H2020 Partnership Landscape and its relevance for Horizon Europe – Cluster ‘Digital and Industry’

Description and Analysis

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Information

Project no.	811171
Project acronym	ERA-LEARN
Project full title	Strengthening partnership programmes in Europe
Funding scheme	CSA
Start date of project	1. July 2018
Duration	48 months

Background

The description and analysis of networks follow the recommendation of the ERAC ad hoc Working Group on Partnerships to provide an analysis on the status-quo of partnerships in prospective areas of Horizon Europe. The individual Cluster Reports will inform a Synthesis Report which is based on the partnership analyses that have been performed in relation to the clusters under Pillar II “Global Challenges and Industrial Competitiveness” of Horizon Europe (Commission proposal).

Disclaimer

The Cluster Reports were elaborated by ERA-LEARN to support the coordination and cooperation among networks. They are work in progress and should be seen as a basis for starting discussions among the networks about the potential to adjust and streamline the partnership landscape in view of the challenges addressed by Horizon Europe. They are based on:

- a listing of networks provided by DG RTD, reviewed and partly modified by ERA-LEARN experts
- the ERA-LEARN database and
- desktop research and professional background knowledge of the ERA-LEARN authors of the individual Cluster Reports.

While due diligence was applied there are certain limitations that readers should bear in mind:

- The papers display and discuss existing partnerships, serving current framework priorities, and apply educated guesses about their relevance for the thematic clusters and (groups of) intervention areas sketched for Horizon Europe. They do not take into account the gradual thematic flexibility of networks or parts thereof, or the changes of research priorities that national ministries and funding initiatives may undertake. Nor do they consider the invaluable capacity of ministries to design and implement MS-based transnational funding initiatives across Europe across all innovation phases and aspects, and beyond their mere match with future thematic intervention areas of the clusters under Pillar II “Global Challenges and Industrial Competitiveness” of Horizon Europe (Commission proposal).
- The clustering of intervention areas to sub-clusters has been determined by the authors by means of expert assessment, for greater clarity of the connections displayed.
- The displayed connections are limited to formal connections and existing collaborations among partnerships.

Taking these limitations into account the parties involved in creating the databases and drafting the Cluster Reports would like to emphasize that references to networks and/or their relevance and/or their connections are not meant to be exhaustive nor judgemental but a preliminary input to the discussion process on the rationalisation and reform of the partnership landscape.

Background

This report is part of a series of reports addressing the five suggested Clusters of Horizon Europe (EC Proposal from June 2018). General information about the scope and methodology applied as well as on the description of the network types, etc. is provided in the so-called "Synthesis Report" to avoid duplication. All reports focus on R&I related partnerships in the areas suggested for Horizon Europe. Other networks are not considered. The Synthesis Report also includes the definition of the different partnership types that are considered in the individual reports.

Table of content

1. Overview of Cluster, Actors and Activities

1.1. Overview

A: Description of Cluster

The proposal of the European Commission for Horizon Europe emphasises the importance of digitisation and key enabling technologies for the economy of the EU. Investing in digitisation will strengthen EU economic growth while progress in key enabling technologies will secure EU strategic autonomy and help EU industry reduce its carbon and environmental footprints. At the same time, space is of strategic importance for the EU. Investing in digitisation, key enabling technologies and space research will help the EU become *"a global leader and increase its share of world markets, by showcasing how digital transformation, leadership in key enabling and space technologies, the transition to a low-carbon, circular economy and competitiveness can reinforce each other through scientific and technological excellence".* This also necessitates collective action at EU level as well as strong engagement of the industry.

Serving the above overall goal, the 'Digital and Industry' cluster includes nine areas of intervention based on the EC proposal for Horizon Europe. These are briefly presented in the following table along with the broad lines of focus for each intervention area[1].

The 'Digital and Industry' cluster follows on from the Industrial Leadership Pillar of Horizon 2020 and specifically the objective targeting 'Leadership in Enabling and Industrial Technologies (LEIT)' that covers Key Enabling Technologies (KETs: nanotechnologies, advanced materials, advanced manufacturing and processing and biotechnology), ICT and Space as the key areas of industrial competences determining Europe's global competitiveness.[2]

In Horizon 2020, the budget allocated to the LEIT part of the Industrial Leadership Pillar is € 13 557 million.[3] In Horizon Europe the Digital and Industry cluster is placed under Pillar II 'Global Challenges and Industrial Competitiveness' and a total of € 15 000 million is foreseen.

[1] https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-horizon-europe-decision-annexes_en.pdf
[2] https://ec.europa.eu/programmes/horizon2020/node/11
[3] http://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/applying-for-funding/find-a-call/h2020-structure-and-budget_en.htm

Table 1: Intervention areas and relevant sub-topics of the Cluster 'Digital and Industry' in Horizon Europe

	Intervention Areas								
	Manufacturing technologies	**Key digital technologies**	**Advanced materials**	**Artificial intelligence and robotics**	**Next Generation Internet**	**High Performance Computing and Big Data**	**Circular Industries**	**Low-Carbon and clean industries**	**Space**
Relevant Sub-Topics	Additive manufacturing, industrial robotics, human integrated manufacturing systems	Nano-electronics design and processing concepts	Materials (including plastic, bio-, nano-, two-dimensional, smart and multi-materials)	Enabling AI technologies (explainable AI, unsupervised machine learning and data efficiency, advanced human-machine interactions)	Connectivity beyond 5G, software defined infrastructures, Internet of things, cloud infrastructures, cognitive clouds, radio, edge computing, blockchains	key exascale and post-exascale technologies and systems; algorithms, codes, applications, analytic tools and test-beds; world-class HPC infrastructure	Industrial symbiosis; processes and materials, to transport, transform, re-use and store resources, combining the valorisation of by-products, waste and CO2	Process technologies; reductions or avoidance of industrial emissions of greenhouse gases and pollutants	European Global Navigation Satellite Systems; Next generation systems development for new challenges such as security or autonomous driving
	Converging technologies, artificial intelligence, data analytics, industrial robotics, bio-manufacturing, advanced batteries technologies	Sensing technologies for the IoT and innovative solutions on flexible and conformable materials for human-friendly interacting objects	Integrated materials processes and production	Safe, smart and efficient robotics and complex embodied systems	Next Generation Internet applications and services for consumers, industry and society	Extreme-performance data analytics; "Privacy by design" in Big Data analysis; technologies for full-scale data platforms; management, interoperability and linking tools;	Valorisation and life-cycle assessment of materials and product streams	Industrial CO2 valorisation	Copernicus; Next generation systems development for new challenges such as climate change, and security
	Skills and workspaces adapted to the new technologies	Neuromorphic computing powering artificial intelligence applications, or integrated quantum computing	Materials enablers like characterisation (e.g. for quality assurance), modelling, piloting and upscaling;	User-driven AI technologies for AI-based solutions	Software-based middleware, including distributed ledger technologies,	Reduced carbon footprint of ICT processes	Enhanced life-cycle performance, durability, upgradeability and ease of repair, dismantling and recycling	Unconventional energy sources and energy and resource exchanges between industrial plants	Space Situational Awareness
	Flexible, high-precision, zero-defect and zero-waste cognitive plants and smart manufacturing systems	Computing architectures and low-power processors	EU innovation ecosystem of technology infrastructures	Developing and networking the research competences of AI centres			Recycling industry	Industrial products that require low or zero carbon emissions production processes	Secure Satellite Communications for EU governmental actors

	Manufacturing technologies	Key digital technologies	Advanced materials	Artificial intelligence and robotics	Next Generation Internet	High Performance Computing and Big Data	Circular Industries	Low-Carbon and clean industries	Space
	Techniques for exploring construction sites, automation, on-site assembly and prefabricated components	Computing hardware designs for trusted execution, privacy and security protection	Future and emerging trends in advanced materials and other key enabling technologies	Technologies for open AI platforms			Elimination of harmful substances in production and end-of-life phases; safe substitutes, and production technologies		End-to-end satellite Communications; Enhanced ground segment and user equipment, standardisation and interoperability
		Photonics technologies	Solutions for adding value to industrial sectors and the creative industries				Primary raw materials and substitution of critical raw materials		Supply chain sustainability, reduced dependence on non-EU critical space technologies; space technologies for use by other industrial sectors
		System engineering technologies							Space ecosystem
		Software technologies							Space science
		Emerging technologies expanding digital technologies							

Source: COM(2018) 436 final Annexes: https://eur-lex.europa.eu/resource.html?uri=cellar:7cc790e8-6a33-11e8-9483-01aa75ed71a1.0002.01/DOC_2&format=DOC

B: Description of partnership programmes related to the intervention areas

The cluster 'Digital and Industry' can be separated into two main groups, i.e. the 'digital' part (including the areas '*digital technologies'*, '*high performance computing'*, '*next generation internet'* and '*artificial intelligence')* and the 'industry' part (including the areas '*manufacturing technologies'*, '*advanced materials'*, '*circular industries',* and '*low-carbon and clean industries')*. The cluster also contains the area '*space'*.

In total, there are 28 fully relevant partnerships in this cluster and 17 other fully relevant networks and governance structures (see Appendix for detailed list). The fully relevant ones consist of

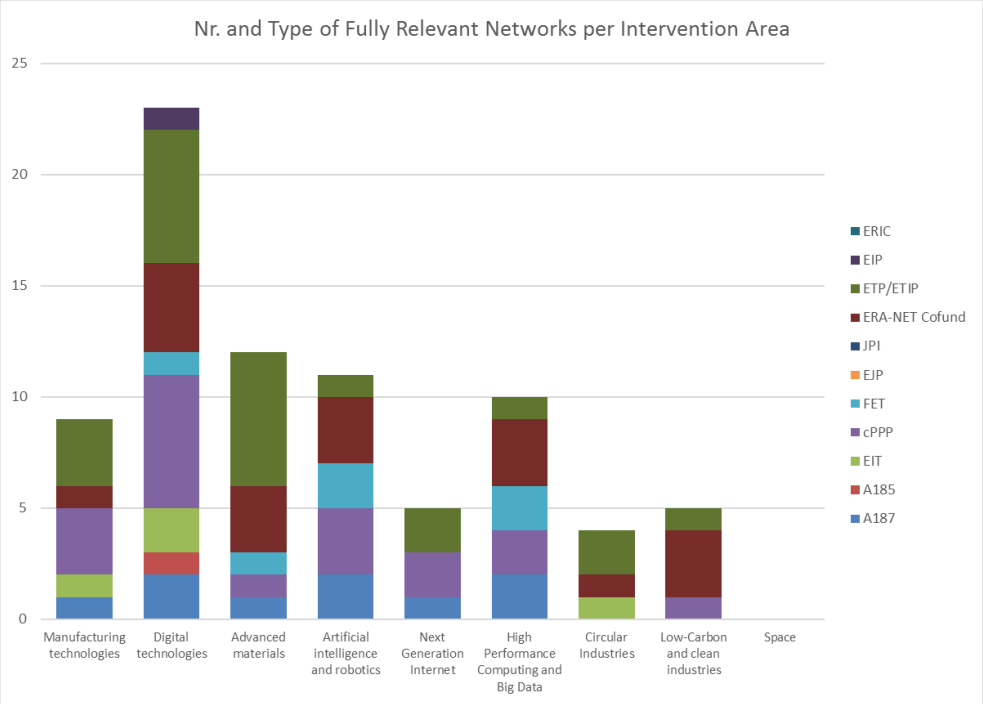
- 12 P2Ps (11 ERA-NET Cofunds, 1 Art 185 initiative)
- 8 cPPPs
- 2 Art 187
- 16 ETPs
- 3 EIT-KICs
- 1 EIPs
- 3 FET Flagships

Please note:

- We consider initiatives as fully relevant if the initiative and its research and innovation programme and/or activities deals with the thematic content of the specific intervention area to a large extent. For example, Electronics in Health is one of the top priorities of ECSEL, it is therefore considered to be fully relevant for the intervention area "Tools, Technologies and Digital Solutions for Health and Care" in the Cluster Health.
- We consider initiatives as partly relevant, if certain parts of the research and innovation programme and/or activities of a partnership initiative are relevant for the intervention area. For example, the JPI MYBL launched a call on "Welfare, Wellbeing and Demographic Change: Understanding Welfare Models" in 2016. It is therefore deemed to be partly relevant for the intervention area "Social and Economic Transformation" as the results of this action could provide some knowledge base for "policy advice" and related studies concerning "changes in the labour market".
- A network can also be partly relevant to a specific area of intervention in case the focus of the network serves as the application area for the respective technologies or services to be developed in the intervention area. For instance, EIP on Active and

Health Ageing is partly relevant to the intervention area of 'Digital Technologies' as digital technologies can be applied to improve healthy ageing of people. In a similar line, EIP on Smart Cities and Communities is partly relevant for the areas "Next Generation Internet" or "High-performance Computing and Big Data" as the respective technologies or services can find various application opportunities in the framework of smart cities.

Figure 1: Number of current networks that are considered fully relevant for Cluster 'Digital and Industry'[4]



Source: ERA-LEARN

Fig. 1 includes multiples of the same partnership where it is deemed to be cutting across the various thematic sub-areas. Some immediate observations can be made:

- The most represented network types (i.e. ETPs and cPPPs) span almost all the intervention areas of the cluster. In particular ETPs dominate the areas of '*advanced materials*' and '*digital technologies*'
- There is greater concentration of ERA-NET Cofund networks in the areas of *'digital technologies'* and about the same presence in '*high performance computing' and*

[4] A specific note is pertinent here. Some ERA-NET Cofund Actions may be serving the needs of JPIs or FET Flagships in terms of implementing the joint calls and possibly other joint activities. In these cases the ERA-NET Cofunds can be regarded as integral parts of the wider initiatives (the respective JPIs or FET Flagships). However, they are considered as individual partnerships as they consist of separate H2020 contracts with their own scope, objectives, timeline and expected impacts. More details in section C below.

Big Data', '*artificial intelligence and robotics*', '*advanced materials'* and '*low carbon and clean industries*'.

- The areas with the least variety of network types are '*low-carbon and clean industries*', '*next generation internet*' and '*circular industries*'.
- The area '*Digital technologies*' is populated with the widest variety of relevant networks.
- The '*space*' area is not populated with any fully-relevant network or partnership.
- Two areas in this cluster ('*low carbon and clean industries*' and '*circular industries*') are directly related to the cluster 'Climate, Energy and Mobility'. In the 'Digital and Industry' cluster the area '*circular industries*' is mainly addressed by four networks (EIT-KIC Raw Materials, ERA-NET Cofund ERA-MIN 2 and ETP ESTEP and ALICE) being the least populated area. Interestingly, the respective area of '*building / industrial facilities in transition*' in the cluster 'Climate, Energy and Mobility' is also among the less populated areas with only two, fully relevant networks (cPPP EeB, EIT-KIC Innoenergy).

Based on the number of networks that are relevant to each intervention area (cf. table 2 below) we see that the areas of '*digital technologies'*, '*advanced materials*' and '*artificial intelligence and robotics'* comprise the largest numbers of networks. Non-P2P initiatives dominate with ETPs being the most represented type of partnerships.

Table 2: Intervention areas of the 'Digital and Industry' Cluster and number of relevant ongoing partnerships and networks (a partnership/ network may be relevant to a number of different intervention areas)

Intervention areas in Horizon Europe	*Fully relevant*	*Partially relevant*	*P2P*	*PPP*
High Performance Computing and Big Data	11	12	7	16
Next Generation Internet	6	3	1	8
Digital technologies	24	17	14	27
Artificial intelligence and robotics	12	5	6	11
Advanced materials	13	7	7	13
Low-Carbon and clean industries	6	9	6	9
Circular Industries	5	13	6	12
Manufacturing technologies	10	8	2	16
Space	1	6	-	7

Source: ERA-LEARN

C: Networks working under a common roof

The current report considers all networks that have a separate Horizon 2020 contract. This means that even in the cases where certain ERA-NET Cofunds are implementing parts of the research and innovation programmes of other networks such as JPIs or FET Flagships, these are considered separate initiatives in our analysis. This is the case for the following networks in the Cluster 'Digital and Industry':

- The ERA-NET Cofunds FLAG-ERA II and III as well as CHIST ERA III and IV are serving the implementation needs of the FET Flagships (Human Brain Project and Graphene)
- The ERA-NET Cofund QuantERA is serving the needs of FET Quantum
- The ERA-NET Cofunds WaterWorks 2014, 2015 and 2017 are serving the implementation needs of Water JPI
- The JPcofuND and JPco-fuND2 are used by JPND for implementing their joint calls

D: Main observations

'Digital' sub-cluster (areas: *High Performance Computing and Big Data, Digital technologies, Artificial intelligence and robotics, Next Generation Internet*)

In all the digital-relevant intervention areas there is dominance of non-P2P networks over P2P partnerships. This ranges from 7 out of 8 (87.5%) fully or partly relevant networks in the area of '*next generation internet*' to 10 out of 16 (62.5%) in the area of '*artificial intelligence and robotics*'.

P2P partnerships are mostly located in the intervention areas of '*artificial intelligence and robotics*' and '*digital technologies*'. The area '*Next generation internet*' is addressed by one P2P (ERA-NET Cofund CHIST-ERA IV) that is partly relevant, whereas '*high performance computing*' is addressed by 7 P2Ps, all of them ERA-NET Cofund actions.

The most populated area in this cluster is '*digital technologies*'. This area is addressed by a number of topics including electronic components and systems, smart systems integration, micro- and nanosystems, photonics, robotics, ICT, micro and nanoelectronics, software, systems, data, cloud, cyber physical systems, Internet of Things and digital platforms. These topics are complemented by other fields that are more associated with application such as active assisted living, added-value manufacturing and ICT-supported ageing or smart cities and communities. Thus, although an intervention area may be populated with a variety of network types, there may be complementarities instead of overlaps in the themes addressed.

There are areas that are addressed by a variety of instruments even without having a broad thematic focus. For instance, photonics is addressed by a cPPP, an ETP as well as an ERA-

NET Cofund. The presence of the ETP and a cPPP in the same area is usual as the ETP is the association of involved industries that represents the private sector in the respective cPPP.

Additionally, the ETP may also serve as a forum for Member States that have discussed and agreed upon certain topics to be implemented through an ERA-NET Cofund (or ERA-NET Plus action in the past). Notwithstanding, it is important to assess the complementarity or degree of overlap in the objectives, activities, thematic focus and actors between the cPPP and the Cofund action.

There are also instruments focusing on technological advancements that have a variety of applications in several areas. For instance, ECSEL is covering electronic components & systems, an area that is cross-cutting all other sub-areas.

'Industry' sub-cluster (areas: *Manufacturing technologies, advanced materials, Circular Industries, low carbon and clean industries, Space*):

There are no fully relevant Art.185 initiatives and no fully relevant JPIs for these areas and only 1 partly relevant JPI (JPI Water).

There is one cross-cutting partnership (Art. 187 ECSEL) which is considered relevant for all sub-areas. Similarly, the FoF can be considered relevant to all intervention areas. All other partnerships address typically only one or two relevant sub-area.

In the '*manufacturing technologies*' area only 2 of the relevant networks are P2Ps (ERA-NET Cofunds MANUNET III and Photonic Sensing).

There is a very high number of ETPs (17) in this cluster with the areas of '*advanced materials*' '*circular industries*' and '*manufacturing technologies*' attracting most of them (7 each). The '*advanced materials*' area has the highest number (7) of ERA-NET Cofunds, with 3 fully relevant (M-ERA.NET 2, EuroNanoMed III and MANUNET III) and 4 partly relevant (Flag-ERA II, Flag-ERA III, ERA CoBioTech, ERA-MIN 2).

There is only 1 fully relevant ERA-NET Cofund in each of the sub-areas '*manufacturing technologies*' (MANUNET III) and '*circular industries*' (ERA-MIN 2).

1.2. Actors and activities

The ‘Digital and Industry’ Cluster includes a variety of different funding organisations from many countries. While some of these funding organisations take part in 5 to11 networks each the vast majority takes part in less than 3 networks thus making the cluster membership quite dispersed across a wide variety of agencies and countries.

Actors and activities seem to follow the orientation and focus of the different types of networks. For P2Ps the usual members include ministries and funding agencies with industry and user representatives usually engaged in governance structures such as Stakeholder Advisory Boards (apart from the Scientific Advisory Boards). Individual research performing organisations are members of special networks enabling their direct membership as in the case of Art 185 EMPIR or the newly established EJPs.

In PPPs including ETPs the presence of the private sector is more pronounced with the direct engagement of industry associations specifically formed for this purpose (e.g. Photonics21, ETP4HPC, etc.).

EIT-KICs are also characterised by a strong presence of the private sector as well as universities, technology developers and city/regional authorities depending on the area addressed. For instance, EIT KIC Digital acts through a pan-European ecosystem of over 180 European corporations, SMEs, start-ups, universities and research institutes.

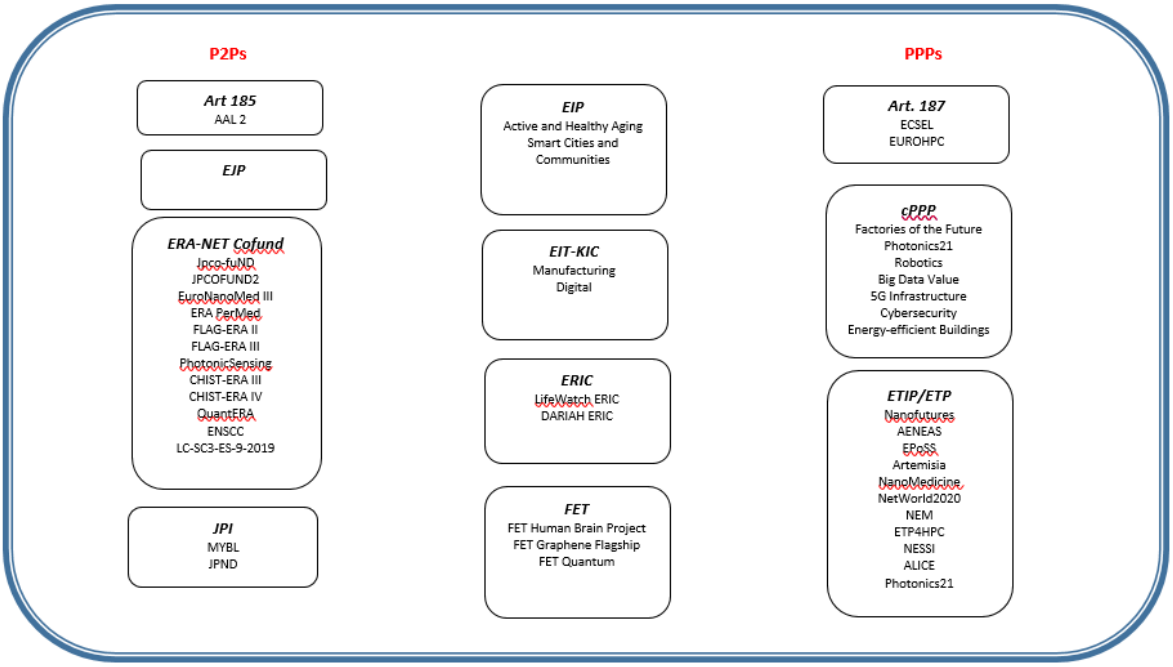
Furthermore, the regional dimension seems more prominent in some networks: e.g. EIT-KIC Raw Materials with the Regional Innovation Hubs.

2. Connections between partnerships and networks

2.1. Partnerships and networks

The figures and narrative below are an attempt to summarise the landscape of partnerships for each of the two main thematic areas of the Cluster ('Digital' and 'Industry') and to highlight some examples for the extent of connections between them.

Figure 2-1: Partnerships and networks related to the sub-cluster 'Digital' of Horizon Europe



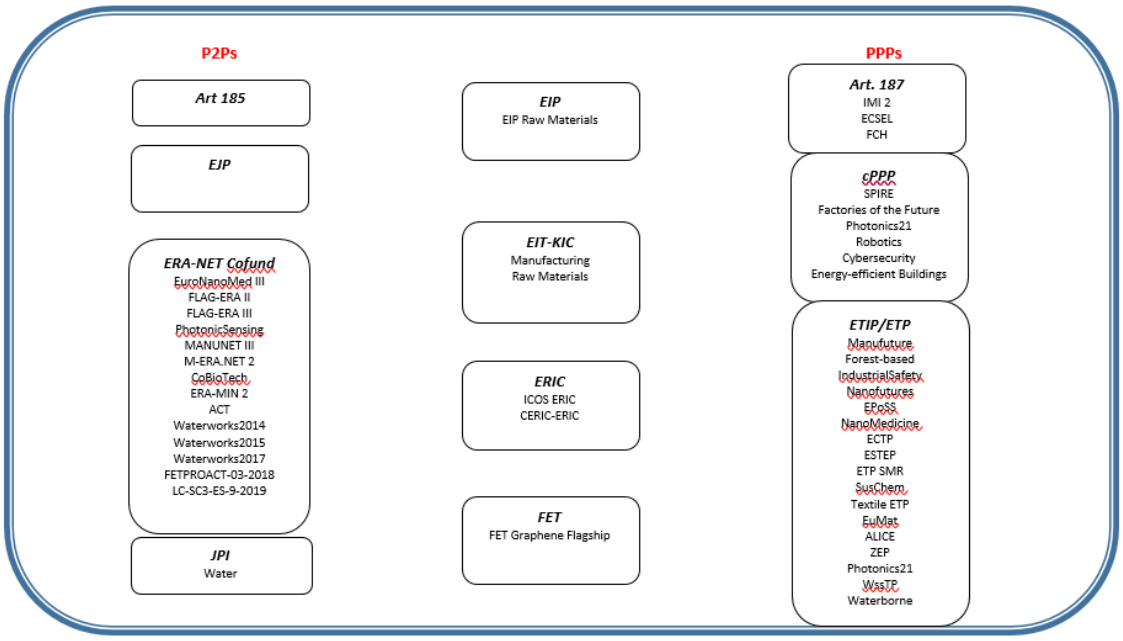
The 'digital' sub-cluster is highly populated. Some of the ERA-NET Cofunds seem to serve as the 'implementation channels' for overarching initiatives, for instance QuantERA for FET Quantum, FLAG-ERA for the FET Flagships, or JPco-fuND and JPco-fuND2 for JPND.

The other P2Ps involved are also connected with each other (e.g. AAL 2 with JPI MYBL) as well as to other networks (e.g. JPI MYBL with EIP Active and Heath Aging).

- The non-P2P world is more inter-connected. ETPs providing strategic orientations are directly connected to suitable 'implementation' channels, i.e. the respective cPPPs.
- Several ETPs (AENEAS, ARTEMISIA, EpoSS) are linked to ECSEL.
- Certain cPPPs are also connected with each other (e.g. Big Data Value and 5G Infrastructure cPPPs).
- EIT-KICs collaborate with each other as well as with several cPPPs and ETPs.

Links between P2Ps and non-P2Ps have been found to be very few.

Figure 2-2: Partnerships and networks related to the sub-cluster 'Industry' of Horizon Europe



The 'industry' sub-cluster is heavily populated with PPPs, with ETPs being the most represented type. There are four fully relevant cPPPs and 2 partly relevant ones. There is also networks such as JTI ECSEL or FoF cPPP that are relevant to all areas. For the ETPs there are nine that are fully relevant and eight that are partly relevant ETPs.

On the other hand, there is a relatively small number of P2Ps with only four fully relevant ERA-NET Cofunds, together with 10 partly relevant ERA-NET Cofunds and one partly relevant JPI.

In addition there are two EIT KICs (Manufacturing, Raw Materials) and one FET Flagship (Graphene) relevant in this cluster.

2.2. *Examples of different types of interactions*

A few selected examples are listed below to illustrate the different types of connections among the networks.

Formal connections (e.g. one serves as continuation or implementation of the other's work-programme)

- ETPs providing the overarching strategy and orientation in the specific thematic area 'use' cPPPs as their operational framework and the respective H2020 calls serving the cPPPs focus. This is the case for instance for Photonics21 ETP and the Photonics cPPP, for ETP4HPC and EuroHPC JU, or for Manufuture ETP and Factories of the Future cPPP.
- In a similar vein QuantERA is the ‚implementation tool' used by FET Quantum.
- ARTEMISIA, AENEAS and EPoSS are the private partners in the ECSEL partnership with the European Commission.

Existing collaborations (e.g. joint activities, some joint decision making through common membership in boards)

- AAL2 shares members in Governing Boards with the relevant JPIs, HDHL and MYBL. It also implements joint activities with other JPIs (HDHL).
- Three cPPPs (Robotics, Photonics and FoF) collaborate closely with each other through launching joint calls.
- EIT Digital has existing collaborations with cPPPs 5G, Big Data Value and Factories of the Future.
- EIT Raw Materials collaborates with the other KICs, as well as SPIRE, ERA MIN 2, EIP Raw materials, Factories of the Future, ESTEP, ETP SMR, SUSCHEM and EuMat.
- ERA-MIN 2, EIT-KIC Raw Materials and ETP-Forest Based Sector are members of the High-Level Steering Group of the EIP Raw Materials.
- EIT-KIC Raw Materials is also a member of the ERA-MIN 2 Advisory Board.

Other informal connections (e.g. sharing information, considering each other's priorities)

- There are plenty of informal links in the sense of considering priorities of related networks. For instance, Photonics and Robotics cPPP take into account the priorities and activities of the Factories of the Future cPPP. EPoSS coordinates strategies and priorities with other relevant ETPs and ETIPs. AAL2 coordinates their strategy building and activities with EIT-KIC Heath and wider umbrella initiatives such as EIP AHA. ERA-NET Cofund networks also cooperate with other related Cofunds. MANUNET has links to Manufuture, M-ERA.NET 2 takes into account the priorities of EuMAT ETPs, M-ERA.NET 2 shares and promotes relevant funded projects with the FET flagship Graphene.

2.3. Summary on overall connectivity between the networks

Recent reports such as the Mid-term Review of cPPPs[5] include suggestions about links to be created/strengthened. For instance, ECSEL should be connected to both relevant cPPPs (FoF and BDV) and EUREKA Clusters as well as wider 'umbrella' networks such as EIP AHA providing overarching strategies and relevant application areas. NESSI should be linked to relevant cPPPs such as BDV and 5G. The EPoSS ETP should also be connected to EIT-KIC on Added-value Manufacturing, which in turn should form links with the ETP MANUFUTURE as well as the FoF cPPP.

Our analysis shows that connections between the P2P and non-P2P world are limited even in areas that are addressed by both communities. For instance, in the '*photonics'* and '*manufacturing'* area there is an ERA-NET Cofund as well as an ETP and cPPP. While the ETP provides the overarching strategic framework for the respective cPPP that is mainly the implementation vehicle of the ETP, the question arises:

- What is the level of collaboration between the ERA-NET Cofund PhotonicSensing and the respective cPPP that is also implementing collaborative research activities?
- Given that the strong orientation of the ETP and cPPP towards industrial participation and innovation are there any potential complementarities to be explored between the ERA-NET Cofund and cPPP or overlaps to be streamlined?
- What is the level and type of collaboration between for instance ERA-NET Cofund MANUNET III and the non-P2P partnerships cPPP Factory of the Future and ETP Manufuture? Is it optimal or what needs to be done further?

[5] Mid-term review of cPPPs https://publications.europa.eu/en/publication-detail/-/publication/6de81abe-a71c-11e7-837e-01aa75ed71a1.

Further questions that arise may include:

- Most ETPs represent the industrial partners in the areas addressed. How can future partnerships benefit from already well-established advocacy groups such as ETPs/ETIPs?
- How can future partnerships create synergies and avoid overlaps with well-established networks with a wide ranging focus cutting across several intervention areas (e.g. ECSEL, FoF or the EIP on Smart Cities and Communities)?
- How are the networks in this cluster connected to related areas in other clusters? For instance the networks in the 'AI and robotics' with the networks in the 'Health cluster', or those in the 'advanced manufacturing' area with those in the 'Climate, Energy and Mobility' cluster? Overall, how the cross-cluster connections among partnerships should be addressed in the future?
- Should the area of space not be supported by a relevant network/partnership with the necessary links to other relevant networks given that the applicability of space research results to other industrial sectors is an explicit focus in Horizon Europe?

3. Appendix

Summary of the various partnerships and networks that are relevant to the Cluster 'Digital and Industry'

The black dots indicate 'full relevance' to the specific intervention area, whilst the white dots indicate 'partial relevance'.

	Subject	Manufacturing technologies	Digital technologies	Advanced materials	Artificial intelligence and robotics	Next Generation Internet	High Performance Computing and Big Data	Circular Industries	Low-Carbon and clean industries	Space	Start	End	Members
A187													
ECSEL	Electronic components & systems	●	●	●	●	●	●	❍	❍	❍	2014	2024	33
IMI2	Manufacturing for personalised medicines	❍									2014	2024	30
FCH	Fuel cell and Hydrogen								❍		2014	2024	2
EUROHPC	High Performance Computing in Europe		●		●		●				2019	2026	31
A185													
AAL 2	Active Assisted Living		●		❍						2014	2024	22
EIT-KIC													
Manufacturing	Manufacturing	●	●								2014	2024	50
Digital	Digital technologies		●		❍		❍				2010	2022	>190
Raw Materials	Raw Materials			❍				●			2014	2020	>120

	Subject	Manufacturing technologies	Digital technologies	Advanced materials	Artificial intelligence and robotics	Next Generation Internet	High Performance Computing and Big Data	Circular Industries	Low-Carbon and clean industries	Space	Start	End	Members
cPPP													
SPIRE	Sustainable process industry, resource/ energy effic.	●						❍			2014	2020	>150
Factories of the Future	Factories of the Future	●	●	●	●	●	●	●	●	●	2008	2020	161
Photonics 21	Photonics technologies	❍	●				❍				2014	2020	>15
Robotics	Robotics	❍	●		●		❍			❍	2013	2020	261
Big Data Value	Big Data Value creation and Artificial Intelligence		●		●		●				2014	2020	>200
5G	5G Infrastructure		●		❍	●	❍				2014	2020	>50
Energy-efficient Buildings	Energy-efficient Buildings		●	●					●		2008	2020	30
Cybersecurity	Cyber Security	●	●		●	●	●				2014	2020	>20
FET Flagships													
FET Human Brain Project	Human Brain		●		●		●				2013	2023	>100
FET Graphene Flagship	Graphene research		❍	●					❍		2013	2023	>150
FET Quantum Flagship	Quantum technologies		❍		●		●				2018	2028	>100
ERA-NET Cofund													
FLAG-ERA II	FET flagships; Graphene; Human Brain; ICT; Rob		●	❍	●		●		❍		2016	2021	21
FLAG-ERA III	FET flagships; Graphene; Human Brain; ICT; Rob		●	❍	●		●		❍		2019	2023	23
PhotonicSensing	photonic sensing tech	❍	●								2016	2021	10
MANUNET III	Advanced manufacturing	●		●							2016	2021	12
CHIST-ERA III	Long-term ICT		●		❍		❍				2017	2022	18
CHIST-ERA IV	Long-term ICT		❍		❍	❍	❍		●		2019	2024	23
M-ERA.NET 2	materials science and engineering			●							2016	2021	33
CoBioTech	Cofund on Biotechnologies			❍							2016	2021	27

	Subject	Manufacturing technologies	Digital technologies	Advanced materials	Artificial intelligence and robotics	Next Generation Internet	High Performance Computing and Big Data	Circular Industries	Low-Carbon and clean industries	Space	Start	End	Members
QuantERA	Quantum technologies		❍		●		●				2016	2021	26
ERA-MIN 2	Raw Materials	❍	❍	❍	❍			●			2016	2021	17
ACT	CO2 Capture and Storage (CCS) technology							❍	❍		2016	2021	12
ENSCC	Smart Cities		❍				❍				2014	2019	28
Jpco-fuND	Neurodegenerative Diseases		❍								2015	2019	26
JPCOFUND2	Neurodegenerative Diseases		❍								2019	2023	29
EuroNanoMed III	Nanomedicine		❍	●							2016	2021	25
ERA PerMed	Personalised Medicine		❍								2017	2022	32
LC-SC3-ES-9-2019	Energy Systems, Digitalisation						❍		●				
Waterworks2015	water use efficiency							❍			2016	2020	33
Waterworks2014	European water challenges							❍			2015	2020	25
Waterworks2017	closing the water cycle gap							❍			2018	2022	23
JPIs													
MYBL	demographic change		❍								2013	2022	15
Water	sustainable water systems for a sustainable economy in Europe and abroad							❍			2011	2022	30
JPND	Neurodegenerative Diseases		❍								2011	2022	27

	Subject	Manufacturing technologies	Digital technologies	Advanced materials	Artificial intelligence and robotics	Next Generation Internet	High Performance Computing and Big Data	Circular Industries	Low-Carbon and clean industries	Space	Start	End	Members
ETP													
Manufuture	Future in manufacturing	●						❍			2007	2022	
Forest-based	forest-based bioeconomy	❍						❍		❍	2007	2022	
IndustrialSafety	Industrial safety	❍									2007	2022	
Nanofutures	Nanotechnologies	●	❍								2007	2022	
AENEAS	micro and nanoelectronics		●								2007	2022	
EPoSS	Smart Systems Integration; Micro- and Nanosystems	❍	●								2007	2022	
Artemisia	systems, Internet of Things and Digital Platforms		●								2007	2022	
NanoMedicine	NanoMedicine		❍	●							2005	2022	
ECTP	Innovative Built Environment			●							2007	2022	
ESTEP	Steel technology			●				●	●		2007	2022	
ETP SMR	Sustainable Mineral Resources			●							2007	2022	
SusChem	Sustainable Chemistry			❍							2007	2022	
Textile ETP	Textiles			●							2007	2022	
EuMat	Advanced Engineering Materials and Technologies	●		●							2007	2022	
NetWorld2020	communication networks and services					●				❍	2007	2022	
NEM	New European Media					❍					2007	2022	
ETP4HPC	supercomputing systems		●		●		●				2007	2022	
NESSI	software, systems, data, cloud, cyber physical sys		●			●					2007	2022	
ALICE	Logistics		❍					●	❍		2007	2022	

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ZEP	Zero Emission Fossil Fuel Power Plants - Capture and Storage (CCS							❍	❍		2007	2022	
Photonics21	photonics technologies	❍	●				❍				2007	2022	
WATERBORNE	WATERBORNE INDUSTRIES							❍			2007	2022	
WssTP	Water Supply and Sanitation							❍			2007	2022	
EIP													
Active and Healthy Aging	Aging		❍				❍				2011	2020	
Smart Cities and Communities	Smart communities & cities		●			❍	❍			❍	2011	2021	
Raw Materials	Raw Materials							❍			2013	2020	
ERIC													
LifeWatch ERIC	Biodiversity, Ecosystem functions and services						❍				2017	2022	
ICOS ERIC	carbon cycle and greenhouse gas								❍		2008	2022	
DARIAH ERIC	arts and humanities - computational methods		❍								2014	2022	
CERIC-ERIC	materials, biomaterials and nanotechnology			❍							2014	2022	

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