Stock taking of initiatives supporting the development of Digital Innovation Hubs: Lessons learned from EU and national actions

Input to the working group of the DEI Round Table developing a plan of actions to support the development of Digital Innovation Hubs across Europe.

DRAFT

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1. PURPOSE OF THE DOCUMENT

The overall objective of the "*Digitising European Industry (DEI): Reaping the full benefits of a Digital Single Market*" Communication (COM(2016)180)[1] is to ensure that *any industry in Europe, big 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 change.*

Digital technologies[2] are dramatically changing the way we design, produce and commercialise all types of goods and services. They will shape the markets of the future. If we want to reap the potential of digital technologies across the economy, industry in all sectors and everywhere in Europe needs to integrate digital innovations as essential part of value creation in their business strategies. Digital Innovation Hubs aims at supporting businesses and notably SMEs and non-tech industry in their digital transformation.

Digitisation is an essential track in the modernisation of European industry[3]. It requires not only a dynamic digital sector in Europe but also the full integration of digital innovations across all sectors of the economy.

Digitisation of industry would create an additional €110 billion of revenue for industry per year in Europe over the next five years, according to studies by PwC and Boston Consulting Group[4], and can keep industry in Europe.

In its Communication on DEI the Commission proposed the following lines of action related to Digital Innovation Hubs:

The Commission plans to focus 500M€ investment from Horizon 2020 on digital innovation hubs on:

- ***Networking and collaboration of digital competence centres*** *and cluster partnerships.*
- *Supporting* ***cross-border collaboration*** *of* ***innovative experimentation*** *activities.*
- *Sharing of best practices and developing, by end of 2016, a* ***catalogue of competences****.*
- ***Mobilising regions*** *with no Digital Innovation Hub to join and invest[5].*
- *Wider use of* ***public procurement*** *of innovations to improve efficiency and quality of public sector*

The Commission will also set up in June 2016 a thematic smart specialisation platform for industrial modernisation.

The Commission encourages ***Member States*** *and Regions to invest in DIH and incentivise industry to embrace digital innovations.*

[1] COM(2016)180, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0180

[2] Typical digital technologies are robotics and artificial intelligence, data analytics, simulation, laser, 3D printing, Internet of Things, Cyber Physical Systems, cloud computing, photonics, micro/nanoelectronics, or high performance manufacturing. These technologies enable new solutions for societal challenges and consumer needs.

[3] Industry is used here in a wide sense. It includes all activities (including services) to develop, produce, sell and maintain tangible products. Agrifood would be considered as an industrial activity as well.

[4] PwC, opportunities and Challenges of the industrial internet (2015), and Boston Consulting Group: the future of productivity and growth in manufacturing industries (2015)

[5] E.g. the mentoring programme in I4MS

This document, developed by several Commission Services of DG CNECT, GROW, REGIO, RTD and AGRI serves as input to a working group of experts from national administrations involved in industrial and innovation policies and from industry that aim at developing and implementing a plan of action to make Digital Innovation Hubs at working distance of all companies in Europe a reality.

The document will not pre-empt any decision taken by the working group of national policy makers and innovation experts. To the contrary, the aim of the document is to take stock of existing policies, projects and initiatives and to clarify concepts.

The mandate of the Working Group is provided in Annex.

2. DIGITISATION SITUATION 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 large 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.[6]

The Digital Intensity Index (DII) is a micro-based index that measures the availability to the firm of 12 different digital technologies: the internet for at least 50 % of employed persons, recourse to ICT specialists, fast broadband (30 Mbps or above), mobile internet devices for at least 20 % of employed persons, website, a website with sophisticated functions, social media, Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), electronic sharing of supply chain management information, eCommerce turnover accounting for over 1 % of total turnover, business-to-consumer (B2C) web sales of over 10 % of total web sales. The value for the index therefore ranges from 0 to 12.[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). In IT, RO, BG and EL, less than one firm out of eight has invested heavily in digital technologies (i.e. has a high DII).[8]

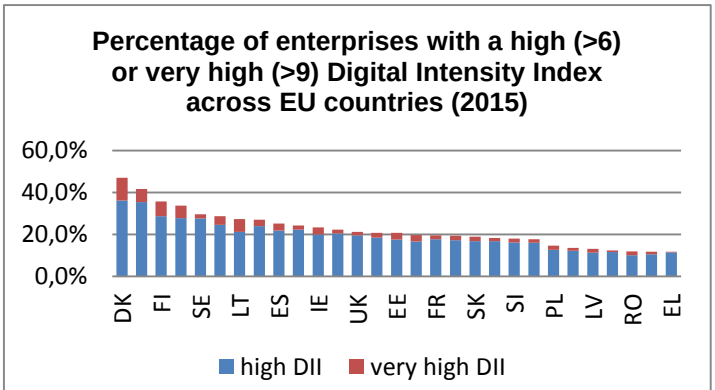

Figure 1. Overview of the Digital Intensity Index across EU countries (2015)

[6] Digital Entrepreneurship Scoreboard: http://ec.europa.eu/growth/tools-databases/

[7] Even though the index mainly covers the use of ICT for administration, logistics and sales, this is still a good proxy for digitisation from advanced technologies like robotics, photonics, 3D printing, etc. It is highly unlikely that companies are using such advanced technologies and would not use the more "basic" technologies. At the moment we also do not have such extensive company surveys of the use of these advanced technologies. In the future, Eurostat is considering adding these to their survey.

[8] https://ec.europa.eu/digital-single-market/en/integration-digital-technology

If we look at the breakdown per type of company, we can see that 54% of large enterprises are highly digitised (i.e. use more than 7 of the digital technologies mentioned above), whereas this is the case for only 17% of the SMEs.

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

Economies in Europe are closely connected, and our industry has built strong cross-border value chains. This is why digitisation of our industry needs to be comprehensive all across Europe. It is therefore important to focus more efforts on helping the digitisation in those regions of Europe and those economic sectors were digitisation is not happening sufficiently yet.

When asked about public support to help the digital transformation of companies, industrial stakeholders point out to the urgent need for "facilities to experiment with, and test digital innovations" before investing in digitisation. Regions and cities with a higher digital readiness had invested in digital competence centres (e.g. Research and Technology Organisations (RTOs) and university labs) offering such support to industry[10].

EU actions[11] supporting such competence centres in digital technologies that cooperate with companies have shown not only an increase of competitiveness of existing industries, notably for SME and mid-caps, but also additional business creation in new digitised products and services. This is also the case for networks of start-up accelerators such as Startup Europe and FIWARE initiatives.

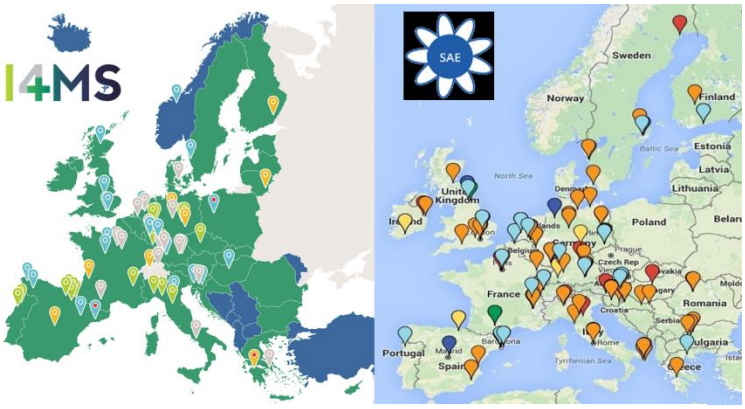

Figure 2. Overview of competence centers in I4MS (left) and Smart Anything Everywhere (right)

However, if we look at the map of Europe and see where the competence centers that are engaged in aforementioned EU actions are located, we see big gaps in Eastern and Southern Europe. As an example, see the overview of I4MS and Smart Anything Everywhere centers in Figure 2.

In a similar vein, the map of technology centres open to companies and active in key enabling technologies (KETs), including three ICT-KETs, shows that 60% of these centres are located in only four Member States (DE, FR, ES, UK).

Figure 3: Overview of technology centres active in KETs

[9] http://digital-agenda-data.eu/charts/analyse-one-indicator-and-compare-breakdowns#chart={"indicator-group":"ebusiness","indicator":"e_di_hivhi","breakdown-group":"econsector","unit-measure":"pc_ent","time-period":"2015","ref-area":["EU28"]}

[10] E.g. UK Catapult, NL Smart Industry Field Labs, German SME and mid-caps centres, …

[11] I4MS: www.i4ms.eu, SAE: smartanythingeverywhere.eu, ECHORD++: echord.eu, ACTPHAST: www.actphast.eu, FIWARE: www.fiware.org and Start-up Europe initiatives

Not only competence centers will play an important role. Also regions with strong clusters[12] in digital industries[13] are characterised with very high innovation levels. Therfore, clusters should also be used to achieve the goal of more digitisation of industry.

3. WHAT ARE DIGITAL INNOVATION HUBS?

3.1. What is a Digital Innovation Hubs

A Digital Innovation Hub refers to an ecosystem through which any business can get access to latest knowledge, expertise and technology for testing and experimenting digital innovations relevant to its products, processes or business models. The Hub can provide also the connections with investors, facilitates access to financing of digital transformations of businesses and help connect users and suppliers of digital innovations across the value chain.

The core of a Digital Innovation Hub is one or multiple "competence centres. These provide advances technical expertise and facilities (labs, infrastructures, pilot lines for production, etc..). They cooperate within the hubs with the necessary partners in the innovation chain to support businesses in their digital transformation including investors, business development and legal experts, etc. No one competence centres can be excellent in all digital fields. Hence the need of networking between competence centres (and their hubs) with complementary disciplines so to offer a "one stop shop" for businesses.

The goal is to ensure that any business in Europe should have access to a DIH at a working distance.

In comparison with traditional technology transfer activities of competence centres that are normally focused on collaboration with the digital supply industry, (including start-ups and SMEs), the DIHs will add also more intensive cooperation with businesses from all industrial sectors that were so far considered as just users of technology. The activity of DIH is driven by the demand for digital innovations. The approach is "bottom up": By providing access to latest digital knowhow and technology, any business can become an active digital innovator.

Experience so far has shown the demand has grown rapidly. Most businesses today would like to assess what Big Data, IoT, robotics and AI can bring to their products, processes and business models. Digital Innovation Hubs should have the capacity to offer services to a sizeable amount of industry.

[12] Currently, despite the fact that there is no widely accepted single definition of the term cluster, almost all definitions introduce to common characteristics: they share the ideas of proximity, networking and specialisation, and a central assumption that a cluster is more than the sum of its parts. The relationships between the firms of a cluster are characterised both by cooperation and interdependence on the one hand, and by innovation-related competition on the other hand. Furthermore, it is assumed that spatial proximity produces positive externalities for the involved firms such as a supply of labour with an appropriate qualifications profile or specific infrastructural provision.

[13] Map of European digital clusters in the Atlas of European ICT Poles of Excellence: is.jrc.ec.europa.eu/pages/ISG/EIPE.html

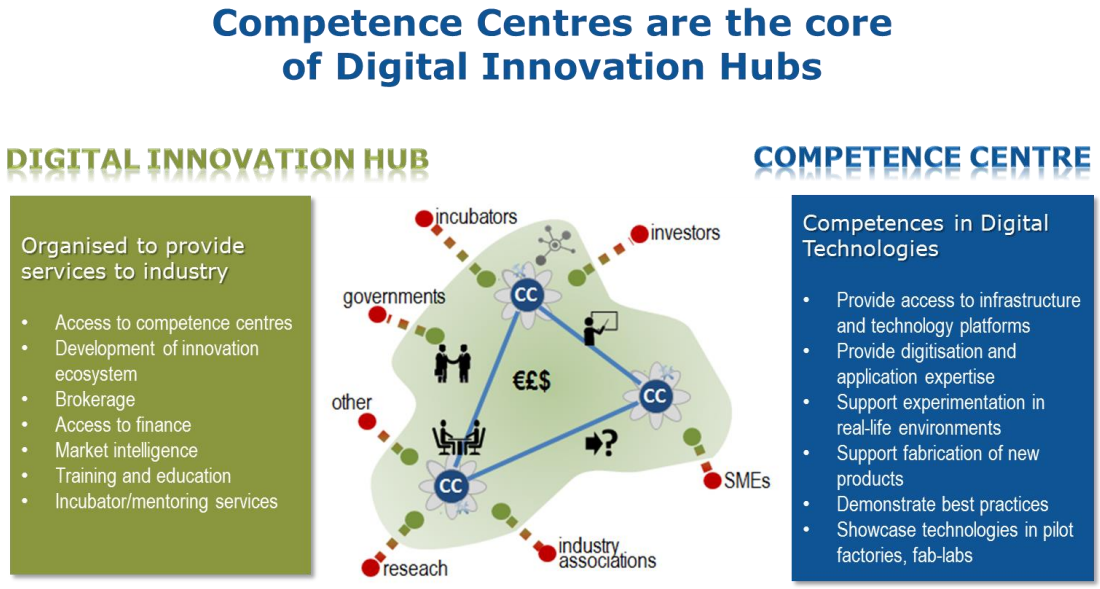

Figure 4: Schematic overview of Digital Innovation Hubs

3.2. The role of Competence Centers

Based on experience with existing competence centres and hubs, the following offerings are useful to help companies with their digital transformation:

- Supporting experimentation and testing with new technologies to transform products, processes or business models
- Supporting fabrication of new products and processes
- Showcasing technologies in pilot factories
- Offering introductory courses to understand new technology based on an understanding of the training needs and train a sufficient number of trainers for further upscaling.
- Brokering between users and suppliers of technologies, e.g. on tools, data, and intellectual property around technologies
- Keep track of global developments, propose technology options and provide a flexible support
- Support mobility of experts and entrepreneurs

Competence centres should be networked to ensure specialisation and excellence. When certain expertise is necessary which is not available in the center, it should be possible to find it in another centre. This will ensure that any company can get the help they need, and multidisciplinarity is adequately handled.

3.3. The added value of Digital Innovation Hubs

Competence centers should be embedded in a Digital Innovation Hub. Only technological support will not be sufficient to spur bottom up innovation. Therefore, the Digital Innovation Hub will provide the necessary support to finance and nurture the technological developments to a level that the company can become more competitive. Such services will include:

- Access to finance.
- Access to training services (see also Section 3.5)
- Mentoring services to grow the business; business and market intelligence; access to new markets. Advice on IPR and legal issues
- Startup support.
- Actively outreach to SMEs and midcaps to understand their needs and raise their awareness how digital technologies can make their companies more competitive, e.g. through innovation scouts who are trained in all relevant aspects of technology offerings and innovation. Channels for this outreach should be web-based as well as more traditional means such as trade fairs and exhibitions.
- Brokering, matchmaking, partnering between stakeholders, providing access to "living labs" type of network to validate new products or services

3.4. Varying nature of competence centres and Digital Innovation Hubs

Several competence centers exist in Europe, usually with a regional focus. They can be very different in nature, e.g.:

- high tech organisations / research institutes (universities, RTOs – research technology organisations, private consultants, design houses, private research organisations) that are specialised in applying certain innovative technologies to solve challenging problems of enterprises.
- demonstration factories/show cases that show advanced technologies integrated in manufacturing processes.
- testbed facilities: for instance a factory, hospital, farm, urban area, test-house, power plant, … opening its facility to the technologists for solving their problems and accompanying them during the whole process, from requirement to testing phases.
- pilot lines, offering production facilities for companies that have developed new products based on e.g. based on nano-electronics, photonics, new materials.
- "maker labs" or "fab labs" which offer introductory courses to understand new technology and offer services for using specialised equipment.

Some offer only technical services without financial and training services, whereas others offer all the services of a Digital Innovation Hub.

It is also possible that a kind of Digital Innovation Hub already exists (e.g. through an ecosystem of different organisations and entities that provide general innovation mechanisms or as a cluster organisation) but without a competence center providing the core competencies and facilities to support the industry in its digitisation. In such cases, the Digital Innovation Hubs, or cluster organisations that already execute different functions of an innovation hub, should be reinforced and ensure collaborations with competence centres.

3.5. Training and skills development

Digital Innovation Hubs should also play a strategic role in 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, but 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.

Particularly SMEs in many industrial domains do not have access to digital training solutions, even though they can represent a major cost reduction in enhancing both the performance of the workers and the quality of the industrial process. DIHs should leverage on the specialised companies[14] within and across the Hubs providing cutting-edge industrial training solutions and bridge to the specialised research groups within universities[15] that are developing these technologies.

This will also link up two still separated policies: the policies for skills development in digital technologies for the labour force or in individual companies and the need for modernisation along the entire value chain.

3.6. Business models for DIHs

DIHs are fulfilling services of different kind that have a mixed public and private nature. They need a hybrid 'business model' that can combine public and private financing sources. Depending on the situation, money will be needed for building and maintaining the infrastructure, buying machines and equipment, having qualified personnel for the services they deliver.

Public goods and services are information and knowledge that can be shared and that expose (positive) externalities: therefore they can be subsidised. Private goods and services can be appropriated by clients that should fully pay the price. Parts of the financing of infrastructures can therefore be provided by private service contracts (that are also covering usage of the infrastructure) and by subsidies for research. The same is

[14] E.g. SedApta/Skillaware in the area of the Italian Technology Cluster "Intelligent factories" http://www.sedapta.com/en/performance-support-training

[15] See for example the large European R&I projects WEKIT (http://wekit.eu/) TELL-ME (http://www.tellme-ip.eu/) or Learning Layers (http://learning-layers.eu/)

valid for training that can also be performed on this infrastructure. The combination of different services and functions to fully use the capacity of the infrastructure can be translated in a business model and financial plan that would make it possible to attract promotional banks or other financial agents with a longer-term perspective to invest in the set-up of new infrastructures or their extension of already existing ones.

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 is bigger when more innovation hub services will succeed in de-risking private investments in the modernisation of industry that are now still hesitant. The use of shared infrastructures is reducing costs and increasing returns for experimentation. The more successful the more the capacity will be used and the more services will be paid fully with private funds.

In the Commission Communication we foresee that funding of cross-border services (such as a Company X wants to make use of the specialised services of a DIH Y and this hub is located outside the region or country of X) could be funded at European level through H2020. Local public goods and services could be funded by local public funds.

4. EXAMPLES OF EXISTING COMPETENCE CENTRES AND DIGITAL INNOVATION HUBS (EC, MEMBER STATES)

4.1. Digital Innovation Hubs in H2020

The European Commission is programming €500 million in the 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 of H2020, which has well proven its applicability in running initiatives like I4MS and Smart Anything Everywhere.

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. Using the new "cascading grants" model of H2020, also 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.

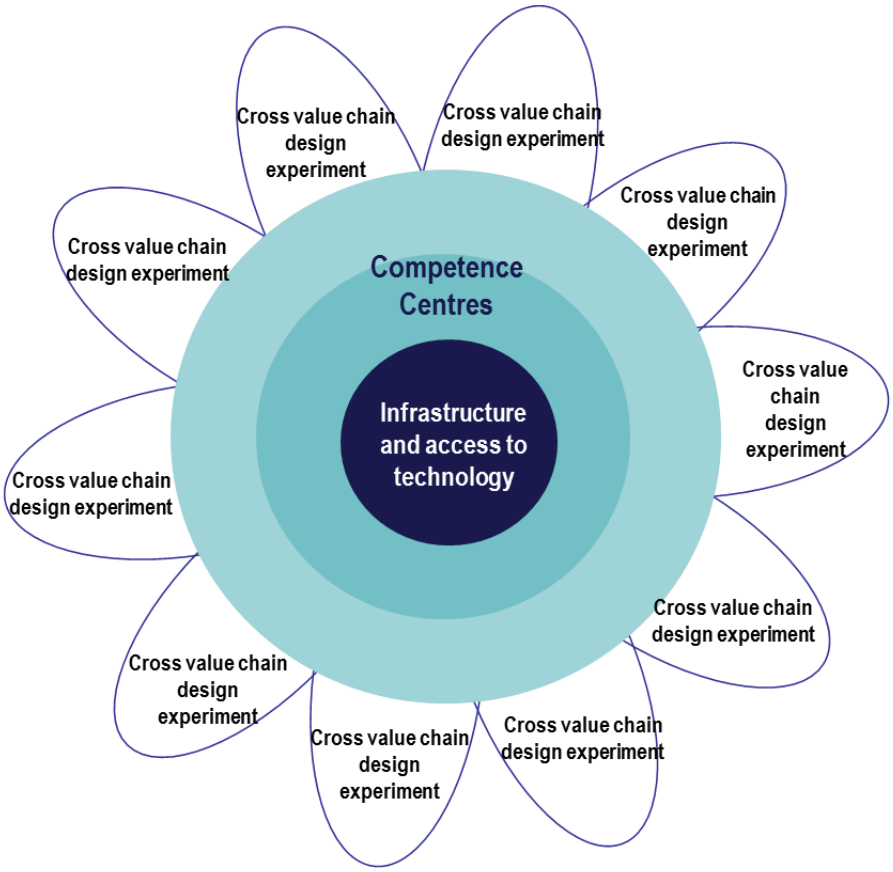

Figure 5: The I4MS and SAE model were every competence center in a project supports a large number of cross value chain experiments to support SMEs with their digital transformationThe projects are focussed on helping individual companies to increase their innovation capacity and competitive position in the value chain, although many of the projects are also bringing together actors along the value chain for short experiments, where suppliers of innovative technologies can get access to first customers and users can get access to innovative technologies. The last three years, around 100 M€ of investments have gone to this type of innovation actions on a yearly basis.

4.2. ICT Innovation for Manufacturing SMEs (I4MS)

As an example, the I4MS initiative of the European Commission launched in July 2013 (budget: 77M€ funding) targets to help SMEs and mid-caps in the manufacturing sector along three dimensions:

- Provide access to competences that can help in assessing, planning and mastering the digital transformation.
- Provide access to innovation networks of a broad spectrum of competences and best practice examples.
- Provide financial support to SMEs and mid-caps on the demand and the supply side to master the digital transformation.

The basic idea is to enable and foster the collaboration of manufacturing SMEs and mid-caps across their value chains through the help of European competence centres (such as top universities, application oriented research organisations, centres of excellence in

High Performance Computing[16]) in predominantly cross-border experiments to create a win-win situation for all actors.

In those focused experiments of short duration brokerage and transfer of know-how and technology are provided by the innovation hubs to the SMEs and mid-caps. I4MS therewith resolves the competence gap of SMEs at the same time providing them with the financial means to adopt leading edge technology such that they are capable to bring innovative and highly competitive new products and services to the market.

Innovative suppliers profit from I4MS as the experiments enable them to mature their existing technologies and to broaden the field of their application ultimately opening them new markets. The competence centres benefit from the initiative, as they extend their largely research oriented activities with industrial projects thereby gaining a new sustainable business model.

The initiative focuses on four technology areas that have been identified to be key for the digital transformation of the manufacturing sector at large:

- HPC cloud-based simulation services

  Designing high tech products such as aircraft wings or turbines involve simulations that require knowledge of modelling and simulation technologies in combination with high power computing (HPC) resources. To have and maintain an HPC data centre with a mainframe computer is not affordable for SMEs. Europe has a good coverage of HPC centres which have the computing power required for complex simulations. However, access to those HPC facilities needs specialised knowledge and software.

  Experiments funded by the initiative bring HPC centres, independent specialised software vendors (ISV), simulation experts and manufacturing SMEs together to establish an affordable pay-per-use cloud-based HPC simulation service for the SMEs. This ultimately enables SMEs to design high tech products and ultimately boosts their business.

- Advanced laser based equipment assessment

  Laser technology has scientifically strongly advanced in the last years. However, this new knowledge has only rarely been applied industrially facilitating more sophisticated and cost efficient production processes. The I4MS experiments transfer knowledge of research institutions into new laser based products of SMEs and assess their applicability in the production contexts of potential end-user customers. The twofold effect is that SMEs now can offer leading edge laser equipment products for industrial manufacturing that are already verifi ed by end-users. This ultimately extends their customer base and enables increased revenues.

- Industrial robotics systems for SMEs

  Well-established industrial robotics platforms are targeted towards large industrial manufacturers (e.g. automotive) only and are complex and costly in set-up and maintenance. To bring the benefits of robotics also to SME and mid cap manufacturers the I4MS experiments motivate leading suppliers of industrial robotics platforms and system integrators to develop in collaboration with SME end-users a

[16] The EC is funding under the H2020 eInfrastructures workprogramme nine Centres of Excellence which will help strengthen Europe's existing leadership in HPC applications and cover areas such as renewable energy, materials modelling and design, molecular and atomic modelling, climate change, bio-molecular research, and tools to improve HPC applications performance.

light-weight and modular robotics solution. To ensure that it is suitable to SME and midcap manufacturers the solution is validated in an industrial environment.

- Smart Cyber Physical Systems for high precision and efficient production

The introduction of Cyber-Physical-Systems in the shop floor will dramatically improve the effi ciency and quality control of production processes thus reducing costs and producing better products. The I4MS experiments develop in close collaboration between SME technology providers and sensor system OEMs on the one hand and SME manufacturers on the other hand a Cyber Physical Production System (CPPS) cloud-based platforms federation to extend shop floor control functionalities.

Some interesting facts and figures:

- 340 out of 480 contractors are from industry
- 75% of industrial contractors are SMEs
- More than 300 applications received in 11 open calls since 2014
- Good success rate of about 1 out of 3
- Strong collaboration across Europe – Significant economic benefits for SMEs
- More than 70% of the experiments have a European dimension combining existing regional strengths and know-how
- About 200 experiments are either already performed or planned
- More than 75% of the completed experiments created significant economic benefit for the involved SMEs

More detailed information and success stories of I4MS is available on https://ec.europa.eu/digital-single-market/en/news/i4ms-initiative-ict-innovation-manufacturing-smes-enhancing-digital-transformation-european

4.3. Data experimentation incubators

Another example of H2020 support towards digital innovation hubs is in the field of Data experimentation incubators. These will be set up under H2020 ICT 14 WP 2016-17 (Big Data PPP: cross-sectorial and cross-lingual data integration and experimentation).

Their objective is to foster exchange, linking and re-use, as well as to integrate data assets from multiple sectors and across languages and formats. A more specific challenge is to create a stimulating, encouraging and safe environment for experiments where not only data assets but also knowledge and technologies can be shared. 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.

Annex 1 lists the main ongoing initiatives at EU level. They are funded mostly in the context of H2020 and focus more on technology transfer of digital technologies. At the same time, there are many regional and national initiatives with an already good level of exchange of practises and experience between regions. Annex 2 lists some of these national and regional initiatives.

Note that these lists are not exhaustive lists, but should be further completed.

It will be the objective and challenge of "Digitising European Industry" to connect better all these initiatives to enable the digital transformation of all industries in Europe.

5. RELATED POLICIES – DIGITAL ENTREPRENEURSHIP, SMART SPECIALISATION, VANGUARD INITIATIVE, KETS, EIT KNOWLEDGE AND INNOVATION COMMUNITIES

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 are:

5.1. Regions and cities of digital transformation

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**[17]**,** which is a smart policy guidebook for regions and cities to build-up **successful local innovation ecosystems**.

It was based on the comparative analysis of 13 different European cities and regions which pioneered in digital transformation and restored spectacular economic growth, amidst the current economic downturn. The Forum identified four main attributes characterising the most successful regional and local initiatives and shaped relevant policy recommendations, addressed to all local stakeholders, so that they can effectively help their cities and regions, notably through:

1) Excellent collaboration among all stakeholders: among large traditional corporates and innovative startups, research organisations, technology centres, clusters, business incubators, academia and the civil society, they are all important partners in this game;

2) Developing and retaining the right talents and entrepreneurs to lead the modernisation process.

3) Unleashing access to data (open public data) and technologies in order to spur innovation. Local and regional policies should incite and help their companies to invest in innovation. E.g. by supporting the operation of digital innovation hubs, technology centres, fab-labs, incubators, etc. to make is easier for SMEs to access the equipment and professional expertise they need to grow. Cooperation accelerates innovation.

4) Last, by helping establish key infrastructures and big cross-border investments. Europe needs to do more to boost investments and Regions and cities have to foster more critical cross-border investment by using in a smarter way existing funds, such as EFSI, structural and regional funds, social funds, research and innovation funds, etc.

[17] Blueprint for cities and regions as launch pads for digital transformation by the Strategic Policy Forum on Digital Entrepreneurship (May 2016):

http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8820

In addition of the Blueprint for cities and regions, the Commission launched in September the action "Transforming regions and cities into launch-pads for digital transformation and industrial modernisation"; this will provide professional advice and support to regions to shape their local digital ecosystems. They will intensify experimentation and networking, help their companies and organisations to innovate, and boost investments in industrial modernisation.

5.2. Smart specialisation platform for industrial modernisation and the Vanguard Initiative

A thematic Smart Specialisation Platform for Industrial Modernisation has been set-up in June 2016 by GROW and REGIO (to be joint by DG RTD and DG CNECT). This initiative offers support to regions to foster interregional cooperation based on matching smart specialisation priorities related to industrial modernisation. It is hosted by the European Commission's Smart Specialisation Platform located in Seville.

The aim of this initiative is 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. First thematic areas will be launched in November 2016. This effort is supported through several activities financed under different EU programmes, notably the COSME programme. It will in particular target more efficient use of ERDF funding for research and innovation (in total 41 billion), on the basis of priorities in research and innovation strategies for smart specialisation (RIS3).

The Platform will support an entrepreneurial discovery process at EU-level for co-investments in joint opportunities. The methodology for matching complementarities is inspired by the Vanguard Initiative but extends to catching-up regions to cover fully EU value chains.

This platform will be an important enabler for EU regions who would like to set up a new DIH or reinforce an existing one, especially when it comes to finding partners and developing together an investment project that could be facilitated and supported under the Smart Specialisation Platform on industrial modernisation.

The Smart Specialisation Platform on industrial modernisation was highly inspired by the Vanguard Initiative. Vanguard was established in 2014 and was driven by political commitment of a number of EU regions (currently 30 members) with triple helix[18] participation in each region to solve common problems. It pioneered a new approach to support EU industry internationalisation and competitiveness by bringing regions (and clusters) together to:

- discuss common objectives and find complementarities,
- map and better understand regions' industrial competencies and capabilities,

[18] According to the triple helix concept, innovations depend on relations between science (universities, research units, etc.), business (represented by entrepreneurs and business-related organisations) and public authorities. The closer the cooperation and the more levels and areas involved, the more significant and clearer the effects of innovations.

- develop joint strategic action plans (building critical mass and complementary specialisations) and

- align strategic investments arising from these roadmaps

The goal of this approach is creating "inter-regional smart specialisation platforms" and to explore how the combination of different strengths can lead to a faster deployment of new technologies. The so-called "VI methodology" consists of four subsequent phases: learn, connect, demonstrate and commercialise. The methodology is currently tested in five pilot projects in the areas of: Bio-Economy – innovative use of non-food Biomass; Efficient and Sustainable Manufacturing; High Performance Production through 3D-Printing; Components for marine renewables and offshore energy applications; New Nano-enabled Products. These pilots will be further supported by the Smart Specialisation Platform on Industrial Modernisation.

5.3. Key Enabling Technologies (KETs)

KETs are a group of six technologies: micro and nanoelectronics, nanotechnology, industrial biotechnology, advanced materials, photonics, and advanced manufacturing technologies. They have applications in multiple industries and help tackle societal challenges. Three out 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 include assistance to small businesses in accessing KETs technology platforms, and activities on trade, skills, and on the facilitation of large industrial projects. Actions on facilitating cooperation between technology centres and industry have the same objective as the actions proposed in the Digital Innovation Hubs initiative. Therefore, in order to increase impact on businesses and innovation, Digital Innovation Hubs should also foster synergies with other advanced technologies (e.g. sustainable manufacturing technologies, advanced materials, industrial biotech, nanotech). In function of their innovation needs, businesses will be guided by the DIH to the right competence centre (with expertise in digital, other key enabling technologies or a combination of both).

To be noted is that in many cases, competence centres have expertise in digital as well as in other advanced technologies and their combination (this is also confirmed by current mapping of KETs technology centres). On the other hand, there are also digital technologies that are not yet covered by the current KETs technology centres mapping, e.g. cloud-based systems or robotics, but which will be covered as part of the updating process. The current webtool already provides an overview of 187 digital and other KETs related technology competence centres. They provide services to enterprises, such as help with prototyping, testing, upscaling, first production and product validation. The webtool is being updated with additional (network of) centres and additional fields of activities and technologies.

5.4. EIT Knowledge and Innovation Communities (KICs)

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 every area imaginable, including climate change, healthy living and active ageing

- new companies to be started

- a new generation of entrepreneurs to be trained

The KICs carry out activities that 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. The EIT's role is to guide the process and set the strategies, but it's up to the KICs to put these into practice and provide results.

There are currently five KICs and each focuses on a different societal challenge:

- Climate-KIC: addressing climate change mitigation and adaptation

- EIT Digital: addressing Information and Communication Technologies

- KIC InnoEnergy: addressing sustainable energy

- EIT Health: addressing healthy living and active ageing

- EIT Raw Materials: addressing sustainable exploration, extraction, processing, recycling and substitution

Each KIC has been set up as a legal entity and has appointed a CEO to run its operations – a first for an EU initiative. The EIT has provided the KICs with a great degree of autonomy to define their legal status, internal organisation and working methods, and the KICs have been conceived so that they are able to react in an effective and flexible way to new challenges and changing environments.

The co-location centers of EIT Digital and the one on Advanced Manufacturing that is currently under preparation and will be active from 2017 onwards will provide a very important basis for Digital Innovation Hubs in these places.

EIT Digital is mobilising a pan-European ecosystem of over 130 top European corporations, SMEs, start-ups, universities and research institutes. It is focused on entrepreneurship and is at the forefront of integrating education, research and business by bringing together students, researchers, engineers, business developers and entrepreneurs. This is done in our pan-European network of Co-Location Centres in Berlin, Eindhoven, Helsinki, London, Paris, Stockholm, Trento, as well as in Budapest and Madrid. We also have a hub in Silicon Valley.

EIT Digital invests in strategic areas to accelerate the market uptake of research-based digital technologies focusing on Europe's strategic, societal challenges: Digital Industry, Digital Cities, Digital Wellbeing and Digital Infrastructure. EIT Digital breeds T-shaped entrepreneurial digital talent focused on innovation through a blended Education Strategy that includes a Master School, Doctoral School and Professional School.

6. WHAT COULD BE THE MAIN PRIORITIES FOR ACTION?

The existence of a Digital Innovation Hub can become a magnet for private investments. Traditional government incentives (e.g. grants, fiscal, free land provision) will (or may?) increasingly lose their importance as factors affecting investment decisions, at the expense of the availability of dynamic ecosystems, access to knowledge and digital talent. Digital innovation hubs cover all these aspects and are therefore a strong candidate to become magnets for investments. The question now is, how can policy makers, research and technology organisations, industry and investors work together to have sufficient digital innovation hubs in Europe, building on what is already existing. Here we try to give examples of the type of actions that can be envisaged by the Working Group.

6.1. Upgrade of Competence Centres to Digital Innovation Hubs

As mentioned above, some competence centres offer only technical services without financial and training services, whereas others offer all the services of a Digital Innovation Hub. For those competence centers that are not yet embedded in a digital innovation hub, it is important they form alliances with other entities in order to offer an integrated set of services as a 'one-stop-shop', on technology, skills, finance and business growth. In these cases, the action is to upgrade or transform Competence Centres into Digital Innovation Hubs.

6.2. Set up new Digital Innovation Hubs (and new competence centres where needed)

Chapter 2 describes that competence centres and innovation hubs are not equally spread in Europe, and that some regions are lacking some in order to support the local companies in their digitisation. In these cases it will be necessary to set up new Digital Innovation Hubs in places where they do not exist yet. The smart specialisation strategy can be a guide to understand what the needed competencies are for this DIH.

6.3. Networking between Competence Centres and Digital Innovation Hubs

In the case that a kind of Digital Innovation Hub already exists but without a competence center providing the core competencies and facilities to support the industry in its digitisation, this Digital Innovation Hubs should be reinforced and ensure collaborations with competence centres by networking with these. Equally when a local competence centre exists, but specific compentence is not present, it can be found by networking with competence centres in other regions. In conclusion, an intense collaboration between different hubs will be necessary and networking may be necessary at three levels:

- Competence centers with competence centers: This will ensure excellence and specialisation since not all competence centers need to cover all competencies.
- Competence centers with Digital Innovation Hubs: This will ensure that a DIH can become a one stop shop and can offer all necessary support for companies for their digital transformation
- Digital Innovation Hubs with Digital Innovation Hubs: This will ensure that cross regional and cross-national collaborations between companies can be set up and that the markets of companies benefiting from the DIH can be enlarged.

The networking can lead to learning from each other and prevent re-inventing the wheel over and over.

6.4. Financing digital innovation hubs

The full development of a network of digital innovation hubs needs a surge in investment in adequate competence centres and in capacity to deliver the services to implement digital transformations. The mandate of the working group (Chapter 1) mentions that over the next 5 years an additional 100 new hubs and an upgrade of 200 existing hubs is necessary. This means:

- 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) to 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 (40 hubs upgraded per year). Sustainable business models need to be established for every competence centres. Sustainability is essential and this includes resources from contract research.

The to be developed investment plan will 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. This working group takes stock on what is in these plans and, if necessary, strengthens the national plans for DIHs further.

Possible funding sources are ESIF[19] , EFSI, or other national and regional funds. In total at least 5B€ from different financial sources needs to be mobilised.).

The ESI Funds have programmed around €14 billion euro **specifically for the enhancement of access to and use and quality of ICT** (one of the 11 thematic objectives for the new European Structural and Investment Funds). The ERDF investment priorities under this thematic objective 2 (TO2) are:

- extending broadband deployment and the roll-out of high-speed networks and supporting the adoption of emerging technologies and networks for the digital economy;
- developing ICT products and services, e-commerce, and enhancing demand for ICT;
- strengthening ICT applications for e-government, e- learning, e-inclusion, e-culture and e-health;

Another €7 billion ESIF investments are programmed for **digital growth in all other thematic objectives,** e.g. related to low-carbon economy, SME competitiveness, research and innovation, transport, environmental and climate solutions, educational infrastructure, e-inclusion, entrepreneurship, health and other themes.

This is expected to lead to a significant increase in funding for digital growth.

[19] ESIF – European Structural and Investment Funds - comprise ERDF – European Regional development Fund, ESF – European Social Fund, the Cohesion Fund, the European Agricultural fund (EAFRD) and the European Maritime Fund (EMFF)

Allocations from ESIF contributing to the DSM (Digital Single Market) work streams:	
III: Access and connectivity:	around EUR 6 billion
IV: Digital economy:	around EUR 7 billion
V: Promoting e-society:	around EUR 5.5 billion
VI: Digital Innovation & Research:	around EUR 2.5 billion.
This adds up to more than 20 billion EUR ERDF-ESF-CF funds for DSM[20] support.	

ESIF support for **digital growth i**nvestments are based on national Digital Growth Plans. These plans are not limited to the ESIF investments, but reach beyond into legislation, other funding sources, including private investments. These plans will be the guiding documents for possible investments in DIHs.

In addition, investments in research and innovation for ICT-related priorities are based on the Research and Innovation Strategies for Smart Specialisation (RIS3). Total funding under ESI Funds related to RIS3 priorities accounts for 42 billion euro. 74 regions and countries have included an ICT-related priority in their RIS3.

Both TO2 ESIF and investments in RIS3 are two sources of funding that can be used for the set-up of new DIHs[21].

Furthermore, the EIB-EFSI will leverage over 315 billion euro new investments in the framework of the European Investment Plan. This financing will be geared towards infrastructures and business investments that provide a European additionally. The 'thematic investment platform' can be an instrument to pool investments for the modernisation of industry with a common risk profile, e.g. for piloting and demonstrating new solutions. This might help the set-up of the business services of the DIH (e.g. in setting-up dedicated infrastructures).

7. ON-GOING AND PLANNED ACTIVITIES FOR A NETWORK OF DIGITAL INNOVATION HUBS IN EUROPE

In order to create new or upgrade existing hubs and get them networked to maximise an impact on EU-level value chains, the following concrete actions are important:

- Sharing of experiences across MS and Regions
- Develop a catalogue of Digital Innovation hubs in Europe, linking to the mapping of KETs competence centres

[20] Digitising European Industry is one of the Digital Single Market policy measures.

[21] For monitoring planned ICT-investments under ESIF see: http://s3platform.jrc.ec.europa.eu/ict-monitoring

- Develop larger initiatives by synergies of funds and creation of a "DIH" label
- Intensified outreach to regions with few DIHs
- Ensure high-level political support for investments in DIH
- Investments in H2020 and COSME
- Investments by Member States
- Further connecting all stakeholders, including industry, national/regional players, private investors, EIB/EIF and equivalent financial institutions
- Wider use of public procurement

This section will explain what is already happening or planned on each of these issues.

7.1. Sharing of experiences across MS and regions

- Organising meetings between Digital Innovation Hubs to get to know each other, and share best practices, success stories, training methods and material and learn from each other. The yearly stakeholder event that will be organised in the context of Digitising European Industry will be one opportunity for DIH to meet. The first one will take place at the end of January in Germany.

- In the area of High Performance Computing there is the CSA SESAME-NET that focusses on creating a network of HPC Competence Centres which will address coordination, outreach, training and the exchange of best practice and software components between the participating national and regional competence centres.

7.2. Develop a catalogue of Digital Innovation Hubs in Europe

A catalogue of Digital Innovation Hubs, building on and complementing other initiatives such as the map of KETs technology infrastructures (https://ec.europa.eu/growth/tools-databases/ketsobservatory/kets-ti-inventory/map) will be developed. The current mapping of KETs technology centres (sharing their equipment and expertise with companies) starts to get well known and is promoted through European Enterprise Network.

This catalogue will serve different purposes:

- It helps companies to find the support they need by showcasing success stories and by showing the way to a DIH in their environment

- It helps Digital Innovation Hubs to find other hubs with which they want to collaborate

- It helps policy makers to give an overview of Hubs and decide on which additional investments or collaborations are necessary.

Possibly, this catalogue could be linked to the Smart Specialisation Platform for industrial modernisation and Investment.

7.3. Network projects funded by different sources into larger initiatives -

The competence centers/DIHs listed in Annex 1 and 2 are all separate projects and initiatives. Their source of funding link immediately to their focus. In the future, it would be desirable if all these projects can work together and can become part of a larger DIH network.

7.3.1. Why do we want to combine different projects into one network?

To explain the need for combining different projects together consider the example of H2020. Hubs at European level, funded through H2020, focus at highly innovative use of new technologies and at providing European added value. Concretely this means that the target group of beneficiaries of the hubs are "Innovators" and "Early adopters", and that the goal is to support technology suppliers in crossing the "valley of death", and the technology users in gaining competitive advantage through early adoption. This is depicted in Figure 7.

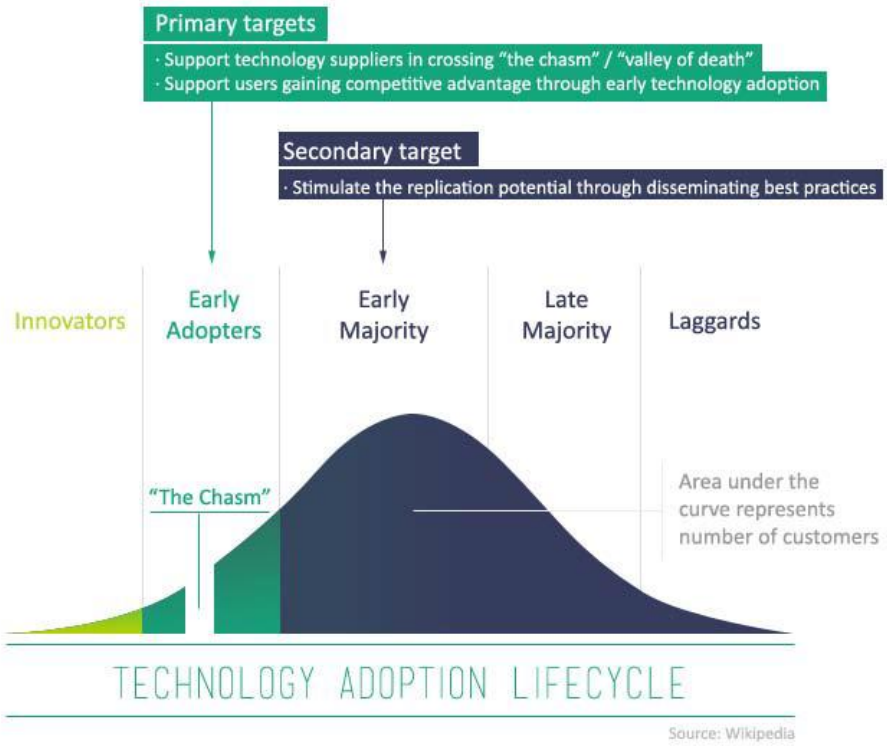

Figure 7: Technology adoption lifecycle and target beneficiaries of H2020 Innovation actions

However, companies that are classified as Early Majority, Late Majority and Laggards in the Technology Adoption Lifecycle are not directly addressed. These also need to be supported in their Digital Transformation. Regional innovation hubs (not bound to the "innovation excellence" criterion of H2020) could do that. They could replicate successful experiments developed under H2020, or respond to direct needs of the companies of their region. To network these different types of hubs, we could combine different sources of funding in bigger projects. This is in theory possible, but in practice it is still very difficult. The next calls in H2020 for digital innovation hubs encourages collaborations between DIHs funded by different sources.

7.3.2. Practical ways of combining different sources of funding:

- Coordination and Support Action EU-GREAT! (http://eu-great.com/) will provide guidelines and initiate the development of RDI initiatives that combine different funding mechanisms. The CSA will publish by the end of the year 2016 a list/map of large RDI initiatives (including digital innovation hubs) with hands-on analysis and elaboration of concrete plans for investment. A cooperation between I4MS and EU-GREAT was created in order to maximize the results of both actions.

- ERANET Co-fund is a mechanism to align research funding at Member State and regional level with EU top-up funding. There is already experience with this through the Eranet Co-Fund MANUNET III in the area of manufacturing technologies, which is a successor project of MANUNET I and II. Since 2006, the project partners have established a forum of relevant stakeholders to define and schedule research cooperation between Member States and regions in the thematic area of manufacturing technologies through annual transnational calls (for more information: http://www.manunet.net/). Since its inception, MANUNET has funded more than 180 projects and 500 SMEs. More than 190M€ have been invested in these projects. The ERANET Co-fund could be used to share good practices between Member States and to connect the digital innovation hubs.

- The EIT-KICs (see Section 5.4) are a model for European networking of competence centres and excellent education and training programmes. They have their own budget, but combine this with other funding sources on the basis of projects and services. The EIT Digital with its accelerator capacities should become part of the digital innovation hubs networks. The KIC Advanced Manufacturing that is in preparation will be from 2017 onwards an important player with co-location centres in major industrial technologies and outreach to regional innovation hubs in catching-up countries.

- Also, pan-European e-Infrastructures funded through the Excellence part of H2020 and other sources could play an important role as their mission is to support not the only scientific community but also research communities and centres, which are directly linked to the Innovation Hub concept.

7.3.3. Mentoring scheme for knowledge transfer

Not only funding needs to be combined, there also needs to be knowledge transfer from the highly innovative competence centers to DIHs focusing on companies that make part of the groups "early majority", "late majority" and "laggards" (see Figure 7). As a best practice in this field, the I4MS projects have started with a mentoring and sponsorship programme. Regional hubs are associated to the H2020 projects. Their particular role is to learn about supporting SMEs with their digital transformation from the competence centers involved in I4MS and to do a feasibility study if these experiments can be successfully replicated in their own region. Figure 8 below shows the 25 new regional hubs that have been selected through a call. In total, 1.2 Mn EUR has been made available for the mentoring and sponsorship programme. The programme has kicked off with a workshop about Digital Innovation Hubs at the Manufacturing Technology Centre – Catapult in the UK.

Figure 8: New regional hubs that will be mentored and sponsored by I4MS competence centers.

7.4. Intensified outreach to regions without DIHs.

The mentoring and sponsorship programme is also proposed as a mechanism for regions to understand what DIHs are and which benefits they can bring, so that the regions can use their ESIF or EFSI or other sources of funding to set up DIHs.

Concretely, a 2 Million Euro project "Smart factories in new EU Member States" will be set up. The call for tender is now open on https://etendering.ted.europa.eu/cft/cft-document.html?docId=18562.

Similar types of action may follow in 2017, since the European Parliament proposed more of these actions:

- For 2017 (not sure yet):
    - Digital Enablers in SMEs: support digitalisation to enhance SMEs' capacity to go international and innovate (1 M€)
    - "Digital Transformation of European Industry" (1,5M€)
    - "Digital Hubs Network" (1,5 M€)

Through mentoring programs these new Digital Innovation Hubs can learn from already existing ones and rapidly serve the needs of their local industry.

7.5. Ensure high level political support for investments in Digital Innovation Hubs

Of course investments in DIH will not come by itself, therefore it will be priority to ensure high-level political support for these investments.

7.5.1. Roundtables of Commissioner Oettinger

The Roundtables that Commissioner Oettinger is organising with all Member States in the context of the "Platform of Digitisation Initiatives" is one way to obtain the political support. The last meeting took place on 20 September 2016. A short report is available on https://ec.europa.eu/digital-single-market/en/news/roundtable-digitising-european-industry-commissioner-oettinger-september-2016

7.5.2. Conferences, workshops and events

In addition, several conferences and workshops are being organised on this topic:

- I4MS Workshop 2016: Digitising European Industry: A key role for Europe's digital competence centres, see http://i4ms.eu/videos/video.php?id=-1&type=a

- Digital assembly 2016: The session https://ec.europa.eu/digital-single-market/en/digitising-european-industry-workshop-1 focused on how to develop Digital Innovation Hubs in Europe. People involved in DIHs and policy makers involved in the development of national digitisation plans discussed together how to set up DIHs.

- Smart Regions in Smart Europe: Digital Innovation Hubs shaping the Digitisation of European Industry, 11 October, see http://ec.europa.eu/regional_policy/regions-and-cities/2016/main_programme.cfm

It needs to be explored how the Digital Compass for decision makers (developed by the Strategic Policy Forum on Digital Entrepreneurship) can be applied on these events. http://ec.europa.eu/DocsRoom/documents/17924. The Digital Compass is meant to train policy makers on digital transformation by allowing participants to experience and experiment with the showcased technologies. They could for example be encouraged to remotely control a connected car, to fly a drone, or to scan an object and print it in 3D. Digital compasses can be held either as independent events or in parallel with a conference or larger event, as was the case for the pilot experience held in November 2015 during the Luxembourg Presidency of the Council of the European Union.

7.5.3. Programme Committee of Horizon 2020

Digital Innovation Hubs also need to be discussed with the Programme Committees of H2020, consisting of national policy makers in the field of research and innovation.

7.5.4. Regional authorities

A final target group will be Regional Authorities. These could be addressed through the Smart Specialisation Platform, Cluster activities and other activities of DG REGIO.

7.6. Investments in H2020 and COSME

7.6.1. €500 million in the H2020 and COSME work programmes 2016-17 and 2018-2020 towards digital innovation hubs

The European Commission is programming €500 million in the H2020 and COSME work programme 2016-17 and 2018-2020 towards digital innovation hubs. The 2016-2017 Workprogramme, of which some calls have already happened and some are still open, dedicated 200 M€ to hubs[22]. Annex 1 with already existing DIHs names the individual initiatives. The plan is that in the workprogramme 2018-2020 300 M€ will be dedicated to DIHs. Many of the existing initiatives will be continued, in addition the following new hubs are foreseen:

- ICT Innovation for Manufacturing SMEs will be continued in 2018-2020
- Smart Anything Everywhere, now including EuroPractice will be continued in 2018-2020
- ACT-PHAST, will be continued in 2018-2020
- A one-stop shop access for SMEs to technology services and/or facilities from a network of technology infrastructures in the field of advanced manufacturing for clean production will start in 2017. (INNOSUP-3-2017)
- "Innovation and Scaling up Health and Care", a digital innovation hub for the health sector, foreseen for 2018-2020. Europe needs to innovate and scale up Health and Care services and businesses to meet the number and complexity of challenges in health, well-being and demographic change. The "Blueprint on Digital Innovation for Active and Healthy Ageing" http://ec.europa.eu/research/conferences/2016/aha-summit/index.cfm?pg=blueprint addresses some needs of the ageing population. Additionally, some EU initiatives support Europe's leading health IT companies addressing institutional and consumer health while there are support actions in place for procurers to provision the services, see e.g. http://innovationithospitals.com/. Further public sector work is needed to facilitate an improved environment for innovation in (digital) health.
- There is a high potential for the pan-European e-Infrastructures to support the digitalization of European SMEs and other industrial actors through networking with Digital Innovation Hubs. Pan-European e-Infrastructures (EGI, PRACE, GÉANT, OpenAIRE etc.) would enable access for SME users to a wide portfolio of remote services, including access to data, data processing or cloud storage. This would also stimulate the collaboration between SMEs and other stakeholders like universities or research centres. In practical terms, this could be fostered by making funding available through the Horizon 2020 e-Infrastructures Work Programme 2018-20 for the e-Infrastructures to be able to contribute to the networking with the Digital

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

Innovation Hubs and to allow the e-Infrastructures to adapt their services to the specific needs of SMEs.

- A Digital Innovation Hub for the agriculture sector is planned to support the uptake of digital technologies at farm level for 2018-2020.

- The action “Transforming regions and cities into launch-pads for digital transformation and industrial modernisation"(COSME 2016) will provide professional advice and support to regions to shape their local digital ecosystems. This will intensify experimentation and networking within and among local ecosystems, help companies and organisations to innovate, and boost investments in industrial modernisation.

- Virtual **European advanced manufacturing support centre** (COSME Work Programme 2017): the centre will

  1) provide at cross-sectoral level SMEs with practical information, advice and support (e.g. company self-scan, elaboration of transformation plan, guidance to right competence centre…) on how to transform their company towards a smart factory with more competitive and sustainable production;

  2) support learning networks of next-generation ('factories of the future') companies which will become inspiring examples for all other European manufacturing companies.

- Technical and financial assistance facility for industrial modernisation and investment (to be set up under COSME Work Programme 2017 to support the work of the Smart Specialisation Platform on Industrial Modernisation (SSP-IM))

- InnovFin consists of a series of integrated and complementary financing tools and advisory services offered by the EIB Group, covering the entire value chain of research and innovation (R&I) in order to support investments from the smallest to the largest enterprise. By 2020, InnovFin is expected to make over EUR 24bn of debt and equity financing available to innovative companies to support EUR 48bn of final R&I investments.

- Startup Europe to support startups by Europe-wide networking of local startup ecosystems and thus facilitating cross-border access to resources for entrepreneurs. This includes H2020 projects connecting stakeholders (accelerators, investors, startups, media), within 16 cities (www.startupeuropeclub.eu), a Startup Europe Partnership which brings together innovative startups and corporates, or the Startup Europe regions network, which brings together regions committed to supporting startups.

- To optimally support pilot production, there is a need for a "European Pilot Production Network" (EPPN) that would act as a coordination platform in the area of nanotechnologies and advanced materials upscaling and pilot actions. EPPN would exploit synergies and maximise impact of the various investments, innovation programmes and financing from H2020, regional and private sources, ensuring cooperation with the Member States and Associated Countries and regions, as well as other stakeholders (Horizon 2020 Work Programme NMBP-38-2017).

As mentioned before, it will be important to combine all these projects with existing initiatives to obtain the desired networking between Digital Innovation Hubs.

7.7. Investments foreseen by Member States

There are already many ongoing initiatives at regional and national level, some of which have been included in the table of Annex 2.

It is expected that the existing initiatives will be further reinforced in the next years as well as new initiatives will be launched. This paragraph could contain planned investments or actions.

7.8. Further connecting all stakeholders, including industry, national/regional authorities, innovators, private investors, EIB/EIF and equivalent financial institutions

All actors that can play a role in an efficient network of Digital Innovation Hubs need to be connected, so that each one can play their role to provide their expertise and services to the companies. To achieve this, the following actions are important:

- Awareness raising campaign on digital transformation and key enabling technologies. This is part of the WATIFY II project under COSME which will run from mid-2016 to mid-2018. Through this campaign (240 local awareness and communication events in at least 20 EU Member States) SMEs should become better aware of the potential of digital transformation and gain confidence in the application and added value of digital technologies, business processes and new business models. Policy makers should be stimulated to work together with other regions to launch and implement joint projects on digital transformation and/or KETs in the framework of the Smart Specialisation Platform for Industrial Modernisation.

- The role of innovation vouchers as instrument to fund digital transformation services by competence centers. The project InnoVoucher funded under Horizon 2020 (managed by EASME) will develop a new model of innovation voucher programme supporting the transnational exchange of innovation services in Europe. (https://www.innovoucher.eu/main/index.php)

- Public procurement can also 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.

- One of the main challenges is to design business models for multi-stakeholder co-investment and co-financing of digital innovation hubs, in order to provide transformation services on a sustainable basis (after the initial programmes have ended). The EIB-EFSI might be part of the co-financing solution through the establishment of specific investment platforms that operate a financial engineering of different sources. The financial instrument logic applies to services that will have an economic return.

8. MONITORING THE IMPACT

To monitor if Digital Innovation Hubs are effectively engaged in the network and the necessary investments are being made, the following indicators are proposed:

- Nr of digital innovation hubs that are part of the catalogue
- Nr of digital innovation hubs that are making use of the network to extend their services to their local companies
- Nr of digital innovation hubs participating to the yearly stakeholder event
- Nr of digital innovation hubs that are engaged in mentoring new ones
- Nr of initiatives that are making use of combined sources of financing
- Financial investments made by industry, regional and national authorities in Digital Innovation Hubs.
- Number of companies supported by the DIHs
- The private investments in digital transformation inside the companies, across the value chains, will of course be the ultimate measure of success.

To monitor if the support offered by DIHs helps companies in their digital transformation (both supplier as user companies) a self-assessment tool is proposed. Through a short questionnaire each beneficiary of support of the DIH is asked to fill in what type of support has been received, if this improved the digital abilities of the company, if this will lead to follow up investments or roll out of a new process or technology or business model. The outcome of this self-assessment can be used by DIH to improve their support and by policy makers to assess the effectiveness of the policy measures.

These indicators should be monitored on a yearly basis by the Round table.

9. CONCLUSIONS

This staff document contains the views and already existing policy actions of the European Commission services. It serves as input to the working group that has been set up by the Round Table on 20 September on Digital Innovation Hubs, and is not meant to pre-empt any decision taken by the Working Group. Experts from Member States on Digital Innovation Hubs will work together with other persons with specific experience in setting up DIH, in financing innovations and mobilising regional investments.

The WG should develop a **Report on approaches, best practices and plans for the roll-out of Digital Innovation Hubs**.

Expected timing:

- A first draft of this report should be ready before the end of December 2016.
- Revised draft for stakeholder forum (end of January 2017)
- Final version for Hannover Fair 2017.

In particular, the WG is invited to reflect on the following questions:

- what do competence centres and DIH need to offer to support more effectively industry?
- how to ensure that the knowledge of the network, in particular missing competences, reaches out to the DIH where it is needed?
- what is the volume of investments necessary to ensure the creation and expansion of the DIH across Europe? How to leverage European, national and regional public investments? Which investments are already foreseen by MS and regions?
- how to reach out to regions without DIH?
- how to foster synergies and collaboration between DIH and relevant competence centres, such as KETs Technology Centres/ Pilot Lines?
- which targets and indicators should be retained to monitor progress?

10. ANNEX 1. ALREADY EXISTING EU INITIATIVES TO BE EMBEDDED IN DIGITAL INNOVATION HUBS

10.1. ICT Innovation for Manufacturing SMEs (I4MS , www.i4ms.eu)

I4MS consists of 11 large "Innovation Actions" funded by FP7 and H2020. 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 sensor systems, CPS and IoT.

A network of competence centers provides access to competences and technology transfer to SMEs through competitive calls for experiments. Successful candidates will receive funding for the experiment. Both technology suppliers as well as user SMEs can benefit from the experiments. So far 110 M€ of funding has been invested in I4MS, starting in 2013.

10.2. Smart Anything Everywhere www.smartanythingeverywhere.eu

SAE consists of several "Innovation Actions" funded under FP7 and H2020 that support SMEs to improve their products through the inclusion of advanced ICT components and systems, in particular through the inclusion of Cyber physical systems and embedded systems, Low power computing systems, Advanced micro-electronic components and Smart System Integration, Organic Large Area Electronics.

Just like in I4MS a network of competence centers provides access to competences and technology transfer to SMEs through competitive calls for experiments. Successful candidates will receive funding for the experiment. Both technology suppliers as well as user SMEs can benefit from the experiments. So far 28 M€ has been invested and the initiative started in 2013.

10.3. iHubs http://ihub.eu/

iHubs provides business incubation and acceleration for start-ups and SMEs that make use of FI-WARE technologies, these are technologies developed in the context of the Future Internet PPP (e.g. FI-Ware open service platform). In FP7 100 M€ funding has been invested.

10.4. ECHORD++ http://echord.eu/

ECHORD++ supports different activities to bring robots from the lab to the market. These are:

- Through the RIFs (Robotics Innovation Facilities) they provide a unique chance to try out new business ideas and make field tests at zero risk. It enables companies, public institutions, research organisations, … to get easy access to state-of the art robotic hardware, software and scientific expertise. They also help SMEs of the manufacturing sector with small lot sizes and the need for highly flexible solutions to try out innovative robotics technologies.

- Support to public authorities that are looking for robotics technology at competitive prices for tender processes.

The total costs for this initiative was around 25 M€.

10.5. ODINE https://opendataincubator.eu/

The Open Data Incubator for Europe (ODINE) is a 6-month incubator for open data entrepreneurs across Europe. Successful applicants will receive up to 100.00 € financial support, and incubator services.

10.6. ACTPHAST http://www.actphast.eu/

ACTPHAST offers a one-stop-shop solution for supporting photonics innovation in European companies, especially adapted to the needs of small- and medium-sized enterprises. Through a 6 - 9 months innovation project, European companies are matched with a photonic expert to improve their products by providing them with direct access to the expertise and state-of-the-art facilities of Europe's leading photonics research centres. The total cost for this project was around 10 M€.

10.7. EuroPractice http://www.europractice-ic.com/

EuroPractice helps companies improve their competitive position in world markets by adopting ASIC, Multi-Chip Module (MCM) or Microsystems solutions in the products they manufacture. The program helps to reduce the perceived risks and costs associated with these technologies by offering potential users a range of services, including initial advice and ongoing support, reduced entry costs (e.g. Multi Project Wafer prototyping) and a clear route to chip manufacturing (small and medium volume), packaging, test operations and product supply. Europractice can also provide users with the training and CAD software required to design and develop their ASIC, MCM or Microsystems solutions. The Europractice service is run by a consortium of IMEC (B), STFC / Science and Technology Facilities Council (UK) and Fraunhofer IIS (D). Total costs for this project were around 6 M€.

11. ANNEX 2. SOME EXAMPLES OF EXISTING NATIONAL AND REGIONAL INITIATIVES

11.1. United Kingdom

11.1.1. Catapult

A Catapult is a technology and innovation centre where the best of the UK's businesses, scientists and engineers can work side by side on research and development, transforming ideas into new products and services to generate economic growth. Catapults add an important new dimension to complement existing research and development programmes established by Innovate UK.

Catapult centres will help businesses to adopt, develop and exploit innovative products and technologies. They offer concentrated expertise, access to cutting edge equipment and specialist facilities to develop and test ideas in reality.

Entrepreneur Hermann Hauser produced an influential report, The Current and Future Role of Technology & Innovation Centres in the UK, which identified best practice from around the world and made a robust case for long-term UK investment in a network of technology and innovation centres which would 'deliver a step change in the UK's ability to commercialise its research'.

The Catapults represent over £1bn of private and public sector investment over the next five years, transforming the UK's innovation capability for the long-term.

High Value Manufacturing Catapults: Address manufacturing at large spanning from raw materials to product development addressing 22 "national competencies". The national budget contribution generates a leverage effect of 3.9 of additional investment. The mission is to accelerate and de-risk concept to commercialisation with the aim to more than double the contribution of manufacturing to the national economy. It required an initial investment of £140 million from Government.

Digital Catapults: The mission is to help increase the number of digital businesses, and the number of people employed in digital roles. Digital Catapult works with SMEs to help them grow and scale faster. It does this through programmes of collaboration and open innovation, by bringing academic leading edge expertise into the mix combined with the organisation's own business and technological expertise. So far a collaboration has been established with 2000 SMEs. A wide range of ICT areas is covered.

11.1.2. Action Plan for Manufacturing in Scotland :

A joint Centre of Excellence for Manufacturing and Skills Academy will act as a hub that provides businesses with access to expert services and advanced demonstrator facilities and training programmes focused on innovative manufacturing. It will also help to address anticipated demand for skills by promoting Science, Technology, Engineering and Mathematics.

11.2. Germany

Mittelstand Competence centres: An initiative of the German ministry of Economy and Technology: 6 Centres are already operational, 5 more will be starting by the end of 2016, 5 more are planned for 2017, providing information, training and partially help in

the implementation of digital technologies in mid-caps and SMEs covering a wide range of manufacturing technologies. Funding is 56 M€/3y.

ICT Competence Centres: Funded by the German ministry of Education and Research: 3 centres on Cybersecurity and 2 on Big Data and Data Services respectively.

11.3. France

Alliance d' Industrie du futur : Organises and coordinates digital transformation activities of its members (research institutions, public authorities and associations) on national level. Around 1200 SMEs involved. They have developed 4 showcases with Air Liquide, Bosch, SNCF and DAHER on different technologies

11.4. Italy

The Italian Technology Cluster “Intelligent factories” groups big and medium-small size enterprises, universities and research centers, entrepreneurial associations, technological districts, non-governmental organizations and other stakeholders operating in the sector of Manufacturing and of the Smart Factory. Activities: research, technology transfer, sharing of research infrastructures and mobility, support to a smart and sustainable entrepreneurship, support to the growth of the human capital. A total funding of 43M€ is foreseen.

11.5. Belgium

Flanders Make: Manufacturing innovation network: Mission is technology transfer from the 5 Flemish universities to manufacturing companies including SMEs. The 8 programmes cover 4 technology areas and 4 application domains. Established collaboration with about 70 companies.

iMinds : Flanders’ digital research center and business incubator: iMinds’ focus is on 5 key markets that face significant societal and economic challenges: ICT, Media, Health, Smart Cities and Manufacturing. So far more than 1100 collaborations with industry and more than 70 start-ups created.

Digital Wallonia Hub This hub on ICT technologies in general is about to be established as a "Wallonian iMinds" at the CETIC research centre. Mission is in general to accelerate digital research and its application in companies. Funding: 500M€/4y.

11.6. Netherlands

Fieldlabs: The initial national Smart Industry strategy is translated to the regional level , 5 more hubs in 2016, wide spread of technologies (mainly manufacturing)and activities (also business coaching), access to regional funds . Funding: 100M€/5y.

11.7. Austria

COMET Centres are considered to be the nucleus of future DIHs. Out of 40 existing centres 7 are already functioning as a hub in one or another way, 2 more are about to be transformed thereto. Furthermore, 2 incubator centres will provide DIH functions and 3 more DIHs will be established end of 2016. A wide range of ICT technology and manufacturing areas are covered.

ANNEX 3: MANDATE OF THE WORKING GROUP ON DIH SET UP WITH REPRESENTATIVES OF MSS AND INDUSTRY

The mandate of the working group was endorsed by the Round Table of 20 September and is as follows:

- The WG will describe current approaches and best practices and **elaborate in more detail the digital innovation hub approach** and the plans for their further development in line with the suggestions below. The Commission will provide support with a document explaining current EU-financed initiatives on Digital Innovation Hubs and the various types of implementations.
- **Foster the further expansion of Digital Innovation Hubs, alongside significant investments into these.** The plan is to help establish over the next 5 years an additional 100 new hubs and to upgrade 200 existing hubs. This means:
    - 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) to 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 (40 hubs upgraded per year). Sustainable business models need to be established for every competence centres. Sustainability is essential and this includes resources from contract research.
    - The WG shall reflect on how Member States, regions and the private sector could fund the expansion of digital innovation hubs from sources such as ESIF, EFSI, or other national and regional funds, mobilising at least **5B€ from different financial sources.**
- **Mobilise all levels of policy and decision makers**: Investment decisions are essential to modernise our industrial fabric and trigger a bottom wave of innovation across Europe requires a clear vision at regional and national level. In order to promote investment in innovation (in particular ESIF), specific actions need to be proposed to bring this vision to high level attention.
- **Engage with the private sector:** This includes investment directly by private companies to build their own digital innovation hubs open to external partners. Successful examples of this are already found in Europe such as Philips' high-tech campus in Eindhoven or IBM's European Watson innovation centre in Munich. This includes as well co-investment in pilot lines for production in ECSEL and the Photonics PPP.
- **Connect to the investment community (VC, BAs, etc):** The link to private investment includes also the connection to venture capital firms, business angels and other financial investors. Bringing these communities including EIB and EIF (under the EFSI umbrella) into the innovation hub framework of Digitising European Industry is crucial.
- **Supporting industry and Digital Innovation Hubs to find the right competences** is a necessary mechanism to foster the integration of digital innovations into products and processes. The European Commission plans to launch a study to **map dynamically digital innovation hubs** encompassing the actual data and a tool/portal

to make this data accessible. The WG is invited to reflect on how to best support this key instrument.

- **Set up a thematic smart specialisation platform:** A thematic Smart Specialisation Platform for Industrial Modernisation has been set-up in June 2016 by GROW and REGIO. This initiative offers support to interregional cooperation based on matching regions with similar smart specialisation priorities related to industrial modernisation. It is hosted by the European Commission's Smart Specialisation Platform located at IPTS in Seville.

  The aim of this initiative is 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. First thematic networks will be launched in October 2016. This effort will be supported through several activities financed under the COSME 2017 programme. For example, the action to help transforming cities and regions into launch-pads of digital transformation and industrial modernisation will provide hands-on policy advisory services and facilitation and showcasing services.

- The WG should reflect on how they could mutually reinforce both objectives of the smart specialisation and of the digital innovation hub schemes put forward in H2020 such as I4MS, and in particular to reach out to less developed regions.

- **Wider use of public procurement of innovations**: the WG should identify areas where public procurement of innovations would support the further development and scaling up of digital technologies.