

Scoping Paper for
Horizon 2020 work programme 2018-2020
LEIT – Information and Communication Technologies

Important Notice: Working Document

This scoping paper will guide the preparation of the work programme itself. It is a working document not formally endorsed by the Commission, and its content does not in any way prejudge the final decision of the Commission on the work programme.

The adoption and the publication of the work programme by the Commission are expected in October 2017. Only the adopted work programme will have legal value.

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LEIT – Information and Communication Technologies

1. Context

Information and Communication Technologies underpin **innovation** and **competitiveness** across private and public sectors and enable scientific progress in all disciplines. The huge opportunities offered by digital technologies for addressing economic and societal challenges are highlighted in one of the seven political drivers of the Horizon 2020 strategic programme: **physical meets digital**. In this context, the LEIT-ICT part of the programme aims at developing and maintaining the EU's leadership in key technological areas.

Further to the adoption of the **Digital Single Market Strategy** in May 2015, the Commission published a major communication package outlining its plans for **digitizing the European Industry** (DEI) in April 2016.

The overall objective of the **Digitizing European Industry strategy** is to ensure that any company in any sector in Europe, big or small and wherever situated, can fully benefit from digital innovations to upgrade its products, improve its processes and adapt its business models to the digital transformation. The strategy is based on an ambitious collective effort involving public and private stakeholders across Europe at regional, national and EU level. H2020 and the LEIT ICT Programme part will play a crucial role in delivering it along four major axes:

- **Partnerships for leadership in digital technology value chains and platforms:** more should be done to facilitate the coordination of the large but often fragmented R&D&I efforts in key digital technology fields. For this, H2020 **PPPs** should become effective aggregation frameworks and more should be done to integrate technologies into complete systems and **platforms** where a lot of future value creation will happen. A set of initiatives will be launched to support the building of such digital industrial platforms. The goal is to cover the full spectrum of activities, from research into technology building blocks, to platform development and large-scale testing and experimentation, to deployment and market roll-out. Activities should also extend to non-technical market barriers such as ethical, legal and socio-economic issues affecting take-up.
- **Digital innovation hubs:** with the rapid pace of change in digital technologies, most industrial stakeholders, and especially SMEs, point out to the urgent need for facilities to experiment with and test digital innovations before investing in digitization. Digital innovation hubs contribute to solving this problem by providing easy access to the latest digital innovations and experimentation facilities. The overall goal is to contribute to the upgrade of existing digital innovation hubs and establish new ones in all European regions. As indicated in the DEI Communication, reaching this goal goes beyond the scope of the H2020 Programme and will require the mobilisation of significant additional resources from Member States and regions. Coordination with EIT KICs will also be encouraged.
- **European Cloud Initiative:** the contribution from LEIT-ICT to the development and deployment of state-of-the-art infrastructure - with super-computing capacity,

fast connectivity and high-capacity data solutions - will be instrumental in delivering the **European Data Infrastructure**. This will be complemented by support to the development of an ecosystem to strengthen the cloud industry in Europe on the basis of an industry-driven strategic research and innovation agenda (SRIA).

- **ICT standards:** the identification of the necessary essential industry-driven ICT standards and, where appropriate, the acceleration of their development are prerequisites to the blossoming of digital innovations across the economy.

The orientations outlined in this document were identified from the following inputs:

- papers and reports issued by the **CONNECT Advisory Forum (CAF)**, which gathers high-level experts from industry and academia, covering a wide range of digital technologies, as well as related aspects such as digitally-enabled innovation and the social impact of ICT,
- **Strategic Research and Innovation Agendas** developed by the stakeholders' associations involved in **contractual public-private partnerships** implemented in accordance with article 25 of Horizon 2020 regulation and by **European Technology Platforms:**
 - 5G association (5G infrastructure cPPP)ⁱ,
 - Photonics 21 (Photonics cPPP)ⁱⁱ,
 - euRobotics (SPARC – Robotics cPPP)ⁱⁱⁱ,
 - Big Data Value Association (Big Data cPPP)^{iv},
 - European Factories of the Future Research Association (EFFRA)^v - (FoF cPPP),
 - ETP4HPC (High Performance Computing cPPP)^{vi},
 - European Cyber Security Association (ECSO) – (ECS cPPP)^{vii},
 - New European Media (NEM) initiative^{viii},
- first analysis performed in the context of the **Horizon 2020 interim evaluation for ICT-related activities**,
- inputs from stakeholders collected through **specific workshops and events**,
- exchanges with the LEIT-ICT configuration of the H2020 **Programme Committee**.

A **gap analysis** was also performed. It concluded that all priorities set out in the Horizon 2020 Specific Programme have already been addressed at least once in the two first work programmes.

The LEIT-ICT strategy is furthermore fully in line with the strategic guidance given on 25 May by the Research and Innovation Commissioners. Commissioners underlined the importance of **digitization as one of the key drivers for the last phase of Horizon 2020** and the need to achieve a better integration of ICT-related activities across all parts of the programme in order to **maximise their impact**.

2. Strategic orientations for 2018-2020 and translation into calls

Ensuring future-proof connectivity and preparing for the internet of the future

The **5G cPPP** will implement the third phase of its strategic R&I agenda, moving towards demonstrated impact of advanced network technologies. In addition, a large initiative will be launched, with the objective of addressing in a holistic and interdisciplinary way the essential architectural and service building blocks of a **next**

generation Internet, strengthening its open character and driving it towards decentralisation.

Building on European strengths and supporting the digitization of industry

The LEIT-ICT part of the work programme 2018-20 will keep on supporting large-scale industry-led initiatives in key technology areas through the final phases of the **Photonics, Robotics and Factory of the Future public-private partnerships**.

HPC cPPP activities which were previously covered in the FET part of the programme only will also be partly addressed in LEIT-ICT, where mature (higher TRLs) technologies will be integrated into system prototypes.

In order to contribute to the **European Cloud Initiative** announced in April 2016, an industry-driven effort on 'next generation cloud' will be supported, so as to create an ecosystem enabling European players to drive the evolution of cloud technologies and lead in tackling key research challenges.

Building a competitive and inclusive data-driven economy and society

The communication entitled "Towards a thriving data-driven economy"¹ issued by the Commission in July 2014 highlighted the importance of data at the centre of the future knowledge economy and society, and presented a vision of a data market, based on value creation by integration and cross-sector re-use of data assets. The main instrument for implementing this transition is the public-private partnership on Big Data.

The **Big Data Value cPPP** will ramp up its activities initiated in the work programme 2016-17 by supporting large-scale innovation and demonstration projects and secure environments for experiments facilitating data re-use and value creation across industrial and societal sectors and across languages and borders. This cPPP also contributes significantly to the "digitization of industry" strategy.

Beyond this cPPP, the work programme 2018-20 will promote the take up of new opportunities offered by the **data revolution in the creative industries** and in specific fields such as **languages and learning technologies**.

Setting up large scale pilots addressing cross-sector challenges

The work done on the **Internet of Things** in 2016-17 should be continued and expanded into a **large focus area on "Digitising and transforming European industry and services"** combining other digital technologies and addressing more application areas (such as e.g. smart cities, smart living environments, driverless cars, wearables, mobile health and agro-food). The investment will address both the integration of converging digital innovations into **sectorial platforms** providing full solutions and **platforms cutting across sectors** to be tested and demonstrated in **large scale pilots**. This should accelerate innovation by companies and communities of developers through reference implementations and experimentations in real settings. In addition to **IoT**, this approach would address **Big Data, robotics, photonics, artificial intelligence, micro-/nano-systems, cyber physical systems and cybersecurity** as appropriate.

As a further contribution to the European Cloud Initiative, the **European Science Cloud** should be leveraged as a testbed for innovative cloud technology solutions.

¹ COM(2014)442 - http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=6210

Boosting digital innovation capacity across Europe and supporting standards

Building on initiatives launched in previous work programmes, the development and the networking of competence centres and experiment facilities across Europe, in partnership with Member States and regions, will be ramped up. **Digital innovation hubs** will help boost Europe's digital innovation capacities and accelerate the adoption of ICT technologies and ICT-related innovations across all sectors, notably by SMEs.

These hubs may take different forms and possibly focus on specific technologies or application sectors. More work is needed to better frame hubs implementation modalities, share existing best practices in some areas and map them on other sectors. The following areas were already identified as particularly relevant to the rollout of innovation hubs: photonics, TOLAE, robotics, smart factories, micro- and nano-electronics, 5G, Big Data, cultural and creative industries. It is proposed to address hubs in the respective programme sections with possible groupings around thematic areas and to set up appropriate coordination mechanisms to ensure coherence in implementation and building of synergies between hubs.

Support to industry-driven **standardization** activities, including through hubs, will also be reinforced with a particular focus on the five priority areas mentioned earlier.

The further exchange of skills of artists and creative people with entrepreneurs and technologists will be promoted. The STARTS (S&T&ARTS) activity will promote silo-breaking research and innovation practices across the Programme via collaboration between Science and Technology and the Arts.

Exploring new high potential areas

In view of the recent advances in **Artificial Intelligence** and its potential in a number of application areas, it is proposed to support both generic AI technologies and domain specific research in relevant areas such as Big Data, IoT, Robotics, Human Machine Interface, or languages.

Further developing an ambitious international agenda serving our Digitizing European Industry strategy

In continuation of the two first work programmes, LEIT-ICT will contribute to a **focused international strategy**, mainly through a limited number of coordinated calls with key partner countries on a set of specific topics, with a view to ensuring EU's scientific leadership and industrial competitiveness as well as accessing markets worldwide.

In this overall context, it should be clear that software is an integral component of many of the actions under LEIT-ICT and beyond, as software-defined technologies become the norm. For this reason a specific action on software is not proposed, but the Commission will continue to review the role of software engineering and the needs for self-managed and evolving systems underlying the activities being developed in the WP2018-20.

In order to increase efficiency and maximise impact, this last Horizon 2020 work programme will be focused on key priorities with sufficient scale and better links to political drivers. As a consequence, its structure will be streamlined and the number of topics reduced. The main areas for investment in 2018-20 are given below.

2.1 Ensuring future-proof connectivity and preparing for the internet of the future

2.1.1 5G (cPPP)

The phase 3 of the 5G cPPP roadmap aims at moving towards technology validation, implementation and usage, with an increased share of innovation actions. It will be structured around the following priorities:

- **End-to-End 5G platform**
Availability of an end-to-end 5G network platform that will be based on the outcome of earlier phases of the 5G cPPP and on the interworking of several experimental platforms existing in Europe, and preparing for validation of the main technological network KPI's of the 5G roadmap, including energy efficiency aspects.
- **Trials for KPI validation involving verticals**
Trials of various scale (depending on the target technology validation) will be carried out to demonstrate that performances are in line with most demanding KPIs as set out at the 5G PPP inception. The objective will be to cover multiple vertical use cases requirements (including e.g. connected and autonomous driving).
- **5G Long Term Evolution**
Research activities will be based on the industry roadmap preparing for the evolution of 5G until 2025, covering issues such as millimetre-wave large scale deployment, deep programmable networking, novel routing architecture, as well as later evolutions of radio and optical networking.
- **5G core technologies innovation**
The corresponding actions will support trial and validation of key technological blocks like terminals, array antenna, array processors, low cost access points, with a view to providing opportunities to innovative high tech SME's. A specific focus may be put on new types of IoT devices using the 5G new features in several vertical sectors.
- **Network innovation with 5G third party services**
The focus is on innovation for operations and service provisioning taking advantage of pre-existing experimental facilities featuring virtualised and software implemented functions and representative of a redesigned virtualised core network. The facilities should provide opportunities for SMEs and developers to experiment their applications on open experimental network platforms, and to create 5G open source repositories.

As in the previous phases, resulting actions will be integrated under programme logic, using cooperation clause 41.4 to maximise impact, especially for what concerns architecture, standards and spectrum choices.

2.1.2 Next Generation Internet initiative

The objective is to find new ways to support **mid- to long-term research and development on essential architectural and services building blocks** of a next generation Internet, strengthening its open character and opening new opportunities to European Internet industry. The initiative addresses technological opportunities arising

from cross-links and advancements in various research fields. Bringing this technology to the market will be key. Both long-term research and applied research are necessary.

The scope ranges from new network architectures to open service platforms, and from software transforming application domains and intelligent services to aspects of digital social innovation. A public consultation will start in Autumn 2016 to identify the specific research topics, which could include:

- non-centric architectural thinking and blockchains,
- artificial intelligence, new forms of search engines and data crawlers,
- personal data spaces, immersive environments and privacy by design,
- innovative forms of service discovery and composition,
- context and semantics, software defined everything and beyond IP.

The preparatory phase in WP2016-17 will be followed by the implementation of the first phase under WP2018-20 which will pave the way towards a larger initiative in the next framework programme.

2.2 Building on European strengths and supporting the digitization of industry

2.2.1 Electronics and Photonics

• Electronics

The activities supported in this area will be complementary to those carried out through the ECSEL Joint Technology Initiative. Components and systems will be mainly addressed through the ECSEL JTI.

○ Micro- and nano-electronics

Activities should address the challenge of low power consumption at all levels and underpin future advances in the Internet of Things and computing. They should focus on exploring the development of promising beyond-CMOS devices, developing low power computing solutions, pushing the miniaturisation of the millimetre-wave technologies and supporting increasing system integration.

○ Thin, Organic and Large Area Electronics (TOLAE)

The key challenges are to overcome the barriers of manufacturability, integration with conventional electronic components, and take-up in applications. Supported activities will thus aim at advancing the readiness level of TOLAE, enhancing manufacturability and demonstrating TOLAE-enabled prototypes in selected applications.

○ Smart Anything Everywhere

Digital innovation hubs will be supported for TOLAE, CPS, SSI, micro- and nano-electronics.

• Photonics (cPPP)

The objective is to improve the technological and manufacturing capabilities and the innovation potential of the photonics industry in Europe, as well as the wide diffusion of photonics technologies in many industry sectors. The corresponding priorities for the work programme are:

- **Strengthening the technology leadership in photonics**, through developments on materials, device architectures and fabrication processes, enabling progress in performance, power consumption, functionality, miniaturisation and cost and targeted **disruptive research exploiting e.g. nano-scale and quantum effects**.
- **A better exploitation of the enabling potential of photonics**, with joint strategic actions with other relevant sectors, such as networking, HPC, Cloud, FoF (3D printing and automation).
- **Bridging the innovation gap and establishing digital innovation hubs for photonics**
In addition to closer-to-market actions and digital innovation hubs building on existing innovation accelerators and emerging pilot lines, financing measures involving ESIF, EIB, EFSI could be considered.

2.2.2 Advanced computing and Cloud computing

• Advanced computing

The main objective in this area is to contribute to the implementation of the European Data Infrastructure, one of the two main components of the European Cloud Initiative.

- **High-Performance Computing (cPPP)**
In complement to the work done in the FET part of the programme and in ECSEL, the HPC cPPP activities of LEIT-ICT should support the development of common exascale technology building blocks (low-power processor, exascale prototype systems and the exascale software and application layers) and address the integration of higher TRL technologies into prototypes.
- **Advanced Computing for Cyber Physical Systems Activities** should support the development of building blocks (minimum energy architectures, methods, tools and engineering techniques) for future cyber-physical systems, the "disappearing computers".

• Cloud computing ecosystem

In the context of the European Cloud Initiative Communication, two priorities will be addressed in order to help develop an ecosystem to strengthen the cloud industry in Europe:

- **Cloud research**, intended to implement an industry-driven strategic research and innovation agenda (SRIA) focusing on areas such as cloud management, platforms linking computing, storage and networking, fog and edge computing, cloud and data centre infrastructures, energy-efficient clouds, novel cloud-native applications, cloud federation and scalability, cloud deployment methodologies and tools, migration of applications and services to the cloud, as well as **cloud security and privacy** aspects.
- **Cloud innovation**, leveraging the EOSC as a testbed for innovative cloud technology solutions in partnership with industry and the public sector.

2.2.3 Robotics

In continuation of the work carried out in the context of the SPARC cPPP through the two first work programmes, the priorities for the support to the area are:

- **Robotics for novel production value chains and enabling innovation in services**, which includes:
 - robotics-based customised production enabled by improved human-robot collaboration and learning by robots,
 - robot-based innovation in services,
 - research and development on core technologies, where activities could cover learning and AI, integrated cognitive mechatronic systems, technologies for closer human-robot co-working, improved perception and cognition for increased autonomy, design tools and models to accelerate systems developments,
 - open standards for modularity, re-use and safety and their certification and validation processes,
 - the engagement with users and non-robotics experts.
- **Digital innovation hubs for robotics**

2.3. Building a competitive and inclusive data-driven economy and society

2.3.1 Big Data (cPPP)

The objective is to implement the strategy² adopted in 2014 and aiming at supporting and accelerating the transition towards a data-driven economy in Europe, while also contributing to the European Cloud Initiative. Activities should address:

- **research and innovation on Big Data technologies**, such as analytics, prediction, visualisation, privacy-preserving methods, deep learning;
- **secure environments for experiments** incubating novel business ideas based on the reuse of data supported by functioning data markets;
- **large-scale innovation and demonstration projects** to foster value creation by re-use and integration of data assets across sectors, while encouraging the use of high performance and cloud computing infrastructures;
- **development of personal data spaces** based on privacy-by-design principles and technologies;
- **data management tools and practices**, big data processing architectures, and engineering principles improving productivity, reliability, efficiency and quality;
- **support to the framework conditions**, such as data standards and improving **technology transfer and entrepreneurial support**.

2.3.2 Interactive and Media Technologies

The ambition is twofold: firstly, to support the development of innovation ecosystems centred on innovations in human machine interaction and data usage to address the requirements of sectors such as healthcare, video games, retail, education, media and engineering; secondly to contribute to achieving a truly competitive European space

² COM(2014)442 - Towards a thriving data-driven economy, 2 July 2014

for media content production and distribution, accessible to everyone, anytime on any device.

Activities should contribute to policy development in the areas and address:

- **Research on interactive technologies (AR, VR)** and standards for Human-Machine Interaction, haptics, emotional monitoring and user behaviour to provide the industries with a full content value chain from authoring to application.
- **Take-up actions on interactive technologies by SMEs** to stimulate the adoption and deployment of innovative interactive technologies solutions by SMEs through collaboration with ICT providers and short focussed actions.
- Innovative solutions fostering the **convergence among media sectors and new services** allowing personalised, interactive and enriched experiences in a multi-platform scenario; development of business innovation ecosystems for open and interoperable media and publishing value chains with a particular focus on SMEs.
- New tools for advanced **analysis and profiling of social media content**, assessing its veracity (news, data, etc.) and for **disruptive usages** of smart objects and digital companions in social media.

2.3.3 Digital empowerment through data-driven learning, language and accessibility technologies

The aim is to promote a skilled and inclusive society by digitally empowering all European citizens and businesses.

- Key technologies for **non-cognitive skills** (resilience, adaptability, self-control, etc.) tested and piloted in various learning and training contexts aiming for robustness and reliability.
- **Language technologies** for social intelligence and e-participation, and socially-aware interactive assistants.
- **Adaptive interfaces** for people with disabilities, including authoring/monitoring tools for accessible websites and mobile apps as well as **Smart and user-friendly parental filtering tools**. Activities will include work on rating user generated content and **age classification systems**.

2.4. Cross-cutting activities and new high-potential areas

The ongoing massive digitization is enabled by advances in several technological areas. However, in many application cases, the value is actually created through the combination of these advances. Cross-cutting activities also encompass horizontal issues such as cyber-security. Some of these activities could be part of a large Focus Area on "Digitising and transforming European industry and services" that would extend to other parts of the programme and involve closer collaboration with partner DGs.

• Cross-sectorial and integrated large scale pilots and digital platforms

As part of the implementation of the DEI strategy, the work programme 2018-20 should support the development of both **sectorial platforms** providing full solutions and **platforms cutting across sectors**, to be tested and demonstrated in **large scale** pilots. This would enable the integration of digital technologies such as IoT, cyber-

physical systems, Big Data, Cloud, HPC, robotics and autonomous systems, cybersecurity or artificial intelligence in order to address societal challenges. Options and examples for such pilots mentioned in the DEI Communication or building on previous activities include:

- **Connected and automated driving:** support the move to more secure, more efficient and cleaner transportation system by setting-up a cross-border testing facility pooling investments across Europe and connecting various stakeholders from AI-experts to automotive OEMs and communication service providers.
- **Smart agriculture:** contribute to the development of smart solutions (decreasing use of water, lowering ecological footprints, reducing costs, increasing traceability and food security) for precision agriculture through large scale pilots and demonstration projects integrating robots, sensor networks, data management technologies and other IoT technologies in different agricultural sub-sectors.
- **Digital transformation of health and care:** accelerate the introduction of robotics, IoT, Big Data and AI as cost-effective technologies into the healthcare system by establishing large pilot projects demonstrating added value in diagnostics, surgical procedures, clinical services, prosthetics, rehabilitative care, smart hospitals, healthy living and active ageing or age-friendly housing. This should contribute to a common European policy vision on digital innovation for active and healthy ageing.
- **Cross-cutting integration platforms:** support IoT-driven open platforms providing seamless services and experiences and enabling innovations across at least two of the following areas: **smart living, home care, mobility, farming, energy, city/regions, water management.**

Pilots addressing other sectors may be proposed at a later stage. Large-scale pilots are expected to draw financial support from most contractual PPPs and be supported in collaboration with other parts of Horizon 2020, LEIT-NMBP and Societal Challenges in particular.

- **Digital Automation**

As part of the **FoF cPPP** and in line with the DEI strategy, activities will aim at integrating and **making the latest developments in the following technologies easily available in factories:** robotics, artificial intelligence, IoT, Big Data, 3D printing.

In addition, the transformation of European industry towards the next generation of digital production systems - based on the technologies mentioned above – will be accelerated by launching large demonstration pilots spanning entire value chains and the entire process, from order to delivery.

Digital innovation hubs dedicated to the inclusion of digital technologies into the process of manufacturing SMEs will also be supported through the **I4MS** scheme (ICT innovation for manufacturing SMEs).

- **Internet of Things**

The IoT is taking central stage in a variety of application areas and constitutes a key building block of the DEI strategy. For 2018-20, the objective is to support research

addressing the specific technical challenges for the implementation of the Internet of Things, namely common standards and architectures, interoperability, connectivity, data handling, numbering, addressing, identification and discovery.

- **Cyber security**

Cyber-security is part of one of the seven political drivers of the strategic programme 2018-20 and will be supported through a contractual Public Private Partnership. It spans way beyond LEIT-ICT and the Societal Challenge on security, and it needs to be addressed with a cross-cutting approach that could catalyse partnerships between players from thematic application sectors and the digital sector. These activities will in particular be implemented through the **Cybersecurity cPPP**.

- **Artificial intelligence**

In view of the high potential of artificial intelligence in a number of application areas, such as search engines, image recognition, vehicle navigation and robotic control e.g., it is proposed to introduce actions addressing this new priority in the work programme:

- **Artificial intelligence research**, allowing to develop the core technologies necessary for AI systems and capabilities, such as learning, combining local and distributed AI service layers (e.g. to get real-time, online machine analysis), or sliding autonomy (adapting machine autonomy to a particular situation or context).
- **Applied research and innovation leveraging AI as an enabling technology for e.g. Big Data, IoT, robotics, networking etc.:** key target areas could include autonomous cars, drones, assistive systems (healthcare and home assistance) or smart farming.

2.5 Boosting digital innovation capacity across Europe and supporting standards

- **Support to standardisation**

In complement to the strengthened support to industry-driven standardisation in the five priority areas identified in the DEI strategy, horizontal actions will reinforce EU presence in the international ICT standardisation scene, mainly through a **standardisation observatory** and a **facility supporting the participation of key European specialists** (especially from SMES and Academia) in key international and global SDOs and consortia.

- **Innovative procurement**

Together with digitization, innovation procurement is widely recognized as one of the main instruments to improve the quality and efficiency of the public sector, whilst creating opportunities for companies to gain leadership in new markets. Innovation procurement is an effective way to actively engage the demand side stakeholders that are underrepresented in Horizon 2020, but that are needed to bring R&I to the market.

- **Inducement prizes**

The potential offered by the use of inducement prizes to reach innovators beyond traditional Horizon 2020 participants and communicate on R&I towards general public should be further exploited in 2018-20.

- **Innovation radar**

The continuation of the Innovation Radar initiative should also allow a better identification of high-potential innovations and the continuing support of the most promising innovators involved in Horizon 2020 projects.

2.6 Further developing an ambitious international agenda serving our Digitizing European Industry strategy

In continuation of the cooperation initiated in previous work programmes, coordinated calls will be launched with Brazil, Japan and South Korea.

Call title	Brief description	Possible contribution from and to other work programme parts
<p>FA - Digitising and transforming European industry and services</p>	<p>The potential focus area aims at enabling all sectors and application areas to adapt, transform and benefit from digitization.</p> <p>Through cooperation and coordination between activities carried out in LEIT-ICT and societal challenges, the focus area will fill the gap between technology development on one hand and market pull as pursued in societal challenges on the other hand.</p> <p>Large-scale pilots, integrated digital platforms and innovation hubs will be instrumental in the implementation of this focus area.</p> <p>Amongst others, pilots in the focus area could address topics such as the digital transformation of health and care, smart agriculture and rural renaissance, smart and energy-efficient buildings or connected and autonomous vehicles.</p> <p>In addition the Focus Area will include support to R&I in IoT and support to connected factories and digital automation as part of the FoF PPP.</p>	<p>Collaborations can be envisaged with LEIT-NMBP, LEIT-Space, SC1, SC2, SC4 and SC6</p>
<p>Information and Communication Technologies</p>	<p>Call addressing mainly research and innovation on core information and communication technologies.</p>	<p>Contribution to the focus area on security.</p>

As mentioned in section 2.6, there should also be several coordinated calls with third countries.

Links to **strategic research agendas** developed by the stakeholders' associations involved in **contractual public-private partnerships** implemented in accordance with article 25 of Horizon 2020 regulation and by **European Technology Platforms**:

ⁱ <https://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>

ⁱⁱ http://www.photonics21.org/download/Brochures/Photonics_Roadmap_final_lowres.pdf

ⁱⁱⁱ https://eu-robotics.net/cms/upload/PPP/SRA2020_SPARC.pdf

^{iv} http://www.bdva.eu/sites/default/files/EuropeanBigDataValuePartnership_SRIA_v2.pdf

^v <http://www.effra.eu/attachments/article/129/Factories%20of%20the%20Future%202020%20Roadmap.pdf>

^{vi} <http://www.etp4hpc.eu/image/fotos/2016/01/ETP4HPC-SRA-2-Single-Page.pdf>

^{vii} <http://www.ecs-org.eu/documents/ecs-cppp-sria.pdf>

^{viii} <http://nem-initiative.org/wp-content/uploads/2016/05/NEM-Research-and-Innovation-Priorities-2016.pdf>