.2 Meeting Industry Needs

Digitisation is essentially an innovation issue and companies will approach it with the usual wide variety of attitudes, approaches and expectations encountered in managing innovation. These range from 'early adopters' keen to climb the technology ladder, to the 'early majority' and 'late majority' who wait for teething troubles to be ironed out before adopting an innovation, to 'laggards' who may need some convincing about the benefits of new digital technology (see diagram). Thus, the client base spans a wide spectrum, from the digitally 'mature' to 'immature'. Services will need to be equally broad and accessible to companies through **multiple entry points**.

Figure 4: Technology Adoption Lifecycle[8]



More specifically, in digital enterprises and SMEs are seeking:

- Process optimisation based on ICT leading to more efficiency;
- Improvement and development of ICT-based products, services and business models leading to more innovation

However, ICT is changing so fast and there are so many different technologies available that companies do not know what is the best choice for investments. They are therefore seeking 'honest brokers', able to facilitate exchange of information help them to make a decision in a trusted way. . Companies need help in building the business case for their digital transformation, covering the production processes and the commercial processes, which is best achieved by having the opportunity to engage in pilots and testing activities of the new digital technologies within their own daily business operation.

All of this support has to be communicated in a language that SMEs understand; for example, in terms of solutions that increase profitability, competitiveness or customer satisfaction rather than hard technologies. Abstract terms such as 'Industry 4.0' or 'digital transformation' are likely to be especially unattractive.

[8] Based on work by Joe M. Bohen, George M. Beal and Everett M. Rogers, Iowa State University. The area under the curve represents the size of the customer group affected.

2.3 Closing the Digital Skills Gap

Digitisation brings an associated need for upskilling of the workforce across the new digital economy. The situation in Europe is critical in this respect and is the subject of numerous reports and studies. Some headline figures serve to illustrate the point:[9]

- 37% of the EU workforce has insufficient digital skills; 13% have no digital skills at all;
- Employment of ICT specialists has grown by 2.9 million in the EU over the last 10 years;
- 40% of enterprises trying to recruit ICT professionals have difficulty doing so;
- The number of ICT vacancies in the EU is predicted to rise from 337k in 2015 to 756k by 2020. Such an increase is a clear sign of market failure.

The New Skills Agenda for Europe aims to address the digital skills gap.[10] Adopted in June 2016, it foresees digital skills in all actions, in particular under:

- A Skills Guarantee to help low-skilled adults acquire a minimum level of literacy, numeracy and digital skills and progress towards an upper secondary qualification.
- The 'Blueprint for Sectoral Cooperation on Skills' to improve skills intelligence and address skills shortages in specific economic sectors.

Building on the achievements of the Grand Coalition for Digital Jobs, the Digital Skills and Jobs Coalition will build multi-stakeholder partnerships (spanning education, business, social partners, Member States) to tackle the digital skills challenge with concrete actions.

Digital Innovation Hubs should play a strategic role in assessing skills needs and in skills delivery, ensuring that there is seamless access within and across the DIHs to relevant education and training offers and providers. The DIHs can link local and regional training providers, and also connect with other DIHs in brokering and channelling training offers and capacity-building across different industrial sectors in Europe. Furthermore, the same technologies that drive the digitisation of industry (e.g. artificial intelligence, data analytics, AR/VR simulation, robotics) can be used to build digital solutions for up-skilling and re-skilling of the workforce, either through online training courses or on-the-job training. Access to digital training solutions will be especially important for SMEs.

2.4 Taking Stock: Existing Initiatives and Policies

Many initiatives and policies relevant to the proposed Digital Innovation Hubs exist at regional, national and European levels and span the public and private sectors.

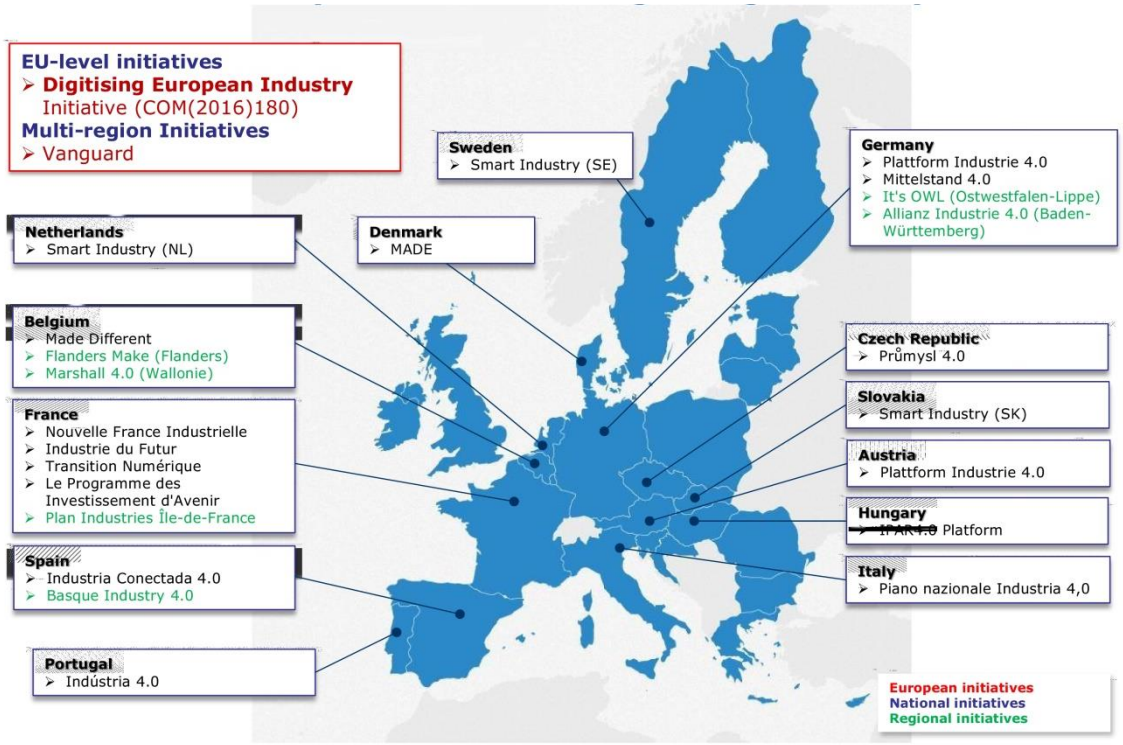
- **At European level**, these include Digital Innovation Hubs within Horizon 2020, where around €500m is programmed over the period 2016-20, including initiatives such as I4MS and SAE. Other activities include incubators being set up under the Big Data PPP, pilot lines in nanotechnology and advanced materials under the NMBP[11] work programme, and a network of technology centres providing services to SMEs in advanced manufacturing for clean production under the INNOSUP work programme[12].

- **At national level**, several EU Member States have launched initiatives relating to digital transformation of industry, some with a policy focus, others concerned more with research and innovation. Around ten policy-level initiatives or platforms are already active and more are planned. Examples include Mittelstand-Digital Competence Centres in Germany, the

[9] Digital Economy and Society Index (DESI), https://ec.europa.eu/digital-single-market/en/desi and European Digital Progress Report 2016, https://ec.europa.eu/digital-single-market/en/european-digital-progress-report
[10] http://ec.europa.eu/social/main.jsp?catId=1223
[11] Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing
[12] INNOSUP-03-2017

High Value Manufacturing Catapult in the UK, and Fieldlabs in the Netherlands.[13] Most EU countries are likely to develop a national strategy within the next few years. In certain countries, regional initiatives have also been launched.

Figure 5: National Policy Initiatives for Digitisation of Industry, 2016



- **Related policies** are emerging to accompany, to accelerate and to give direction to digital transformation. They enable new capacities and new connections to be built so as to adopt key enabling technologies for creating value, and could make a significant contribution to establishing a network of Digital Innovation Hubs all over Europe. These policies include: the Regions and Cities of Digital Transformation initiative[14]; the thematic Smart Specialisation Platform for Industrial Modernisation (SSP-IM); A catalogue of competence centres in Key Enabling Technologies[15]; a pan-European advanced manufacturing support centre assisting SMEs to transform their organisation towards a factory of the future and setting up learning networks of factory of the future companies[16]; the EIT's Knowledge and Innovation Communities; and the Digital Transformation Monitor (DTM) and KETs Observatory initiative.

These key activities are described further in Annex 1 although this is by no means an exhaustive list.

Industry needs to be better informed about the availability of these existing initiatives and policies, and what they offer in order to make best use of them. As yet, however, there is no comprehensive listing of what is happening 'on the ground', especially outside of European

[13] Current and planned initiatives are listed, with live web links, at the Futurium website, http://ec.europa.eu/futurium/en/content/digitising-european-industry-catalogue-initiatives.
[14] http://ec.europa.eu/growth/industry/digital-transformation/role-cities-regions_en
[15] https://ec.europa.eu/growth/tools-databases/kets-tools/kets-tc/map
[16] COSME Work Programme 2017 - Action GRO/SME/17/C/06 - Action 3 - Access for SMEs to advanced manufacturing support (http://ec.europa.eu/DocsRoom/documents/21624) and follow-up action under Horizon 2020

initiatives.[17] The recently-launched Catalogue of Digital Innovation Hubs aims to provide this more comprehensive picture (see Section 5.1).

2.5 Mainstreaming Digital Innovation

For Europe to remain competitive it must move faster and more decisively to digitise its industry. Digital innovations must be embedded in and embraced by companies of all types, sizes and capabilities, and across all industry sectors and regions of Europe. This has to be done sensitively, in a way that addresses the many and varying needs of businesses across the innovation spectrum. Access to highly skilled workers, including through up-skilling and re-skilling of the existing workforce, will be key. And much more has to be done to capitalise on the many existing digitisation initiatives already underway at regional, national and European levels, including within industry.

The challenge in knitting together all these different elements is huge. To bring digitisation into the mainstream, such that it is within the day-to-day reach of companies everywhere and at any time, calls for new tools and approaches.

Under the DEI, it is proposed to make the latest digital technologies available for all industry anywhere in Europe through networks of Digital Innovation Hubs.

3. Digital Innovation Hubs: A Key Agent for Mainstreaming Digital Innovation

3.1 What is a Digital Innovation Hub?

A Digital Innovation Hub (DIH) is a support facility that helps companies to become more competitive by improving their business/production processes as well as products and services by means of digital technology. DIHs **act as a one-stop-shop**, serving companies **within their local region and beyond** to digitalise their business. They **help customers address their challenges** in a business-focused way and **with a common service model**, offering services that would not be readily accessible elsewhere.

The services available through a DIH enable any business to **access the latest knowledge, expertise and technology**[18] for testing and experimenting with digital innovations relevant to its products, processes or business models. DIHs **provide connections** with investors, facilitate access to financing for digital transformations, and help connect users and suppliers of digital innovations across the value chain. They also **foster synergies** between digital and other key enabling technologies (such as biotech, nanotechnologies, and advanced materials). These services are of particular relevance to **companies which currently have a relatively low level of digitisation** and which do not have the resources or personnel to address the digitisation challenge.

Under the DEI initiative, **the goal is to ensure that any business in Europe has access to a Digital Innovation Hub at 'a working distance'** (i.e. within a form and location convenient for their day-to-day business). The services provided should be available to firms in any industry sector, with a specific focus on SMEs, mid-caps and low-tech companies.

[17] The Commission background paper *Stock taking on initiatives supporting the development of Digital Innovation Hubs: Lessons learned from EU and national actions* provides an initial mapping.

[18] Key technologies driving the digitisation agenda, to which DIHs may provide access, include: robotics, photonics, high performance computing (HPC), data analysis, simulation, Internet of Things, cyber-physical systems, and cybersecurity.

Apart from a focus on technologies, a DIH may focus as well on certain sectors, for instance on agriculture, textiles, or construction. Proximity between DIHs and companies is an important factor and the first point of contact for companies will often be a DIH in the same region.

Figure 6: The Digital Innovation Hub Model[19]

As **an innovation ecosystem** that provides access to the services, facilities and expertise of a wide range of partners, Digital Innovation Hubs ensure that individual customers get the services they need; that the target market segments receive innovative, scalable solutions; and that DIHs co-operate effectively with each other.

3.2 Defining the Value Proposition

3.2.1 What is different about DIHs?

Initiatives with certain of these features are already evident in many parts of Europe and across various sectors.

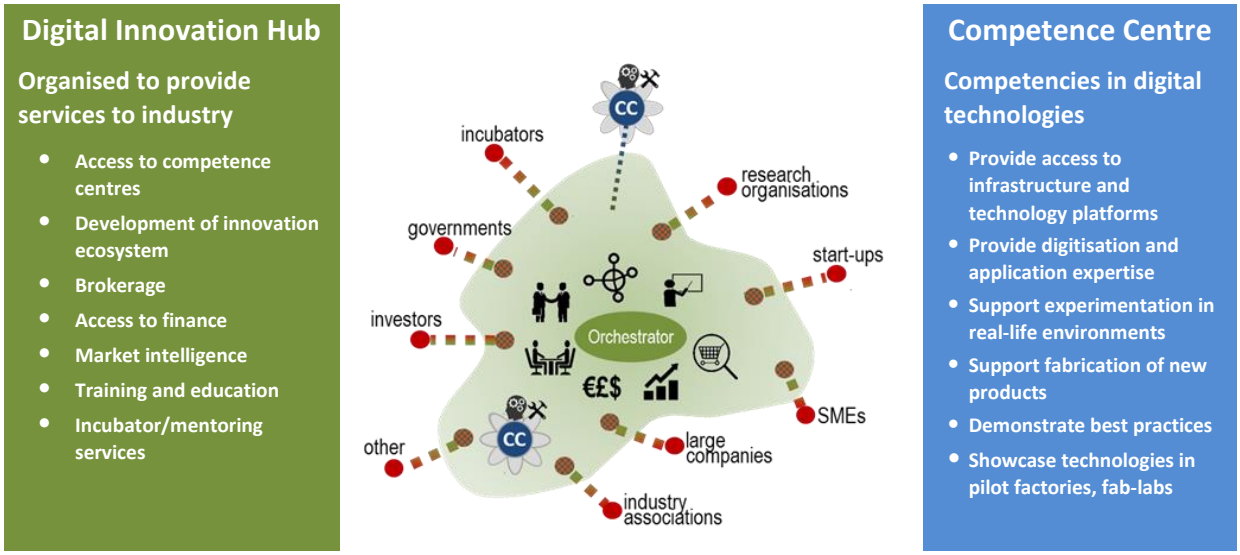
- Universities and research and technology centers (RTOs) (generally referred to as 'competence centres' (CCs) or 'centres of competence' (CoCs)) are already providing their expertise and access to advanced facilities to industry.
- Private companies (large and small) have useful products and services for the digitisation of processes, products and services.
- Incubators and accelerators help start-up companies to grow and scale.
- Cluster organisations, industry associations representing individual companies are also playing an important role with respect to innovation of a sector. Investors are providing access to finance already.
- Local authorities are aware about the importance of innovation and are developing their smart specialisation plans.

What is new and different about DIHs is that they will bring all these actors together in a region and develop a coherent and coordinated set of services that are needed to help those companies (especially small companies or enterprises from low tech sectors) that have difficulties with their digitisation through a one-stop-shop. The holistic view of **digitisation as a company-wide transformation process** enables companies not just to identify technical solutions but to finance and nurture the innovations to a level that they may actually be implemented within the business and contribute to improved competitiveness. Figure 7 shows how competence centers can collaborate with other innovation actors in a digital innovation hub to provide a holistic set of digital transformation services to industry.

[19] Diagram by Tapio Virkkunen, Ministry of Economic Affairs and Employment of Finland

Furthermore, every DIH will have its own specialisation, in line with the smart specialisation priorities of a region. Through the networking of DIHs, competences not available within the regional DIH may be found in another DIH. This mechanism will lead to specialisation and excellence, and will avoid that every region needs to invest in all competences necessary for the digital transformation.

Figure 7: Competence Centres as an Element of Digital Innovation Hubs



3.2.2 The added value of Digital Innovation Hubs

The value proposition for Digital Innovation Hubs should reflect industry needs. This amounts to more than simply a list of solutions and services: it goes to the heart of the Hubs' mission and how they operate.

The added value of Digital Innovation Hubs over existing initiatives and approaches may include one or more of the following:

- Acting as **a one-stop-shop** for companies and providing **a gateway** to specialist platforms and infrastructures.
- Possessing **significant know-how** spanning, for example, across technical disciplines and between technology and non-technology areas (e.g. business, finance, law, IPR).
- Ability to market themselves and **proactively identify relevant customers** for their services.
- Ability to **'speak the language' of SME businesses** and understand their needs.
- Understanding of **business models and business transformation** and being able to help companies transform.
- Ability to work with companies at **all levels of digital maturity**, including offering low-tech transfer to companies lower down the maturity curve.
- Ability to **broker** between the needs of industry and relevant technology providers in **an independent and unbiased way**.
- Ability to **assess current and future skills needs** and provide appropriate support.
- Providing **funding or facilitating access to funding** from external sources.

These aspects are reflected in the Hubs' service offer and operating characteristics as described below.

3.3 The Digital Innovation Hub Offer

3.3.1 The service portfolio

Digital Innovation Hubs have to translate this value proposition into a unique offer that addresses the specific needs of the companies they serve and does not replicate existing service provision.

In broad terms, the services available through Digital Innovation Hubs may be categorised under three pillars, with the services split as shown:[20]

- **Innovation activities**, concerned with identifying opportunities for digitisation, and developing and validating innovative solutions based on cutting-edge technology;
- **Business development**, concerned with helping companies to apply their solutions, assess the business implications, and manage the resultant changes; and
- **Skills creation**, concerned with building innovation capacity through enriching human capital.

Innovation Activities	Business Development	Skills Creation
• Awareness creation • Digital needs/maturity assessment • Innovation scouting • Access to specialist expertise • Access to platforms & infrastructure • Collaborative research	• Envisioning & strategy development • Matchmaking & brokering • Business coaching & mentoring • Start-up support • Access to finance	• Technical training & skills development • Business & finance training & skills development • Management training & skills development

More specifically, the principal services may be defined as follows:

1) **Awareness Creation around Digital Technologies**: Engage objectively and at large within the business community to create awareness of the opportunities and benefits of digitisation. This should go beyond simply disseminating information. **Hubs must be evangelists**, challenging companies to evaluate whether their current efforts really address global trends and threats. Only by focusing on the gap between where companies think they are and where they actually are can they start to formulate their true needs in a way that enables them to remain competitive.

2) **Innovation Scouting**: Actively searching for SMEs and midcaps that could benefit from digitisation, understanding their needs and showing them through success stories how they can digitise their processes, products or business models. Channels for this outreach should include innovation scouts who are trained in innovation management; trade fairs and exhibitions; and online channels, including social media.

3) **Digital Maturity Assessment**: Diagnosing a company's needs and readiness in relation to digital technologies, providing feedback on its level of maturity in relation to digital technologies, and identifying potential solutions.

[20] Model developed by EIT-KIC Trento

4) **Visioning and Strategy Development for Businesses**: Having identified a company's needs, work with the client to envision its digital future and develop a strategy for delivering this vision. DIHs would help to evolve companies' business models, ensuring they targeted the right combination of digital technologies, digital services, and other advanced technologies in their products. This may involve working with the client directly or directing them to further tailored help and advice within the Hub's ecosystem. In some cases it may be necessary to bring producers and end-users together to develop a common understanding.

5) **Brokering/matchmaking**: Having stimulated interest in digitisation, work with companies to understand their challenges, develop a solution and propose technology and service providers that could help to implement a solution. This could be achieved through direct contact and through physical events that bring stakeholders (e.g. digital IT SMEs, user SMEs, supply chains, investors, other regions) together to network, access information, share experiences, and/or tackle innovation-related problems. Large enterprises could play a key role here, especially by helping small companies within their own supply chains. Formats include roadshows, workshops, innovation camps, and hackathons.

6) **Access to Specialist Expertise and Infrastructure**: Support the technology providers and users to carry out experiments and to test whether the proposed approach would indeed be beneficial for the user. At the same time these experiments can be useful for the provider that has an early customer and can adapt the technology to the needs of a certain class of user. Learning from this experience and creating a best practice which will be disseminated further will be important. The support can be:
    - providing expertise;
    - providing technology building blocks on the basis of which the solution may be built;
    - providing manufacturing pilot lines to produce prototypes or first series production;
    - providing facilities that are needed for testing or providing a gateway to such facilities in other regions;
    - providing access to living labs that can validate new products/business models.

7) **Mentoring**: Once a successful experiment has been carried out, provide support on how to roll it out to the next level (start-up/scale-up expertise, business expertise, access to finance, incubator support services, internationalisation, marketing, market assessments, trend analysis, co-creation, value-chain creation, etc.).

8) **Training**: both technical and management, for the workforce to be able to deal efficiently with the newly digitised products, processes or business models (see below).

9) **Access to Funding and Investor Readiness Services:** Help for SMEs and start-ups to access regional, national and/or European funding to make use of new technologies (see below).

10) **Collaborative Research on Issues of Common Interest**. Although in general DIHs are not research organisations, in certain cases applied research and development may be justified in areas of common interest for the client companies. Depending on the local circumstances, the DIH could either undertake this research directly or act as the gateway to relevant expertise within universities or RTOs.

3.3.2 Characteristics of DIH activities

Key features of the service offer and the way Digital Innovation Hubs operate will include the following.

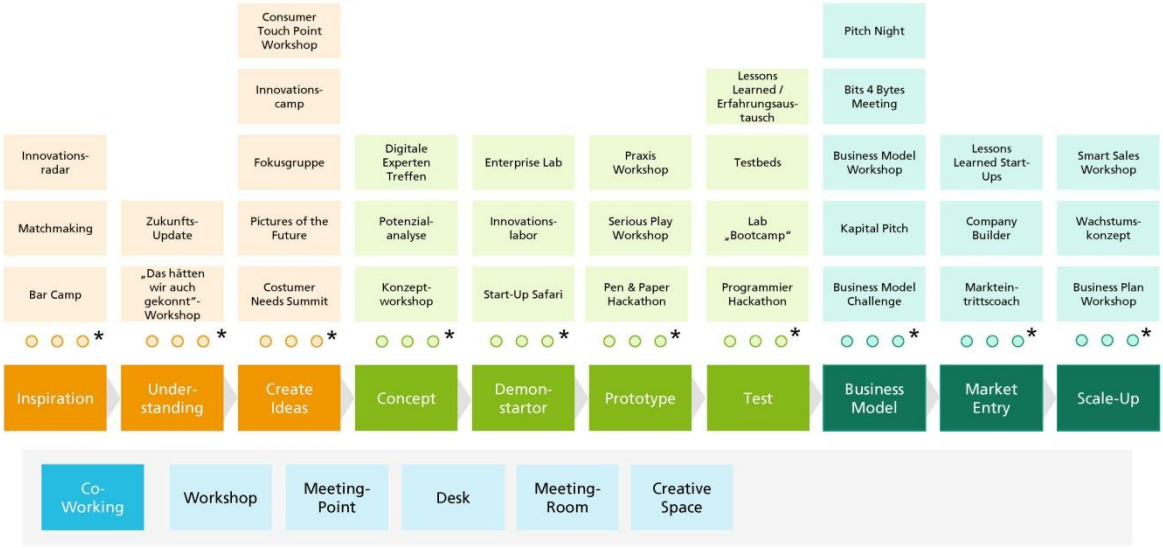
Complementing and bringing together existing service provision, building an ecosystem

A hub should build on already existing strengths in the region, therefore the collaboration with existing service providers (such as digital SMEs offering ICT and other services to non-tech SMEs, existing business support centres, RTOs and training centers, the Enterprise Europe Network[21]) will be key. Hubs must **pioneer a new and distinctive approach** so as not to replicate existing forms of support and advice, but to fill current gaps. They could have a particular role in **reaching out to companies that have yet to engage with the digital transformation agenda** and which are hard to reach.

Staged services offering companies a clear path towards digitisation

Every hub will have its own approach and categorisation of services. What matters is that they are delineated in such a way as to offer companies a clear progression as their needs change and evolve. Digital Hub Dortmund, for example, a digital hub supporting transformation in logistics, offers a portfolio of over thirty services and activities designed to address the full spectrum of needs encountered within its client base. These are arranged in ten groups, spanning from 'inspiration' through to 'scale-up' (see diagram). This illustrates how hubs will need to cater for a very broad range of service provision.

Figure 8: Service Portfolio at Digital Dortmund Hub 'Start-In Factory'



Courtesy of Digital Hub Logistics Agency, Dortmund

Digital Maturity Assessment as a core service

Assessing what stage a business has reached on its digitisation journey is likely to be one of the most important services offered by Digital Innovation Hubs. Such an assessment helps both the business and the Hub to understand the company's current position and to identify future options and needs.

Typically, this would involve either a survey undertaken by Hub experts or a self-help tool that the company could apply itself. The assessment would diagnose the company's needs and readiness in relation to digital technologies, provide feedback on the level of maturity, and direct the client to further tailored help and advice within the Hub's ecosystem. This could include referrals to recognised private sector suppliers (digital IT SMEs, consultancies, etc.). For example, Mittelstand 4.0-Kompetenzzentrum Dortmund utilises such an assessment to place companies at one of five stages within a maturity ladder, allowing it to match the business to available services accordingly.

[21] http://een.ec.europa.eu/

Figure 9: Mapping of Digital Maturity Level to DIH Services at Dortmund DIH

Courtesy of Mittelstand 4.0-Kompetenzzentrum Dortmund

Core focus on technology validation and demonstration

In terms of innovation level, the focal point for DIH services should be around TRLs 4-7, i.e. technology validated in a lab scenario through to system prototype demonstration in an operational environment. A focus on TRLs 8-9 may also be justified in some cases. Hubs will not generally address TRLs 1-3 – basic and applied research – except where there is a clear and unmet need from within the client base.

Easy and cost-effective access to specialist testing, pilot and experimentation facilities will play a central role in technology validation. Such facilities are often complex and expensive and no one hub will be able to afford to equip itself with all relevant testbeds. Hence, this is a key area for hub-to-hub collaboration, with hubs sharing and opening up their facilities to others within the network of digital and other innovation hubs. It might even extend to co-investment between hubs/regions in new facilities.

Training and skills will be essential in building capacity within businesses

Activities in relation to training and skills should cover the whole employment spectrum. Students should be introduced to the fundamentals of digitisation and its potential. Industry should communicate its vision about future needs and requirements to academia and collaborate in developing curricula, such as pan-European Masters courses. Junior employees should have opportunities to take digitally-based apprenticeships and employees at all levels should have access to courses to upgrade their competences. Managers, too, will need to hone their skills around economics, business models and change management. Means should be found to ensure continuous feedback from industry on training and skills needs.

A strong physical presence

Although concerned with promoting digital technologies and services, DIHs should not operate only in the online space. Many of their target clients are still 'analogue' and it will be essential not only that Hubs have a physical presence within the communities where these companies are situated, but also that they proactively 'scout' for businesses within those localities. There should be a named contact point for firms to speak to. DIHs should certainly have a strong online identity, but they must also be identifiable physical entities.

Another reason for Hubs being physical is so as to provide access to specialist (and expensive) technology assets – demonstrators, testbeds, pilot lines, etc. – which must be readily accessible either within a dedicated DIH facility or at a partner organisation within the DIH network.

Nurturing a digital culture

Digital innovations and business models will involve a profound shift for many companies. They need to be encouraged not just to write a business case but to think more deeply about the implications of digitisation for the business, addressing issues such as sustainability and monetarisation. Business aspects – such as business models, training, and establishing a digital culture – will be as important a part of the message as the technology. Entrepreneurial thinking will need to be nurtured and employees empowered.

Access to funding as a key service

Digital Innovation Hubs should help SMEs and start-ups to access regional, national and/or European funding to make use of new technologies, possibly in line with regional Smart Specialisation Strategies. They could also help and support SMEs to explain their strategies to banks and private investors who often do not understand the need for (apparently) low-tech companies to 'go digital'.

Addressing public awareness and the social dimension

As well as the direct concerns of target sectors, in their communication activities Hubs must also address public awareness of digitisation, including the social dimension. Consideration should be given to issues related to the impact on employment (e.g. job losses/displacement due to digitisation; creation of new jobs from increased competitiveness, new markets and business models; benefits and challenges in upskilling of the workforce, etc.); the impact on services (e.g. decrease cost at point of care, safer products, better quality of life, etc.); and issues related to privacy and security.

4.0 A Guide for a Digital Innovation Hub

While at theoretical level the value and benefits of Digital Innovation Hubs are clear for all to see, many issues arise as to how the DIH model can be made to work in practice. What factors have to be taken into account when setting up a Digital Innovation Hub within a region? How should they operate 'on the ground'? How can we build an effective network of hubs across Europe? How should such hubs be funded and maintained?

This section outlines a guide for operationalising Digital Innovation Hubs in Europe, offering 'a recipe' for any national or regional authority or innovation intermediary wishing to establish a DIH or expand an existing initiative. The issues highlighted here inform the policy discussion and related recommendations presented in Section 5.

Step 1: Define Regional Needs

Every Digital Innovation Hub works with a different combination of inputs and outputs, and hence is unique. The first step in establishing a DIH, therefore, is to identify regional needs and define the regional model that best fits these unique circumstances. This model must:

- **Identify the target constituency**: Which industry sectors require support within the region? What types of companies do these sectors comprise?

- **Identify the industry needs**: What are the issues and challenges facing companies within the region? What tools are necessary to address them? What services do they require?
- **Identify regional characteristics and specialisms**: What are the strengths of the region and what are its key assets? (e.g. competences in mechatronics, simulation, 3D printing, start-up community)? What support is already available within the region? (research institutes, testbeds, demonstrators, pilot lines, fablabs, etc.).

Definition of the model should include a gap analysis based on mapping the regional and national landscape in terms of need and existing coverage.

Step 2: Develop the Vision

The next step is for stakeholders, including industry, to work together to develop a vision for digital transformation within the region and the role the Digital Innovation Hub will play. This should be driven by people involved in a regional/national initiative for digitisation, local governments, industry associations, competence centers, incubators to make sure that the vision will be shared among the main players of the future ecosystem involved in the Digital Innovation Hub.

The vision should set out how the DIH will work closely with regional authorities and with national agencies to promote digitisation and scope the necessary services and tools. It should define a well-coordinated initiative that leverages the skills and capacities of entities across the region and beyond. It should describe the collaborative relationships the DIH will build in order to:

- be able to identify and respond to the needs of local client companies;
- bring together technology providers and user industries;
- involve the whole value chain;
- animate their networks – both local and further afield – as a coherent ecosystem;
- provide links to other hubs and to digital industry platforms (as being promoted under WG2).

In addition to scouting and brokerage services, service delivery should be supported by networking and match-making activities that directly link needs with the technology and business offering. For instance, the DIH could put SMEs and start-ups in contact with supply chain partners and financial services to support product and service innovations, which would establish a channel for growth. Detailed analysis and specification of companies' training needs will also be an important aspect. This should go beyond the usual academic target-setting and embrace also upskilling of the existing workforce. Stakeholders should be involved in governance so as to help Hubs to define their long-term goals.

A key part of the planning will be the Digital Innovation Hub's own business model, which sets out how its services are to be funded and how the initiative will become and remain sustainable. Relevant considerations are summarised in the box below.

Business Models for Digital Innovation Hubs: Key Considerations

Business models based on mixed funding and that evolve over time

DIHs are fulfilling services of different kinds that have a mixed public and private nature. They require a hybrid 'business model' that combines public and private financing sources. Depending on the situation, money will be needed to build and maintain the infrastructure, buy machines and equipment, and employ qualified personnel. Public funding may also be needed to engage user and supplier companies into specific experimentation projects. On the income side, membership fees, training, contract R&I, testing, and service brokerage are all potential revenue streams.

Public goods and services are information and knowledge that can be shared and that expose (positive) externalities: therefore they may be subsidised. Private goods and services are appropriated by clients who should pay the market price. Parts of the financing of infrastructures could therefore be provided by private service contracts (that also cover usage of the infrastructure) and by subsidies for research. The same is true for training that is performed on this infrastructure. The

combination of different services and functions to fully use the capacity of the infrastructure can be translated into a business model and financial plan that would make it possible to attract banks or other financial agents with a longer-term perspective to invest in the set-up of new infrastructures or the extension of existing ones. Other considerations are image and reputation, management and governance models, ownership of assets. During the first meeting of the working group, 24 October 2016, Lina Huertas of MTC presented an example of such a business model.[22]

Utilising public funds as a means of de-risking private investments

The business model can only take account of direct financial returns, but the indirect return on investment provides a guarantee for the financial risks. The leverage effect on private follow-up investments will be bigger when more innovation hub services succeed in de-risking private investments in the modernisation of industry which at present are still hesitant. The use of shared infrastructures reduces costs and increases returns for experimentation. The more successful the facilities, the more the capacity will be used and the more services will be paid fully with private funds.

European funding for cross-border collaboration and services

The Commission Communication foresees that funding of cross-border services (such as a company wanting to make use of the specialised services of a DIH located outside its region or country) could be funded at European level through H2020. Local public goods and services could be funded by local public funds, for instance from ESIF funds, in particular ERDF. See Annex 3 for an overview of the allocation of funds by the Member States in categories most suitable for funding DIHs.

Step 3: Look at what is already available in the region

The Hub must build as far as possible on what is already available in the region, such existing initiatives or projects. These need to be brought together to establish a critical mass of capability and experience. In particular where there is experience with providing services to companies, this needs to be built on further.

Step 4: Define the services that the DIH should offer

A first step could be to offer support for individual companies to experiment with the technologies necessary to achieve the innovations. Such experiments should involve suppliers (e.g. start-ups, ICT, mechatronics) and users (e.g. furniture, metal working, automotive).

Incentives may need to be put in place to encourage SMEs to engage with the Hub and its activities. Small innovation grants (e.g. innovation vouchers) could be offered to facilitate the cooperation. In general, such activities should be financed by local (national/regional) agencies. The DIH services should also include activities which look beyond the region such as collaboration with other DIHs or other (non-digital) hubs which can provide complementary services, networking (e.g. travel, events), building skills or to help SMEs find new business partners and customers.

Step 5: Build links and establish Collaboration

Once the Hub is up and running, the next step would be to build links with other Hubs in order to access additional facilities, fill missing competences, and develop new services and tools.

Hubs could collaborate in a number of ways:

- Developing a common approach to service provision (e.g. covering contracts, IPR);
- Developing common services and solutions (e.g. training, tools, events);
- Identifying best practices and areas of competence excellence around which to develop links.
- Putting in place exchange programmes between Hubs and/or between client companies[23]
- Establishing a transferable innovation voucher which companies could utilise to access services from a hub outside their own country.[24]

[22] https://ec.europa.eu/futurium/en/system/files/ged/mtc_lina_huertas.pdf

[23] For example, exchanges based on the Erasmus model. The scheme could be open both to members of the DIH network and professionals from industry, and could offer both short-term and long-term assignments.

[24] This would be similar to that developed under the InnoVoucher project, www.innovoucher.eu

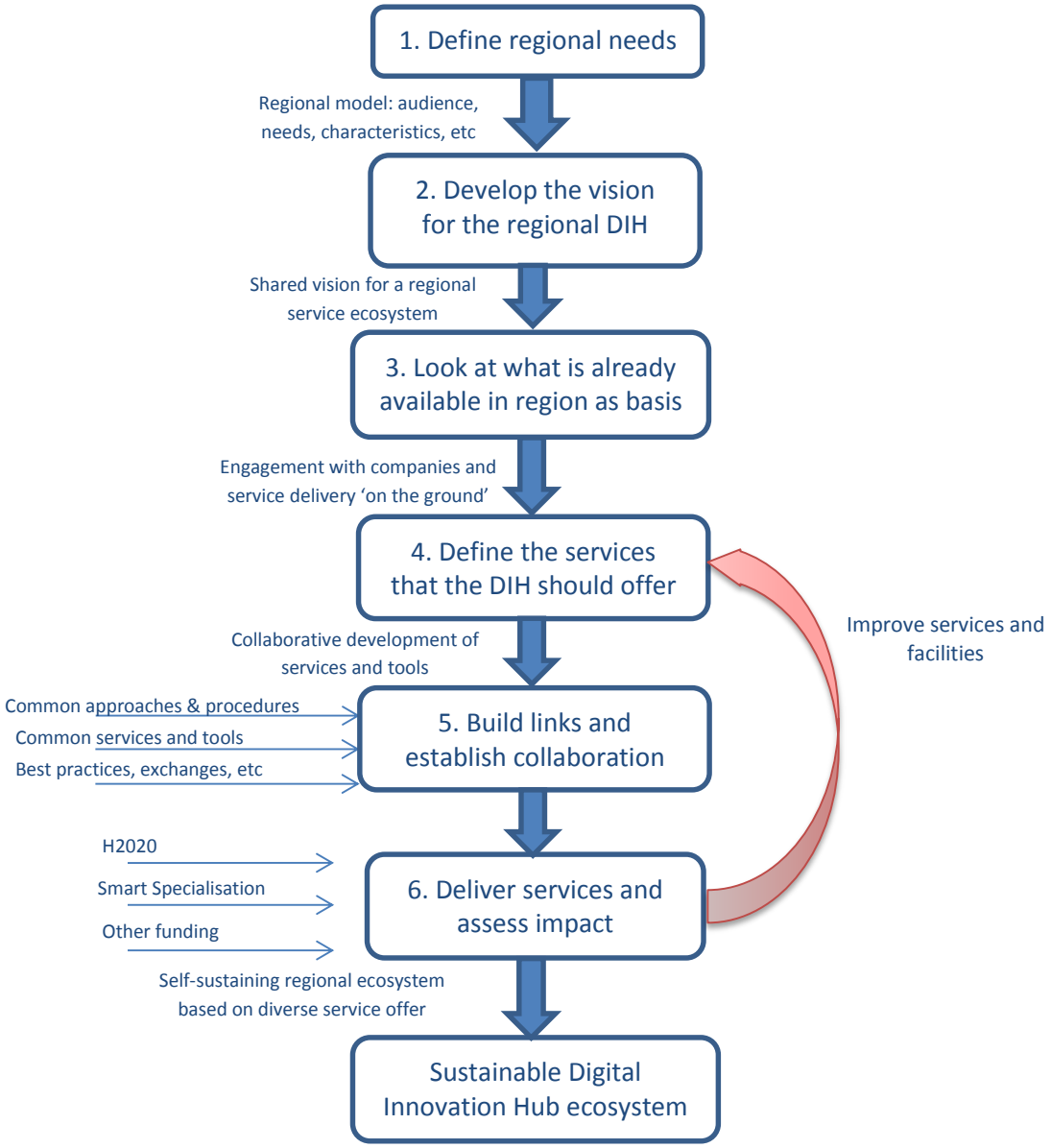
To ensure activities stay close to the market, cross-border supply chains should also be leveraged for the collaborative development of Digital Innovation Hubs across regions. Such interactions would have a real and visible benefit for all supply chain actors.

Where large investments are necessary, the Smart Specialisation Platform for Industrial Modernisation (SSP-IM) could be used to team up with other regions (see Annex 1).

Step 6: Deliver services and assess impact

After the services have been launched it is important to have clear indicators by which the impact can be measured. These indicators could be related to the impact on the business of the regional companies which the DIH are aiming to help as well as leveraging private investment. The indicators should be a used as a means to improve the DIHs operations and the services they offer.

Figure 10: A Guide for a Regional Digital Innovation Hub



What does Success Look Like for Digital Innovation Hubs?

The process in the Guide is summarised in diagram 10 above. It is an iterative process which, if followed, should lead to a sustainable Digital Innovation Hub ecosystem within the region. Indications that sustainability has been attained would be that the Hub:

- Has a diverse service portfolio that directly addresses the needs of industry within the region.
- Has a visible physical presence, working closely and successfully with other actors (universities and RTOs, chambers of commerce, training centres, supply chains, consultants, digital IT SMEs, etc.) as part of a regional ecosystem.
- Is proactively approached by companies from within the region for support and advice.
- Is a local entrepreneurial culture appearing and is it possible to retain local talents? On the long run, the ability of a territory lays in the hands of the talented people working in the territory.
- Is the whole territory becoming a magnet of attraction for companies to settle themselves because there is a flourishing ecosystem of innovative companies?
- Actively engages with hubs in other regions, either as a recipient and/or as a provider of services.
- Is financially self-sustaining, based on a hybrid business model that combines public and private financing. Public investment need to be made in a way that economic gains are maximised and the risks of supporting a project likely to underperform or fail is minimised. Therefore local public authorities need to able to assess the extent to which DIH can become sustainable in the long run without continued public investments and make a strategic choice.

5.0 Towards a European Network

While the challenges facing individual regions are substantial, the common, shared challenge is in creating and growing a Europe-wide network of Digital Innovation Hubs. Only by establishing a strong network with nodes in every region will it be possible to realise the ambition of providing companies with access to added-value services ‘at working distance’.

Working Group 1 foresees four key challenges in establishing such a network ‘on the ground’: building consensus and a shared vision on how the network should operate and what it should achieve; building the capacity, skills and collaboration incentives for hubs to work effectively at European scale; mobilising the investment necessary to seed and grow both new and existing hubs; and putting in place the necessary coordination and governance for the network to operate.

5.1 Building Consensus for a European Network of DIHs

As a first step, stakeholders need to come together to develop a shared vision over the nature and direction of a European network of Digital Innovation Hubs. This consensus building has three main aspects: improving the available information base; promoting the sharing of experiences and best practices across Europe; and mobilising high-level political support.

5.1.1 Mapping service provision

While Europe has a wealth of knowledge and experience in hub-type initiatives, the available provision is not sufficiently visible either to industry or to other hubs. Greater transparency on the range of initiatives available would make it easier for companies to know where to turn for help. It would also help individual hubs and the network as a whole to understand the gaps and needs, and the opportunities for collaboration. At the same time it can help public authorities to review the current offer and invest in gaps.

Such information should be made readily accessible through a **Central Information Portal**, an open catalogue or web-based tool documenting the types of hub, their competences, services, facilities, etc. It should be widely disseminated to industry and multiplier organisations (industrial associations, Hubs themselves, other networks), and regularly updated and maintained. The portal should be used to share experiences and disseminate use cases, for example, to stimulate reuse of solutions between industry verticals and between regions.

The Commission has issued a contract to compile an initial Catalogue of Digital Innovation Hubs, which was awarded to a consortium led by TNO. The project aims to map the provision of DIHs in Europe and compile a database with over 100 DIHs in the EU28, including comprehensive information on each hub. The Catalogue will enable SMEs and industry to find infrastructure and expertise they need and to contact potential partners, as well as provide a platform for CCs and DIHs to advertise their expertise to potential customers. It will also identify networks in the field of digitisation in industry, so as to enable connections between them, and provide policymakers with information about the state-of-play of DIHs in Europe. Recommendations on how to maintain and further extend the database will also be proposed, including strategy for updating.[25]

While the Catalogue of Digital Innovation Hubs will provide much-needed clarity on DIH initiatives in Europe, it should be seen as only a first step towards building the information base on DIH activities and services. Other activities that are contributing to close the information gap are:

- The KET Catalogue mapping competence centres offering expertise in key enabling technologies (see Annex 1). The DIH and KETs catalogues will be closely coordinated to create maximum synergies, clarity and impact for stakeholders.
- The Digital Transformation Monitoring national policy reports prepared by DG GROW (see Annex 1).
- National and regional mappings being undertaken by Member States and regional authorities, in some cases as a direct result of involvement in WG1.

Involvement in the WG is also helping actors responsible (or potentially responsible) for DIHs to establish common understanding of needs and requirements and how to deliver them.

> ➢ **Recommendation 1: Develop the information base**: Continue to maintain and extend the Catalogue of Digital Innovation Hubs and plan for its evolution into a Central Information Portal for the whole European DIH network as well as for other hubs and technology centres.
>
> ***Responsible: European Commission***

5.1.2 Sharing best practices

As awareness of the DIH concept grows, actors from Member States and regions will need to come together to plan and develop the network. Such meetings would enable hub actors to get to know each other and share best practices, success stories, training methods and materials, and learn from each other. WG1 meetings provide a forum for such networking to a certain extent, as does the annual DEI Stakeholder Forum. However, more should be done to support Europe's emerging DIH community, in particular by reaching out to practitioners (i.e. innovation intermediaries who actually run hubs) as well as policy-makers.

> ➢ **Recommendation 2: Share experiences across Member States and regions**: Network stakeholders across Member States and regions, building on the WG1 and the annual DEI

[25] For further information see https://ec.europa.eu/futurium/en/content/digital-innovation-hubs-catalogue-project-0

Stakeholder Forum.

- Further dedicated events intended to publicise and promote the DIH concept should be organised, including in regions with current gaps.
- An Annual Conference of DIH Practitioners should be held, possibly alongside or within the annual DEI Stakeholder Forum.

Responsible: European Commission, Member States and regions

5.1.3 Mobilising political support

Investments in DIH will not materialise by themselves and therefore it will be essential to ensure high-level political support within Member States and regions. Channels here include:

- The Roundtables on Digitising European Industry convened by the European Commission and held twice per year, to which all Member States and other key stakeholders are invited.
- Interventions in the European Parliament, the European Council and the Committee of the Regions
- Conferences and workshops on the Digitising European Industry agenda.
- The Programme Committees of H2020, consisting of national policymakers in the field of research and innovation.
- Regional authorities, which could be addressed through the Smart Specialisation Platform, cluster activities and other activities of DG REGIO.

A useful tool in this context is the Digital Compass[26] to train policymakers on digital transformation by allowing participants to experience and experiment with the showcased technologies. It was developed by the former Strategic Policy Forum on Digital Entrepreneurship.

- **Recommendation 3: Ensure high-level political support within Member States and regions** for DIH investments through the DEI Roundtables, the Smart Specialisation Platform and other policy forums.

  Responsible: European Commission, Member States and regions

5.2 Developing Capacity and Collaboration

Digital Innovation Hubs need expertise in both breadth and depth. On the one hand, they must possess the 'soft skills' necessary to communicate with companies, assess their business needs, and promote their own offer. In addition, they need specialist technical and management skills to provide tailored solutions, or to access these from elsewhere in the network. Hubs must also be proactive in building networks of stakeholders that help them to engage with companies and others.

Measures will need to be taken to ensure that all Digital Innovation Hubs have the necessary capacity to deliver services across all of these areas and are able to collaborate effectively. Such actions should address in particular three distinct situations:

5.2.1 Upgrading of Competence Centres to Digital Innovation Hubs

Existing initiatives sit along a spectrum, with some offering a wider range of services than others. For those competence centres that are not yet embedded in a DIH, it is important they form

[26] http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8892

alliances with other entities in order to be able to offer an integrated set of services as a 'one-stop-shop', covering technology, skills, finance, and business growth. In such cases, specific measures will be needed to upgrade or transform existing centres into Digital Innovation Hubs. Horizon 2020 (together with COSME) will be a powerful catalyst in seeding and growing the DIH ecosystem.

Plans in this area are already well advanced. The European Commission is programming €500m in the H2020 work programmes 2016-17 and 2018-2020 towards DIHs. The 2016-2017 Work Programme, of which the calls have already happened, dedicated €200m to hubs.[27] Under Work Programme 2018-2020 the remaining €300m will be dedicated to DIHs. Many of the existing initiatives will be continued as well as new hubs being created.

EU funds will be used to coordinate resources across programmes. Digital Innovation Hubs will **become the linking pin**, with contributions from H2020, ESIF, EFSI, national, regional and private funding. Specific action may be required to ensure the various instruments are compatible and are able to fit together seamlessly (for example, in relation to State Aid Rules). In the new workprogramme for H2020 LEIT ICT, it is foreseen to make EU funding of digital innovation hubs conditional on other investments done in a DIH.

- **Recommendation 4: Utilise H2020 investments to enhance EU added value.** European funding should be focused in such a way as to enhance the EU-added value of the European DIH network. This should be achieved by:
  - Using EU funds to better network EU, national and regional infrastructures;
  - Encouraging convergence of EU-schemes under the DEI and broad innovation umbrella;
  - Focusing EU schemes on highly innovative cross-border/transnational experiments;
  - Rooting EU-supported hubs in national and regional infrastructures;
  - Bringing industry hubs/labs into the structure;
  - Making EU models more sustainable.

  Responsible: Member States and regions, Innovation intermediaries, Industry

5.2.2 Federating existing activities into larger initiatives

To work as ecosystems that span from the local to the European level, DIHs must effectively join up many existing activities. The better networking and upgrading of infrastructures, promotion of cross-border exchanges and experimentation, and integration of regional and industrial hubs and facilities will be essential in creating EU added value.

As well as combining funding from different sources, there needs to be knowledge transfer from the highly innovative DIHs towards the ones focusing on companies further down the technology adoption curve. For example, the I4MS projects have started a mentoring and sponsorship programme, whereby regional hubs are associated to the H2020 projects. Their particular role is to learn about supporting SMEs with their digital transformation from the I4MS competence centres and undertake a feasibility study into whether these experiments could be replicated successfully in their own region. Following a call, 25 new regional hubs have been selected with total funding of €1.2m available for the mentoring and sponsorship programme[28].

Specific actions will be needed to support stakeholders in coalescing around these larger initiatives, including collaboration between digital and other high-tech innovation hubs.

[27] SAE: €25M; FIWARE: €15M; FIRE: €25M; Big Data: €27M ; Creative Industry: €14M; Robotics: €18M +~11; Photonics: €43M; Innovation Radar: €12M; FoF 12 (I4MS): €33M

[28] http://dih.i4ms.eu/

- **Recommendation 5: Launch pilot actions aimed at developing synergies and building large initiatives.** These pilot actions should be varied in their scope and intent, aiming to demonstrate mechanisms for:
  - upgrading existing competence centres to Digital Innovation Hubs;
  - facilitating knowledge transfer within the DIH network;
  - combining different funding sources within scalable projects;
  - creating synergies with hubs active in other advanced technologies; and
  - federating existing projects funded by different agencies into larger initiatives.

  Responsible: Member States and regions, Innovation intermediaries, European Commission

5.2.3 Setting up new Digital Innovation Hubs

Regions with little or no existing infrastructure to support DIHs present a particular challenge. Competence centres and innovation hubs are not equally spread in Europe and some regions lack the necessary capacity to support their local companies in digitisation. In these cases it will be necessary to set up new Digital Innovation Hubs in places where they do not exist yet or to seek access to the services of existing DIHs in other regions. The relevant national or regional Smart Specialisation Strategy or Digital Growth Strategy can be a starting point to understand the competencies necessary for such a DIH. It might also be necessary to start a dialogue between DIH promoters and public funders and to ensure that any feasibility study, reviews, evaluations or other analysis put forward by DIHs in support for funding can be taken into account by the public funding decision makers. They also need to be well informed, understanding what DIH's can and cannot do and the factors that influence their performance. Currently a training programme for new DIHs is starting in 13 different EU countries where there are no or only few DIHs.

- **Recommendation 6: Intensify outreach to regions with few DIHs.** Partnering/sponsorship programmes should be established, where regions work with others with successful Hubs to understand what they are and the benefits they can bring. New Hubs would draw on guidance and support from these other regions and might even set up formal relationships (i.e. become satellite hubs). Regions could use ESIF, EFSI or other sources of funding to seed and develop DIHs during the critical early stages and to generally foster collaboration between Hubs.

  Responsible: Member States and regions, Innovation intermediaries, Industry

5.3 Mobilising Investment

5.3.1 Funding requirements for Digital Innovation Hubs

The full development of a network of Digital Innovation Hubs calls for a surge in investment in adequate competence centres and in capacity to deliver the services to implement digital transformations.

The volume of investment necessary is difficult to assess at present. In the Commission Communication on Digitising European Industry[29], it is estimated that at least €5bn needs to be mobilised from various financial sources from 2016 to 2020. This would allow for an additional 100 new hubs and an upgrade of 200 existing ones. This means:

[29] Digitising European Industry (DEI): Reaping the full benefits of a Digital Single Market. Communication (COM(2016)/180)

- Around 20 new hubs to be established every year with investments primarily targeting the establishment or reinforcement of digital competence centres, focusing on development and experimentation facilities and on relevant expertise (technical, business and financing) through collaboration within a multi-partnership. The investments should also be dedicated to the development of attractive services that support industry in its digital transformation.
- A regular re-assessment of existing Digital Innovation Hubs across regions in Europe leading to updating and upgrading the existing facilities and resources and services (40 hubs upgraded per year). All hubs need to have sustainable business models. It should however be checked that management competence and good governance can be demonstrated. If for an existing DIH finances are bad and the recovery investment needed would be very high or structure is becoming indistinguishable from a business or office park, then public investment should focus preferably on investing in a brand new initiative. At this stage, the factors that public sector might consider before committing new capital would be:
    - Confirmation that the DIH is securing demand of an appropriate quality at a rate that justifies the proposal for further investment in infrastructure
    - Confirmation that the DIHs existing revenue projects are delivering the anticipated socioeconomic outputs in the Region
    - Evidence that the existing DIH is integrating well with other key players in the local innovation ecosystem
    - Evidence that the DIH is broadly on track to meet promoter determined breakeven targets as embodied in the current business plan
    - Evidence that the management are performing well and have the confidence of their owners and governing body.

The possible future investment plans of Member States and regions should take into account the diversity of starting conditions and future needs in the regions and countries. National and regional public-private partnerships are shaping co-investments through their national initiatives on digital transformation.

Possible funding sources are ESIF[30] , EFSI,[31] and other national, regional or private funds. As noted in Section 4, significant funding is programmed under the European Structural and Investment Funds (ESIF) as part of the digital growth and other objectives, for an overview see Annex 3.

The table below gives an initial overview of the necessary investments. Further study is required to assess this more fully.

2016-2020	No. of hubs	EU (planned)	Member States (digital focus)	Industry
EU networks (continuation/refocus/stream-lining of existing initiatives)[32]	250 hubs (10-20 digitisation experiments per hub)	€500m (from H2020) (additional cost on top of basic national or regional infrastructures)	Basic innovation/ competence centre infrastructure and digital innovation hub services	€150m
New hubs	100		€2000m	Incl. in MSs
Reinvestment, upgrading of national or regional hubs	200		€3000m	Incl. in MSs
TOTAL		€500m	€5000m	

[30] While respecting all rules and management principles as set out in REGULATION (EU) No 1303/2013

[31] The European Fund for Strategic Investments (EFSI) administered jointly by the EIB and the European Commission as part of the 'Juncker Plan'.

[32] I4MS, SAE, iHubs, ODINE, ECHORD, ACTPHAST, …

5.3.2 Availability of funding across the project lifecycle

It is clear that a great many investment tools and funding programmes exist and need to be mobilised. The new Smart Specialisation Platform for Industrial Modernisation (SSP-IM), which aims to facilitate co-investment in new industrial value chains within European regions, is seen as an especially important vehicle (see Annex 1). Indeed, applications are already being received relating to Industry 4.0 and the assimilation of digital services by SMEs. The aim should be to create an 'investment triangle' between region-technology-funding, with the three elements being co-located. Structures should be transparent so as to prevent double investments.

Three distinct but closely related issues have been identified by the working group 1:

1) **Accessing launch funding for DIH initiatives**: In most cases some form of launch or seed funding will be required. Where relevant initiatives already exist this might be achieved by aligning existing funds towards the Digital Innovation Hub mission; in other cases separate/dedicated funding may be necessary to facilitate such a realignment. Public bodies can provide valuable pump-priming funds to help create Digital Innovation Hubs.
2) **Ensuring funding is relevant and scalable**: Digital Innovation Hubs will be organic entities whose funding needs (and those of their clients) will evolve over time. Ensuring that the available funding streams are relevant and able to scale as the Hub grows is a key concern. For example, many existing EU schemes aim towards early adopters. It may be necessary to adapt these for mainstreaming investment or to introduce new schemes better suited to those further down the adoption ladder. It will be essential that stakeholders learn from the experiences in this area available through actors such as the RTOs, which show that investments need to be able to scale as the initiative progresses (see Annex 2).
3) **Effectively combining funding from different funding sources**: The strategic alignment of financing from different schemes (EU, national, regional, private) will be a key issue. DIHs are not unique in this respect: similar issues are encountered in many large-scale research, development and innovation initiatives (LSIs) and common solutions need to be sought. The recently-completed EU-GREAT! project has studied experience in this area and developed guidelines and policy recommendations (see Annex 2).

In general, in finding the appropriate balance for DIH funding the approach should be to **stay local where possible and go European where necessary**.

Post-2020 inter-regional collaboration is likely to become much more of an issue. New thinking is needed on how to mainstream the experiences of Vanguard pilots and other innovative initiatives: networks of (digital) innovation hubs could be key to this.

5.3.3 Mobilising national investment

Concerted support at national and regional level will be essential to realising a truly pan-European DIH network. As well as innovation within the Hubs themselves, policy-makers need to think creatively so as to facilitate them in doing their job. In addition to developing digitisation policies and providing investment for Digital Innovation Hubs, national and regional authorities must stimulate and animate their own local ecosystems, for example by taking the lead in:

- Showcasing how DIHs can be set up and operationalised within the specific national/regional context;
- Engaging local/regional hubs and competence centres in the DIH concept and fostering synergies with other enabling technologies;
- Showing how European funding could be used to create DIHs. Cooperation with all relevant stakeholders is important and the proposal for a DIH should be based on evidence and on longer-term objectives which are agreed and implemented in cooperation with relevant

stakeholders of MS and Regions. This can be established in a single policy document (e.g. national or regional "digital agenda", digital growth plan or if it is a RIS3 DIH, within the national or regional innovation strategic policy framework for smart specialisation) or in a set of inter-linked policy documents.

- Removing obstacles and barriers to cross-border activities; and
- Generally creating space for bottom-up initiatives to emerge.

National agencies could also show how ESIF could be used to create DIHs.

Public procurement can be a way to stimulate innovation and Digital Innovation Hubs can help in connecting public authorities with innovators and in helping public authorities to write tender specifications that stimulate innovation.

- **Recommendation 7: Mobilise investment by the Member States and regions.** Authorities at national and regional level should develop digitisation policies, provide the necessary investments for Digital Innovation Hubs, and stimulate and animate their own local ecosystems.

  Responsible: Member States and regions, Innovation intermediaries, Industry

5.4 Shaping the European Network

5.4.1 Network structure and governance

It is clear that a Digital Innovation Hub can take many different forms. How many of the services listed in Section 3 must an organisation cover to be classified as a 'Digital Innovation Hub'? Should there be a list of core services that all DIHs have to provide? What does a DIH mean in organisational terms – is it merely a brand or label that any organisation operating in the field may sign up to? Or does it imply certain minimum competences, in which case who/which organisation would/should certify that relevant standards have been met? Is there a need for accreditation? In short, what does it take to be part of 'the club'?

The touchstone here is flexibility. WG1 believes that we should not be prescriptive in defining what does and does not constitute a DIH. The services offered within a given region should be those **most relevant to the client companies**. Variable geometries are allowed and all Hubs will have access to the extensive expertise and facilities of the wider DIH Network.

The term 'organisation' prompts a further question: should a Digital Innovation Hub be a legal entity? While in some cases Hub services will be delivered by individual organisations, in others the DIH will effectively be a network of collaborating organisations which may or may not be a legal entity. Again, we should be guided by what works and not lay down rules and regulations that may restrict the scope to act. In certain regions and Member States having a recognised legal entity will be a prerequisite for being able to deliver DIH services in any form to SMEs, especially where public funding is involved. In others the rules may allow collective efforts between collaborating organisations. In general, **Hubs should operate according to local conditions** with, perhaps, the legal entity route being considered as a 'best practice' model.

Discussion within Working Group 1 has found little support for a formal certification process. Such an approach would require an accreditation structure, an awarding body, etc.. It would be too rigid and too cumbersome for a network that needs to be defined by its agility and responsiveness to market demands. In order to create a dynamic network, the barriers to entry for DIHs must be kept as low as possible while, of course, maintaining service quality to client businesses. Instead WG members favour an approach whereby:

- Digital innovation hubs are "recognised" through a mention in the national and regional plans for the digitisation of industry. If every initiative can clearly describe what it considers to be its digital innovation hubs it will be possible to have an overview of all DIHs in Europe, their specialisation and expertise. The current version of the catalogue[33] has identified many potential hubs. If a hub type of initiative was funded through European/national/regional authorities it was included in the map. Now it is time every national/regional initiative assesses whether these identified hubs are indeed the hubs that they consider necessary for the future. After several cycles, the map and the listed hubs in each country/region should converge.
- Digital Innovation Hubs are issued with **a lean set of network guidelines** developed collectively and/or by the European Commission, covering aspects such as minimum service levels, working arrangements, etc. The guidance would be flexible to give space for variations based on actual needs.

5.4.2 Measuring performance and impact

Indicators will be required by which to measure the impact of DIHs. Such measures should span from individual hub-client relationships, to a hub's overall performance and the impact of the DIH ecosystem as a whole. Particular emphasis should be placed on measuring the quality and impact of collaborative links, since (as noted above) it is primarily the strength of these links, rather than unconnected activities, which will define DIHs. Key performance indicators at Hub level could include:

- Number of DIH users;
- Number of referrals to ICT companies and other service providers;
- Percentage of users with successful digitisation activities;
- Percentage of users returning and/or referred on for other services;
- Number of events and participation in events;
- Number of collaborations and cross-border linkages;
- Amount of training provided and increases in digital skills;
- Amount of external funding secured for client companies.

Selective measurement indicators could be used to establish benchmarks and standards of services, as well as in sharing best practices.

Further impact could be measured using **econometric measures**, such as increased awareness, enhanced competitiveness and assessment of digital maturity. Examples include: increase in a company's market share; creating value via new markets and business models; establishing new value chains; increasing the turnover ratio between services and products; quantifying cost reductions of services and resource optimisation due to digitisation; number of patents and other IP protections (e.g. registered designs); number of innovation projects (e.g. hackathons); number of people trained in digital skills.

Systematic monitoring should not be complicated and expensive. While certain performance metrics will certainly be needed, **user-rated approaches and social media** should also be used. Users should be able to share their experiences of hub providers through a 'TripAdvisor-type' engine so as to create a user-rated ecosystem for digitisation services. Social media should also be used as a means of evaluating hubs' performance.

[33] https://www.google.com/maps/d/viewer?mid=1NcRnG0H38PlOyuj-oPZ_BjiJLcQ&ll=52.78941844569516%2C12.162742949999938&z=3

6.0 Next Steps

The DEI Working Group 1 has brought together stakeholders with interests in running and operating Digital Innovation Hubs as well as potential beneficiaries in industry. As such it marks a milestone in terms of practitioners 'on the ground' taking ownership of this aspect of the DEI initiative, which up to now has focused at political and strategic level.

6.1 Activating the European Network

After more than six months of intense discussion within the Roundtable and elsewhere, the concept of a European network of Digital Innovation Hubs, readily accessible to firms in all sectors and regions, and able to support, assist and mentor companies in embracing digitisation is well advanced. The objectives, characteristics, modalities, and services have all been intensively explored, most notably through the discussion and collaboration established under Working Group 1 itself.

While certain issues require further elaboration, it is clear that stakeholders must move quickly – and collectively – to start putting the network in place. The message from industry is that **speed is of the essence**: the benefits for the European economy and society from digitisation are huge and our international competitors are already setting their own course. Meanwhile, Horizon 2020 – which will play such a vital role in underpinning the network – is heading towards its final stages and the funding window is limited. **Europe must act now to make Digital Innovation Hubs a reality**.

Building on the solid foundations established through Working Group 1, European stakeholders should take immediate action to operationalise individual Digital Innovation Hubs and start down the path towards a European network.

Activating the network will require two separate but closely related streams of work:

1) Developing activities and services **for the marketplace**, i.e. that form part of the Hubs' offer to client business. Examples include:
   - development of the **Central Information Portal** as a repository for all information on Hubs' services and activities, and for sharing experiences and best practices (see Recommendation 1 above).
   - development of **common systems, methods and tools** (e.g. a Digital Maturity Assessment tool, business mentoring methodology, joint/shared events, training courses, innovation vouchers, etc.).

2) Developing activities and services **to help hubs themselves to grow and improve**. These are not part of the offer to client businesses but facilitate collaboration between hubs and their efficient operation as a European network. Examples include:
   - development of **hub business models**, learning from each other regarding set-up and operation and how to make hubs sustainable. This could include standardised procedures to speed up the launch and development of (new) hubs;
   - development of **collaboration structures**, for example: a communications platform between hubs; training of hub personnel; inter-hub exchange schemes, including business models for cross-border services, sharing of best practices, tracking of interactions between hubs;
   - development of **governance structures**, in line with the 'light touch' approach outlined above. This should include guidelines regarding minimum service portfolios, competition between hubs, sharing of IPRs, and measuring performance.

As noted, DIHs will need to access funding schemes according to their different evolutionary stages: initial set-up & launch; basic operations; 'Europeanisation'; new or improved infrastructure, etc.

- **Recommendation 8: Activate the European network of Digital Innovation Hubs:** Building on the solid foundations established through Working Group 1, European stakeholders should take immediate action to operationalise individual Digital Innovation Hubs and start down the path towards a European network. This should include concerted effort in relation to: hub business models; common systems, methods and tools; collaboration structures; and governance structures. The hub business model should also look into incentives for collaboration among digital innovation hubs. How can hubs support companies coming from other regions or countries if they have the best expertise to help this company?

  Responsible: Innovation intermediaries, Industry, Member States and regions, European Commission

6.2 Investment fund to support industry

Apart from investments in Digital Innovation Hubs themselves, it is also necessary to discuss investments of individual companies to finance their digital transformation. This topic has not yet been discussed in the working group, but could be the subject for follow up discussions.

EU businesses are lagging behind and missing out by not taking full advantage of digital technologies. To close the accumulated gap with the US in ICT investments, the EU would have to invest EUR 335 billion (source Strategic Policy Forum on Digital Entrepreneurship). This is particularly the case of smaller companies and enterprises from traditional sectors, such as manufacturing and construction. Investment is also a prerequisite for adopting more advanced technologies giving competitive advantages to EU firms and innovation ecosystems.

Further study would be needed to understand the current barriers for the existing industry to access funding in the form of loans, equity, venture capital, etc. What are the roles Digital Innovation Hubs can play to de-risk investments? And is there a need for a new investment fund at European level to facilitate the necessary investments?

6.3 Summary of Recommendations

A Europe-wide network of Digital Innovation Hubs able to support any business at 'working distance' is an ambitious but thoroughly achievable goal. DIHs hold significant potential to support and assist SMEs and start-ups and could become key actors in bringing digitisation within the reach of all industry sectors. WG1 strongly supports the proposed European network of Digital Innovation Hubs as a means of supporting business, and especially SMEs and non-technology intensive industry, in seizing the opportunities of digital transformation.

The following matrix and list summarise the Recommendations and associated responsibilities proposed by WG1 in order to take the initiative forward.

	European Commission	Member States & regional authorities	Innovation intermediaries*	Industry
Rec 1: Develop the	⊙⊙⊙	⊙	⊙	⊙

information base				
Rec 2: Share experiences across MSs & regions	⊙⊙⊙	⊙⊙	⊙	⊙
Rec 3: Ensure high-level political support	⊙⊙⊙	⊙⊙		
Rec 4: Utilise H2020 funding		⊙⊙⊙	⊙⊙	⊙⊙
Rec 5: Launch pilot actions for collaboration and LSIs	⊙⊙	⊙⊙⊙	⊙⊙	⊙
Rec 6: Intensify outreach to regions		⊙⊙⊙	⊙⊙	⊙
Rec 7: Mobilise Member State investment		⊙⊙⊙	⊙⊙	⊙
Rec 8: Activate the European DIH network	⊙⊙	⊙⊙	⊙⊙⊙	⊙⊙

⊙⊙⊙ = Lead responsibility; ⊙⊙ = Major participant; ⊙ = Minor participant

* includes existing DIHs and CCs.

6.4 Next steps for the working group

The working group has developed together a set of recommendations for the development of a network of Digital Innovation Hubs in Europe. Now it is time that each member state, and in particular the responsibles for the digitisation of industry, reflect upon these recommendations and assess whether their current offer of Digital Innovation Hubs is adequately addressing the needs of the industry they want to support. For that purpose, the European Commission has prepared a set of presentations for each member state, presenting information available in Commission databases about the country which could be useful to make decisions about Digital Innovation Hubs. It contains the following:

- Position of the country in the Digital Economy and Society Index[34]
- Position of the country wrt digital aspects of human capital
- Position of the country wrt Integration of digital technologies by enterprises
- Position of the country wrt the status of Open data and public sector information reuse
- Overview of the digital intensity of 17 economic sectors in the country
- Overview of the digital intensity of enterprises by enterprise size (small, medium, large)
- Overview of the Digital Innovation Hubs identified so far by for the Digital Innovation Hub catalogue (draft)
- Overview of all the competence centers/Digital Innovation Hubs funded by EU projects in the country
- Overview of clusters in the country that could become part of the digital innovation hubs in the country
- Overview of the KET (Key Enabling Technology) centers in the country
- Overview of pilot lines in nanotechnologies and advanced materials in the country
- Overview of available European Regional Development Funds in the country in categories relevant for Digital Innovation Hubs

[34] https://ec.europa.eu/digital-single-market/en/scoreboard

These presentations are available on https://ec.europa.eu/futurium/en/content/digitising-european-industry-catalogue-initiatives, under the country name.

AT - Austria Information relevant for digitising industry in Austria

BE – Belgium Information relevant for digitising industry in Belgium

BG – Bulgaria Information relevant for digitising industry in Bulgaria

CY – Cyprus Information relevant for digitising industry in Cyprus

CZ - Czech Republic Information relevant for digitising industry in Czech Republic

DE – Germany Information relevant for digitising industry in Germany

DK – Denmark Information relevant for digitising industry in Denmark

EE – Estonia Information relevant for digitising industry in Estonia

EL – Greece Information relevant for digitising industry in Greece

ES – Spain Information relevant for digitising industry in Spain

FI – Finland Information relevant for digitising industry in Finland

FR – France Information relevant for digitising industry in France

HR – Croatia Information relevant for digitising industry in Croatia

HU – Hungary Information relevant for digitising industry in Hungary

IE – Ireland Information relevant for digitising industry in Ireland

IT – Italy Information relevant for digitising industry in Italy

LT – Lithuania Information relevant for digitising industry in Lithuania

LU – Luxemburg Information relevant for digitising industry in Luxembourg

LV - Latvia Information relevant for digitising industry in Latvia

MT – Malta Information relevant for digitising industry in Malta

NL – Netherlands Information relevant for digitising industry in the Netherlands

PL – Poland Information relevant for digitising industry in Poland

PT – Portugal Information relevant for digitising industry in Portugal

RO – Romania Information relevant for digitising industry in Romania

SE – Sweden Information relevant for digitising industry in Sweden

SI – Slovenia Information relevant for digitising industry in Slovenia

SK – Slovakia Information relevant for digitising industry in Slovakia

UK - United Kingdom Information relevant for digitising industry in the United Kingdom

Every country is asked to reflect whether it offers sufficient opportunities for its industry to digitise, or whether more support is desirable. The following questions could guide this reflection:

- Is your current offer of Digital Innovation Hubs and the services they offer sufficiently targeted towards the industry you would like to support?
- Are your Digital Innovation Hubs clearly identified in your national/regional digitisation of industry plans, e.g. through a DIH implementation plan?
- How do you plan to develop further the network of Digital Innovation Hubs in your country?
- Which investments do you envisage in the next 5 years on digital innovation hubs?
- Does your digitisation initiative reflect these investments?

In order to coordinate and network all digital innovation hubs the working group asks all countries to share these plans with the European Commission. They will ensure that all hubs supported by the member states will become part of the catalogue of hubs and they will also make an analysis as a basis for further networking of the hubs.

As a good practice, Spain has already organised a meeting with its own digital innovation hubs to look at the situation in Spain and to come up with a coordinated approach to build a network of hubs in Spain[35].

During the next high level meeting of the European digitisation of industry initiatives the DIH implementation plans may be the basis for a discussion on which issues still need further discussion in the working group. These could be:

- How to network the Digital Innovation Hubs. What could be possible business models for DIHs to offer support to companies outside their territory?
- What are the roles Digital Innovation Hubs can play to de-risk investments? Is there a need for a new investment fund at European level to facilitate the necessary investments (loans, equity, etc) to support European companies in their digital transformation?
- How can Digital Innovation Hubs address training and skills development?

[35] http://www.industriaconectada40.gob.es/Paginas/index.aspx#

Annex 1: Overview of Existing Initiatives and Policies

Many initiatives and policies relevant to the proposed Digital Innovation Hubs exist at regional, national and European levels and span the public and private sectors. Key activities are summarised below, but this is by no means an exhaustive list.

Industry needs to be better informed about the availability of these initiatives and what they offer in order to make best use of them. As yet, however, there is no comprehensive listing of what is happening 'on the ground', especially outside of European initiatives.[36] The recently-launched Catalogue of Digital Innovation Hubs aims to provide this more comprehensive picture (see Section 5.1).

A1.1 European Initiatives

Measures similar in character to competence centres and/or Digital Innovation Hubs are supported under several European programmes, primarily related to the framework programmes for research and innovation. Examples include:

- **Digital Innovation Hubs in Horizon 2020**: The European Commission is programming €500m in H2020 (through the work programmes covering the 2016-20 period) towards Digital Innovation Hubs. Concretely, H2020 is funding projects in which competence centres are providing the desired services and facilities to industry using to a large extent the 'cascading grants' model, which has well proven its applicability in running initiatives like I4MS and Smart Anything Everywhere (SAE). The model allows centres to respond rapidly and with simple contracting mechanisms to industry needs which is essential for SMEs and start-ups. Proposals are short (10 pages) and thus are affordable for SMEs. The contracting mechanisms are simple and lean, allowing for a very short time from idea to hands-on experimentation and development. This is an enormous asset in particular for SMEs.

  I4MS consists of 11 large Innovation Actions funded by FP7 and H2020.[37] It supports SMEs active in the manufacturing sector to improve their products and processes by letting them experiment with digital technologies, such as HPC cloud-based simulation/analytics services, industrial robotics systems, laser-based manufacturing, smart cyber-physical systems, and Internet of Things. A network of competence centres provides access to competences and technology transfer to SMEs through competitive calls for experiments. Successful candidates receive funding for the experiment, from which both technology suppliers and user SMEs may benefit. So far €110m of European funding has been invested in I4MS since 2013. A further €28m has been invested through a similar network of competence centres supported under **SAE**, which supports SMEs to improve their products through the inclusion of advanced ICT components and systems.[38]

- **FIWARE Accelerators and Hubs**: a series of business incubators and accelerators for start-ups and SMEs that make use of the FIWARE technologies developed under the Future Internet PPP (see Annex 2).

- **Data Experimentation Incubators**: A series of incubators being set up under H2020 ICT 14 WP 2016-17 (Big Data PPP: cross-sectorial and cross-lingual data integration and experimentation). The objective is to foster exchange, linking and re-use of data, as well as

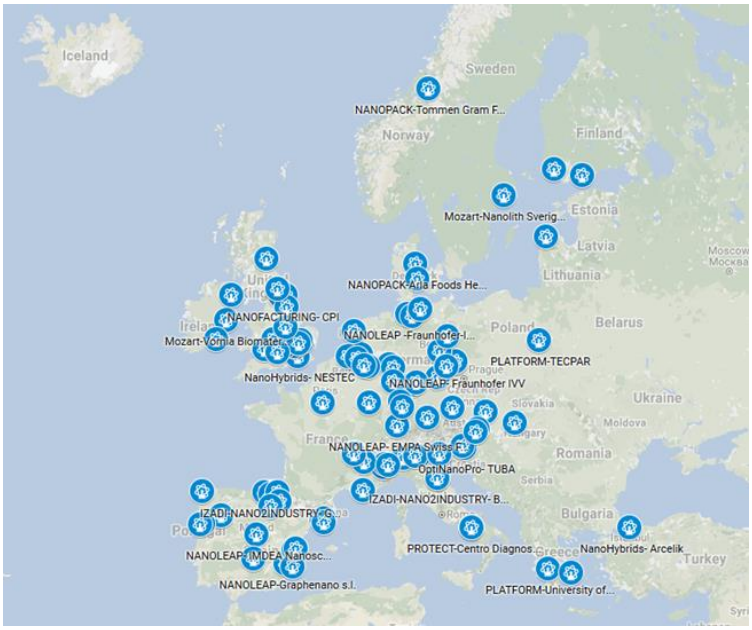
[36] The Commission background paper *Stock taking on initiatives supporting the development of Digital Innovation Hubs: Lessons learned from EU and national actions* provides an initial mapping.
[37] ICT Innovation for Manufacturing SMEs (I4MS, www.i4ms.eu)
[38] Smart Anything Everywhere (SAE, www.smartanythingeverywhere.eu)

to integrate data assets from multiple sectors and across languages and formats. This should lead to the creation of secure environments where researchers and SMEs can test innovative services and product ideas based on open data and business data, and should lead to new innovative companies and services for the data economy.

- **ECHORD++**: an initiative to bring robots from the lab to the market. Activities include: the Robotics Innovation Facilities (RIFs), which allow SMEs to try out new business ideas and make field tests at zero risk. It also helps manufacturing SMEs with small lot sizes and the need for highly flexible solutions to try out innovative robotics technologies. ECHORD++ also supports public authorities that are looking for robotics technology at competitive prices for tender processes.

- **Pilot Lines in Nanotechnology and Advanced Materials.** The PILOTS call activities under the NMBP[39] work programmes in Horizon 2020 and FP7 have resulted in 30 projects with a combined funding of €150m. These PILOT projects aim to help transfer new technology developed under Horizon 2020 into industry by providing open access for upscaling and pilot testing to SME users. Additional investments by Member States, public or private organisations have contributed to establishing a variety of pilot upscaling facilities across Europe, mainly in the EU-15 countries. The locations of the 107 pilot lines are shown in the map below. The pilots use many different raw materials, processes, and products, and address diverse sectors and markets, from automotive, aerospace, defence, energy storage, construction industry to cosmetics, health and packaging. The aim, together with the European Pilot Production Network (EPPN), should be to establish a strategic approach to promote technology take-up and the use of these services in particular for SMEs and across regions (access to technology and support for upscaling).

Figure A1: Locations of NMBP Pilot Lines



[39] *Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing*

- **Mapping of KETs competence centres.** As part of the Commission's actions to stimulate the industrial deployment of Key Enabling Technologies (KETs[40]) in Europe and following a recommendation from the former KETs High-Level Group, a Catalogue of KETs competence centres has been developed as a first step to facilitate cooperation between technology centres and companies, and SMEs in particular. The Catalogue is a mapping tool that provides an overview of the services available through around 200 KETs-related technology competence centres, including centres active in photonics, micro-/nanoelectronics and advanced manufacturing technologies[41]. The centres are selected according to a set of qualitative and quantitative criteria. They provide services to enterprises, such as help with prototyping, testing, upscaling, first production and product validation.

  Actions on facilitating cooperation between KETs technology centres and industry have very similar objectives to those proposed for Digital Innovation Hubs. It is envisaged that the two should work very closely together, such as regarding the mappings, but also especially in fostering synergies between digital and other advanced technologies (e.g. sustainable manufacturing, advanced materials, industrial biotech, nanotech). Some KETs competence centres already have digital expertise.

Figure A2: KETs Competence Centres

[40] *Nanotechnologies, Advanced Materials, Biotechnology, Advanced Manufacturing and Processing, Photonics and Micro-/nanoelectronics*

[41] See https://ec.europa.eu/growth/tools-databases/kets-tools/kets-tc/map. Mapping is currently being updated with additional centres, technologies and services.

A1.2 National, Regional and Industry Initiatives

Several EU Member States have launched initiatives relating to digital transformation of industry, some with a policy focus, others concerned more with research and innovation. Around ten policy-level initiatives or platforms are already active and more are planned (see map below).[42] Most EU countries are likely to develop a national strategy within the next few years.

Examples of industry digitisation activities being supported under existing national initiatives include:

- **Mittelstand-Digital Competence Centres (Germany)**: An initiative of the German Ministry of Economy and Technology under Plattform Industrie 4.0. Six centres are already operational, with five more launched in 2016, and a further five planned for 2017, providing information, training and support in the implementation of digital technologies in mid-caps and SMEs covering a wide range of manufacturing technologies. Funding is €56m over three years.
- **Alliance d' Industrie du Futur (France)**: Organises and coordinates digital transformation activities of its members (research institutions, public authorities and associations) on national level. Around 1200 SMEs are involved. Four showcases have been developed with Air Liquide, Bosch, SNCF and DAHER on advanced technologies.
- **High Value Manufacturing Catapult (UK)**: The HVMC's Manufacturing Technology Centre (MTC) assists UK companies in applying advanced manufacturing system solutions. Focusing on TRLs 4-6, the MTC helps companies to bridge 'the valley of death' in deploying new solutions in their businesses. Around £40m has been invested in four specialist centres, each of which includes match funding from industry. The MTC funding is split roughly equally between core public funding, commercial funding and competitively won R&D. An independent evaluation has shown that for every £1 of core public funding received the MTC produces £15 in net benefits to the UK economy.

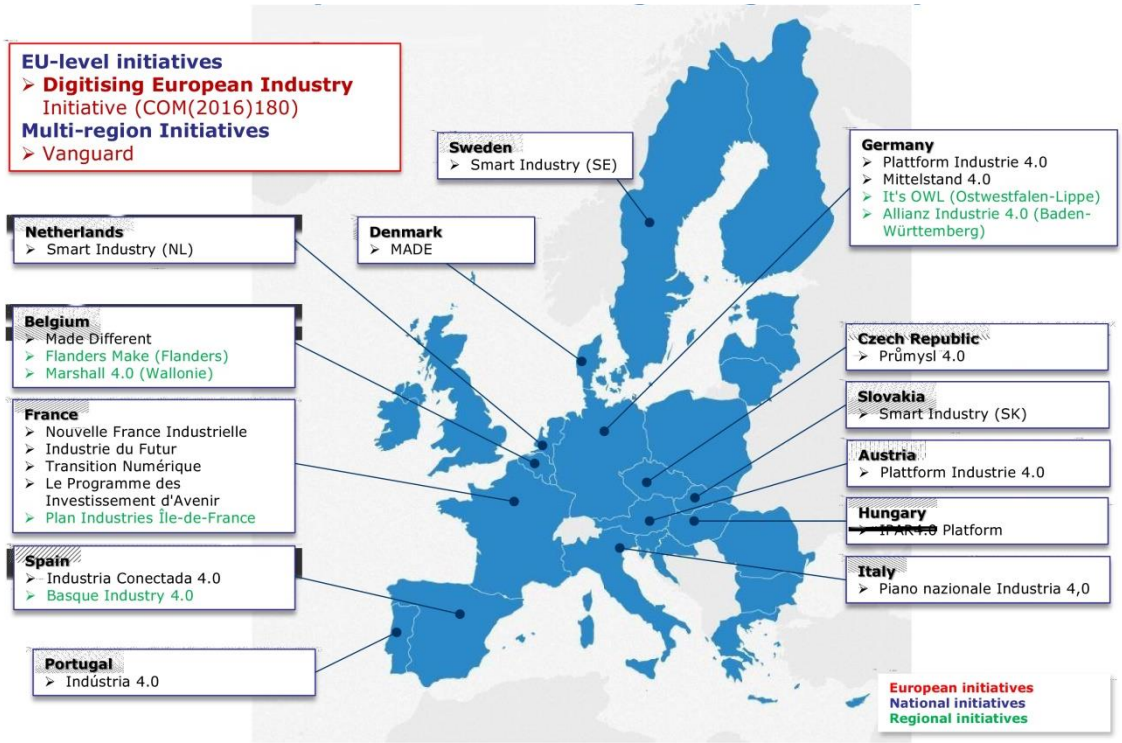
Figure A3: The Manufacturing Technology Centre Ecosystem *(courtesy of MTC)*

- **Intelligent Factories Technology Cluster (Italy)**: Groups large enterprises and SMEs, universities and research centres, entrepreneurial associations, technological districts, and other stakeholders operating in the sector of Manufacturing and Smart Factory. Activities include: research, technology transfer, sharing of research infrastructures and mobility, support to a smart and sustainable entrepreneurship, and support to the growth of human capital. Total funding of €43m is foreseen.

[42] Current and planned initiatives are listed, with live web links, at the Futurium website, http://ec.europa.eu/futurium/en/content/digitising-european-industry-catalogue-initiatives.

- **Tyndall National Institute (Ireland)**: is partnering with a number of regional and national clusters to: launch needs-driven regional and national initiatives; coordinate with public authorities and local government; build European partnerships; and provide B2B match-making and brokerage. For example, Tyndall is part of Ascent, a European project providing SMEs with access to state-of-the-art facilities in nanoelectronics.[43] It is also a partner in PIXAPP, a H2020 project offering the world's first open access photonics packaging pilot manufacturing line. Other activities apply advanced ICT in sectors as diverse as medicine and agriculture, including support for IoT SMEs in accessing funding. It is helping to create innovation networks with multidisciplinary translational competences.
- **Fieldlabs (Netherlands)**: An initiative under the national Smart Industry strategy, translated to the regional level. Supports a wide spread of technologies (mainly manufacturing) and activities (e.g. business coaching), access to regional funds, with five more hubs planned. Total funding of €100m over five years.

Figure A4: National Policy Initiatives for Digitisation of Industry, 2016



As is evident from the map, in certain countries (Belgium, France, Germany, and Spain for instance), regional initiatives have been launched.

Private initiatives are also in evidence. In Barcelona, for example, the I4AM[44] initiative aims to create an ecosystem for 3D printing (3DP) and digital manufacturing with a mixture of private and public funding. Led by leading players such as HP, Renishaw, Leitat Technological Center and others, I4AM aims to accelerate the development and adoption of additive manufacturing and 3DP technologies as an alternative way to design, develop and manufacture new competitive products and services.

Relevant national, regional and industry initiatives are being documented in the Catalogue of Digital Innovation Hubs that has recently been launched.

[43] www.ascent.network
[44] International Institute for Industrial Innovation in Additive Manufacturing and 3D Printing

A1.3 Related Policies

Digital transformation is high on the agenda and several new policies are emerging to accompany, to accelerate and to give direction to this transformation. They converge in building new capacities and establishing new connections to adopt key enabling technologies for creating value. They can greatly contribute to establishing a network of Digital Innovation Hubs all over Europe. These policies include:

Regions and Cities of Digital Transformation

European cities and regions have an important role to play as leaders in the digital transformation process. They create the right environment to accelerate the digital transformation of businesses, organisations and public administrations, and improve the life of their citizens. European Commission initiatives support local policy makers to understand the application of advanced technologies and the opportunities they provide, so that they can design flexible, future-proof policies.[45] In order to leverage regional economic growth and jobs, the Strategic Policy Forum on Digital Entrepreneurship developed a ***Blueprint for Cities and Regions of Digital Transformation*****:** effectively this is a smart policy guidebook for regions and cities to build-up successful local innovation ecosystems.[46] The Blueprint illustrates the strategic role of urban and regional ecosystems in leading a modern, smart transformation of their territories. It underlines the importance of a holistic approach that is motivated by strong leadership and mobilises all local actors. An online tool for the blueprint[47] defines the specific recommendations for local stakeholders on how to support digital transformation and presents the 13 case-studies in detail.

Smart Specialisation Platform for Industrial Modernisation and the Vanguard Initiative

The thematic Smart Specialisation Platform for Industrial Modernisation (SSP-IM) was set up by the European Commission in June 2016.[48] This initiative offers support to interregional cooperation based on matching regions with similar smart specialisation priorities related to the modernisation of industry. It is inspired by the Vanguard initiative on regional smart specialisation strategies (see box) and is hosted by the Commission's Smart Specialisation Platform located in Seville. The first thematic networks were launched in October 2016.

SSP-IM is a powerful means for positioning, aligning and integrating funding investments for innovation projects. It enables to focus on joint demonstrations, bridging between the early R&D phases and later industrial investments. SSP-IM aims to create an investment pipeline across the EU, by mapping regional strengths and needs, matching them within a value chain, and providing tailored advice and support services. The platform could help regions develop or share infrastructure such as testing facilities, pilot plants, data centres, and fab-labs and develop joint investment projects.

Regional Smart Specialisation: The Experience of the Vanguard Initiative

The Vanguard Initiative was established in 2014 and is a coordinated effort by 30 EU regions to better align their regional smart specialisation strategies. It has pioneered a new approach to support internationalisation and competitiveness of EU industry by bringing regions (and clusters) together to:

- discuss common objectives and find complementarities;
- map and better understand regions' industrial competencies and capabilities;
- develop joint strategic action plans (building critical mass and complementary specialisations); and

[45] https://ec.europa.eu/growth/industry/digital-transformation/role-cities-regions_en

[46] *Blueprint for Cities and Regions as Launch Pads for Digital Transformation*, Strategic Policy Forum on Digital Entrepreneurship (May 2016), www.digitallytransformyourregion.eu

[47] http://www.digitallytransformyourregion.eu/

[48] See: http://s3platform.jrc.ec.europa.eu/industrial-modernisation

- align strategic investments arising from these roadmaps.

The goal is to create 'inter-regional smart specialisation platforms' and to explore how the combination of different strengths can lead to a faster deployment of new technologies.

The methodology is currently being tested in five pilot actions in the areas of: innovative use of biomass; efficient and sustainable manufacturing; high performance production through 3D-printing; components for marine renewables and offshore energy applications; and new nano-enabled products. These pilots will be further supported by the Smart Specialisation Platform on Industrial Modernisation.

See: www.s3vanguardinitiative.eu

The SSP-IM could be a key platform for developing innovation hubs across Europe and facilitate sharing and networking between hubs. Experience with science parks, for example, shows that the best parks are not simply landlords but complex organisations that play an increasingly important part in local innovation ecosystems. They work extensively with knowledge-based SMEs and start-ups and make valuable contributions to foreign direct investment by high-tech companies. The newer technology fields in ICT, digital and internet are well represented in two thirds or more of the science parks.[49]

The SSP-IM could support DIHs through facilitating investment in both 'hard' and 'soft' infrastructure, and investment in projects, often as part of a financing mix (multi-level, multi-instrument). The S3 partnerships could be utilised to define user requirements for DIHs and for networked demonstration, again mobilising mixed funding.

EIT Knowledge and Innovation Communities

The EIT's Knowledge and Innovation Communities (KICs) are partnerships that bring together businesses, research centres and universities. They allow innovative products and services to be developed in a wide range of fields; new companies to be started to commercialise these innovations; and a new generation of entrepreneurs to be trained. KICs activities cover the entire innovation chain: training and education programmes, reinforcing the journey from research to the market, innovation projects, as well as business incubators and accelerators.

EIT Digital – one of five current KICs – is mobilising a pan-European ecosystem of over 130 European corporations, SMEs, start-ups, universities and research institutes, organised around 13 Co-location Centres in nine countries. These Centres will provide a very important basis for Digital Innovation Hubs in these places. The Centres **act as a networked DIH** by supporting: the development and validation of innovative solutions based on cutting-edge digital technology; the internationalisation of companies and products; and access to qualified ICT talents and/or improving the ICT skills of existing personnel. Furthermore, EIT Digital's ARISE Europe programme is extending the network benefits to regions/countries where there are no Co-Location Centres present.

Monitoring the Digital Transformation

The Digital Transformation Monitor (DTM) has been set up by the Commission with the objective to assess and monitor the performance of the 28 EU Member States on the level of digitisation in different sectors of the economy. It also provides cutting edge reports on key industrial and technological trends, new challenges and policy initiatives related to digital transformation.[50] The Digital Transformation Scoreboard is part of the DTM framework, published annually and analyses to what extent the new opportunities offered by advanced digital technologies are being captured by industry and service companies.[51] The DTM helps policy makers at EU and national level to create

[49] See also http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/stp_report_en.pdf
[50] https://ec.europa.eu/growth/tools-databases/dem/monitor/
[51] https://ec.europa.eu/growth/tools-databases/dem/monitor/scoreboard

policies supporting EU companies in digital transformation processes and enables companies to understand why digital technologies are important and how they can create or reinforce their own digital strategy.

Key Enabling Technologies

Key Enabling Technologies (KETs) are a group of six technologies – micro and nanoelectronics, nanotechnology, industrial biotechnology, advanced materials, photonics, and advanced manufacturing technologies – that have applications in multiple industries and help tackle societal challenges. Three of the six KETs have a strong digital dimension (micro- and nanoelectronics, photonics, and advanced manufacturing). Countries and regions that fully exploit KETs will be at the forefront of creating advanced and sustainable economies.

Actions undertaken within the KETs initiative include activities on skills and on the facilitation of cross-border industrial projects, fostering successful translation of KETs-related smart specialisation priorities as well as assistance to small businesses in accessing KETs technology centres and expertise. As part of the latter, a catalogue of KETs competence centres[52] has been developed (see above) and a pilot network of technology centres providing services to SMEs in the area of advanced manufacturing for clean production is being set up[53]. The Commission will also support (under COSME and Horizon2020) a pan-European Advanced Manufacturing Support Centre to help SMEs assess the possibility of adopting advanced manufacturing solutions and transforming their business towards a factory of the future. The centre will also help to launch new innovation advisory services for manufacturing SMEs at national and/or regional level on the basis of a coherent EU methodology.

In addition, the KETs Observatory[54] provides EU, national and regional policymakers and businesses with statistical data on the deployment of KETs within both the EU and other world regions (e.g. patenting, production, trade, turnover, and employment statistics).

Annex 2: Best Practices for Digital Innovation Hubs

Experts from many organisations have contributed to the WG1 discussions. During the course of these exchanges many interesting examples of 'best' or good practices have been cited. Certain of these are summarised in the main text and others are presented below. Potentially these could form the basis of an inventory of best practices to be shared across the European Digital Innovation Hub network.

A2.1: Skills for the Digital Economy

Good Practice Example: Digital Skills for Advanced Machine Tools

The machine tool industry is a key enabling and advanced manufacturing sector supplying major European industries. The competitiveness of the sector is based on the knowledge, skills and competences gained through vocational and work-based learning which are needed to design, produce, operate and maintain highly-customized, innovative and high-quality machines.

Funded under the Erasmus+ programme, the Machine Tool Alliance for Skills (METALS) is aiming to develop the skills necessary to maintain the sector's competitiveness. It is developing a new curriculum in areas such as additive manufacturing, building digital learning materials, and generating an e-learning platform.

[52] https://ec.europa.eu/growth/tools-databases/kets-tools/kets-tc/map
[53] INNOSUP-03-2017
[54] https://ec.europa.eu/growth/tools-databases/kets-tools/kets-deployment

See: www.metalsalliance.eu

A2.2: Innovation Scouting

Good Practice Example: Targeting SMEs with High Potential through Innovation Scouting

ACTPHAST, a H2020 support network for photonics innovation, uses innovation scouting as a key part of its business outreach.

Scouts either seek out companies with the potential to benefit from photonics technologies or respond to requests received. A company visit is quickly organised (typically within two weeks of an initial approach) to discuss the innovation request. These discussions take in factors such as: TRL level of the innovation support; company commitment; intellectual property arrangements; maturity of the business plan; and potential impact on growth and jobs.

This personalised interaction between scouts and SMEs enables ACTPHAST to target support towards those SMEs with the highest potential, while also improving the knowledge of many others along the way.

See: www.actphast.eu

A2.3: Business Acceleration for New Technologies

Good Practice Example: FIWARE Accelerators

The Future Internet PPP has developed an open source platform (FIWARE) offering APIs to developers. In order to make these technologies (enablers) better known the European Commission funded 16 accelerators to promote their deployment in real-world applications. Around €100m was invested in FP7.

The accelerators organised open calls on specific domains, such as health, media, smart cities, agrifood, and Industry 4.0. SMEs, start-ups and web developers were able to apply for up to €100k to develop their application. The initiative attracted over 10,000 submissions, from which more than 1000 SMEs and start-ups were selected to be part of the FIWARE business acceleration programme.

Each of the 16 accelerators has developed its own partner network, linking offices and innovation hubs sometimes in distant countries, connecting tutors, mentors, developers and entrepreneurs, building bridges between people and places, assembling an open community around technology. The accelerators collaborated to exchange experiences and were also linked to European regions in order to take advantage of local ecosystems and regional smart specialization.

See: www.fiware.org/fiware-accelerator-programme

A2.4: Mobilising Investment for Digital Innovation Hubs

Combined Funding for Large-Scale Research Development and Innovation Initiatives (LSIs): Meeting the Challenge

Large-scale research, development and innovation (RDI) initiatives (LSIs) are playing an increasingly important role across Europe for the development and commercialisation of new novel products and services. Research under the EU-GREAT! Project found that:

- LSIs generate high economic impact via product innovation and job creation.
- Their funding tends to combine finance from different public and private sources including national, regional, Horizon 2020, European Structural and Investments Funds and commercial subcontracts.
- LSIs create and spinout a significant number of new collaborative R&D projects.

But there can be lack of:

- Stakeholder commitment, mainly from financers, for setting up new LSIs.
- Adequate fiscal grants for industry-driven LSIs.
- Investment requested for setting up and operation of LSIs and as a consequence, they have a high dependency on public sector funding.

The project recommends that EU policy-makers:

- Establish long-term EU policies and strategies to directly support co-financing needs of LSIs in all regions across Europe.
- Design and implement new EU and national level funding instruments that will enable consortia to form, launch and operate LSIs.
- Improve synergies between the finance rules of different national, regional and European RDI funding programmes so as to reduce administration costs.
- Encourage combined funding through Horizon 2020 and European Regional Development Fund (ERDF).
- Increase coherence between policy, legislation, and R&D+I strategy.
- Better and proficient communication of funding opportunities across Europe.

Source: "Combined Funding for Large Scale Research Development and Innovation Initiatives (LSIs)", http://eu-great.com

Scalable Funding for Innovation: The EARTO Experience

The 350 research and technology organisations represented by EARTO[55] are at the forefront of innovation funding in Europe. RTOs work with a wide range of organisations – large enterprises, SMEs and RTO spin-offs – and across all sectors and technologies to bring innovative solutions to the market. In doing so, they address the whole value chain and span many technology levels (expressed as TRLs).

This requires the marshalling of funding streams from various sources, often with very different objectives. There are research and innovation grants, through H2020, that support technology development; ESIF grants that support innovation in a regional context; and EIB financial tools (loans, advice) that finance near-to-market activities as well as the creation and maintenance of infrastructures. Added to this are the various national and regional funding systems.

RTOs frequently encounter different funding tools operating at different TRL levels and with different criteria, rules and timing. There are synergies between them but securing these is not straightforward. Funding streams tend to be sequential rather than parallel, which represents a risk to project continuity. In some cases State Aid Rules are also a factor. For example, State Aid considerations apply to ESIF funding but not to H2020 funding and innovation can often get caught in the middle. A coherent approach requires careful consideration so as to establish appropriate risk-sharing between the various stakeholders.

The experience of Europe's RTO could be extremely valuable both in establishing and financing individual hubs and in operating the DIH network. For example, they have experience in launching and operating

[55] European Association of Research & Technology Organisations, www.earto.eu

innovation infrastructures as well as strong links to InnoFin, the innovation financing arm of the European Investment Bank (EIB). At policy level, too, RTOs – through EARTO – could help create the right climate for hubs to grow and prosper.

Annex 3: Planned investments, allocated resources, in MS, in relation to European Regional Development Funds in categories relevant for Digital Innovation Hubs.

The European Structural and Investment Funds consist of five main funds that work together to support economic development across all EU countries, in line with the objectives of the Europe 2020 strategy; these are the European Regional Development Fund (ERDF), European Social Fund (ESF), Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF). Every EU region may benefit from the ERDF and ESF. However, only the less developed regions may receive support from the Cohesion Fund.

Of particular interest in the context of Digital Innovation Hubs is the ERDF that aims to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions. ERDF can be used for investment in eleven key priority areas; known as Thematic Objectives:

1. Strengthening research, technological development and innovation
2. Enhancing access to, and use and quality of ICT
3. Enhancing the competitiveness of small and medium-sized enterprises (SMEs)
4. Supporting the shift towards a low-carbon economy in all sectors
5. Promoting climate change adaptation, risk prevention and management
6. Preserving and protecting the environment and promoting resource efficiency
7. Promoting sustainable transport and removing bottlenecks in key network infrastructures
8. Promoting sustainable and quality employment and supporting labour mobility
9. Promoting social inclusion, combating poverty and any discrimination
10. Investing in education, training and vocational training for skills and lifelong learning
11. Enhancing institutional capacity of public authorities and stakeholders and efficient public administration

At the same time, the first four of these thematic objectives constitute key priorities for the ERDF, and a significant part of the investment will focus on these areas (in more developed regions, at least 80 % of funds must focus on at least two of these priorities; in transition regions, this focus is for 60 % of the funds; and 50 % in less developed regions.).

The goal of these objectives is to focus regional policy funding on areas that deliver the highest benefits to citizens, creating synergies between the funded projects and avoiding an excessive fragmentation of funding.

The funds can be used to contribute towards meeting the goals of the Digital Single Market by investing in better access, use and quality of ICT, as stated in Thematic Objective (TO) 2 of the ESIF Regulation. ICT measures can also be financed as support measures within any of the other 10 Thematic Objectives of the ESIF, particularly research and innovation, promoting the competitiveness of SMEs and the shift to a low carbon economy. As such, Structural and Investment Funds can be used for the creation and up-grading of ICT infrastructures, to stimulate the take-up of these structures and invest in innovative services and applications. [56]

When EU regions and Member States have prepared their strategies and Operational Programmes (OP), the activities and interventions and planned investment amounts have been expressed as a number of Categories of Intervention and the amounts have also been encoded along the lines of the Thematic Objectives (TO) mentioned above.

[56] http://publications.jrc.ec.europa.eu/repository/bitstream/JRC88896/ipts%20jrc%2088896%20%28print%29%20final.pdf

The categories of intervention are key element of the monitoring and reporting system of the ESIF, which provides regular information on the implementation of cohesion policy on the ground in terms of types of actions financed and the distribution of funding across different types of territory and across sectors. The categories of intervention consist of 123 different categories that indicate different contents of actions to be financed. While many categories are implicitly more relevant for some thematic objectives and investment priorities under the ERDF and the Cohesion Fund than others (e.g. construction of roads or railways is linked to transport) the same category can be financed under different thematic objectives or investment priorities (e.g. building a local road link to a new research institute may be undertaken as a part of a greater investment in research infrastructure). If the use of EU funds to support a category of intervention is well justified in terms of its contribution to the objectives defined, it can be supported.[57]

There are a number of Categories of Intervention that we have deemed as more likely as being used when encoding interventions that could relate to Digital Innovation Hubs, these are listed in Table 1. It is expected that most of the investments will be related to 082 as it is the CoI that is most strongly linked to ICT and then also 066, but the other ones are certainly not excluded. CoI 082 is used for Digital SME support and is planned for many things and Digital Innovation Hubs activities could be one area. The other CoIs listed do not have the same strong ICT component, but we know that ICT will be an important area for investments in research and innovation.[58]

Table1: Name of Categories of Intervention (COI)

082 - ICT Services and applications for SMEs (including e-Commerce, e-Business and networked business processes), living labs, web entrepreneurs and ICT start-ups):
066 - Advanced support services for SMEs and groups of SMEs (including management, marketing and design services):
059 - Research and innovation infrastructure (private, including science parks):
062 - Technology transfer and university-enterprise cooperation primarily benefiting SMEs:
063 - Cluster support and business networks primarily benefiting SMEs:
064 - Research and innovation processes in SMEs (including voucher schemes, process, design, service and social innovation):
058 - Research and innovation infrastructure (public):
060 - Research and innovation activities in public research centres and centres of competence including networking:
061 - Research and innovation activities in private research centres including networking:
067 - SME business development, support to entrepreneurship and incubation (including support to spin offs and spin outs):
072 - Business infrastructure for SMEs (including industrial parks and sites):

Source: COMMISSION IMPLEMENTING REGULATION (EU) No 184/2014; http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0184&from=EN

[57] To learn more about the ESIF, Thematic Objectives and the entire list of Categories of Intervention, please read the COMMISSION IMPLEMENTING REGULATION (EU) No 184/2014; http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0184&from=EN

[58] Jens Sörvik & Alexander Kleibrink, 2016. "Mapping EU investments in ICT - description of an online tool and initial observations," JRC Working Papers JRC102233, Joint Research Centre (Seville site).

An overview of what member states have planned to invest in these categories may be found on https://cohesiondata.ec.europa.eu/ .

Annex 4: List of Working Group 1 participants.

	FIRST NAME	LAST NAME	REPRESENTING
1	Jon	Agirre Ibarbia	Tecnalia
2	Izabela	Albrycht	The Kosciuszko Institute
3	Judit	Anda	Andalucia region
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5	Rémi	Arquevaux	Ministère de l'Economie, de l'Industrie et du Numérique
6	Muriel	Attané	EARTO
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11	Christian	Blobner	Fraunhofer-Institute for Factory Operation and Automation IFF
12	David	Bohmert	CESAER
13	Fabio	Boscaleri	Tuscany region
14	Helmut	Bossy	BMBF
15	Sara	Buisan	Permanent Delegation of Castilla y Leon to the EU
16	Mario	Buisán	General Secretariat for Industry and SMEs, Ministry of Industry, Energy and Tourism
17	Maurits	Butter	TNO
18	Silvia	Castellvi	i2CAT
19	Rinalds	Celmins	LV Perm Rep
20	Alessandro	Curioni	IBM
21	Filipe	Custodio	Visionware
22	Farid	Dailami	Bristol Robotics Laboratory
23	Pierre-Yves	Danet	Orange Labs
24	Nicholas	Davis	World Economic Forum
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26	Marcel	De Heide	TNO
27	Wim	De Kinderen	Brainport Eindhoven EU Office
28	Silvia	De La Maza	Innovalia
29	Nuria	De Lama	ATOS Spain
30	Fabrizio	De Simone	ARCTURUS GROUP
31	Emir	Demircan	CECIMO

32	Nicole	Denjoy	COCIR
33	Fanny	Devaux	FFA French federation of insurers
34	Jean-Luc	di Paola Galloni	Sustainability and External Affairs , and also Co-chairman of the European Road Transport Research Advisory Council
35	Helena	Dias Duarte	Agência para a Competitividade e Inovação, I.P.
36	Jose	Diego	Castilla y León Innovation Agency (ADE)
37	Janine	Dobelmann	NXP Semiconductors
38	Ricardo	Dominguez	Andalucia region
39	Helena	Duarte	IAPMEI - Portuguese Agency for Competitiveness and Innovation
40	Lucie	Durocher	Région Provence-Alpes-Côte d'Azur
41	Cornelius	Eich	ZVEI e.V
42	Fouad	El Khaldi	ESI Group
43	Virginia	Enache	Permanent Representation of Romania to EU
44	Moritz	Ernst	digitalHUB Aachen e.V.
45	Susana	Escária	Ministry of Economy
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47	Daniela	Florea	Geo-Strategies
48	Martin	Friis	SKF
49	Ana	García González	Spanish Permanent Representation to the EU
50	Ana	García Robles	Big Data Value Association
51	Rimantas	Gatautis	Kaunas University of Technology
52	Rodrigue	Germany	Systematic Paris Region
53	Bjorn-Soren	Gigler	European Investment Bank
54	Andreas	Goerdeler	Federal Ministry for Economic Affairs and Energy
55	Arjen	Goetheer	TNO
56	Dominic	Gorecky	German Research Center for Artificial Intelligence (DFKI)
57	Michael	Gruschwitz	Saxon Ministry of Agriculture and Environment
58	Cinzia	Guido	Confindustria
59	Lukas	Hatala	HP Enterprise
60	Ingo	Hegny	Federal Ministry for Transport, Innovation and Technology
61	Alain	Heureux	Your Own Lab
62	Jiří	Holoubek	SPCR
63	Lina	Huertas	MTC
64	Elmar	Hussman	ELIG European Learning Industry Group
65	Martins	Jansons	Ministry of economics
66	Rob	Karsmakers	Philips
67	Mari	Kert Saint Aubyn	Guardtime
68	Francesco	Kienzle	EUResearch
69	Werner	Kohnert	DLR
70	Carolin-	Kosel	ZDH

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72	Christophe	Leroux	CEA LIST
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76	James	Lovegrove	Red Hat Inc
77	Maria	Lozano Uriz	Committee of the Regions
78	Silviya	Lozanova	Bulgarian Ministry of Economy
79	Iñaki	Luaces	FUNDECYT-PCTEX
80	Elena	Maccioni	ENRD Contact Point
81	Michela	Magas	AIOTI (European Alliance for Internet of Things Innovation)
82	Jean-Philippe	Malicet	CAP'TRONIC
83	Martti	Mäntylä	Aalto University
84	Markku	Markkula	Committee of the Regions
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86	Riccardo	Massucci	Intel
87	Walter	Mattauch	Plattform Industrie 4.0
88	Gabriel	Mayer	Ministère de l'Economie, de l'Industrie et du Numérique
89	Tomasz	Mazuryk	FundingBox
90	Kieran	McCarthy	Committee of the Regions
91	Stef	Meijers	brainportdevelopment
92	Gisela	Meister	Giesecke & Devrient
93	Laurent Michel	Mercatali	Gruppo Energent
94	Nebojsa	Milenkovic	Gopa Com S.A.
95	Mercedes	Mira	Galician Innovation Agency
96	Irene	Mitsinga	Ministry of Energy, Commerce, Industry & Tourism
97	Cosmina	Miu	Permanent Representation of Romania to EU
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99	Dirk	Muehlenweg	IBM Watson IoT
100	Antonio	Murta	Pathena
101	Dan	Nechita	Government of Romania
102	Valentin	Necoara	certSIGN
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106	Elli	Pagourtzi	
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108	Mark	Pattinson	Inno Group
109	Zeljko	Pazin	European Factories of the Future Research Association -

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111	Esteban	Pelayo	EURADA
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113	Luigi	Perissich	Confindustria Servizi Innovativi e Tecnologici
114	Jean	Perrot	Airbus Group
115	Pekka	Pesonen	copa-cogeca
116	Ludovic	Petit	ALTRAN
117	Fabio	Pianesi	EIT Digital
118	Francesca	Poggiali	GS1
119	Axel	Pols	BITKOM Research
120	Jana	Radová	Confederation of Industry of the Czech Republic
121	Mario	Rasetti	ISI
122	Lars	Reger	NXP
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127	Justyna	Romanoswka	Polish Ministry of Defence
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130	Tereza	Šamanová	SPCR
131	Luis	Sanz	IASP - International Association of Science Parks and Areas of Innovation
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133	Amardeo	Sarma	Neclab
134	Martin	Schmid	Austrian Federal Economic Chamber
135	Martin	Semberger	Federal Ministry of Science, Research and Economy
136	David	Servat	DGE
137	Michael	Sharpe	MS Consulting & Research Ltd
138	Jakub	Skalos	Ministry of economy of Slovakia
139	Talita	Soares	EARTO
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142	Cornelia	Spycher	EUResearch
143	Jan Filip	Staniłko	Ministry of Economic Development
144	Stefanie	Stündel	BDI The German Business Representation
145	Jan	Sulik	Ministry of economy
146	Roman	Szewczyk	Industrial Research Institute for Automation and Measurements (PIAP)
147	Marco	Taisch	Politecnico di Milano
148	Jaanus	Tärnov	Estonian Ministry of Economic Affairs and

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150	Rasmus	Thusgaard	Danish permanent representation
151	Tomas	Tišler	Ministry of public administration
152	Sebastiano	Toffaletti	DigitalSME
153	Kalin	Tomov	Bulgarian Ministry of Economy
154	Gaston	Trauffler	LUXINNOVATION
155	Richard	Tuffs	ERRIN
156	Tuomo	Tuikka	VTT Technical Research Centre of Finland
157	Reijo	Tuokko	DIMECC Ltd.
158	Anne	Van den Bosch	imec
159	Philippe	Vanrie	EBN
160	Ovidiu	Vermesan	SINTEF ICT
161	Natalia	Vicente	ETNO
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165	Cecilia	Warrol Ersson	Teknikföretagen
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168	Kohnert	Werner	Plattform Industrie 4.0
169	Iris	Wilhelmi	DIH Aachen
170	Markus	Wilkens	ETP Photonics21 / Photonics PPP Secretariat (VDI Technologiezentrum GmbH)
171	Martin	Winter	European Chemical Industry Council
172	Sonja	Witte	German Association of Local Utilities of municipally determined infrastructure undertakings and economic enterprises