

CROSS FERTILISATION THROUGH ALIGNMENT, SYNCHRONISATION AND EXCHANGES FOR IoT

H2020 – CREATE-IoT Project

Deliverable 01.11

EU research and innovation activities overall plan-evaluation

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Table of contents

1.	Executive summary.....	4
1.1	Publishable summary	4
1.2	Non-publishable information	4
2.	Introduction.....	5
2.1	Purpose and target group.....	5
2.2	Contributions of partners.....	5
2.3	Relations to other activities in the project.....	5
3.	Research and innovation activities in collaboration with H2020 partnerships	6
3.1	AIOTI.....	7
3.2	ECSEL JU	8
3.3	BDVA	8
3.4	ECSO	9
3.5	EIP-SCC.....	10
3.6	EIP-AHA.....	11
3.7	EIP-AGRI.....	12
3.8	FoF PPP.....	13
3.9	SPARC PPP	14
3.10	5G IA PPP.....	14
4.	future research and innovation activities in Horizon Europe	16
4.1	High performance computing	17
4.2	Key Digital Technologies	18
4.3	Smart Networks and Services	19
4.4	AI, data, and robotics	20
4.5	Photonics Europe	20
4.6	Made in Europe	21
4.7	Carbon Neutral and Circular Industry	22
4.8	Connected and Automated Driving / Mobility and Safety for Automated Road Transport ..	22
4.9	EIT Digital	24
4.10	EIT Manufacturing.....	24
4.11	Sustainable, Smart and Inclusive Cities and Communities	25
4.12	Safe and Sustainable Food Systems for People, Planet and Climate	26
4.13	Innovative Health Initiative.....	26
5.	Conclusions.....	27
5.1	Other conclusions and lessons learned.....	27
6.	References.....	29

1. EXECUTIVE SUMMARY

1.1 Publishable summary

The delivery is part of the of the former Task 04.02: Integration and coordination with European research and innovation activities that later was transferred to Task 01.01 and having the aim of creating the framework to connect with other initiatives including contractual Public-Private-Partnerships (e.g. in the area of Big Data, Factories of the Future, 5G-infrastructure PPPs), Joint Technology Initiatives (e.g. ECSEL JTI), and European Innovation Partnerships. The delivery gives an overview and evaluation of the results achieved within the framework based on the interactions between CRATE-IoT, the IoT European Large-Scale Pilots Programme projects partners, H2020 initiatives and the Horizon Europe candidate partnerships.

CREATE-IoT has identified that there are many "entities" active in Europe that represent the interest of groups of stakeholders addressing IoT technologies and applications and in some cases these are not properly coordinated. Such entities can be an industry association, a contractual PPP (Public-Private Partnership) or other body representing the interest of players in the R&D on IoT in Europe.

These different European initiatives address technologies and applications developments related to IoT and in many cases “overlap”. However, in case of overlap, it is important at least aim for consistent a unified direction to ensure IoT is well-addressed across Europe and the different Strategic Research and Innovation Agenda (SRIA) documents of the IoT related entities in general (and AIOTI in particular) are aligned with many other SRIA documents that include IoT.

In line with this goal the work covered by this delivery on EU research and innovation activities focuses to provide the desired coordination and alignment between different IoT-related initiatives in Europe, represented by the different entities, each with their own community. Furthermore, the aim is also to ensure adequate inclusion of IoT in the various SRIA documents with consistent terminology.

In this context, the interactions of the CREATE-IoT project with the different European partnerships as described in this document are relevant in the context of accelerating the research, innovation and deployment of IoT technologies and applications considering that a new report from the EIB – "Who is prepared for the new digital age? - Evidence from the EIB Investment Survey" [1], shows that European firms currently lag behind in adopting digital technologies, particularly in the Internet of Things. The report shows that EU firms currently lag behind in adopting digital technologies, particularly in the IoT. The report highlights the importance of adopting digital technologies as they can lead to large boosts in productivity and disproportionate dividends in terms of competitiveness for early adopters. Several leading digital technology companies today are based in the United States or China. The EU, it seems, has fallen behind in the digital services transformation race but it might be able to take up leading positions in new races.

This shows that the integration and coordination of European IoT research and innovation activities is key for the future research and innovation programme and will depend on Europe ‘s ability to seize the opportunities arising from IoT, automation, artificial intelligence and other emerging digital technologies.

1.2 Non-publishable information

The document is public.

2. INTRODUCTION

2.1 Purpose and target group

The purpose of this delivery is to outline the integration and coordination with European research and innovation activities with the aim of creating the framework to connect with initiatives including H2020 contractual Public-Private-Partnerships (e.g. in the area of Big Data, Factories of the Future, 5G-infrastructure PPPs), Joint Technology Initiatives (e.g. ECSEL JTI), and future Horizon Europe partnerships.

The scope included several H2020 and Horizon Europe candidates that are related to research and innovation in the area of IoT.

The target group for this delivery consists of different stakeholders representing, IoT technologies and applications providers, public authorities, and European innovation policy makers.

2.2 Contributions of partners

SINTEF contributed on H2020 research and innovation activities in collaboration with partnerships (AIOTI; ECSEL JU; EIP-SCC; EIP-AHA; EIP-AGRI; and SPARC PPP). SINTEF also contributed on Horizon Europe future research and innovation activities (EuroHPC; Key Digital Technologies; Smart Networks and Services; AI, data, and robotics; Photonics Europe; Carbon Neutral and Circular Industry; CCAM/ Mobility and Safety for Automated Road Transport; Sustainable, Smart and Inclusive Cities and Communities; Safe and Sustainable Food Systems for People, Planet and Climate; and Innovative Health Initiative).

ATOS contributed on H2020 Research and innovation activities in collaboration with partnerships (BDVA, ECSO, EIP-SCC, 5G PPP) and Horizon Europe future research and innovation activities (EIT Digital).

ISMB Contributed on H2020 research and innovation activities in collaboration with partnerships (FoF PPP) and Horizon Europe future research and innovation activities (Made in Europe, EIT Manufacturing).

2.3 Relations to other activities in the project

This work is related to the tasks T01.01: IoT Focus Area coordination and road mapping, and follows the activities in WP4 on European IoT Value Chain Integration Framework. The IoT value chain integration framework and the coordination of EU IoT/IIoT research and innovation activities are vital in streamlining goals and ensuring unified visions across Europe for information flows, policy coordination and knowledge in the implementation of the digital economy. The activities are relevant to selected tasks within most of the work packages, including the work carried out within WP07: Communication and Collaboration Strategy, Dissemination and Events Management.

The activities covered by this delivery are complementary to the coordination activities structured around LSPs, and were focused on providing a structure for supporting the implementation of coordination bodies that will ensure an efficient interplay of the various elements of the IoT FA and liaise with relevant initiatives and partnerships at EU level (JTIs, PPPs, FAs, EPIs) while further promoting the IoT/IIoT research, innovation, deployment in Europe and create societal and market acceptance of IoT applications.

3. RESEARCH AND INNOVATION ACTIVITIES IN COLLABORATION WITH H2020 PARTNERSHIPS

CREATE-IoT has strong links with on-going research and innovation initiatives in Europe. One of the objectives of the project is to strengthen the relationships with relevant initiatives like Public private Partnerships (PPP) and European Innovation Partnerships (EPI).

Among other activities, the series of workshops "CREATE the Next Generation IoT eXperience for the Future" for expanding the horizons of next generation IoT/IIoT technologies and applications and addressing the challenges brought by the convergence of technologies [21]. The workshops provide a Pan European platform to exchange information among initiatives and stakeholders addressing the fast-growing IoT/IIoT European ecosystem, focusing on new IoT/IIoT technology trends.

The Workshops series aims to foster links between communities of IoT/IIoT users and providers, EU and Member States' initiatives, and to connect with existing European partnerships and future initiatives to build new partnerships in Horizon Europe, and support the preparation for the next generation of IoT/IIoT deployment and future funding programmes.

The "CREATE the Next Generation IoT eXperience for the Future" workshop series cover topics and aims like [21]:

- European Industry Partnerships Collaborative Event, (Amsterdam, 17th April 2019). The aim of the workshop was:
 - Present the state-of-play and developments of European research and innovation landscape related to IoT/IIoT.
 - Present the IoT Large-Scale Pilots Programme projects outcomes, the value proposition, the gaps identified and highlight the next steps for sustainability and scaling up the results.
 - Discuss and provide recommendations for the future strategic directions for EU Research and Innovation from across the different European partnerships.
 - Explore the role of European partnerships with industry in the future and analyse the concept for future European partnerships under the "Horizon Europe" EU Framework Programme for Research and Innovation (2021-2027).
 - Focus on European industry-driven priorities for converging technologies such as IoT/IIoT, 5G, AI, DLTs, edge computing in manufacturing, processing, construction, ICT and automotive.
- European Industry Partners for New Digital Age, (Brussels, 12th September 2019). The aim of the workshop was:
 - Discuss the strategic objectives and role of European partnerships from an industrial perspective and current European context and analyse future concepts and perspectives of IIoT.
 - Refer to and identify potential synergies with national and regional programmes, address means to bring together a broad range of innovation actors to work towards a common goal and turns research into socio-economic results.
 - Discuss the links between partnership candidates, possible partnership composition and the role of in future innovation and deployment support programmes like Cohesion Funds, Digital Europe Programme (DEP), InvestEU and CEF Digital priorities.
- European Industry Partnerships Lighthouse to Thrive in the new digital Age, (Brussels, 5th November 2019). The workshop was addressing:
 - Industrial perspective – opinions, views and statements from industrial stakeholders on leveraging future connectivity systems to develop opportunities in related areas, notably distributed edge computing for service provision and intelligent devices across different domains (IoT/IIoT).

- Relevant industrial use cases on how IoT/IIoT would benefit from resilient, low-latency, ultra-reliable and secure 5G and beyond infrastructures, capable of connecting a wide variety of intelligent devices, sensors/actuators, and machines/robots.
- Panel on the proposed European Partnership objective and impact (SWOT) and industry support/involvement. Discussions on the role and ambition of a possible partnership with the objective to maintain European leadership in the field of intelligent connectivity infrastructures, covering the whole value chain of IoT/IIoT implementation stack whilst to develop/support applications in the vertical sectors and guarantee security of connected devices and critical infrastructures.
- Final discussions on “need to act now based on SWOT” through building a European partnership on IoT/IIoT, smart networks, edge computing, AI at the edge in the context of technology competitiveness of Europe in the global context.
- Policies to Support Open Data Marketplace, (The Hague, 29th January 2020). The workshop was addressing:
 - Market views on data sharing and data-driven services from different sectors.
 - Elements of data framework.
 - What needs for smart policy making?
 - Architecture and use cases.
- Navigating IoT Architectures and Standards Days, (Brussels, 19th - 21st February 2020). The workshop was addressing:
 - Security, Privacy, Semantic interoperability, and Platform interoperability.
 - European Large-Scale Pilots projects, including presentations, panel, discussions, and show case.
 - Digital transformation, and Enabled data marketplaces,
 - Horizontal harmonization - AIOTI solutions on breaking down the technology silos.

Upcoming events are covering the following topics:

- Data Sharing in Agriculture, (Webinar, 10th June 2020).
- Advancing the Digital Transformation of European Industry, (Webinar, 12th June 2020).

3.1 AIOTI

CREATE-IoT worked in close cooperation with relevant horizontal and vertical WGs of AIOTI. In the horizontal plane, this means: AIOTI WG01 on research and innovation; AIOTI WG02; AIOTI WG03 which has created an advisory group of standardisation experts (the AGoAWE) whose role would be to work with CREATE-IoT in the promotion of coordination within the IoT ecosystem at large; AIOTI WG04 on policies for aligning views on (personal) data protection, data management, security, user acceptance, societal, ethical aspects, accountability and legal issues. CREATE-IoT will also liaise with the AIOTI vertical WGs for coordinating their contributions to EU IoT adoption roadmap, and their strategies towards other IoT communities and Member States.

The Alliance for Internet of Things Innovation (AIOTI) was initiated as a result of the European and global IoT technology and market developments [1]. AIOTI aims to create and master sustainable innovative European IoT ecosystems in the global context to address the challenges of IoT technology and applications deployment including standardisation, interoperability and policy issues, in order to accelerate sustainable economic development and growth in the new emerging European and global digital markets.

CREATE-IoT and the LSPs have worked in cooperation with AIOTI and the following working groups (WGs): IoT research (WG01) on activities defining a common vision of IoT technology and addressing European research challenges; Innovation ecosystem (WG02) on designing actions to develop innovation ecosystems by stimulating start-ups, encouraging the use of open IoT platforms, enabling Large Scale Pilots, and linking large and small companies through open

innovation; IoT standardisation (WG03) on recommendations to address existing IoT standards, analyses gaps in standardisation, and develops strategies and use cases; and IoT policies (WG04) on recommendations to address existing and potential barriers that prevent or hamper the take-up of IoT in the context of the Digital Single Market.

As an relatively recent example, the Workshop on Policies to Support Open Data Marketplaces (Hague, January 2020) where co-organised and supported by the EC, AIOTI and CREATE-IoT, and is part of a series of IoT events related to data marketplaces. The workshop covered data sharing in IoT ecosystems, data-supported services, concepts, and best practices through market views on data sharing and data- driven services from different sectors, elements of data framework, needs for smart policymaking, and architecture and use cases.

3.2 ECSEL JU

CREATE-IoT established a link with ECSEL to contribute to the identification of research priorities related to the IoT in the context of the program. A link with on-going projects relevant for IoT progress was established for sharing knowledge and methodologies.

Electronic Components and Systems for European Leadership Joint undertaking (ECSEL JU) contribute to the development of a strong and globally competitive electronics components and systems industry in Europe [1]. The key role of the ECSEL JU is to keep Europe at the forefront of technology development in the area of electronic components and systems. These are a pervasive Key Enabling Technology (KET), impacting all industrial branches and many aspects of modern life. The concept of "smart" is based on integrating semiconductor chips running embedded software to provide functionality and features that are useful to society. ECSEL JU combines ENIAC (AENEAS), ARTEMIS and EPoSS bringing together the electronic components and systems research sectors. It is managed by several boards representing key stakeholders.

3.3 BDVA

CREATE-IoT promoted the results of the LSPs towards BDVA whose priorities include Data Management and benefited from IoT experiments with real-life tests of the big data value chain (and possibly also to the small data works developed within BDVA).

The Big Data Value Association (BDVA) is a private association founded to boost research, development and innovation related to Big Data, as well as promoting its uptake across professional and private users [1]. BDVA represents the private (industry led) side of the EU Big Data Value Public-Private Partnership (BDV PPP).

The Big Data Value Association (BDVA) is a private association founded to boost research, development and innovation related to Big Data, as well as promoting its uptake across professional and private users [1]. BDVA represents the private (industry led) side of the EU Big Data Value Public-Private Partnership (BDV PPP).

In the last period the collaboration between the IoT LSP program and BDVA has been strengthened. In particular it is worth mentioning the presence of BDVA in most of the relevant events organized in the context of the IoT landscape, such as the IoT week, where BDVA organized a specific session on data sharing and data platforms aiming to bring visions from the two communities (IoT and big data) and had presence at the opening and closing sessions thanks to Vice-President Laure Le Bars and President Thomas Hahn respectively. BDVA has also been a major participant in the series of workshops organized by the CREATE-IoT project, notably the "European Industry Partnerships Collaborative Event" held in Amsterdam (April 2019), the "European Industry Partnerships for New Digital Age Event" held in Brussels (September 2019)

and the recently held workshop “Navigating IoT Architectures and Standards Days Event” (Brussels, February 2020).

BDVA has played specifically an important role in fostering collaboration with the smart cities community, with explicit participation and contributions to a series of workshops in the domain and notably the last editions of the Connected Smart Cities Conference (Brussels in 2019 and 2020), and workshops organized about data sharing in public sector. BDVA has a task force that works in the area of adoption of big data solutions in smart cities; cooperation with the Open and Agile Smart Cities Alliance has taken place through it and some discussions about common activities are undergoing.

3.4 ECSO

CREATE-IoT cooperated with ECSO, informing of LSPs specific cybersecurity challenges, solutions and remaining gaps that may be addressed in future research roadmaps. The link between the Trusted IoT and cybersecurity were explored.

The European Cyber Security Organisation (ECSO) is the private (industry led) contractual counterpart to the European Commission for the implementation of the cybersecurity contractual Public-Private Partnership (cPPP). The main objective of ECSO is to support all types of initiatives and projects that aim to develop, promote, encourage European cybersecurity. Further, ESCO is instrumental in providing support to the European Commission for a new certification scheme. ECSO members include large companies, SMEs and Start-ups, research centres, universities, clusters and association, users and operators, as well as European Member State’s local, regional and national administrations, countries part of the European Economic Area (EEA) and the European Free Trade Association (EFTA) and H2020 associated countries.

CREATE-IoT established communication with ECSO to make them aware of the IOT LSP projects and potential areas to collaborate and learn from each other:

- Be aware of the LSPs in terms of their Cyber Security needs and lessons / gaps encountered to also consider their findings as part of future ECSO strategy on innovation and research.
- Consider CREATE-IoTs focus on Trust, PSbD and legal frameworks are very relevant to consider in the ECSO SRIA
- ECSO monitors active projects for cyber security in general and is great input for them to gather our view on the needs of IoT especially as it’s a new technology that is driving new services of the future.
- As regards, work on harmonized certification label it is good to get exchange views and further to align with AIOTI.

In April 2019, CREATE-IoT held a collaborative workshop event bringing together Public-Private partnerships and other EU initiatives with the IoT LSPs. Roberto Cascella on behalf of ECSO highlighted the following relevant points to the IoT LSPs¹:

- ECSO Mission to build a resilient EU ecosystem over trusted technologies to address challenges of digitalisation of society and industry.
- Lessons learned -> SRIA 2.0 (2027).
- Three papers on AI, Blockchain and IoT.
- Highlight security challenges on Digital Twins and quantum computing.
- The transversal nature of ECSO see it collaborating with other PPPs such as HPC and Robotics on SRIAs.

¹ <https://european-iot-pilots.eu/2019-april-amsterdam/>

Roberto also highlighted that digitalization in industry require cybersecure operations for data where an end to end security must be guaranteed, where a primary challenge is to promote discussion between stakeholders. In tackling this he sees the ECSO priorities as:

- Security by design
- Awareness (now it is seen as a cost)
- Foster collaboration
- Cyber security strategy ENISA.
- Next multi framework programme, Digital Europe and Horizon Europe.
- Threats increasing a lot due to Digitalisation.
- Convergence of IT and OT (operational technology).
- Security to protect systems.
- 500 MEuros put in leveraging 18000 MEuros.
- Important to boost SMEs.
- 250 organisations engaged of which 25% are SMEs.
- Also have public administration as partners.
- Aim to produce resilient and trusted technologies.
- Technical areas include AI, IoT and blockchain, amongst others identified.
- Finance and Energy are the big areas as well as e-government.
- Industries 4.0 is also important.
- Plan to look at AgriFood in the future – not a priority now.

Also, addressing the transversality of their approach, Roberto highlighted that ECSO is pushing a sector agnostic approach but also looking at sector priorities with their vertical WG e.g. Industry 4.0 can have specific data protection issues, but they push transversal reuse of solutions, processes and best practices across sectors.

3.5 EIP-SCC

CREATE-IoT established a link with the EIP-SCC initiative to contribute to the action clusters to the action clusters related with the support of horizontal IoT activities, mainly to integrated infrastructures and processes, and business models, finance, and procurement.

The European Innovation Partnership on Smart Cities and Communities (EIP-SCC) brings together cities, industry and citizens to improve urban life through more sustainable integrated solutions [1]. This includes applied innovation, better planning, a more participatory approach, higher energy efficiency, better transport solutions, intelligent use of Information and Communication Technologies (ICT), etc. It combines ICT, energy management and transport management facilitating innovative solutions for the major environmental, societal and health challenges facing European cities.

Funded by SCC EIP, ESPRESSO was a CSA focused on standardisation to empower Smart Cities and Communities. A conceptual framework was defined considering a holistic view of the city, defining standards that included not only cities complexity but also coexisting sectors. Avoiding vendor lock-in is also a key point for ESPRESSO, based on open standards and opensource solutions. As a CSA ESPRESSO showed a strong collaboration with different projects under SCC EIP. But it also established strong collaborations with projects, such as, Synchronicity and platforms, such as, FIWARE. Some highlights from this project: “Smart City Information Framework” as a reference data model and the “Creation of shared semantics through the establishment of open and shared vocabularies to foster linking data and metadata”. The work carried out by this project has been considered as a reference in SynchroniCity in connection with the enrichment of the FIWARE data models in the last years.

3.6 EIP-AHA

CREATE-IoT worked in close cooperation with the EIP-AHA both by: creating and animating a community of experts to share information, foster adoption of results, and organize dissemination initiatives, and ensuring coordination with the associated LSP and promoting its results, in particular regarding pre-standardisation (Task 6.2).

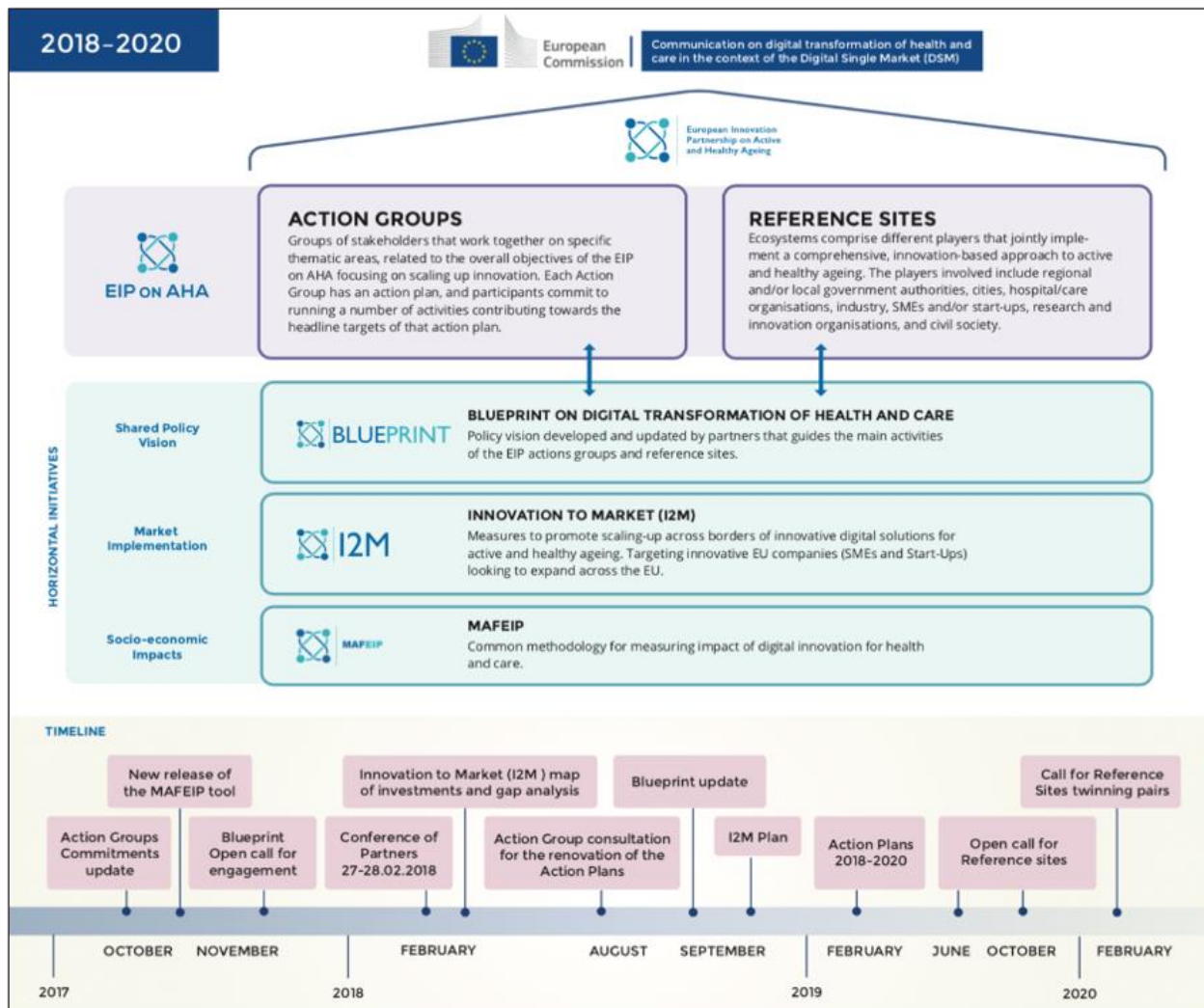


Figure 1: EIP-AHA overview [12]

The European Innovation Partnership on Active and Healthy Ageing (EIP-AHA) is a pilot initiative launched by the European Commission to foster innovation in the field of active and healthy ageing [1]. The concept of EIPs is a relatively new approach to EU research and innovation. It brings together all relevant actors at EU, national and regional levels across different policy areas to handle with specific societal challenges and involves all the innovation chain levels. The EIP-AHA platform/portal is a communication and information hub for all actors involved in Active and Healthy Ageing through Europe, facilitating partner engagement sharing news and events, exchanging ideas, and looking for potential partners on innovative projects [12]. The EIP-AHA aims to promote healthy and active ageing, and the overall goal is to increase the average healthy lifespan of EU citizens by 2 years by the year 2020, which includes [12]:

- Improving the health and quality of life of Europeans with a focus on older people.
- Supporting the long-term sustainability and efficiency of health and social care systems.
- Enhancing the competitiveness of EU industry through business and expansion in new markets.

The EIP-AHA has two main pillars (Actions Groups and Reference sites) and three crosscutting horizontal initiatives (Blueprint, I2M, and MAFEILP) as illustrated in Figure 1 [12].

The six action groups are [12]: Adherence to prescription (A1), Falls prevention (A2), Lifespan health promotion & prevention of age-related frailty and disease (A3), Integrated care (B3), Independent living solutions (C2), and Age friendly environment (D4); and involve stakeholders ranging from academia to public authorities, large industry and SMEs, health and care organisations, investors and innovators, end users and patients' associations. Partners of the ACTIVAGE project actively participated in EIP-AHA and the Independent living solutions action group (C2) [13]. One result was the guideline "Personal User Experience (PUX) Recommendations and Lessons Learned" published in 2018 [14].

The reference sites are ecosystems, delivering creative and workable solutions that improve the lives and health of older people and the whole community [12]. Reference sites are regions, cities, integrated hospitals or care organisations and their partners from industry, civil society, academia, and government authorities that focus on a comprehensive, innovation-based approach to active and healthy ageing. In the 2019, 102 regional and local organisations were awarded reference site status, due to their positive impact in this field.

Regarding the three crosscutting horizontal initiatives [12]:

- Blueprint aims to innovate health and care in Europe and is following up the scaling up strategy. It is the channel for the EIP-AHA partners for giving and receiving policy inputs and reflects the policy vision of the partners.
- Innovation to Market (I2M) targets cross-border scale-up of digital health and care solutions and is part of the EC strategy on digital transformation of health and care in the Digital Single Market.
- MAFEIP is the Monitoring and Assessment Framework and is used as an impact assessment tool to support evidence-based decision-making process for all institutions and users in the health and care sector.

3.7 EIP-AGRI

CREATE-IoT worked closely with the European Innovation Partnership on Agriculture and Sustainability (EIP-AGRI) by ensuring coordination and cross-cutting interaction with the EIP-AGRI focus group on precision farming, which studies the optimization of farming activities by exploiting technologies for data capture and processing and brings together key stakeholders from the demand side.

The EIP-AGRI aims to foster a competitive and sustainable agriculture and forestry sector that "achieves more from less" [1]. It facilitates a steady supply of food, feed and biomaterials, plus sustainable management of the essential natural resources on which farming, and forestry depend. EIP-AGRI is not a Public-Private Partnership (PPP), but a hub that brings together innovation actors (farmers, advisors, researchers, businesses, etc) and helps to build bridges between research and practice.

As part of the Workshop series "CREATE the Next Generation IoT eXperience for the future", the "European Industry Partnerships Collaborative Event" where successfully arranged in Amsterdam 17th April 2019 [20].

The event was organised by the IoT Large-Scale Pilots Programme in collaboration with several European partnerships and DG Connect. Both the partnership EIP-AGRI and the LSP IoF2020 where represented among several other stakeholders, covering European achievements, research gaps and future priorities, and future technologies and the impact for the society.

3.8 FoF PPP

CREATE-IoT collaborated with the FoF PPP by updating them about all the interoperability aspects that will facilitate the integration of solutions into the scope of European manufacturing industry.

Factories of the Future Public-Private Partnership (FoF PPP) focuses on advanced manufacturing research and innovation, with the purpose of increasing EU industry competitiveness and sustainability in the framework of the next industrial revolution, namely Factories 4.0. The European Factories of the Future Research Association (EFFRA) is the official representative on the private side in the FoF PPP. EFFRA promotes pre-competitive research on production technologies within the European Research Area and is also organizing consultations activities with experts to collect contributions to define EU funded call topics.

Priorities and headlines for the ‘Factories of the Future’ work programme 2018-19-20 are based on “Factories 4.0 and Beyond” [7], the roadmap at the heart of EFFRA’s strategic discussions with the European Commission. ‘Factories 4.0 and Beyond’ provides an update of the previous strategic roadmap, ‘Factories of the Future 2020’, by considering the increasing impact of advanced ICT technologies in manufacturing in synergy with advanced material processing technologies and mechatronics systems. Five key priorities focus areas and targets are identified:

- Agile value networks: Lot-size one–distributed manufacturing.
- Excellence in manufacturing: Advanced manufacturing processes and services for zero-defect and innovative processes and products.
- The human factor: Developing human competences in synergy with technological progress.
- Sustainable value networks: Manufacturing driving the circular economy.
- Inter-operable digital manufacturing platforms: Supporting an ecosystem of manufacturing services.

Each key priority is linked to specific research headlines, as shown in the figure below, and IoT technology is one of the main enablers of the different aspects of Factory 4.0 perspective.

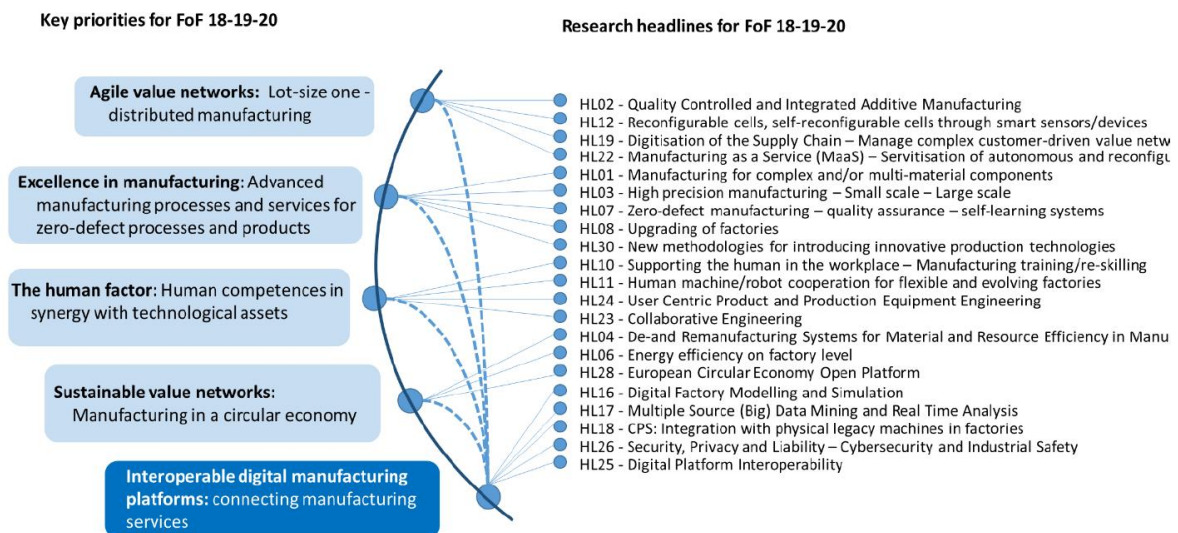


Figure 2 - Factories 4.0 and Beyond: key priorities and research headlines

CREATE-IoT established a contact and a dialogue with EFFRA to present the IoT LSP Programme and identify collaboration opportunities into the scope of FoF challenges related to IoT. Subsequently EFFRA has been a participant in the workshops organized by the CREATE-IoT project, notably the “European Industry Partnerships Collaborative Event” held in Amsterdam (April 2019), the “European Industry Partnerships for New Digital Age Event” held in Brussels (September 2019).

3.9 SPARC PPP

CREATE-IoT will collaborate with the SPARC PPP for helping them through the provision of information about the interoperability work developed within the project.

The Public-Private Partnership in Robotics (SPARC) is a contractual PPP (cPPP) between the European Commission, and the European industry and academia, established to maintain and extend Europe's leadership in robotics [1][3]. SPARC facilitate the growth and empowerment of the robotics industry and value chain, from research through to production, and aim to enter new markets in agriculture, healthcare, transport, security and utilities. As already mentioned, the public side is represented by the EU Commission (The Directorate-General for Communications Networks, Content and Technology), while the private part is represented by the non-profit association euRobotics AISBL (Association Internationale Sans But Lucratif).

3.10 5G IA PPP

CREATE-IoT work in close cooperation with the 5G IA PPP both by creating and animating a community of experts for information sharing, results promotion, and dissemination initiatives, and ensuring coordination with the associated LSP and promoting its results, in particular regarding research (Task 4.2) and pre-standardisation (Task 6.2). In addition, the project worked with 5G IA and AIOTI for preparing the next partnership for Horizon Europe.

	5G EVE	5Genesis HORIZON EU PROJECT	5G-VINCI	
5G DRONES	✓	✓		
5G HEART	✓	✓	✓	
5G GROWTH	✓		✓	
5G smart	✓			
5G SOLUTIONS 5G Solutions for European Citizens	✓		✓	
5G TOURS	✓			
5G VICTORI	✓	✓	✓	
				

Figure 3: 5G trial platforms as vertical validation enablers [4]

The 5G infrastructure Public-Private Partnership (5G-PPP) has been initiated by the European Commission and the European ICT industry (industry manufacturers, telecommunications operators, service providers, SMEs, and researches) [1]. Within the 5G-PPP, the 5G Infrastructure Association (5G-IA) and European Commission represents the private side and the public side respectively. The 5G-IA is committed to the advancement of 5G in Europe and to build global consensus on 5G. The 5G-PPP's objectives are to deliver solutions, architectures, technologies and standards for the next generation mobile networks and communication infrastructures.

Under the 5G PPP initiative there were funded divided in three phases: a) concepts and research focus of 5G, b) implementation and exploring 5G technologies, c) deployments and trials. 5G

architectures and deployments are a base for future developments and a core for the next sectorial LSPs.

5G networks capabilities are the base of the next generation IoT, enabling new possibilities of (massive) scale and connectivity. It is necessary to stablish synergies with projects coming from 5G-PPP (phase 2), that have already deployed trials and communication infrastructures, such as 5GENESIS and VINNI 5G-EVE [4]. Continuing with synergies and the phase 3, these deployed infrastructures are already been used by some projects implementing different sectorial trials.

	 Industry 4.0	 Agriculture & agri-food	 Automotive	 Transport & logistics	 Smart Cities & utilities	 Public Safety	 Smart (air)ports	 Energy	 e-Health & wellness	 Media & entertain.
5G EVE	✓		✓		✓	✓		✓	✓	✓
5GENESIS				✓	✓	✓				✓
5G VINNI	✓			✓		✓		✓		
5GIDRONES				✓		✓				✓
5G HEART		✓	✓	✓					✓	
5GROWTH	✓			✓				✓		
5G SMART	✓									
5G SOLUTIONS	✓				✓		✓	✓		✓
5G TOURS				✓	✓		✓		✓	✓
5G VICTORI	✓			✓				✓		✓

Figure 4: Vertical use cases addressed in the 5G-PPP [4]

Some of these verticals trials over scenarios composed by different IoT infrastructures, despite of the fact that project focuses on 5G networks. It turns necessary to use lessons learnt from IoT-LSPs and 5G-PPP projects to guide the next steps in research and IoT and have a feedback between both synergising communities.

4. FUTURE RESEARCH AND INNOVATION ACTIVITIES IN HORIZON EUROPE

EC launched in May 2019, a consultation with the EU Member States on 44 possible candidates for European Partnerships as part of a strategic coordinating process. Four additional candidates for European Partnerships considered relevant for the first strategic planning of Horizon Europe. In addition, the EIT KIC "Cultural and Creative Industrie" has been identified in the Strategic Innovation Agenda for the EIT that is under negotiation in the European Parliament and Council.

Per today there are 50 candidates for European partnerships including the latest proposal for a European Partnership on (Pandemic) Preparedness and Societal Resilience. An overview is given in Figure 5.



Figure 5: Possible candidates for European partnerships (Source: ERA-LEARN)

The European partnerships provide a framework for programme level collaboration between the EU and public or private partners and are based on a common Strategic Research and Innovation Agenda, shared, and committed by all partners.

CREATE-IoT and IoT European Large-Scale Pilots Programme projects partners are actively participating in shaping the structure, the objectives, and the topics of a number of European partnerships presented below.

4.1 High performance computing

The European High Performance Computing² (EuroHPC) Joint Undertaking has as its mission to establish an integrated world-class supercomputing & data infrastructure and support a highly competitive and innovative HPC and Big Data ecosystem [5]. CREATE-IoT partners collaborated with the partnership stakeholders and were involved in common events organised in 2019 and 2020.

Europe consumes about 29% of HPC resources worldwide today, but the EU industry provides only ~5% of such resources [16]. No EU supercomputer is in the global top 10, and the existing ones depend on non-European technology. The risk is increasing for the EU of being deprived of the strategic or technological know-how for innovation and competitiveness. This situation may create problems related to privacy, data protection, commercial trade secrets or data ownership.

EuroHPC facilitate the European countries to coordinate their efforts and share resources with the objective of deploying a world-class supercomputing infrastructure and a competitive innovation ecosystem in supercomputing technologies, applications and skills, with the aim of [16]:

- Acquiring and providing a world-class petascale and pre-exascale supercomputing and data infrastructure for Europe's scientific, industrial, and public users. Matching their demanding application requirements by 2020 and be widely available to users from the public and private sector. To be used primarily for research purposes.
- Supporting an ambitious research and innovation agenda to develop and maintain a European world-class High-Performance Computing ecosystem, exascale and beyond. Covering all scientific and industrial value chain segments, including low-power processor/middleware technologies, algorithms/code design, applications/systems, services/engineering, interconnections, and know-how/kills for the next generation supercomputing era.

More specific withing 2027:

- Develop, deploy, extend, and maintain a world leading federated and hyper-connected supercomputing, quantum computing, service and data infrastructure ecosystem in the EU
- Support the autonomous production of innovative and competitive supercomputing systems based on indigenous European components, technologies and knowledge and the development of a wide range of applications optimised for these systems
- Widen the use of this supercomputing infrastructure to many public and private users, and support the development of key skills that European science and industry need

The EuroHPC support activities through procurement and open Calls in 2019 and 2020 and will initially operate from 2019 to 2026, and wants to kick-start the activities to address the overall strategy, mainly [16]: to acquire two pre-exascale machines and several petascale systems by 2020, and research and innovation actions covering the full HPC ecosystem launched in 2019 and 2020, including the support for EuroHPC competence centres.

An initial co-investment of about EUR 1 billion are foreseen, where 486 million Euro come from the actions already planned in Horizon 2020 and Connecting Europe Facility (CEF) programmes in the current Multiannual Financial Framework (MFF). In addition, approximately 422 million Euro will be contributed by private or industrial players in the form of in-kind contributions to the JU activities.

Further funds in the next MFF are under discussion and would allow a full coverage of the HPC strategy, where it is expected to have similar support from the Member States to continuing the present EuroHPC JU in the 2021-2028 period, with the already agreed strategic objectives. The

² https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-euro-hpc.pdf

EC has also proposed to support EuroHPC in the next MFF with 2.7 billion Euro from the Digital Europe Programme (DEP) and with additional funds from Horizon Europe.

The objectives include the acquisition in 2022-2023 of two exascale systems [16]. At least one of them with European technology, one post-exascale system, networking and coordination of high-performance computing competence centres, support for the first hybrid Quantum computing infrastructure in Europe, and coordination with the other digital priorities like AI, Cybersecurity, and digital skills.

DEP support will focus on large-scale digital capacity and infrastructure building, with a wide uptake and deployment across Europe of critical existing or tested innovative digital solutions [16]. Horizon Europe will focus on research and innovation needs related to identified digital aspects and established in the Horizon Europe strategic research and innovation plans. High-performance computing research activities in Horizon Europe will provide the supply of technology and applications for the infrastructure development and capacity-building activities foreseen in DEP.

European Regional Development Funds (ERDFs) will also be essential to build national and European supercomputing infrastructure and to co-invest in the next generation and the networking of supercomputing centres and the development of applications (health, public administration, climate, etc.) [16]. Common interests, regional relevance, and synergies should be utilized for deployment and innovation actions and jointly funded by DEP and ERDF.

4.2 Key Digital Technologies

The overarching objective of the Digital Technologies (KDT) partnership³ is to support the digital transformation of all sectors of the economy and society, make it work for Europe and address the European Green Deal. By 2030, EU leadership in KDT will reinforce industrial strongholds having seized emerging opportunities to establish technological sovereignty and boost competitiveness.

Maintain the European Electronics Components and Systems industry at the technological forefront and contribute to boosting the EU's competitiveness, including that of its industries by providing essential components and software as well as the related manufacturing infrastructure in Europe and national strategies.

CREATE-IoT partners collaborated with the partnership stakeholders and were involved in common events organised in 2019 and 2020.

The digitisation is driven by advances in technology, applications, and services around a set of main tracks including big opportunities [5]. The European industrial value chains within for instance automotive, aerospace, machinery and agri-food are currently strong, but are increasingly dependent for their competitiveness and autonomy on access to cutting-edge key digital technologies (KDT). Mastering the development and integration of complex smart systems is vital to a sustainable and competitive Europe.

For the digital transformation and its progress, the key underlying electronics, photonics, software, and connectivity are essential [5]. Progress in digital components and devices continues through disruptive innovations, due to new materials, low-power electronics, and alternative processing concepts, that map cognitive processes into electronic circuits, quantum information processing and open-source hardware. Technologies supporting distributed intelligence will be essential to guarantee the required levels of energy efficiency, real-time operations and security, which includes advances on multi-sensor-based systems providing high levels of intelligence and integrated in a wide range of application

³ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-for-key-digital-technologies.pdf

According to EC's orientations towards the first strategic plan for Horizon Europe [5]; Key digital technologies have been identified as a possible institutionalised future European partnership with relevance for cluster 1 (Health), 2 (Culture, creativity and inclusive society), 4 (Digital, industry and space), and 5 (Climate, energy and mobility). Industry and research funders in member states (MS) and associated countries (AC) are compositions of potential partners, led by cluster 4.

The ECSEL JU symposium will be arranged 24th June 2020. This annual event has been moved online and address the topic "Key Digital Technologies enabling European economic recovery" [17], where some urgent issues will be discussed. One important question to be answered is "How to mobilize the required financial resources supporting national and European policy measures in Key Digital Technologies?"

4.3 Smart Networks and Services

The Smart Networks and Services (SNS) partnership⁴ aims to support technological sovereignty concerning smart networks and services in line with the EU industrial strategy and the 5G cyber-security toolbox. It will contribute to enabling the digital and green transitions, address the coronavirus crisis both in terms of technologies for health crisis response and of economic recovery. It will enable European players to develop the technology capacities for 6G systems as the basis for future digital services towards 2030. It will also allow that lead markets for 5G infrastructure and services can develop in Europe by coordinating 5G deployment with CEF2 Digital.

Enabling the infrastructure basis in terms of key technologies and deployment for Next-Generation Internet services used by citizens and for "smart" services required by vertical sectors such as transport, energy, manufacturing, health, and media.

CREATE-IoT partners collaborated with the partnership stakeholders and were involved in common events organised in 2019 and 2020.

Today's Internet has significant limitations and has become the critical infrastructure for Europe as many social and economic activities depend on it [5]. The next generation Internet (NGI) initiative aims to develop the key technologies and the infrastructures for tomorrow; a human-centric trustworthy internet enabling full connectivity and accessibility, transparent recommendations, and collective intelligence.

According to EC's orientations towards the first strategic plan for Horizon Europe [5], the NGI aims at supporting a competitive European Internet value chain, which can meet the future industrial and societal needs establishing smart networks and services, and content platforms.

Smart networks and services include both IoT and edge computing infrastructures, and address innovative vertical applications supported by such platforms including through LSPs. It also fosters the use of AI, novel data infrastructures and services, from cognitive clouds to edge applications.

Smart networks and services have been identified as a possible institutionalised future European partnership (based on Article 187⁵) with relevance for cluster 1 (Health), 4 (Digital, industry and space), and 5 (Climate, energy, and mobility) [5]. Industry and academia in the field of connectivity are compositions of potential partners, led by cluster 4.

⁴ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-smart-networks-services.pdf

⁵ Article 187 of the Treaty on the Functioning of the European Union specifies that the EU may set up joint undertakings or any other structure necessary for the efficient execution of EU research, technological development and demonstration programmes.

The predecessor is cPPP 5G, and the 5G IA (Infrastructure Association) and AIOTI (Alliance for Internet of Things Innovation Association) are collaborating closely on identifying the research and innovation topics that fall into a common scope of interest across the two associations [18]. These topics are important for the successful development and deployment of Smart Networks and Services under the Horizon Europe programme.

4.4 AI, data, and robotics

European Partnership on Artificial Intelligence, Data and Robotics⁶ aims to deliver the greatest benefit to Europe from AI, data and robotics, this partnership will drive innovation, acceptance and uptake of these technologies. The partnership will boost new markets, applications and attract investment, to create technical, economic, and societal value for business, citizens and the environment. By 2030, European sovereignty is expected in the development and deployment of trustworthy, safe, and robust AI, data and robotics, compatible with EU values and regulations.

The partnership on AI will help structuring the European AI community, develop a strategic research agenda and federate efforts around a topic that holds great potential to benefit our society and economy.

CREATE-IoT partners collaborated with the partnership stakeholders and were involved in common events organised in 2019 and 2020.

According to EC's orientations towards the first strategic plan for Horizon Europe [5]; AI, data and robotics have been identified as a possible institutionalised future European partnership with relevance for cluster 3 (Civil security for society) and 4 (Digital, industry and space). Industry, academia, end users, and civil society are compositions of potential partners, led by cluster 4.

However, according to the EC white paper on "Artificial Intelligence - A European approach to excellence and trust " [15], the EC will set up a new public private partnership in AI, data and robotics to combine efforts, ensure coordination of research and innovation in AI, collaborate with other public-private partnerships in Horizon Europe and work together with the testing facilities and the Digital Innovation Hubs. It is essential to make sure that the private sector is fully involved in setting the research and innovation agenda and provides the necessary level of co-investment, which requires setting up a broad public private partnership, and securing the companies commitment.

BDVA (Big Data Value Association) welcomes this EC white paper [15] and has published a position paper as a response [19]. There is a clear need for a solid AI European approach based on European value, and the white paper is very much in line with the vision of the new partnership on AI, Data and Robotics.

4.5 Photonics Europe

Photonics (light-based technologies) is an essential building block for the digital transformation and for a green and healthy future in Europe. European Partnership for Photonics⁷ aims to speed up photonic innovations, securing Europe's technological sovereignty, raising the competitiveness of Europe's economy, and ensuring long-term job and prosperity creation. By 2030 Europe will have maintained leadership in core and emerging photonic technologies.

⁶ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-european-partnership-on-artificial-intelligence-data-and-robotics.pdf

⁷ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-for-photonics.pdf

Photonics is one of the key drivers for tomorrow's digital markets and the development of the digital European society as a whole. Photons will replace electrons in many of our most important technologies and digital products.

CREATE-IoT partners collaborated with the partnership stakeholders in defining common topics for research.

4.6 Made in Europe

European Partnership Made in Europe⁸ will be the driving force for sustainable manufacturing in Europe. It will contribute to a competitive and resilient manufacturing industry in Europe and affects many value chains. Another priority is circular economy and following a circular by design approach.

The partnership will serve as a platform for aligning national and regional manufacturing technology initiatives. Strategic cooperation with key actors will be developed to ensure take-up of research results.

Towards a competitive discrete manufacturing industry with a world-leading reduction of the environmental footprint whilst guaranteeing the highest level of well-being for workers, consumers and society.

CREATE-IoT partners collaborated with the partnership stakeholders in defining common topics for research and cooperated with EFFRA – European Factories of the Future Research Association on several common events.

According to EC's orientations towards the first strategic plan for Horizon Europe, Cluster 4 “Digital Industry and Space” will contribute to transforming the EU industry for a clean, more bio based, climate neutral, circular and competitive economy and to securing EU global industrial leadership and strategic autonomy in key technologies.

EFFRA is currently preparing the strategic research and innovation agenda (SRIA) for the Made in Europe Partnership under 'Horizon Europe' and published a guidance document in cooperation with the European Commission [8].

Made in Europe partnership will take a leading role in the transition of manufacturing towards a sustainable, economically successful activity with proper consideration of the well-being of workers and society. Achieving these principles will require further digital transformation of the manufacturing industry. In fact, at the same time, manufacturing companies must maintain technological leadership and stay competitive.

The size and the complexity of the associated challenges -such as the integration of Artificial Intelligence, the use of industrial data, the transformation into a circular economy and the need for agility and responsiveness -requires pooling of resources and a novel approach of cooperation.

At the heart of the new industrial strategy for Europe is the ability of Europe's industry to lead the twin ecological and digital transitions and drive our competitiveness.

Green and digital transition is one of the main challenges to focus on and accelerate in this phase of recovery, after COVID-19 emergency, as declared in the Communication from the Commission to the European Parliament “Europe's moment: Repair and Prepare for the Next Generation” presented the 27th of May. [9]

Policies addressing these twin transitions are embodied in the following EU priorities, *European Green Deal* and a *Europe fit for the digital age*, respectively. Societal aspects and in particular welfare of the manufacturing workforce is captured under an *Economy that works for*

⁸ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-made-in-europe.pdf

people. Indirectly, the partnership also contributes to the policy objectives “*Promoting our European way of life*”, “*A stronger Europe in the world*”, and even “*A new push for European democracy*”.

The main expected impacts from the Made in Europe partnership follow its contributions to EU policy objectives.

The partnership aims for a European manufacturing industry which

- Is world-wide competitive, resilient, and adaptive.
- Is technology leading.
- Is resource-efficient and has integrated circular economy principles in all its activities.
- Leads in the implementation of digital solutions.
- Offers high-quality jobs to well-skilled people, in enterprises of all sizes.
- Brings prosperity to all regions of Europe.

In short, the Partnership aims for a competitive, green, digital, human-centric manufacturing sector. Being a part of the Manufacturing industry, the Made in Europe-Initiative contributes the overall objectives of this sector in terms of CO₂-reduction, material & energy efficiency, and competitiveness. Made in Europe is fully committed to:

- Make manufacturing carbon-neutral by 2050,
- Maintain an industrial share of the economy of 20%
- Reduce the use of primary materials by 20% in the next decade
- Increase technological leadership and resilience of its ecosystems

According to the Made in Europe guidance document, published by EFFRA in May 2020, cooperation will be developed with following partnerships/areas/organisations:

- 5G
- AI/Big Data/robotics
- Photonics
- Embedded Systems/Smart Components
- Security
- ISO standardization (OPC-UA, Data eco-systems)
- Materials
- Other emerging technologies

4.7 Carbon Neutral and Circular Industry

Carbon Neutral and Circular Industry partnership aims transforming European process industries, including materials and recycling sectors, to make them circular, clean and climate neutral by 2050, and to enhance their technological leadership at global level and international competitiveness.

CREATE-IoT partners collaborated with the partnership stakeholders in 2019.

4.8 Connected and Automated Driving / Mobility and Safety for Automated Road Transport

European Partnership on Connected and Automated Driving (CCAM)⁹ or the partnership on Mobility and Safety through Automated Road Transport aims to accelerate the implementation of innovative, connected, cooperative and automated mobility (CCAM) technologies and services.

⁹ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-connected-and-automated-driving-ccam.pdf

By bringing together the actors of the complex cross-sectoral value chain, it will develop and implement a shared, coherent, and long-term European research and innovation agenda. By 2030, the partnership will have demonstrated inclusive, user-oriented, and well-integrated mobility concepts, enabled by CCAM, with increased safety and a reduced carbon footprint. It will make Europe a world leader in the deployment of connected and automated mobility for people and goods.

Long-term framework to the strategic planning of research and pre-deployment programmes for connected and automated driving on roads at EU and national levels in a systemic approach (vehicle, interactions, infrastructure, technical and non-technical enablers, and societal impact). CREATE-IoT and AUTOPILLOT partners collaborated with the partnership stakeholders and were involved in defining common topics for research.

According to EC's orientations towards the first strategic plan for Horizon Europe, Cluster 5 cover climate, energy, and mobility [5]. Investments in research and innovation concerning Cluster 5 will contribute to transforming the EU to a climate-neutral and resilient society, and target impact withing several fields, for instance low-carbon and competitive transport solutions across all modes (road, rail, aviation, and waterborne). Regarding mobility, Cluster 5 will target and contribute to develop seamless, smart, safe, accessible and inclusive mobility systems to gather the benefits of digitalisation, increase efficiency and European competitiveness, enable better and sustainable door-to-door mobility for all and increase safety.

Europe needs to maintain the competitiveness within the transport industry and manage the transformation of supply-based transport to demand-driven, safe and sustainable mobility services [5]. Suitable research and innovation initiatives will help to prepare such transformation. Emerging digital technologies, such as big data, IoT, AI, and advanced satellite navigation services, provides potential for developing connected and automated transport and managing traffic across the whole transport network. The research and innovation results will set the basis for future standards, creating European and global markets, and adapting and modernising the overall regulatory framework. To maximise societal, environmental and economic benefits, in addition to technological solutions, it is essential to also address human and social aspects such as: analysis of mobility factors and patterns, representations of different social groups and inclusiveness of new solutions, capacity building and public acceptance, etc. The challenges are summarized as follows [5]:

- Make automated and connected road transport safe and competitive.
- Develop efficient and innovative transport infrastructure.
- Develop the future transport network and integrated traffic management.
- Enable multimodal freight logistics and passenger mobility services.
- Increase transport safety, per mode and across modes.

A European partnership approach is used if it will more effectively achieve objectives and targeted impacts than regular calls for proposals of Horizon Europe [5].

The partnerships shall be established for addressing European or global challenges only in cases where they will more effectively achieve objectives of Horizon Europe than the Union alone and when compared to other forms of support of the Framework programme.

The following possible Cluster 5 areas for future partnerships identified are: Transforming Europe's rail system, Integrated Air Traffic Management, Clean Aviation, Clean Hydrogen, People-centric sustainable built environment, Towards zero-emission road transport (2ZERO), Towards a competitive European industrial battery value chain, Clean Energy Transition, Sustainable, Smart and Inclusive Cities and Communities, Zero-emission waterborne transport, and Mobility and Safety for Automated Road Transport (MOSART). Activities within Cluster 5 will also be closely related and collaborate with relevant the European Institute of Innovation and

Technology Knowledge and Innovation Communities' (EIT KICs), in particular the EIT InnoEnergy, EIT Climate KIC and EIT 108 Urban mobility [5].

Regarding the MOSART partnership, this initiative will contribute to significantly improve road safety and traffic efficiency by addressing problems hindering the uptake of automated mobility systems and services on roads in the EU [5]. It includes the lack of systemic and interoperable solutions at EU level, and the slow market update of research and innovation results and aims at maintaining EU industry leadership in this field. A Partnership is needed to bring together a broader spectrum of stakeholders to better align research and innovation efforts, and to coordinate public and private investments.

4.9 EIT Digital

EIT Digital's mission is to drive digital innovation and develop entrepreneurial talent in order to enhance both economic growth and quality of life across Europe.

Main objective of EIT Digital focuses on accelerating market uptake of digital technologies. LSP technological outcomes would go a step forward through EIT Digital. New products, start-ups or increasing TRL of technologies, tested in the different verticals of LSPs, have a clear path with this initiative. EIT Digital is organized over different pillars: Digital Tech, Digital Cities, Digital Wellbeing, Digital Finance and Digital Industries. The proposed projects need to take a technology/service, as an outcome from a previous project, to create a new pilot to demonstrate a business plan. It does not focus so much on technology development, but to implement a business model exploiting it. These are small projects with an (usually) duration of 1 year.

CREATE-IoT partners collaborated with the partnership stakeholders in 2019. Some IoT LSPs have a clear vertical EIT Digital match, like SYNCHRONCITY with Digital Cities, or Monica and ACTIVAGE with Digital Wellbeing. But in general, Digital Tech would apply to multiple technological outcomes: CyberSecurity, AI, and Networking. Very related to IoT, due to the need of securing, connecting, and exploiting the data produced.

4.10 EIT Manufacturing

EIT Manufacturing¹⁰ is an Innovation Community within the European Institute of Innovation & Technology (EIT), launched at the beginning of 2019. EIT Manufacturing's mission is to bring European manufacturing actors together in innovation ecosystems that add unique value to European products, processes, services – and inspire the creation of globally competitive and sustainable manufacturing [10][11]. CREATE-IoT partners collaborated with the partnership stakeholders in 2019.

EIT Manufacturing aims to increase the cooperation and integration between education, business and research, by bridging the three sides of the “knowledge triangle”: business (large companies and SMEs), education institutions and research centres. For this purpose, EIT Manufacturing brings together 50 European leading partners from business (49%), education (32%) and research (19%), from 17 countries.

While EIT Manufacturing belongs to Pillar 3 of Horizon Europe, its activities will be relevant and closely related with Cluster 4 “Digital Industry and Space” of Horizon Europe [5].

EIT Manufacturing acts around six strategic objectives that will be pursued through a diversified portfolio of Programmes and have concrete impacts. In particular, the six objectives are related to

1. Excellent manufacturing skills and talents,
2. Efficient manufacturing innovation ecosystems,

¹⁰ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/eit_manufacturing-kic.pdf

3. Full digitalisation of manufacturing,
4. Customer-driven manufacturing,
5. Socially sustainable manufacturing, and
6. Environmentally sustainable manufacturing.

The Programme portfolio is built around three main pillars, namely Education (Empower, engage and connect talents and workforce), Innovation (launch, develop, grow innovation), and Business creation (create, accelerate, transform businesses). Together with Objectives and Programmes, EIT Manufacturing defined four Flagships:

1. People and robots for sustainable work,
2. Additive Manufacturing for full flexibility,
3. Waste-free Manufacturing for a circular economy, and
4. Platforms for digitalised value networks

that add value to European manufacturing and address multiple strategic objectives.

Moreover, EIT Manufacturing will create innovation hotspots that will generate value networks in Europe with the ambition of establishing global leadership in the high-value manufacturing arena. EIT Manufacturing will deploy an Enabling Technologies and Customer Radar that continuously monitors the emergence and development of enabling technologies.

One of the initiatives put in place by EIT Manufacturing is the creation of five Innovation Hubs (Co-location Centres) across Europe:

- Bilbao– CLC West (France, Portugal, Spain)
- Darmstadt – CLC Central (Germany, The Netherlands, Belgium)
- Gothenburg – CLC North (Finland, Sweden, Estonia, Lithuania, Ireland)
- Milan – CLC South (Italy, Switzerland)
- Vienna – CLC East (Switzerland, Greece, Slovakia, Austria)

4.11 Sustainable, Smart and Inclusive Cities and Communities

Sustainable, Smart and Inclusive Cities and Communities partnership research and innovation on urban transitions and provides scientific evidence for urban actors on sustainable urban development with a cross-sectoral, inter- and transdisciplinary approach, implemented through activities beyond joint calls. CREATE-IoT and SYNCRONICITY partners collaborated with the partnership stakeholders in 2019.

The partnership will engage and enable the whole spectrum of urban stakeholders (local authorities, municipalities businesses, and citizens) to co-create innovative, systemic, and people-centric approaches, tools, methods and services in support of urban transformative transitions. This will lead to more efficient and decarbonised use of energy, sustainable and people-friendly mobility systems, circular and environmental-friendly use of resources, for the well-being of citizens and preservation of biodiversity.

As already mentioned in section 4.8, the EC's orientations towards the first strategic plan for Horizon Europe, Cluster 5 cover climate, energy, and mobility [5]. Sustainable, Smart and Inclusive Cities and Communities is one of the possible future partnership identified and relevant for Cluster 5 in addition to Cluster 3 (Civil security for society) and Cluster 4 (Digital, industry and Space). Activities within Cluster 5 will also be closely related and collaborate with relevant EIT KICs, in particular the EIT InnoEnergy, EIT Climate KIC and EIT Urban mobility [5].

Regarding the Sustainable, Smart and Inclusive Cities and Communities candidate partnership, this initiative will support the European cities in developing, designing and implementing the required transformation for transition to sustainable urbanisation and climate neutrality in line with relevant EU and international policy frameworks such as SDGs, the EU Green Deal, Paris Agreement, Urban Agenda of the EU and the Habitat III New Urban Agenda [5]. Focus will be on

innovation for the public sector, have an ecosystem approach, and addressing both urban and peri-urban areas. It will align EU, national, regional, and municipal research and innovation agendas, and the rolling out of joint calls and activities to promote EU-wide collaboration, engagement and mobilisation of all relevant resources.

4.12 Safe and Sustainable Food Systems for People, Planet and Climate

The partnership¹¹ is building the safe and sustainable food systems of tomorrow is central to the transition to a ‘Sustainable Europe by 2030’, and key to meeting the IPCC climate targets and operating within planetary boundaries.

This partnership will provide an overarching platform and process to underpin the needed transition to sustainable food systems, provide solutions to the Farm to Fork strategy by connecting national, regional and European research and innovation programmes and food systems actors, to deliver co-benefits for nutrition, climate, circularity and communities. The partnership will foster alignment, boost investment, and increase the societal relevance, impact, uptake and visibility of research and innovation and strengthen EU leadership in tackling food system transformation.

CREATE-IoT and IoF2020 partners collaborated with the partnership stakeholders in 2019.

4.13 Innovative Health Initiative

The EU has an ageing population and rising burden of diseases. These questions the sustainability of EU healthcare systems, which are under increasing financial and organisational pressure. In this context the partnership with the health-related industries such as the pharmaceuticals, diagnostics, medical devices, imaging, and biotech, aims to accelerate the development and uptake of safer health innovations, in areas of unmet public health needs. The initiative¹² intends to:

- Create an EU-wide health research and innovation ecosystem that facilitates translation of scientific knowledge into innovations
- Foster the development of safe, effective, people-centred, and cost-effective innovations that respond to strategic unmet public health needs currently insufficiently served by industry.
- Drive cross-sectoral health innovation for a globally competitive European health industry.

It will cover prevention, diagnostics, treatment, and disease management.

CREATE-IoT and ACTIVAGE partners collaborated with the partnership stakeholders in 2019.

¹¹

https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/european_partnership_for_safe_and_sustainable_food_system_for_people_planet_climate.pdf

¹² https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-innovative-health.pdf

5. CONCLUSIONS

This CREATE-IoT activity has identified more than 20 relevant stakeholder groups that are related to IoT-related research in Europe. For each of the relevant stakeholder groups the Strategic Research and Innovation Agenda documents have been identified and an inventory was made of the IoT-related content.

Common activities and interactions were initiated with the relevant European partnerships and stakeholders that have resulted in common workshops or actions to define priorities for IoT technologies and applications research, innovation, development, and deployment.

5.1 Other conclusions and lessons learned

The process of integration and coordination with European research and innovation activities with the aim of creating the framework to connect with initiatives including existing H2020, and future Horizon Europe partnerships have shown the diversity of applications for IoT technologies and in many cases the overlapping between the activities carried out under the umbrella of different European partnerships.

The interactions and collaborations with various partnerships have shown strong support among all stakeholders for the need to further focus on research and innovation in IoT/IIoT, edge computing, AI at the edge, considering the integration of the stakeholders across the data value chain to deliver the potential of IoT/IIoT for Europe by addressing lead application areas.

The collaboration and common activities between CRATE-IoT, the IoT European Large-Scale Pilots Programme projects partners, H2020 initiatives and the new Horizon Europe candidate partnerships underline the need that further research and innovation activities should focus on intelligent infrastructure for IoT/IIoT, by developing and deploying IoT/IIoT platforms across industrial sectors and accelerate the deployment and adoption of digital technologies based on IoT/IIoT across Europe.

To address the issue of sovereignty as a key aspect of a future industrial policy for maintaining EU's leading industrial position, a clear strategy related to IoT/IIoT should be agreed across the existing and emerging European partnerships.

Sovereignty discussion should concentrate on few key elements of the strategic value chains, and common actions should be implemented across the different European partnerships.

The inputs and recommendations from the common workshops organised by CREATE-IoT and involving several European partnerships and key stakeholders should be considered for the next Horizon Europe research and innovation programme priorities on IoT/IIoT.

European partnerships are providing a framework for programme level collaboration between the European Union and public or private partners and in this context, the partnerships are in a unique position to address complex challenges related to technologies, applications, and society.

CREATE-IoT and the IoT European Large-Scale Pilots Programme projects partners have developed synergies with several existing and emerging European partnerships to align the Strategic Research and Innovation Agenda related to IoT/IIoT technologies and applications and align in implementing additional activities (related to market, regulatory, policy uptake) across Europe.

By organising common events, involving the IoT/IIoT stakeholders in activities related to different European partnerships CREATE-IoT and the IoT European Large-Scale Pilots Programme projects partners introduced a coherent and impact-driven approach to IoT/IIoT integration and coordination with European research and innovation activities across Europe and made a

significant contribution to stimulating collaboration and exchange of ideas, best practices and experiences across European partnerships.

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