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REPUBLIC OF ESTONIA
MINISTRY OF EDUCATION
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Increased coherence and openness of European Union research and innovation partnerships

Final report



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Increased coherence and openness of European Union research and innovation partnerships

Final report

technopolis _{group} June, 2017

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Executive summary

Partnership instruments have been introduced into the European R&D and innovation landscape and more specifically in the Framework programme context after 2000 alongside the Lisbon strategy and the aim to develop the European Research Area. These instruments were designed to address the observed fragmentation in the landscape and to avoid duplication of efforts. Later, new partnership instruments have been added and old ones developed further to address economic crisis, competitiveness and innovation.

This report takes a look at the various partnering instruments to understand the role they play today in the European R&D and innovation landscape. This is followed by reviewing the achieved benefits as well as problems and concerns that have been identified in various monitoring and evaluation reports. Finally, the report presents a number of conclusion and tentative recommendations how to further develop and improve European partnership instruments, especially with respect to openness and transparency, coherence as well as their ability to fully capture the full potential of European R&D and innovation. The overall focus is on analysing the rationale and functioning of the partnership instruments in view of their ability to produce European added value.

The partnership instruments have been developed over time and each reflect the specific policy priorities and context in which they were designed and launched. However, instead of replacing existing ones, the approach has been to launch new partnership instruments alongside with the existing ones. This has resulted in a rather complex landscape of partnership instruments, many with the same fundamental rationale, and several focusing on the same thematic areas. Even though the approach is often different, the synergies from combining industrial opportunities, scientific research and societal needs can hardly be captured if each are being pursued in separate partnerships.

The evidence of European added value from the partnership instruments and partnerships is scarce. Systematic evaluation has not been performed and except for P2Ps the monitoring of partnerships is not systematic or transparent. Hence, there is no clear and convincing evidence of European added value achieved through the partnership instruments.

Justification for the partnership instruments should be that they can produce European added value beyond what can be achieved through other Framework modalities. In this respect, the only clearly visible tool is the requirement to establish a joint long term strategic agenda. This is a common feature in most of the partnership instruments, addressing fragmentation as well as avoiding duplication of efforts. Implementing the joint agenda is done either through an earmarked budget or through participation in annual Horizon 2020 work programme calls. There is no convincing evidence that one would have created significantly higher European added value than the other. Furthermore, significantly higher added value can hardly be expected if the tools used by the partnerships are limited to funding R&D and innovation projects. To reach a higher level of impact, the partnership instruments and partnerships should cover a much wider set of activities and modalities. Especially demand side instruments such as procurement of innovation, smart regulations, standards and norms, and challenge competitions, as well as engagement and co-creation with end-users, development and experimentation in large scale real life virtual and physical platforms, mission oriented research, and other more ambitious approaches could significantly increase the potential impact of partnerships.

Launch of the FP9 is clearly the time to address the complexity of the partnership instrument landscape, especially since the share of total framework budget to partnerships and projects initiated by the partnerships is expected to reach 25% in Horizon 2020. Systematic and transparent processes for identifying, designing, implementing and monitoring should be established for all partnership instruments and partnerships, to ensure sufficient European added value, openness and coherence. These new processes could be developed and tested by analysing the current partnership instruments and partnerships.

The partnership instruments should be developed using a dual approach. Partnership instruments that need to be flexible, address topics fragmentation or duplication of efforts, addressing new less know interactions, etc. should be based on joint strategic agenda, but allow for implementation to be based

on project funding and other traditional modalities. No earmarked funding allocations are needed, instead co-fund, participation in annual FP work programme calls, etc. is enough. Partnership instruments that aim for significantly higher European added value should be more established, but should also capture a much wider range of tools, including demand side and other more ambitious activities. Open access can be achieved in the former one through open access to the partnership and participation in open calls. In the latter case, open access should be based on a membership model consisting on several levels, thus allowing easy access for new entrants through entry level membership.

Partnerships can be an effective way to address fragmentation, avoid duplication of efforts, enhance innovation and address societal challenges. European partnership instruments may have contributed to these objectives, but to what extent is unclear as the evidence is largely missing. However, even with the evidence available, it is clear that the partnership instrument landscape should be simplified. Furthermore, to reach a significant European added value, new types of higher ambition partnerships are needed – not in addition to the existing ones, but as the next step in the evolution of the combination of the most promising ones already active.

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1 Introduction

1.1 Purpose of this study

This study was prepared to act as a background paper for a discussion paper by the Estonian government for the European Council of Ministers. The study takes a look at the various partnering instruments in use for fostering collaborative R&D and innovation activities between key stakeholders at the European level. The aim of the study was to understand the role these partnership instruments play in the European R&D and innovation landscape. The study analyses the rationale and functioning of the partnership instruments in view of their ability to produce European added value. Finally, the study ends with a number of scenarios and tentative recommendations how to further develop and improve European partnership instruments, especially with respect to openness and transparency, coherence as well as their ability to fully capture the full potential of European R&D and innovation.

The study addresses the following questions:

- **Allocation of EU funds to partnering instruments:** What is the budget share allocated to partnering instruments from the total H2020 budget? What is their leverage effect and thematic distributions (e.g. how many partnerships there are in natural sciences, environment, health, social sciences and humanities etc.)? What is the distribution of participants (the participation of EU-15 vs EU-13 in PPPs and P2Ps)?
- **Rationale and functioning of partnering instruments:** What has been the development and functioning (rationale, sustainability, added value, life cycle) of partnership instruments in the EU? What are the verified advantages and added value of using partnering instruments in supporting EU research and innovation cooperation? What are the main barriers?
- **Scenarios and suggestions to improve the partnering instruments:** How to redesign the EU R&I partnering system so that their use would be more in line with the overall competitiveness objectives, objectives of the Framework Programme, other activities funded under the FP and open to newcomers and smaller players?

1.2 Terminology

The key terms used in this report are:

- **partnership instrument** refers to an operational modality which requires numerous actors from several Member states to establish some form of a joint R&D and innovation agenda (long term agenda, roadmap, joint thematic call, etc.), and facilitate networking, preparation and execution of joint R&D and innovation activities launched for the purpose of implementing the joint agenda. This study focuses on European level partnerships initiated and/or managed by the European Commission.
- **coherence** refers to the quality of the system of European partnership instruments of being logical, consistent, and forming a unified whole. Lack of coherence is typically indicated by e.g. overlapping, inconsistencies, ineffectiveness, inefficiencies, etc.
- **openness** refers to transparency of the processes in which instruments and partnerships are being identified, prepared, launched and implemented. Lack of openness is typically indicated by e.g. difficulty for potential new entrants to identify and access partnerships, selection based on lobbying rather than systematic evidence and analysis, etc.

1.3 Methodology and availability of data

This study is based on available documentation concerning European R&D and innovation partnerships in Spring 2017. Relevant Horizon 2020 monitoring and mid-term evaluation documents as well as studies, reports and evaluations of individual partnership instruments and partnerships are referred to in respective chapters.

Systematic data collection or analysis was not possible due to schedule and resource limitations. A few interviews were conducted to get more insight into Commission practices and current policy discussion with respect to partnership instruments and the forthcoming Framework Programme 9, as well as for verification purposes.

The overview of all partnership instruments is difficult to obtain as data are dispersed. While data on the P2Ps is systematically collected and available (ERA-LEARN2020, H2020), data on the PPPs is not available from any comprehensive source. Furthermore, data available from individual PPPs varies as some PPPs are more open with it. Various monitoring and evaluation reports present and analyse selective data, but systematic comprehensive analysis is not available. The conclusions and recommendations presented in this study are based on readily available data, and should therefore be treated accordingly.

2 Partnerships and their role in the Horizon 2020

2.1 Partnerships

2.1.1 Public-to-Public Partnerships

The Public-to-Public Partnerships (P2Ps) were developed to implement one of the European Research Area (ERA) objectives already defined in the original ERA 2000.¹

- To implement the principle of reciprocal opening of national programmes to potential participants from other Member States.
- To put in place mechanisms for information exchange on existing national programmes.
- To encourage evaluation of national research activities by international panels.

It took until FP6 in 2002 before a first dedicated instrument was launched, the ERA-NETs, to ‘kick-start’ the activities of Member States to join forces. In a 2007 review of ERA progress the European Commission expressed disappointment with the degree to which the Member States had responded to the intentions to open up national programmes:

As such, the ERA ambition of restructuring the European research fabric, of which national policies are the main components, with a view to addressing fragmentation and avoiding costly duplication of efforts is still far from being achieved.²

Nevertheless, at that point in 2007 there were already 71 ERA-NETs established and one Article 169 (the predecessor of Article 185). Thus, the origin of the P2Ps were clearly following the ERA philosophy to join up national and EU programmes with the view to reduce fragmentation and duplication. Since 2007 the number and types of P2Ps have clearly mushroomed. As with the whole of Horizon 2020 the P2Ps are managed by different DGs in the European Commission as well as by a number of other implementing bodies. Data on the P2Ps are collected by ERA-LEARN2020 and for H2020 quite comprehensive.³

2.1.1.1 ERA-NETs

As above mentioned the ERA-NETs, were the first P2P instruments implemented and actively used by Member States and the European Commission. The decision to launch an ERA-NET call is initiated by the European Commission in the annual and bi-annual work programmes. These are subsequently discussed in the Programme Committees. In the course of the successive FPs the instrument has

¹ European Commission, Towards a European Research Area, COM (2000) 6, Brussels, 18 January 2000.

² European Commission, Commission Staff Working Document Accompanying the Green Paper: the European Research Area: New Perspectives, COM (2007)161, Brussels, 4.4.2007.

³ <https://www.era-learn.eu/>

changed. Table 1 gives an overview of ERA-NETs instruments since FP6. The foreseen funding of ERA-NETs is announced in thematic work programmes, so it is not yet clear how much that will be for the entire H2020 period.

The ERA-NET instrument does not require a dedicated entity to implement it. Usually research funding agencies from different Member States are the core partners in the ERA-NETs.

Table 1 ERA-NET instruments FP6 – H2020

	Instruments	Funding mechanism	Budget in FP	# NETs
FP6	ERA-NET	Funding for coordination costs (CSA)	FP6 & FP7 EU contribution	71 ERA-NETs
FP7	ERA-NET	Funding for coordination costs (CSA)	€330 million*	82 ERA-NETs
	ERA-NET+	Top-up funding for joint calls (up to a max of 33%)	Approximately €150 million*	23 ERA-NET+
H2020	ERA-NET Cofund	Coordination costs and top-up funding for 1 joint call (up to max of 33%)	WP 2014 €92 million WP 2015 €141 million WP 2016 €162 million¥ WP 2017 € 100 million¥	27 launched in 2014 & 2015**
	EJP-Co-Fund	EU Support to in-kind contribution by Research Performing Organisations	2016 & 2017 €85 million	

*EC, ERA-NET Cofund Training, **2nd Annual Report on P2Ps, ERA-Learn 2020, 2016; ¥ = including €18M for FET in 2016 and €5M for FET in 2017.

2.1.1.2 European Joint Programme (EJP) Cofund Actions

The European Joint Programme (EJP) Cofund Actions is a new instrument introduced in H2020. Its official description is that it is designed to support coordinated national research and innovation programmes and aims at attracting and pooling a critical mass of national resources on objectives and challenges of Horizon 2020 and at achieving significant economies of scales by adding related Horizon 2020 resources to a joint effort.⁴ The minimum number of participants in EJPs is five independent entities from different member States or associated countries owning or managing national research and innovation programmes. This number is higher than the standard Participation Rules for H2020. The participation of programme managers has to be mandated by the national/regional authorities in charge. The main activity of the EJPs are activities to attain objectives common to Horizon 2020. The EJP Action needs to develop annual work programmes submitted and approved by the Commission. The EC funding is limited to 70% of the total eligible costs of the action and the rate of co-funding is to be set in the work programme. The EJP funding models make it possible that national research laboratories take part in the research activities (institutional funding) so the EU co-funding is not only for national programme funding. The Commission expects these EJPs to have an ambitious overall budget (20-50 million) and the possibility to work towards a long term legal structure such as an Article 185.

The EJP was set up originally with Euratom in mind. The first two EJPs launched were indeed under the Euratom agreement. The first large EJP under Euratom is Eurofusion, a consortium from 23 member states and 2 associated states bringing together research in fusion laboratories. Its budget is €857 million with 55% EU co-funding. The EJP for the integration of radiation protection (Concert) is the other Euratom example which pulls together several radiation protection research platforms, 23 EU member state funders (23) and 2 associated states to develop a joint Strategic Research Agenda.

Apart from these two Euratom EJPs there are now two EJPs running and one in preparation. The Human Biomonitoring Initiative (HBM4EU) was launched through a call in 2015. The Initiative was launched in December 2016 involving 26 countries, the European Environment Agency and the

⁴ See General Annexes Horizon 2020 Work Programme 2016 -2017, Part 20 pages 15-17.

Commission with a total budget so far of €74 million. A fourth EJP is recently launched under the name One Health and deals with diseases that move between animals and humans. The consortium brings together funders and laboratories from 20 countries and can have a 50% contribution from the European Commission. The total five-year budget is €90 million.⁵

2.1.1.3 Article 185 Initiatives

Article 185 Initiatives started off as Article 169 in the previous European Treaty. The first to be launched was the European & Developing Countries Clinical Trials Partnership (EDCTP). It originated from an existing EU “Programme for Action” responding to the urgent issue of HIV/AIDS, malaria and tuberculosis in sub-Saharan countries, in the context of poverty reduction. 14 Member States and Norway decided to combine their research and clinical work in this domain, with the aim to accelerate the development of vaccines and treatments. It was thus a societal challenge that needed urgent action that gave the impetus for the first Article 185 (then 169) and was an experiment for all those involved how to set it up. It was officially launched in 2003. The first years showed that it was difficult to develop good governance structures that ensured ownership of all funders and stakeholders involved. The following Art. 185s were Ambient Assisted Living (AAL) and Eurostars. The latter was initiated in 2004 by the intergovernmental organisation Eureka that had similar SME innovation programmes as the European Commission. The definite co-decision (European Parliament and European Council) to launch the joint EU and EUREKA programme was taken in 2008. The EMPIR Article 185, set up in 2014, was the follow up of two generations of ERA-NETS: iMERA and EMRP. The associations of metrology institutions in key European Member States had already achieved quite some joined research activities in its two predecessor ERA-NETS. The Article 185 was the next ‘logical step’ of further integration with a dedicated implementation organisation. A similar pattern can be seen with BONUS, which is funded as an Article 185 between 2011 and 2017, as part of FP7. Bonus has a history of two ERA-NETS, Bonus ERA-NET 2003-2008 and BONUS+ between 2009 and 2011. It is foreseen that it will not continue as an Art 185 in H2020.

Table 2 Total Public Budget FP7/H2020 for Article 185s

	EU (maximum)	Participating States
EDCTP 2 (EDCTP1 in FP6)	€683 m (€200 m)	€683m (€200m)
EMPIR (EMRP in FP 7)	€300 m (€200 m)	€300 m (€200 m)
Eurostars 2 (Eurostars in FP7)	€287 m (€100 m)	€861 (€300)
AAL 2 (AAL in FP7)	€175 m (€150 m)	€ >175 m (€200 m)

Source: EC DG RTD, ERA-Net Cofund under H2020 Training, ERA-Learn website

Each of the Art 185s has a history of preceding joint research initiatives, in later years mostly ERA-NETS. Judging by the diversity of the existing Art 185s and their origins, there seems to be no single rationale to step up existing activities from an ERA-NET type status, to the much more ‘heavy weight’ Art 185 instrument. The history shows a number of pragmatic choices by stakeholders involved to evolve existing initiatives into a long term contractual arrangement of an Art 185.

The decision to launch an Art. 185 needs high level political support (following the ordinary legislative procedure of the European Union), the establishment of a dedicated implementation structure and multi-annual financial backing by the member states and the Commission. The Commission’s contribution is however potentially much higher than in ERA-NETS (up to 50% top up of joint calls).

⁵ Erlearn 2020, Newsletter, May 2017, volume 05.

In H2020 the same rules of participation are applied in Article 185s. Thus, Art 185s are initiated by a sufficiently large group of Member States, mostly backing an already existing network of national agencies and research performers.

2.1.1.4 European Innovation Partnerships (EIP)

The EIPs were launched as part of the Innovation Union (2010) responding to the economic crisis. The intention of the EIPs is to install a new logic of innovation. Their objective is to integrate, harness and exploit Europe's potential in a way that creates a new ecosystem of innovation. Their original objective is to break down "silos" and bring together stakeholders across policies, sectors and borders. The EIPs develop a Strategic Implementation Plan (SIP) presenting the vision of the EIP, its objectives, and proposed implementing measures. Through the SIP, the EIPs act as advisory bodies in the development of the policies and programmes, including the Horizon 2020 work programme.

The five EIP topics are 1) Active and Healthy Ageing, 2) Agricultural Sustainability and Productivity, 3) Smart Cities and Communities, 4) Water and 5) Raw Materials.

The EIPs are mostly a 'strategic' tool trying to apply a new logic on the basis of voluntary action by European, national and regional stakeholders. No funding tools or instruments are attached to EIP. An expert Group that reviewed the EIP in 2014 stated:

*"... the EIP process has suffered from a complex operational model, hampered by a lack of a single dedicated structure at the Commission to deal with the EIPs and a divergence of views between the different Directorates of the Commission. While an extensive array of stakeholders has taken part in the EIPs, a stronger commitment of the Member States and clearer channels to bring in new actors, including more SMEs, would improve future EIP performance."*⁶

There is no funding for EIP reported in the annual monitoring report for H2020 although some H2020 funded projects address the priorities of the EIP themes. Thus, the influence of this partnership model does not seem great.

2.1.2 Public-Private-Partnerships

In 2005, the European Council relaunched the Lisbon strategy with a new partnership for growth and employment. The conclusions of the European Council underlined the core role of knowledge and innovation as engines of sustainable growth and stated that

"the European area of knowledge should enable undertakings to build new competitive factors, consumers to benefit from new goods and services and workers to acquire new skills. With that in mind, it is important to develop research, education and all forms of innovation insofar as they make it possible to turn knowledge into added value and create more and better jobs".

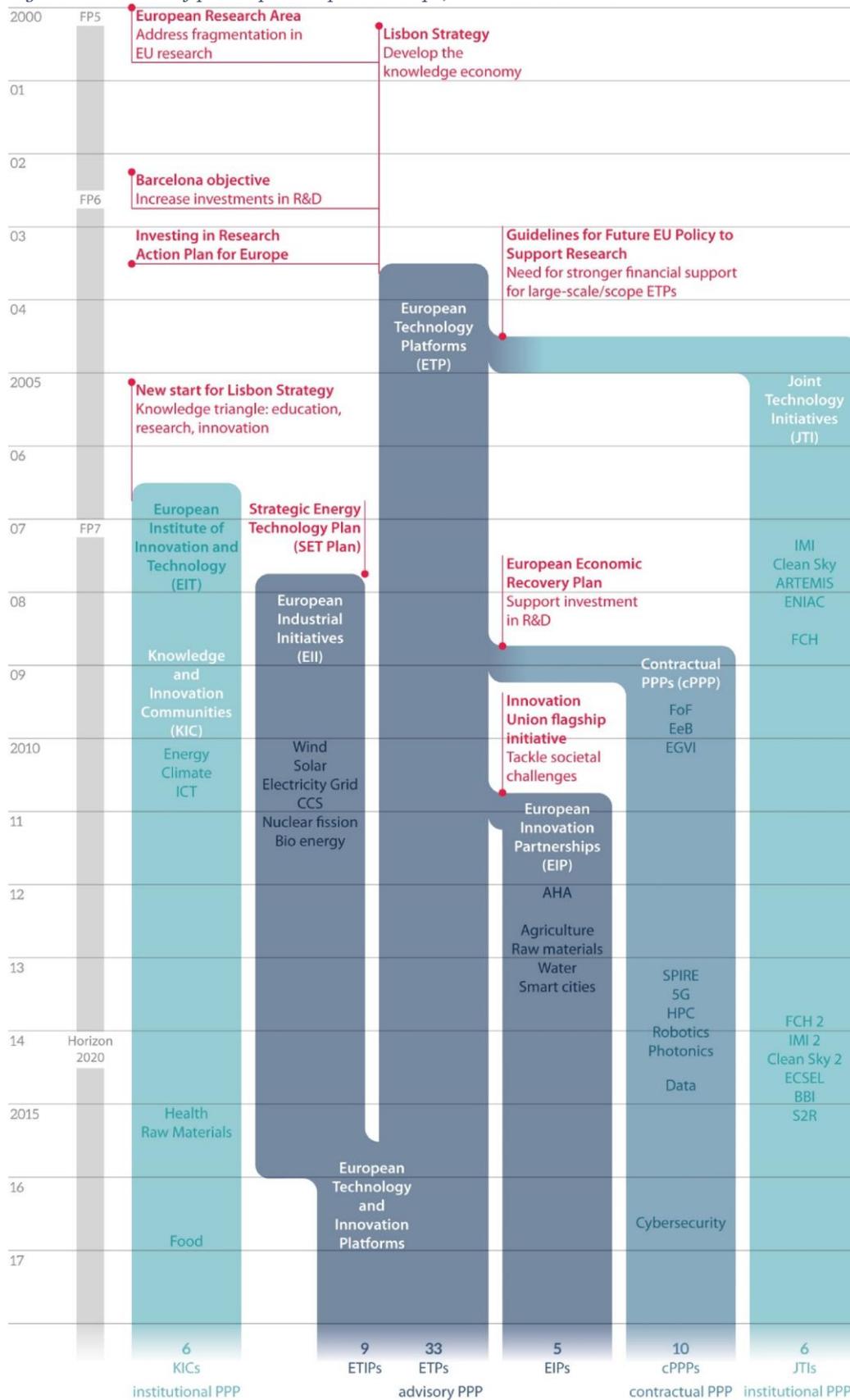
To realise this ambition and to ensure a solid industrial fabric throughout the European territory, a stronger link between research and industry was deemed particularly important. Increasing the scale and impact of research investment, enhancing the co-ordination of research in Europe and raising the technology content of industrial activity were seen critical if Europe was to strengthen its position as a technologically innovative economy.

Figure 1 shows the evolution of public-private partnerships⁷ and the relevant policy context in which this has taken place.

⁶ Independent Expert Group, 2014 Outriders for European Competitiveness, European Innovation Partnerships as a Tool for Systemic Change, Brussels, page 4.

⁷ EIPs and EIT KICs are not public-private partnerships in the same sense as ETPs, cPPPs and JTIs. They facilitate industry-research collaboration, but they are not industry driven. Hence, in this report, they are discussed under P2Ps and other partnerships. Despite their slightly different origin, both ETPs and ETIPs are typically and also in this report identified as ETPs.

Figure 1 Evolution of public-private partnerships, EIT KICs and EIPs



source: European Commission, "Public-private partnerships in research", European Parliament briefing, May 2017

Public-private partnerships involving industry, the research community and public authorities was understood to play a significant role in meeting these challenges. In 2005, the European Council recognised the role of “*technology initiatives based on public-private partnerships*” and “*the organisation of European Technology Platforms aimed at setting long-term research agendas*” in “*strengthening the competitive advantages of the industrial base while ensuring the complementarity of action at national, trans-national and European level*”⁸.

A limited number of European Technology Platforms which were seen to offer the opportunity for significant technological advances and which have achieved such a scale and scope that implementation of important elements of their Strategic Research Agendas requires the setting up of long-term public-private partnerships. In these cases, loose co-ordination through the European Technology Platform and support through the regular instruments of the Framework Programme for Research and Development was not seen sufficient. Effective implementation was believed to require a dedicated mechanism that enables coherent, large-scale legal structures to be set up to provide the necessary leadership to achieve the research objective. To meet effectively the needs of this small number of European Technology Platforms, it was proposed to set up “Joint Technology Initiatives” (JTI)⁹.

Joint Technology Initiatives involve a dedicated legal structure (Joint Undertaking, JU) to implement a clearly defined objective. They can, therefore, serve to implement a specific part or the entirety of a European Technology Platform. Hence, all JTIs have been developed on the basis of earlier ETPs. The aim of Joint Technology Initiatives are to ensure coherent implementation of European research efforts in the strategic technological fields for the future, accelerate the generation of new knowledge, innovation and the uptake of research into strategic technologies, leading to enhanced productivity and strengthened industrial competitiveness, concentrate efforts on key projects that can help meet Europe’s industrial competitiveness goals, enhance the technology verification process in order to identify and remove obstacles to future market penetration, and pool user requirements to guide investment in research and development towards operational and marketable solutions.

Joint Technology Initiatives allow funding from the Framework Programme to be combined with other public funding sources, including, where appropriate, the Structural Funds. This, in turn, can have a significant leverage effect on private investment in Joint Technology Initiatives and related economic activity.

At the same time, Joint Technology Initiatives are not intended to have a restrictive effect on competition. They are designed to enhance downstream competitiveness in key technologies by addressing market failures arising from the high costs and risks associated with long-term, pre-competitive, multidisciplinary research.

In 2013, Commission introduced contractual public-private partnerships (cPPP) and launched the first three under the European Economic Recovery Plan. cPPPs were established to complement the JTIs in FP7 to seek direct input into the preparation of the work programmes in areas which were defined upfront and which are of great industrial relevance. Unlike JTIs, cPPPs do not require additional legislation because the funding is implemented by the Commission through the normal thematic calls launched under the Horizon 2020 annual work programmes. Besides being administratively lighter and agile, cPPPs are also more transparent, as they are based on a contractual agreement between the Commission and the industry partners.

Characteristics of existing European public-private partnerships as well as their respective budget allocations are listed in Table 3.

⁸ Conclusions of the Spring European Council, 22-23 March 2005

⁹ Report on European Technology Platforms and Joint Technology Initiatives: Fostering Public-Private R&D Partnerships to Boost Europe’s Industrial Competitiveness, SEC(2005) 800 of 10.06.2005

Table 3 Comparative view of existing European public-private partnerships

PPP	European Technology Platforms	Joint Technology Initiatives	Knowledge and Innovation Communities	European Industrial Initiatives/European Technology and Innovation Platforms	Contractual PPPs	European Innovation Partnerships
Type of PPP	advisory/coordination	institutional	institutional	advisory/coordination	contractual	advisory/coordination
Proposed in	2003	2004	2005	2007 (EII)	2008	2010
First established in	2003	2007	2010	2009 (EII) - 2015 (ETIP)	2009	2011
Number of active partnerships	33	6	6	9	10	5
Structures	Not-for-profit associations	Joint undertakings by Council regulation under Article 187 TFEU	Not-for-profit associations, private companies, European companies	Not-for-profit associations	Not-for-profit associations	Steering Group
Key deliverables	Strategic research agenda (SRA)	Strategic research agenda and annual work plan	Annual business plan	Strategic research agenda (SRA)	Multi-annual roadmap of research priorities	Strategic implementation plan
Thematic scope	Broad on a given technological field	Focused on a specific technology or field	Broad on a given societal challenge	Broad on a given energy technology	Focused on a specific field	Broad on a given societal challenge
Key partners	Research actors from the private and public sectors	Commission and private sector (with Member States in one JTI)	Public and private actors covering research, innovation and education activities	Research actors from the private and public sectors	Research actors from the private and public sectors	Public and private actors covering the innovation process (policies, research, regulation, standards, funding, etc.)
Timeframe	Long term - 10/15 years	Medium term - 7 years	Long term - 15 years	Long term - 10/15 years	Medium term - 7 years	Medium term - 7/10 years
EU funding	Indirect - SRA taken into account to prepare FP work programme	Direct - JUs develop their own work plan and distribute EU funds	Direct - KICs develop their own work plan and distribute EU funds	Indirect - SRA taken into account to prepare FP work programme	Direct - Part of FP budget is ring-fenced for the cPPPs. Roadmap used to establish the work programme adopted under normal FP process	Indirect - Support provided for the secretariat
Budget under FP7		€ 3.14 billion	€ 309 million (for EIT)		€ 1.65 billion	
Budget under Horizon 2020		€ 6.67 billion	€ 2.28 billion (for EIT)		€ 7.15 billion	

source: European Commission, “Public-private partnerships in research”, European Parliament briefing, May 2017

2.1.2.1 European Technology Platforms (ETP)

European Technology Platforms (ETPs) are industry-led stakeholder fora recognised by the European Commission as key actors in driving innovation, knowledge transfer and European competitiveness.

ETPs develop research and innovation agendas and roadmaps (SRA) for action at EU and national level. They encourage industry participation in European R&D and innovation programmes, as well as foster cross-border networking and co-operation opportunities. ETPs operate transparently and they are continuously open to new members¹⁰.

Besides targeting industrial needs and opportunities, selected ETPs also aim to address major societal challenges such as the ageing society, the environment and food and energy security.

ETPs are independent and self-financing entities facilitating the preparation of collaborative projects to be supported by both private and public funding. ETPs have an impact on the framework programme annual work programmes through their SRA. However, there is no earmarked funding for ETPs. Hence, funding for ETP initiated projects must be applied from normal Commission and national calls.

The fundamental rationale for ETPs is to enhance the effectiveness and impact of European R&D and innovation activities, and increase Europe's innovation capacity by addressing major technological challenges with high economic potential and social relevance, better structuring and streamlining activities at European level, establishing long-term joint research and innovation agenda, and increasing the scale and scope of research investments.

2.1.2.2 Joint Technology Initiatives (JTI)

To identify the European Technology Platforms for which the Strategic Research Agendas suggest the need for a Joint Technology Initiative to be set up, a thorough and rigorous identification process must be carried out. The purpose is to ensure that identification is objective and rigorous and, in this way, enhance the credibility of Joint Technology Initiatives as an innovative mechanism for supporting industrial research. The identification and preparation is done through an industry led bottom-up process. The selection is based on the following criteria:

- strategic importance of the topic and presence of a clear deliverable;
- existence of market failure;
- concrete evidence of Community value added;
- evidence of substantial, long-term industry commitment;
- inadequacy of existing Community instruments.

JTI implemented by the legal entity JU established under art. 187 is, in principle, an extension of ETP. While ensuring stronger and longer-term commitment of all stakeholders, it is administratively heavier, requires a separate legal entity and is less flexible than ETP or the later introduced cPPP.

Decision launching new JTIs is made at the Council of Ministers based on a Commission proposal. Commission is a founding and full member of the JU board. It has veto rights to all major funding decisions. Funding is allocated to projects typically through open calls¹¹.

The European added value of JTIs should materialise in the form of:

- achieving critical mass;
- increasing higher leverage of community funding;

¹⁰ As indicated by the offer and instructions how to join found on their websites

¹¹ Some JTIs have also calls restricted to partners, e.g. Shift2Rail up to 70% is allocated to members (<https://shift2rail.org/participate/call-for-proposals/>), and in Clean Sky 2 40% of then budget is allocated to leaders (<http://www.cleansky.eu/sites/default/files/inline-files/CS-GB-2016-12-16%20Amended%20WP%20and%20Budget%202016-2017.pdf>)

- community funding and other (legal, standards, procurement, etc.) instruments having an important role facilitating implementation of the strategic agenda;
- having impact on community policy objectives (e.g. health, safety, environment, etc.)

While allowing the stakeholders in the Joint Technology Initiative a significant degree of autonomy in relation to the implementation of research activities, the structures should promote transparency, co-operation among existing stakeholders and openness to new stakeholders who could add value to the endeavour, while also avoiding creating conflicts of interest¹².

There are currently 7 active JTI/JU with a total planned budget of €7.253 billion during Horizon 2020:

- Shift2Rail (S2R, rail transport)
- Innovative Medicines Initiative (IMI2)
- CleanSky2 (aero industry)
- Fuel Cells and Hydrogen (FCH2)
- Electronic Components and Systems for European Leadership (ECSEL)
- Bio-Based Industries (BBI)
- Single European Sky ATM Research (SESAR, air transport)

2.1.2.3 Contractual Public-Private-Partnerships (cPPP)

Initially launched as part of the European Economic Recovery Plan in 2008, the three research PPPs on Factories of the Future, Energy-efficient Buildings and Green Cars had proved that they can help innovate key industrial sectors. As broad, cross-sectoral initiatives, they are also ideally positioned to advance the breakthrough research required to address major societal challenges, economic growth and job creation.

Under the Seventh Framework Programme (FP7), 366 projects were launched within the three PPPs included in the Recovery Plan. These projects involved 4 409 participations by research teams and received a total combined investment – from the EU and from the private side – of €2.4 billion. The PPPs are continuing under Horizon 2020 in the form of contractual Public-Private Partnerships, and were joined by a new PPP on Sustainable Process Industry.

The Final Assessment of the Research PPPs¹³ found that:

- PPPs have been inclusive: participation of organisations not belonging to industrial research associations was around 75 % and they received around 70 % of the EU funding available.
- PPPs have had a better leverage effect for private investment, and have boosted industrial participation compared with the standard FP7 programme (57 % in the PPPs versus 34 % in FP7 programme).
- PPPs have proved useful in strengthening European value chains and in particular giving a role to SMEs (which accounted on average for 25 % of project partners).
- The efficiency of the calls was significantly improved, particularly with respect to success rates and shorter time to grant.

cPPPs were established as a more flexible tool to complement the administratively heavy JTIs (18-month legislative process to establish a JTI). Contractual PPPs follow the Horizon 2020 rules and procedures, with industry providing key advice on research priorities. The contractual arrangement forming the basis for each contractual PPP is signed by the European Commission and representatives of the respective industry grouping. It specifies the partnership's objectives, commitments, key

¹² Joint Technology Initiatives: Background, State-of-Play and Main Features, Commission staff working document, SEC (2007) 692, 15.05.2007

¹³ The Final Assessment of the Research PPPs in the European Economic Recovery Plan, published in June 2013

performance indicators and expected outputs. Each contractual arrangement mentions an indicative budget, although formalisation is only done through the Horizon 2020 work programmes. EU funding is expected to be in the region of the support received under FP7, with the following budgets tentatively earmarked:

- €1 150 million for Factories of the Future
- €600 million for Energy-efficient Buildings
- €750 million for European Green Vehicles Initiative
- €900 million for Sustainable Process Industry
- €700 million for 5G networks for the Future Internet
- €700 million for High Performance Computing
- €700 million for Robotics
- €700 million for Photonics
- €500 million for Data

These nine EU contributions would add up to a combined amount of €6.7 billion. Industry has pledged to complement these amounts with private investment; with related activities included, a leverage factor of three to five times the level of public funding is anticipated.

Based on a contractual agreement, where the Commission commits to long term public investment in research and innovation in a given field defined by the cPPP. cPPPs are consulted during the preparation of annual work programmes. Projects facilitated by cPPPs are funded from normal Horizon 2020 thematic calls. Projects may also apply funding from other sources.

The fundamental rationale is to increase private investment in research and innovation.

2.1.3 Other partnerships

2.1.3.1 Future Emerging Technologies Flagships (FET)

With the FET Flagships, the EC started a new partnering model for long-term European co-operative research. The FET Flagship Model is the implementation and Governance Model for the Flagship projects in Horizon 2020. The FET Flagship Staff Working document published by the EC DG CONNECT sets out the working arrangements and governance for the two Flagships.¹⁴ These should be about visionary, science-driven, large-scale research initiatives addressing grand Scientific and Technological (S&T) challenges. Two topics Human Brain Research and Graphene were selected through a consultation process and competitive calls.

The funding tool used is a Framework Partnership Agreement. This model is based on the combination of a large Core Project playing a leading role for the whole duration of the initiative and a set of Partnering Projects. In this model, the research community drives the process of defining and selecting the grand challenge of the Flagship, and developing the related research roadmap. Half of the Flagship budget will be invested by the Commission into the Core Project, while the Commission expects that the other half will be invested by the MS and private funding sources into Partnering Projects. Flagships are expected to run for about 10 years, with a budget of around 100 million Euros per year per Flagship. FET Flagships differ from other P2P initiatives in that they are science-driven research initiatives that are led by scientific communities, while the industrial participation is expected to build up over the duration of the Flagships.

¹⁴ European Commission, FET Flagships: A novel partnering approach to address grand scientific challenges and to boost innovation in Europe, Commission Staff Working Document, 2014, Brussels

2.1.3.2 European Institute of Technology (EIT) Knowledge and Innovation Communities (KIC)

The EIT was launched in 2008 with the aim to bridge the gap between the research-focused universities and market-oriented companies. The EIT had an integrated approach to the knowledge triangle to promote innovation and entrepreneurship. It is not primarily set up as a P2P instrument. Managed by a central hub in Budapest with a separate agency status that is governed as decentralised body that gives grants to KICs. At the European Commission EIT is managed by DG EAC rather than DG RTD because of the strong education angle. It was not originally integrated in the FPs until H2020.

Knowledge and Innovation Communities (KICs) are autonomous partnerships of higher education institutions, research organisations, companies and other stakeholders, involved in the innovation process in the form of a strategic network on a defined topic. The EIT is set up as an independent EU body by the European Parliament and the European Council. Member States do not have an official role in the governance of EIT. Although supervised by DG EAC, it was intended to be independent from the European Commission in the implementation of its activities. The EIT defines a Strategic Innovation Agenda (SIA) where it selects the topics for which Knowledge and Innovation Communities (KIC) are to be established. These were top down decisions by EIT - after an extensive consultation process - although the domains are quite close to key topics in the FPs. The EIT does need to have their five-year Strategic Innovation Agenda - which selects these topics - approved by the European Parliament and the European Council. Once approved, the EIT opens a call for proposals and selects, for each topic, the best partnership to form the KIC. It then oversees the activities of the different KICs.

Each EIT-KIC has its own governance model and are separate legal entities. EU funds from the European Institute of Innovation and Technology are provided to the KICs based on a long-term Framework Partnership Agreement between the EIT and the KIC Legal Entity. The EIT funding is provided annually to each KIC through a specific grant agreement that includes basic support funding (similar for all KICs), and competitive funding based on the results of the KIC performance assessment and future objectives.

In practice, the EIT-KICs became networked initiatives with local, regional and national partnerships. There is no formal framework or rationale and each KIC has chosen quite differently. For national governments, there is no formal channel to get into a partnership with a KIC.

In the first two years (2014 and 2015) of H2020 the EU contribution allocated to EIT was €444 million. In 2014 €218 million was allocated to the first three KICs.¹⁵

2.1.3.3 Joint Programming Initiatives (JPI)

The Joint Programming Initiatives (JPIs) stem from the Joint Programming Process, one of the building blocks of the European Research Area (ERA) launched in 2008 as a result of the aforementioned Green Paper on ERA. Its aim is to tackle grand societal challenges through more efficient use of resources, by the alignment of funding at national level and through decreasing fragmentation. In a structured and strategic process, Member States agree, on a voluntary basis and in a partnership approach, on common research and innovation priorities and they implement Strategic Research Agendas (SRA) together. Ten Joint Programming Initiatives (JPIs) have been launched to date. They have established their own governance structures and have elaborated their SRAs, or are in the final stages of their preparation. In comparison to the ERA-NETs it is expected that JPIs have high level political commitment, with decision makers who have an influence on national budget allocations. Commitment is also expected for a longer time frame than the ERA-NETs that commit themselves for at least one joint call.

The top-level governance is set by the High-Level Group or GPC which is founded by the European Research Area Committee (ERAC) that assists the European Commission and the European Council. This GPC sets the overall strategic direction and was responsible for the choice of the first ten topics.

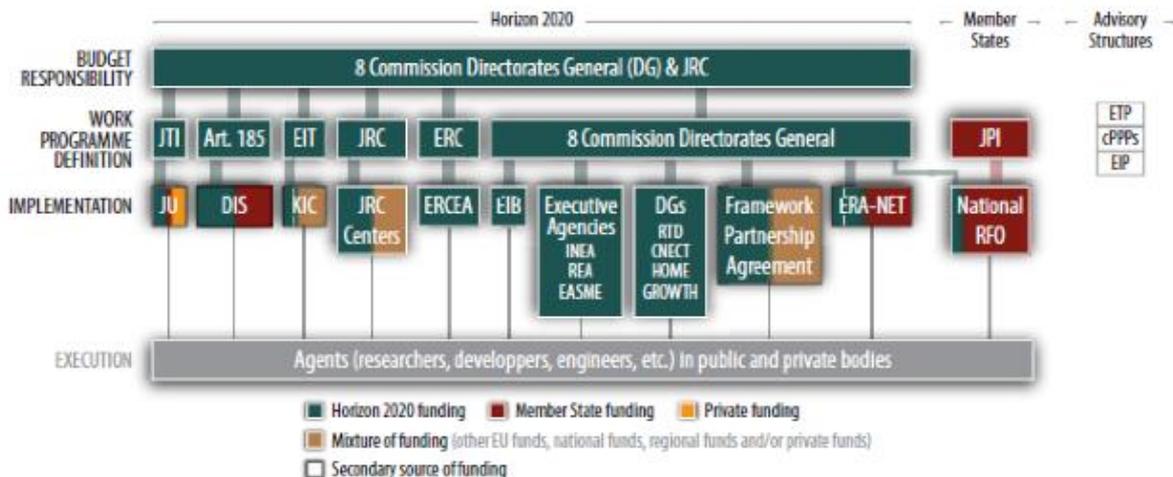
¹⁵ H2020 Annual Monitoring Report 2014 and 2015

The European Commission has an observer role and is less hands on involved as with other P2Ps in the strategic decision making. The funding for JPIs was initially mostly focused on supporting the management costs of the JPI networks. With the current ERA-CoFund instrument the European Commission can support JPIs or combination of JPIs with selected joint calls. So far in 2014 and 2015 the Commission has supported specific calls for JPND, FACCE, Water, Healthy Diet & Healthy Living, Urban Europe and Climate through the ERA-CoFund instrument. The JPI Co-fund calls had a budget of around €42 million.¹⁶

2.2 Positioning and funding of partnerships within Horizon 2020

A 2015 report by the European Parliamentary Research Service provides one of the few clear overviews of the implementation of H2020¹⁷, the many different bodies involved in its implementation and the large suite of instruments in operation. The following Graph gives an overview of this for the complete H2020. In the context of partnership programmes, it shows that JTIs, Art 185s, EIT and JPIs have a separate body that is involved in defining the work programmes. FETs and ERA-NETs are managed by 8 different Commission Directorates General. ETPs, cPPP and EIPs are Advisory structures that operate outside the implementing bodies. Member States have a role in the Article 185 Dedicated Implementation Structures, the ERA-NETs and particularly in JPI.

Figure 2 Overview of Horizon 2020



Source: EPRS, based on European Commission data.

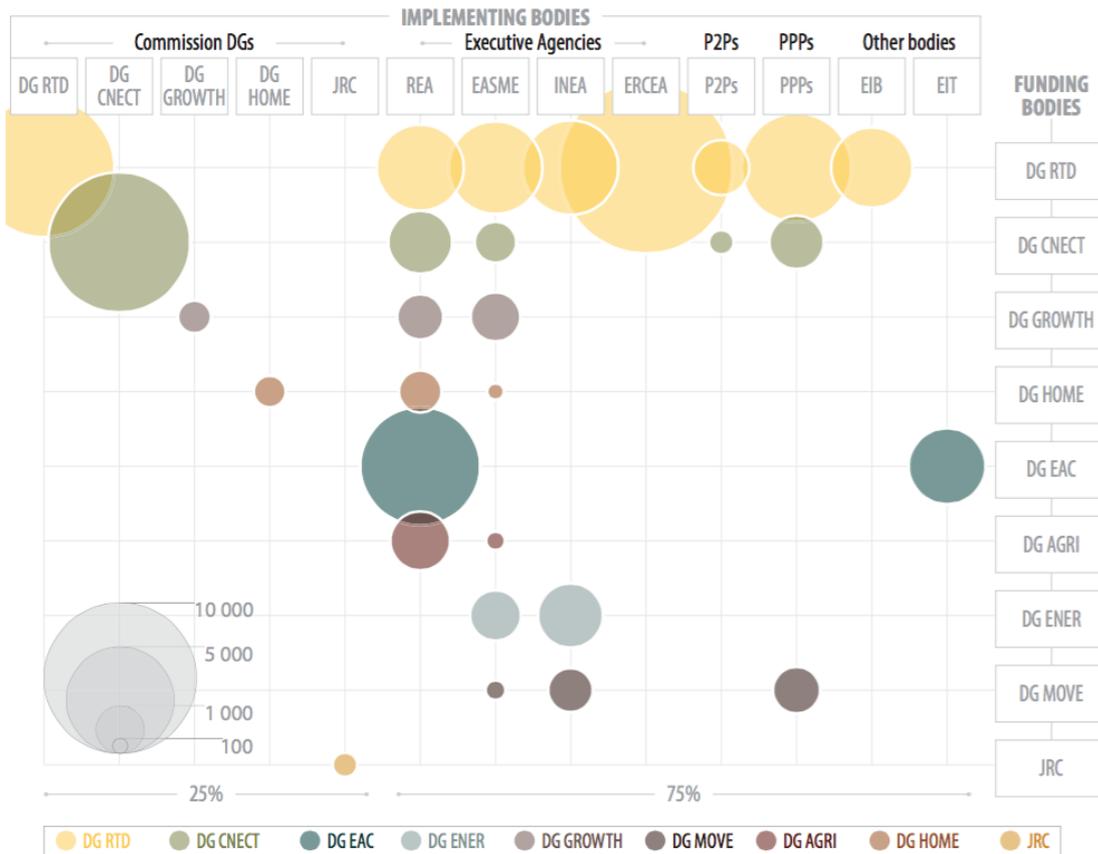
In terms of funding, the entire Partnership instruments are estimated to capture roughly 25% of the total Horizon 2020 budget¹⁸. However, only 16% of Horizon 2020 budget is earmarked for specific partnerships, while the rest are estimated budgets for projects initiated by partnerships (9%), including ERA-NET, JPI and EJP co-funding (<1%). The PPPs managed by DG RTD clearly receive the largest budget. The three directorates general involved in P2Ps and PPPs are DG RTD, DG CONNECT and DG Move. EIT is as mentioned managed by DG EAC due to its attention to higher education.

¹⁶ ERA-Learn 2020, 2nd Annual Report of Public-Public Partnerships, 2016, page 10.

¹⁷ http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/571312/EPRS_IDA%282015%29571312_EN.pdf

¹⁸ For details, see Figure 8

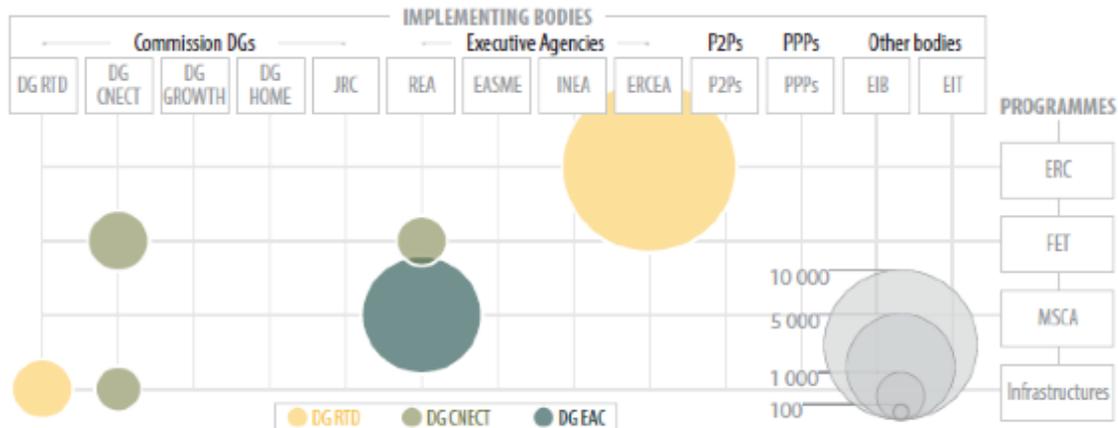
Figure 3 Estimated Horizon 2020 breakdown between the implementing bodies (€million)



Source: EPRS, based on European Commission data.

The EPRS report also describes the allocation of H2020 funding and P2Ps¹⁹ and PPPs²⁰ to different Pillars and societal challenges. In Pillar 1 Excellent Science has the FET Flagships as only P2P.

Figure 4 Pillar I Excellent Science H2020 budget (€million)



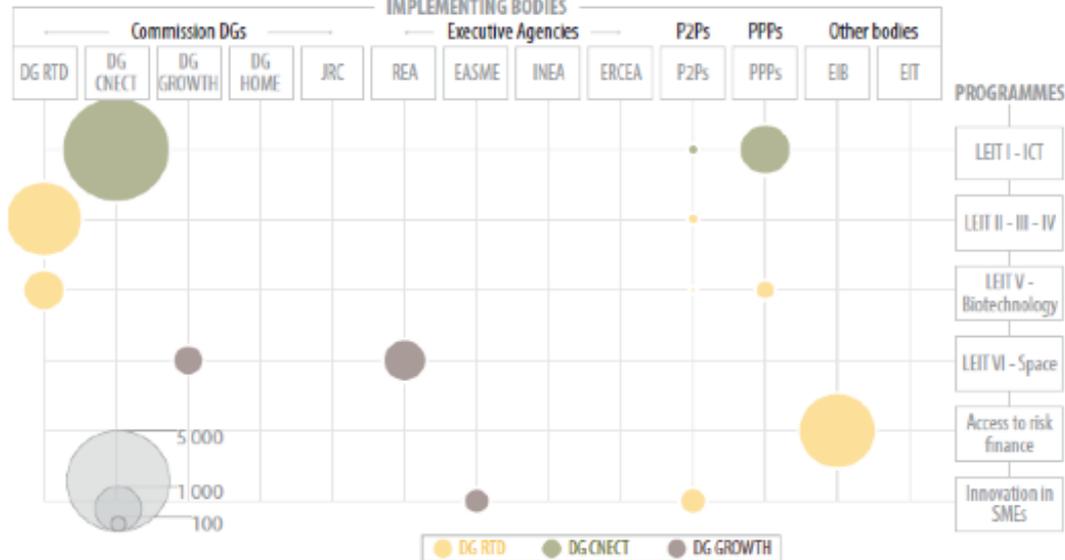
Data source: EPRS, based on European Commission data.

¹⁹ P2Ps in the EPRS report refer only to formal contractual P2Ps, i.e. Art 185s. ERA-NETs are managed from the DG RTD budget. FET flagships are depicted separately in Figure 4. Other P2Ps are identified as advisory structures.

²⁰ PPPs in the EPRS report refer only to formal contractual PPPs, i.e. JTIs. ETPs and cPPP are identified as advisory structures as they have no earmarked budget allocations.

In Pillar II Industrial Leadership the largest budgets are allocated to the PPPs in ICT. The P2Ps for SMEs (Eurostars) and other areas are extremely small.

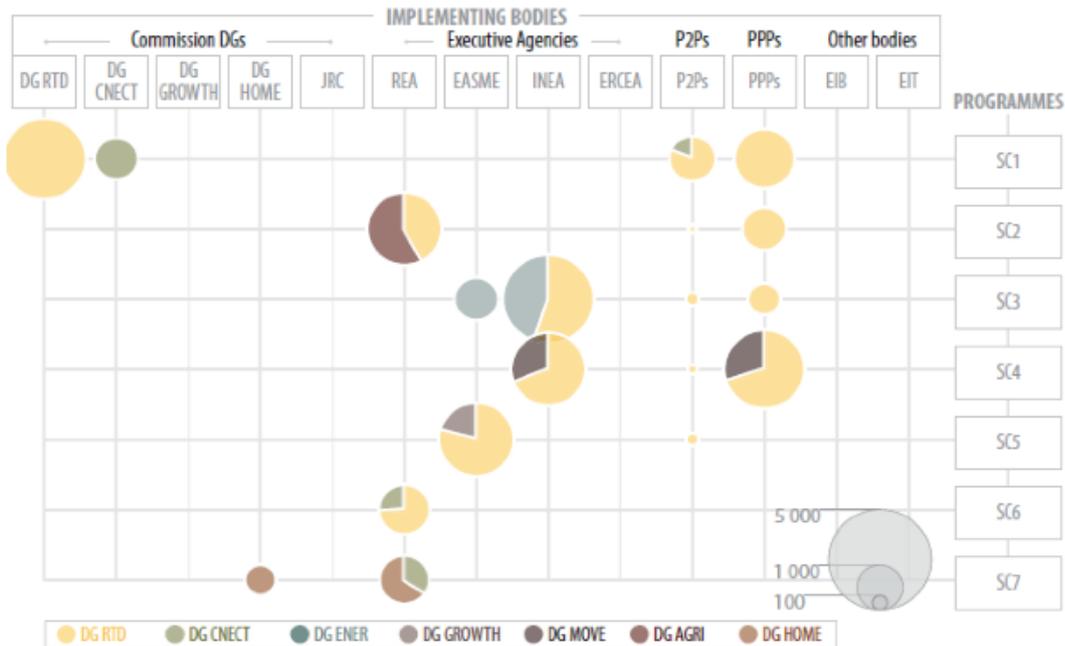
Figure 5 Pillar II Industrial leadership H2020 budget (€ million)



Source: EPRS, based on European Commission data.

The picture is more diverse in Pillar III which shows considerable budgets in Health (SC1) both in P2Ps and PPPs (e.g. IMI). However, the largest partnership funding is in Transport (SC4) with funding from both DG RTD and DG Move. Food (SC2) and Energy (SC3) are the other two areas with some PPP budgets. The P2P budgets for Food, Energy, Transport and Environment are relatively very small. Inclusivity (SC6) and Security (SC7) have limited funding through partnership instruments with a small number of ERA-NETs on gender equality (1 in Fp7 and 1 in H2020), safety (1 in Fp7) and security (1 in FP6 and 2 in FP7).

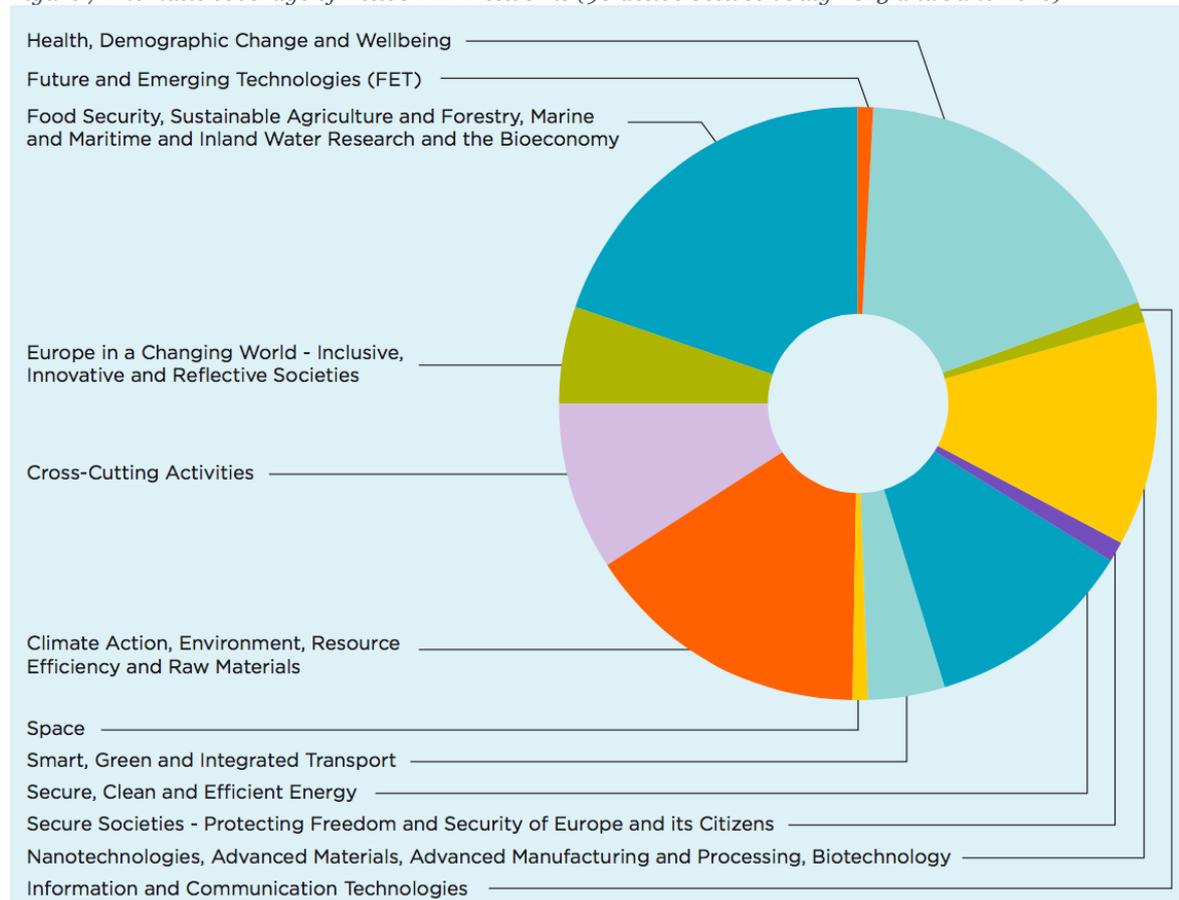
Figure 6 Pillar III Societal Challenges H2020 budget (€million)



Source: EPRS, based on European Commission data.

If we zoom in on only the ‘joint programming’ P2Ps (ERA-NETs, JPIs and Art 185s) a more diverse thematic pattern emerges, with Health (SC1) and Food (SC2) as the big themes and attention to all other SCs and cross-cutting activities.

Figure 7 Thematic coverage of Active P2P Networks (90 active between July 2015 and June 2016)



source: 2nd Annual Monitoring Public to Public Networks, page 13

2.3 Conclusions

- The rationale of the P2P instruments, and particularly the ‘joint programming’ instruments ERA-NETs, Article 185s and JPIs are basically the same: to reduce fragmentation in the European research funding landscape, to address societal challenges with a larger critical mass and to align strategic research programming at EU and national level. The difference between these instruments are the implementation and governance models (and consequently their levels of bureaucracy), the degree of (financial) commitment of the stakeholders involved and the timeframe of the agreements.
- In ERA-NETs, Article 185s and JPIs the research funders and policy makers are the key stakeholders involved in setting agenda’s, identifying the bigger themes and defining the calls. Public research performers are the main beneficiaries. The private sector is hardly involved in any of these instruments. In considering harmonisation and simplification for FP9 this set of instruments could be reviewed to see their respective European Added Value.
- The FET Flagships are unique in the sense that the scientific community is in charge of most of the research programming and definition of the calls. They differ from the mainstream EU projects due to their scale and longer time frame.
- The EIT instrument is unique in its focus on entrepreneurship, start-ups and education rather than on funding research. In this sense, it has little overlap with the P2Ps or PPPs. The synergy with other P2Ps is consequently not well developed.

- The rationale for the public-private partnerships is fundamentally the same, even though the emphasis has slightly changed over time. With the ETPs, the rationale originated from concerns for Europe's global competitiveness and highlighted the need to close the gap between industry and science, increasing the scale and impact of research investment, enhancing the co-ordination of research in Europe and raising the technology content of European industry. The rationale for JTIs is basically the same, although it further emphasises longer term commitment and higher leverage on private R&D and innovation investment. With the contractual PPPs, the rationale focuses on increasing private investment in R&D and innovation.
- The difference between public-private partnership instruments is clear in the formal sense, but less clear in practical impact. ETPs and cPPPs are primarily industry led platforms which focus on establishing a joint strategic R&D and innovation agenda. This agenda is introduced to the Commission and has an impact on the contents of the future Framework Programme thematic calls (work programme). The other main function of the platform is to facilitate networking and preparation of consortia for future calls. The only significant differences between ETP and cPPP seem to be in the decision-making processes and in the formal relationship between the partnerships and the Commission. The JTIs differ from ETPs and cPPPs both in legal set-up and in mandate. However, it is not clear whether the stronger legal framework and earmarked Commission funding can be argued and justified by higher added value, which might be expected from the JTIs compared to ETPs and cPPPs. Furthermore, there doesn't seem to be a clear separation between thematic areas covered by JTIs and cPPPs with respect to the time scale and level of challenge, although one might expect JTIs to cover the more challenging and longer-term topics (rationale indicates that they exist for that particular reason). The mere decision to establish cPPPs as a new operational modality would indicate that the JTIs were not seen as sufficiently effective instrument. On the other hand, there is hardly any thematic overlap between cPPPs and JTIs.
- Several public-private partnerships focus and claim to address societal challenges in addition to industrial needs and opportunities. However, the current modalities (open calls for projects) don't seem to support the development of more systemic innovative solutions for societal challenges. Especially longer-term more stable partnerships should systematically and resolutely develop large scale experimental real-life environments, which would allow the testing and demonstration of radically new systemic innovations. These environments could act as platforms for developing new generation innovative products and services. JTIs would in principle be best suited for such a purpose. However, there is no evidence that they would have or would plan to take this role.
- In terms of themes and domains P2Ps focus mostly on societal challenges with hardly any private sector involvement, and PPPs focus on domains of interest to industry (transport, ICT). Despite the fundamentally different approach, both address research topics relevant for addressing societal as well as industrial challenges. However, there doesn't seem to be any definite intention or systematic action to forge a link between P2Ps and PPPs to capture the potential synergies.
- In relative terms the budgets for the partnership instruments in the bigger context of H2020 are modest. The cumulative investments in all P2Ps has clearly grown, but this includes investments from the Member States. EU funding has thus had a leverage effect. With current data, it is not possible to assess whether this has been additional money for the P2P domains or a reshuffling of existing (national) budgets.
- According to the 2nd annual report on P2Ps²¹, the share of EU-13 countries of P2P funding is around 8%, which is almost twice the share of EU-13 of the total R&D investments in Europe (4,5% in 2015)²². While data is not available concerning EU-13 share of PPP funding, it may be expected to be at similar levels, probably closer to 5% as industry share of total national R&D investments is typically lower in EU-13 countries compared to EU-15. Levels above 5% would

²¹ ERA Learn 2020, 2nd Annual Report on Public-Public Partnerships, November 2016

²² Total intramural R&D in Europe was €299billion in 2015, of which EU-13 covered €13,5billion, for further details see http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_research_and_development

indicate that the partnerships are contributing to the widening of participation, even though it is not among their main objectives.

3 Benefits and impact of partnerships

3.1 Public-to-Public Partnerships

The public-to-public partnerships (P2Ps) were formed with the idea to improve collaboration in research and overcome fragmentation of public research efforts with the commitment to improve societal challenges. The P2Ps are made up of ERA-NETs, Article 185, Joint Programming.

3.1.1 ERA-NET

The **positive results and potential benefits** of ERA-NET were mainly an improvement in the quality of research activities and innovation system which brought about an increased visibility of certain previously unnoticed research areas. This was also useful for improving country scientific and technological capabilities as well as increased collaboration with countries thereby making it possible for countries to have access to research expertise from other countries leading to an overall improvement in their scientific and technological capabilities.

The **concerns** with ERA-NET were that there was obvious duplication of efforts in spite of the benefits and a lot of fragmentation. The ERA-NET annual report revealed that there was weak in-country coordination across the different ministries and research agencies, as well as challenges with alignment in P2P research generally. There were problems with understanding what this alignment should actually look like and how it should function and there were no clear funds set aside for the alignment process.²³

3.1.2 Article 185 Initiatives

The article 185 initiative was found to have a **positive effect** on the reduction of fragmentation. In addition, the fact that a substantive mass of research and innovation activities are being created contribute to the positive outcomes.

Here again it was noted that the Art. 185 initiative has **challenges** with gathering political will to back the programme and with achieving the desired transnational funding that it requires.

3.1.3 Joint Programming Initiatives (JPI)

Tackling societal challenges can be seen as the broad goal for the JPIs, with some of the major **positive results** of the joint programming being the high level of commitment of members and the involvement of stakeholders especially the end users. The long-term perspective outlook, combined with the common strategic agenda and different types of actions all lead to the positive reported results. The long-term perspective and the research to policy mechanisms are further benefits.

The partnerships have been found to have challenges with achieving a uniform national inter-ministerial structure, there is a lot of bureaucracy that is affecting progress, not enough financial investment in spite of high management costs and it was noted that “*the Joint Programming Process does not yet have sufficient commitment from national stakeholders to achieve its potential.*”²⁴

²³ ERA Learn 1st Partnerships Report 2015 <https://www.era-learn.eu/monitoring-and-assessment/Monitoring-and-impact-assessment-of-networks/ERALEARN2020AnnualReportonP2PPartnershipsNo.1FINAL.pdf>

²⁴ Evaluation of Joint Programming to Address Grand Societal Challenges Final Report of the Expert Group Available from: https://www.era-learn.eu/.../joint-programming.../JP_evaluation_final_report.pdf

3.1.4 European Innovation Partnerships (EIP)

The EIPs work towards providing an opportunity for collaboration between the public and cooperate sectors by focusing on linking research and innovation. They have **fostered** the diffusion of good practices and allowed cross-fertilisation between sectors, and they have leveraged capacity to map markets in order to identify new opportunities for innovation diffusion. As has already been mentioned previously they do not bring in any new funding although some H2020 funded projects address the priorities of the EIP themes.

There were **problems** with cohesiveness, structure and proper links between the different sectors and with the execution of some of the EIPs. A lack of quantitative measures and difficulty in keeping track of results and the impact of these results was noted as well as the need for a monitoring framework for some of the EIPs. The frequency and regularity of governance meetings was also cited as a problem.

An interim evaluation of the implementation of the Innovation Union Flagship Initiative and of each one of its 34 commitments by a consortium composed by Ernst & Young, Open Evidence and Wuppertal Institute set up a tracker innovation website in 2013 that shared the above information as well as listed some further concerns according to the different EIPs below.

Active and healthy ageing - had a difficulty in scaling up good practices due to sectoral protection and as the pioneer had to experience and learn first-hand the hard way how to best set up an innovation driven framework and how to remain relevant as well as adaptable in the market.

Water –There is a paucity of EC resources both for working on the EIP and for providing support to stakeholders and this causes some frustration especially the lack of political support.

Agricultural productivity and sustainability – there have been challenges establishing links between regional funding (smart specialization) and programming and in some instances some groups have not wanted to work together on projects.

Raw Materials – lack of a public procurement tool and differences among member states, “in terms of legislation, procedures, industrial conditions related to Raw Materials” and varying commitment between some member states and “Difficulties and problems related to voluntary commitments: it was not easy to explain the link between commitments and funding, that is not obvious and the funding was not guaranteed, and when some stakeholders with voluntary commitments did not receive funding they were not very satisfied”²⁵

3.2 Public-Private Partnerships

3.2.1 ETPs

The objective of reducing the fragmentation of research in Europe has been **achieved** by increasing the collaboration and coordination between the industry, researchers and other relevant stakeholders on research and technology development in Europe. There is also a shared vision and clear definitions of the implementation and deployment plans and the involvement in debate of national authorities on the research priorities.

The **concerns** were centred around the high skilled workforce and how to retain them as well as identifying future training needs and providing the needed training as at when due. There are also various barriers including regulatory ones that impede the use of technologies, and those need to be addressed.²⁶

²⁵ <http://www.open-evidence.com/innovation-union/commitment.html?id=29>

²⁶ Evaluation of the European Technology Platforms (ETPs) final report 2008, https://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/evaluation_studies_and_reports/evaluation_studies_and_reports_2008/evaluation_of_the_european_technology_platform_2008.pdf

3.2.2 JTIs

Industry partners and researchers express very **positive** views on this public private partnership which has as a main focus tackling the major societal challenges. A common research agenda is implemented and there is a large emphasis on partnerships and collaboration to ensure that EU remains competitive and a leader in innovation and technology. According to the report by the Sherpas Group 2010 regarding the Clean Sky project ‘For the first time the whole aeronautical community is working together in one programme, with common targets’²⁷ JTIs are a good instrument for strengthening the industrial base of Europe by connecting the European eco system to global companies and by encouraging good quality industry led research.¹⁹

To remain ahead the JTIs need to be able to respond quickly to developments in technology and innovation but are not always able to do so due to the checks and balances that surround them¹⁸ and there have been some **concerns** that there is not enough visibility surrounding the JTIs ‘sort of like closed clubs’ but there is no clear evidence supporting this.

Despite the requirement to be open for new stakeholders, JUs don’t seem eager to attract new partners. For example, they don’t provide any information on their website on how to apply or become a member. Furthermore, JUs don’t publish information about allocation of funds (by type of participant and by country) in their annual monitoring reports, even though that is a clearly stated requirement in the legal statutes establishing each Joint Undertaking.

3.2.3 Contractual Public Private Partnerships (cPPP)

The contractual public private partnerships cPPPs have **achieved** more activities and more, close to market projects than regular EP7 projects. There is more industry participation across board and the shorter grant times and the success rate have been credited with an increased participation by SMEs.

However, **challenges** have also been identified. There needs to be more transparency and openness of the workings of the cPPP so that there is a clear understanding of all the roles and how the processes function. There also needs to be more cooperation between the industry and research infrastructures to remain in the fore front of innovation and technology. There needs to be better knowledge management and dissemination of information and better engagement from new member states.

In the Final assessment of the research PPPs in the recovery plan 2013 report centred on the Factories of the Future Energy-efficient Buildings and European Green Cars Initiative **recommendations** were outlined that are useful and relevant for all the cPPPs. The recommendations range from formalizing the governance model of the research PPP to have a clearer idea of the roles of the public private groups and to have more streamlined ease of entry for the industry. There should be sufficient funding and focus on strengthening innovation activities and getting the European based product to markets. Finally raising more awareness about the PPP especially to SMEs.²⁸

3.3 Other partnerships

3.3.1 Future Emerging Technologies (FET)

The Future Emerging Technologies projects have **succeeded** in churning out a high number of good quality scientific publications and have exceeded the indicator targets that they set out to achieve. The FET research is mainly focused on the ICT programmes and they go a step further by working with different disciplines to work on novel research concepts and innovation.

²⁷ Designing together the ‘ideal house’ for public-private partnerships in European research JTI Sherpas’ Group, http://ec.europa.eu/research/jti/pdf/jti-sherpas-report-2010_en.pdf#view=fit&pagemode=none

²⁸ FINAL ASSESSMENT OF THE RESEARCH PPPs IN THE RECOVERY PLAN 2013 Factories of the Future Energy-efficient Buildings European Green Cars Initiative, <http://www.kowi.de/en/Portaldata/2/Resources/horizon2020/coop/cPPP-final-assessment.pdf>

The **challenges** that have been observed are mainly with the transparency and openness of the partnerships in the flagship selection process and the mechanisms used to link to national initiatives. Because of this the EU added value of the flagships is not easily demonstrated as there are challenges with linking funded research initiatives to the flagships and as the flagship instrument has a dual purpose which is the both the pursuit of high quality science and impactful innovation then further clarification is needed on streamlining this dual purpose.²⁹

3.3.2 European Institute of Technology (EIT)

As the main aim of the EITs was a European level integration in the areas of entrepreneurship, innovation and education, it can be **credited** with a large number of innovative start-ups.

Issues surrounding the right for EIT to choose its own projects³⁰, the need to become financially independent and thus sustainable and the fact that there are predetermined models involving a Knowledge and innovation community in each field are some of the challenges that EITs face. The lack of a formal framework for choosing the KIC and no formal channel for governments to form the partnership with the KIC are further issues. Added to this were the rather complicated, cumbersome and strict reporting that the EIT and KICs demanded.³¹

According to a special report, The European Institute of Innovation and Technology must modify its delivery mechanisms and elements of its design to achieve the expected impact, 2016, the following **problems** were outlined

- The practical arrangements between the EIT and the KICs, such as the procedures for EIT grants to the KICs, are ill suited given the nature of the innovation activities the EIT aims to support.
- The financial sustainability of the KICs is doubtful. Businesses are not involved enough in the KIC activities even though their participation was a prerequisite for the EIT to be successful. EIT funding is concentrated within a few countries and a limited number of KIC partners.
- The performance indicators and the monitoring and reporting processes do not provide an informative picture of results and impacts.³²

Recommendations according to “The Future of the European Institute of Innovation and Technology (EIT) Strategic Issues and Perspectives Report by Commissioner Navracsics' High Level Group on the EIT” were listed as follows:

- The EIT’s future activities can thus remain focused on goal-driven innovation to address societal challenges, and on its strategy to integrate education, business and research.
- In addition, the EIT should – rather than working as a lone institution – become increasingly embedded in the broad future EU innovation ecosystem.
- In synergy with the other innovation support efforts in Europe (like Eurostars, FET-Open - Future and Emerging Technologies, and the SME-instrument), the EIT should strive to deliver a ‘pact for ‘breakthrough innovation’, in order to allow the EU to better address its various social, economic and cultural challenges

3.4 Conclusions

Based on the benefits and impact, and the weaknesses described in the previous chapter, the P2P partnerships have only been partly able to reach their objectives. There seems to be some positive

²⁹ <https://www.kowi.de/Portaldata/2/Resources/horizon2020/H2020-FET-Flagship-Instrument-Interim-Evaluation.pdf>

³⁰ see Chapter 2.1.3.2 for more details on how EIT manages KICs and project funding.

³¹ The Future of the European Institute of Innovation and Technology (EIT) Strategic Issues and Perspectives https://ec.europa.eu/education/sites/education/files/eit-hlg-final-report_en.pdf

³² Special report: The European Institute of Innovation and Technology must modify its delivery mechanisms and elements of its design to achieve the expected impact, 2016 http://www.eca.europa.eu/Lists/ECADocuments/SR16_04/SR_EIT_EN.pdf

impact on reducing fragmentation. However, several partnership instruments and partnerships suffer from lack of political and high-level commitment and support. This may be partly explained by lack of alignment between national objectives and measures, and partly by lack of coordination at the national level (between authorities). The P2P partnerships often seem to function in isolation with limited interaction with other relevant initiatives (other partnerships in similar or neighbouring thematic areas).

It can be argued that the partnerships facilitate developing critical mass around relevant thematic areas. However, as the partnership landscape is rather complex with several different instruments and topics, the remaining fragmentation is likely to dilute the potential impact. Most of the P2Ps are research driven, which has resulted in rather limited industry participation. Emphasising industry (and society / societal actor) participation and economic (and social) impact in monitoring and future funding decisions could help focus the P2P partnerships better. Being more explicit about the eventual objectives could also help fix the necessary political and high-level commitment and support.

Despite the original ERA and the later Horizon 2020 objectives as well as competitiveness and innovation related objectives partly coming from the economic crisis, the operational modalities still mostly rely on the traditional thematic calls for projects. Especially with respect to more systemic reforms and innovations – such as those needed in addressing societal challenges or capturing the full potential and leadership in areas such as Industry 4.0 – the traditional approach based on calls for projects is not likely to result in major impact. Partnership instruments are a tool that could and should be used to establish ambitious new innovation environments facilitating the development of new experimental platforms, which would allow the development, testing and demonstration of radically new platforms – platforms, which facilitate the development of new and innovative products and services. This requires the development and adoption of new types of approaches, activities and projects constellations, as well as integration of demand side policy measures (smart regulations, standards and norms, procurement, etc.).

ERA-NET, JPI, art 185 and EIP have lots of similarities with respect to the fundamental rationale and objectives, but also in the problems these partnerships face. It would seem viable to consider the possibility of replacing these with two partnership instruments, one flexible model based current ERA-NET and JPI (and partly on EIP), and another requiring much stronger commitment based on art 185 and EIP. The former would be viable for facilitating flexible variable geometry cross-border collaboration and alignment between Member states. It would be administratively quick to set up and afterwards dissolve. The latter would require a more formal collaborative arrangement and much stronger and high-level commitment. It would also require adoption of the new modalities suggested in the previous paragraph in view of developing new innovation environments. The more formal instrument would need to forge collaboration across ministries and Commission DGs, and extend from project funding to demand side instruments.

EIT and FET both face specific challenges relative to their nature. However, the common challenge for both is their relation to industry and their ability to attract companies. This relates to both existing leading companies and to creation of new innovative startups. EIT needs to focus on the former (as there is already positive impact on startups), while FET needs to address both types of industrial partners.

The similar dual approach would seem viable also for the public-private partnerships. Merging the current ETP and cPPP concepts into a one single partnership instrument would seem to make sense. The resulting instrument should be industry led and focus on defining a longer-term joint strategic agenda, and acting as a facilitating and supporting platform. The other modality would be based on the current JTI type approach. However, instead of current project call-based approach, the partnership should extend, develop and adopt operational models and modalities that would allow them to be more ambitious and establish new and explorative innovative environments and platforms.

A similar dual approach in P2Ps and PPPs would increase coherence of the whole partnership instrument portfolio. However, it would not address the further challenge of linking research driven

and industry driven partnerships. While some companies and research organisations participate in several similar or neighbouring thematic partnerships, the link between these two types of partnerships seems to be quite weak. If the instruments can be developed to better address the respective objectives of the partnerships, the link is likely to become stronger naturally without significant external support. However, the link is likely to remain relatively weak even with external support, if the approach continues to rely on traditional project calls.

One possible approach to strengthen the link between research driven and industry driven European level activities is to adopt a mission-oriented approach. This approach refers to research and innovation activities designed for solving specific problems (or capturing specific opportunities). Missions should be based on a long term societal or industrial leadership agenda, and capture a wide range of instruments ranging from partnerships and collaborative projects to procurement of innovation, smart regulations, standards and norms, and various support measures to address and facilitate shaping and adoption of innovation. Mission orientation not only facilitates, but forces the alignment of resources and activities around a common concrete objective and strategy to achieve it. On a more practical level, mission orientation requires enhanced interaction between projects, interdisciplinary activities, integration between natural, technological and human sciences, as well as research and innovation activities, and engagement of societies, citizens and other end-users.

The structure of Horizon 2020 captures three dimensions. One is research driven, another is industry driven, and the third one is societal driven. Partnerships and modalities have been established to address the first two, but so far not much has happened in the third area. While EIPs and several other partnerships claim to address societal challenges, the practical level activities mostly rely on the approaches used in the first two dimensions. In order to truly address societal challenges, new types of society led partnership instruments should be considered. While in the longer term they should be based on a more formal structure, flexible approaches should be used in the beginning. On one hand, few societal actors have the necessary capabilities and experience in R&D and innovation to engage in long-term partnerships, let alone drive and manage them. On the other hand, sufficient commitment and high-level support is essential to seize the necessary leadership role and see activities all the way from research to adoption of innovative solutions in real-life context.

The evidence available in the various studies, reports and evaluations indicates some positive impacts and developments validating the underlying rationales and objectives. However, the impact seems mostly rather limited compared to the allocated resources and what would have been achieved without the partnerships (normal thematic calls and consortia projects). Hence, the limited additional European added value achieved through partnership instruments would indicate that the future of partnership instruments should be seriously considered in view of the next Framework Programme.

4 Processes for identifying, setting up and managing partnerships

4.1 Public-to-Public Partnerships and other partnerships

The P2Ps are relatively transparent in terms of how themes are chosen. ERA-NETS themes are identified in the Commission Work Programmes following consultations and discussed with representatives from the Member States in Programme Committees. As the demands for financial commitment for future ERA-NET calls gets stricter and more Member States are prioritising their involvement in partnership instruments, ERA-NETS proposals tend to be continuations of existing ERA-NETs rather than completely new ones. In the meantime, there is a well organised community of research funders that have to engage with the lobbies of existing ERA-NET stakeholders from the research community. The emergence of completely new networks and topics has halted. There is no clear policy agenda at the European level, to define what new topics should be pushed forward. Individual ERA-NETS are relatively open as long as national research funders can provide financial commitments. However, researchers from countries with a relative high level of institutional funding and little programmatic funding are structurally cut off from taking part in ERA-NETs. A similar pattern can be seen with JPIS. After the initial identification of topics through the GPC, the launching

of new JPIs has stopped for quite some years. The list of JPIs seemed to have something of interest to all countries. At the time, the GPC was criticised for not being selective enough and launching too many JPIs in a short time. As EC funding is involved H2020 participation rules and proposal evaluation criteria apply.

The identification of new Article 185s is less transparent nor coherent. The four existing Art 185s have had very diverse lobbies and high level political supporters to endure the long formal decision-making process involving the Commission, the Parliament and the European Council. The recent example of a new Art 185 PRIMA (in preparation) was mostly put forward through strong lobbying of high level national policy makers from the participating countries. Each Art 185 seems to have its own particular story how it came into existence.

The launch of FET Flagships (FFs) as a new partnership model came from one Directorate General in the Commission but the final decision on the projects was subsequently dealt with in all transparency, consulting stakeholders and international experts to assess the proposals of an open call. The FFs funding model is based on a Core Project with Partnering Projects. The Commission is expecting to fund half of the budget while the member and associated states are expected to fund the other half. Therefore, the Commission has set up for each FF a Board of Funders (BoFs) in 2015. Members are the participating countries and the European Commission. The BoFs is tasked with exchanging information on the overall direction and strategy of the FFs. The BoFs should discuss and plan the financial support for the FF. So with this funding model there is a strong interdependence between EC and member and associated states.

The preparation of a Quantum Technologies FF was announced in the Commissions European Cloud Initiative Communication Paper. New FFs are introduced in the work programmes and therefore member states do have some influence on their choice. As the initiatives are dependent on considerable funding from participating countries, their actual launch will depend on their appetite to co-fund them.

However how viable this instrument is in the future and whether Member States can initiate new Flagships is less transparent.

4.2 Public-Private Partnerships

Public-private partnerships are prepared and planned bottom-up by industry. JTIs and cPPPs have originated mostly from the large number of ETPs. After a negotiation between the industry consortia and the Commission, the partnership is either recognised by the Commission or taken into formal political decision at the Council of Ministers. New ones can be prepared and negotiated basically all the time. However, establishing a JTI and JU can take 1-2 years, which means new ones might be difficult to establish before FP9.

JTIs and the legal entities JUs are approved by the Council of Ministers based on Commission proposal. Commission carries out an Analysis of the "Economic and Social Effects" for each proposed Joint Technology Initiative. The selection criteria include additionality of funding, existence of market failure, governance and role of Member States. Commission is a founding and full member of the JU board. It has veto rights to all major funding decisions.

cPPPs are contractual arrangements between the industry consortia and the Commission. It seems that they have been at least partly politically motivated.

None of the PPPs go through a competitive process, i.e. partnerships aren't selected through a systematic and consistent analysis based on competition. It is not clear when and how new PPPs can be suggested or accepted, or how long a partnership is expected or is allowed to continue. The doesn't seem to be any process where specific poor performing partnerships could be dissolved, nor any related criteria.

Each JTI has specific measurable objectives and key performance indicators (KPI) allowing monitoring and evaluation. The indicators are defined in the European Council regulation for

establishing each Joint Undertaking³³. According to the same statutes, JUs are required to report annually about their activities (including a breakdown by participant type and by country), and progress towards the achievement of the objectives. The annual activity report should be made publicly available. However, the information regarding allocation of funding by type of participant or country is not made public in the annual activity reports of all JUs.

It is not clear what could happen to a partnership should it fail to reach its objectives. There doesn't seem to be any requirement for an exit-plan, i.e. plan how do scale down or dissolve a partnership³⁴. All focus seems to have been in launching new partnerships and lately to some extent also collecting data and analysing and evaluating the performance and impact of the partnerships.

Since the preparation process is bottom-up, national ministries and agencies are not always aware of the potential new partnerships. Access to public-private partnerships relies much on the companies' linkages to leading companies managing or at least having a central role in the process. Although the Commission encourages openness and transparency, they take limited action to ensure or enforce it. Hence, during the design stage, awareness and access may often be limited.

5 Conclusions and recommendations

5.1 Conclusions and concerns

Currently around 16% of the Horizon 2020 budget is allocated to the partnerships, and a further 9% is estimated to be allocated to projects initiated by the partnerships via Horizon 2020 annual work programme calls or as co-funding for P2Ps³⁵. Hence, the total share of Horizon 2020 funding estimated to be allocated to partnerships and projects initiated by partnerships is around 25%.

Partnership instruments have been developed and adopted during FP6 and FP7. So far, the impact of partnership instruments has not been seriously analysed. From the limited and sometimes only anecdotal evidence available, it looks like some progress towards addressing the fragmentation of the European R&D and innovation landscape has been achieved. However, it would seem that the progress has been moderate at best and potential for much more exists.

Partnership instruments are primarily structural and contractual arrangements, which rely on traditional project funding. It might be argued, that perhaps the biggest additional impact of partnerships originates in fact from the joint strategic agenda. There is only limited evidence (e.g. EIT/KIC startup creation, SME participation in PPPs, leverage of private funding) indicating that the funded projects would differ much from those that would have been funded without the partnerships. The potential for added value from partnerships is most likely much higher than achieved so far.

New partnership instruments have been developed and introduced partly because of new perceived policy needs and partly because existing instruments have not been seen appropriate or sufficient to address the identified needs. Existing instruments have not been discontinued. This has led into a **complex structure** consisting of several instruments, many with the same or at least very similar underlying rationale and purpose.

Both Member states and the Commission find it **difficult to coordinate** policies and policy initiatives **across ministries or DGs**. Even though one-size-doesn't-fit-all, there is also variance between partnerships within the same instrument, which further complicates the partnership landscape.

³³ e.g. <http://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:32014R0642&qid=1497011902770&rid=9>, <http://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:32014R0561&qid=1497011902770&rid=10>, <http://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:32014R0559&qid=1497011902770&rid=11>

³⁴ Other than legal procedures necessary for winding up the JU.

³⁵ Based on the estimated budget allocations and the total Horizon 2020 budget (see Figure 8).

Because of all these reasons, the partnership landscape lacks coherence. Lack of coherence typically leads to ineffectiveness, inefficiencies, overlaps and inconsistencies. Furthermore, the **administrative burden** is typically higher than in coordinated structures, both for the Commission and the partnership governance, as well as R&I actors participating in them.

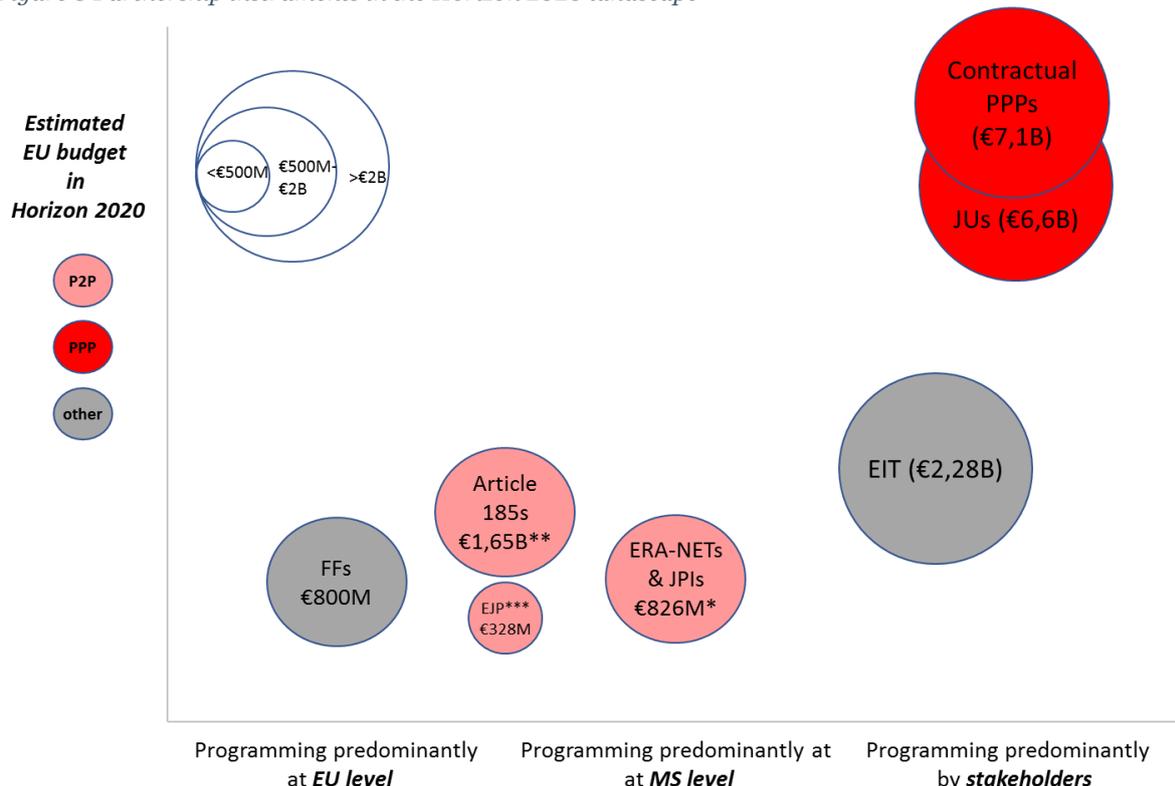
Formally, the Commission has the mandate to either require valid KPIs and systematic impact monitoring, or impose it. However, after the original decision, the Commission seems to have mostly limited itself in the role of an observer.

Most of the P2Ps are initiatives driven by Member states. Hence, access to these should be easy enough to organise at the national level. FET and EIT/KIC are not driven by Member states. Information of new FET initiatives as well as KICs are basically available, but the preparation is typically managed by a group of strong research actors. Openness of the preparation process and access to it depends on the connection to the core team preparing the proposal.

PPPs are industry driven and access to them takes place between companies. The openness of the preparation process is somewhat limited. ETPs are more transparent than JTIs and cPPPs, but even with those, access depends on connections between companies.

Figure 8 illustrates the relative sizes of the different partnerships and how they are positioned with respect to who drives the partnership agenda. By far the largest EU funding allocations are directed to industry driven public-private partnerships, which indicates that in terms of EU funding, industry is the main beneficiary of the partnership instruments. The next largest is EIT, followed by P2Ps. Member state driven partnerships rely largely on national funding, and are only co-funded from Horizon 2020.

Figure 8 Partnership instruments in the Horizon 2020 landscape



* Budget ERA-CoFund and JPIs extrapolated from average 2014/2017 for 7 years, ** Article 185s assuming a €200M budget in H2020 for the new PRIMA Article 185, *** EJP (excluding Euratom EJPs) and extrapolating budgets of existing 2 EJPs, while estimating that H2020 will launch 4 EJPs, Source: Budgets for JUs, EIT and cPPPs from EPRS, 2015

The Commission doesn't have consistent and well-defined processes for identifying, deciding, managing and dissolving partnerships. The processes and criteria are instrument specific. There is **no systematic process** for developing new partnerships or partnership concepts. Without a systematic process, partnership concepts and partnerships have been prepared and selected without a pre-defined, transparent and coordinated process. This has partly contributed to the complexity, maintained the lack of coordination, and given room for lobbying. This means that the renewal, coordination, and other European level objectives are left mainly in the hands of current strong R&I actors, who lobby, prepare, launch and govern major partnerships.

The Commission has already recognised many of the challenges and weaknesses of partnership instruments, and it is expected to take some action. However, **internal barriers within the Commission** (internal competition, lack of coordination, personal preferences, lobbying, etc.) are likely to hinder or make it difficult or impossible to make major changes. Furthermore, both the Commission and Member states are very sensitive of their mandate. This means that any major or even smaller changes have to be perceived as both parties maintaining or increasing their mandate, or at least neither clearly losing.

Many partnerships are managed by influential actors and have already managed to establish a relatively strong foothold. Even if partnership structures would be changed, it is likely that existing strong consortia will inevitably have a leading role in the new ones. This may lead into **serious lock-ins** in the European R&I landscape, and in longer term may hinder the renewal of European R&I.

To address potential lock-ins, the partnership landscape should find a balance between sufficient long-term commitment and the need to keep the partnership alive and dynamic through new entrants as well as ensuring that new research directions are sought and identified (or cut off, once new partnerships constructs with higher potential impact are identified).

Applying existing partnership concepts and modalities also in the future would mean that partnerships will be prepared and managed by current big R&I players, thus consolidating their strong role in European R&I landscape. The underlying concern (also reflected in the interim evaluation of Horizon 2020) is that this will further **centralise** European R&I and leave other R&I actors and most R&I actors from smaller Member states into the side-lines. Strengthening and especially ensuring the renewal of European R&I requires that if partnerships are to have a prominent role in future European R&I landscape, they should extend and capture the full European potential.

It is difficult to say in light of available evidence, if the observed centralisation is a result of the in-built bias towards existing strong R&D and innovation actors in the core role of designing and preparing the partnerships. Even without the partnerships, these actors would most likely capture significant amounts of European funding.

However, access to the preparation of the joint European strategic agenda is a starting point which should invite all relevant actors throughout Europe. Early access to the discussions allows identification of common challenges and needs, and consortia addressing these. It is always more challenging to access consortia which are already established.

Partnership instrument should not be analysed in isolation, but in the **wider context** of Horizon 2020 (or in future FP9). The acceptance rates for research projects are relatively low. Hence the research organisations would like to see more funds allocated to scientific research. On the other hand, the need to emphasise the role of innovative startups and SMEs has been recognised and more resources are called for them. At the same time, concerns at the national level regarding the viability of public funding of leading large companies is increasing. Hence, the industry driven pillar of the Framework Programme is being actively discussed. This is also where the future role of industry driven PPPs should be considered.

As it has already been indicated earlier in this report, the need to establish **partnerships with stronger commitment and higher ambition** towards more **systemic innovations** is increasing. It is here, where the role of leading companies is vital. Similarly, the role of societal actors in addressing societal

challenges should be significantly strengthened. This could balance the Framework Programme with respect to its overall objectives, and ensure practical adoption of new innovative solutions.

5.2 Recommendations

Transparency and openness of partnerships can be significantly improved through relatively simple measures. The Commission has the mandate to take action. It can easily require additional measures from the partnerships to ensure openness and transparency.

Recommendation 1 – Commission and Member states should jointly establish a systematic approach enhancing and ensuring openness and transparency during the preparation and selection of new partnerships. This can be either pushed as a requirement to the consortia managing the preparation process, or as a separate activity linked to the preparation process (e.g. series of virtual and physical events). This could be supported by organising a shared electronic platform (website) covering all identified partnerships under preparation.

It is difficult to evaluate the impact and European added value of partnership instruments without access to data about resource allocations, activities, output and impact. Data is particularly important in verifying the realisation of the European added-value targeted by the partnerships, and thereby justify their existence. The Commission has the mandate to require systematic collection/production of relevant data from the partnerships and from the national funding organisations. To facilitate an effective launch of a more systematic approach, framework and activities for monitoring, the Commission could consider a comprehensive analysis of the impact of partnership instruments, preferably in collaboration with the Member states.

Recommendation 2 – Commission and Member states should jointly establish a systematic framework for setting KPIs and collecting relevant monitoring data. Indicators used in monitoring (and later evaluation) should cover resource allocations, activities and outputs, but focus specifically on the impact on policy objectives derived from the original rationale (e.g. reduced fragmentation, adopted innovative solutions, leverage of private funding, etc.), both planned and achieved by the partnerships. The collected monitoring data related to KPIs should be regularly analysed against objectives and made public. The results of the regular analyses, evaluations and possible separate in-depth studies should be systematically used by the partnerships, Member states and the Commission to further develop the partnership instruments (or stop them, if they fail to produce the desired impact).

The fragmented and complex partnership landscape should be simplified to avoid lack of coherence, and potential inefficiencies, ineffectiveness, unnecessary administrative burden, etc. Even though different types of partnerships might require somewhat tailored approaches in practice, the overall processes of identifying, introducing, managing and monitoring partnerships and partnership instruments have enough similarities to allow the development of a common conceptual and operational approach. Furthermore, the Commission should require that all partnerships develop an exit strategy, i.e. conditions under which the partnership may be dissolved and how it is managed in practice.

Recommendation 3 – Commission should establish common processes for identifying, analysing, introducing, managing, monitoring the impact and dissolving of partnerships and partnership instruments. These processes should be transparent and participatory allowing inputs from all Member states as well as relevant stakeholder groups.

Capturing the full potential of European R&D and innovation capacity and preventing from partnerships to become “closed clubs”, the Commission should require or at least encourage establishing multi-layered partnership structures. These are already in use at the project level and can

be partly built on existing association models, where the key partners form the core supported by associate partners and project partners with various levels of influence to the common agenda and R&D and innovation activities.

Recommendation 4 – Commission should require/encourage establishing multi-layered partnership models to lower the threshold and allow easier access of new entrants. These models should offer the real possibility and encouragement to later on advance to full membership.

The current rather fragmented partnership instrument landscape should be simplified. Especially, since there are a number of instruments based on the same or similar rationale and to large extent similar modalities. This can be achieved by merging selected similar instruments, or discontinuing instruments that don't provide sufficient added value. At the same time, the remaining partnership instruments should be revised and improved to increase their potential for producing European added value.

Recommendation 5 – The number of partnership instruments should be reduced and focus on and develop further the most potential ones. Special attention should be given to developing new modalities beyond the traditional funding of individual R&D and innovation projects, and extending to capture the potential of demand side policy measures.

Partnerships should be either based on dynamic shorter-term project level commitments combined with a common longer-term agenda, or more stable longer-term commitment with significantly higher ambition to produce radical and systemic innovations. Consider encouraging mergers between different types of existing partnerships by allowing partnerships to combine both approaches (linked to the multi-layered partnership structures).

Recommendation 6 – Partnership instruments should be redesigned based on a dual approach – long-term common agenda with dynamic short-term project level commitments, and more stable long-term commitments with significantly higher ambition for radical and systemic innovation.

The allocation of resources to research, industry and societal driven elements within the Horizon 2020 and the future FP9 should be balanced. This could be achieved by introducing and strengthening mission oriented approaches as well as fostering the development of new large scale experimental innovation environments. For example, mission oriented approach to smart cities should seek to utilise entire cities as innovation platforms, covering several areas (e.g. smart transport, smart and green urban energy systems, smart tourism and other location based services, urban security systems, etc.). Similarly, leadership in industry 4.0 should make use of virtual and physical experimental platforms reaching multiple sites over entire production systems.

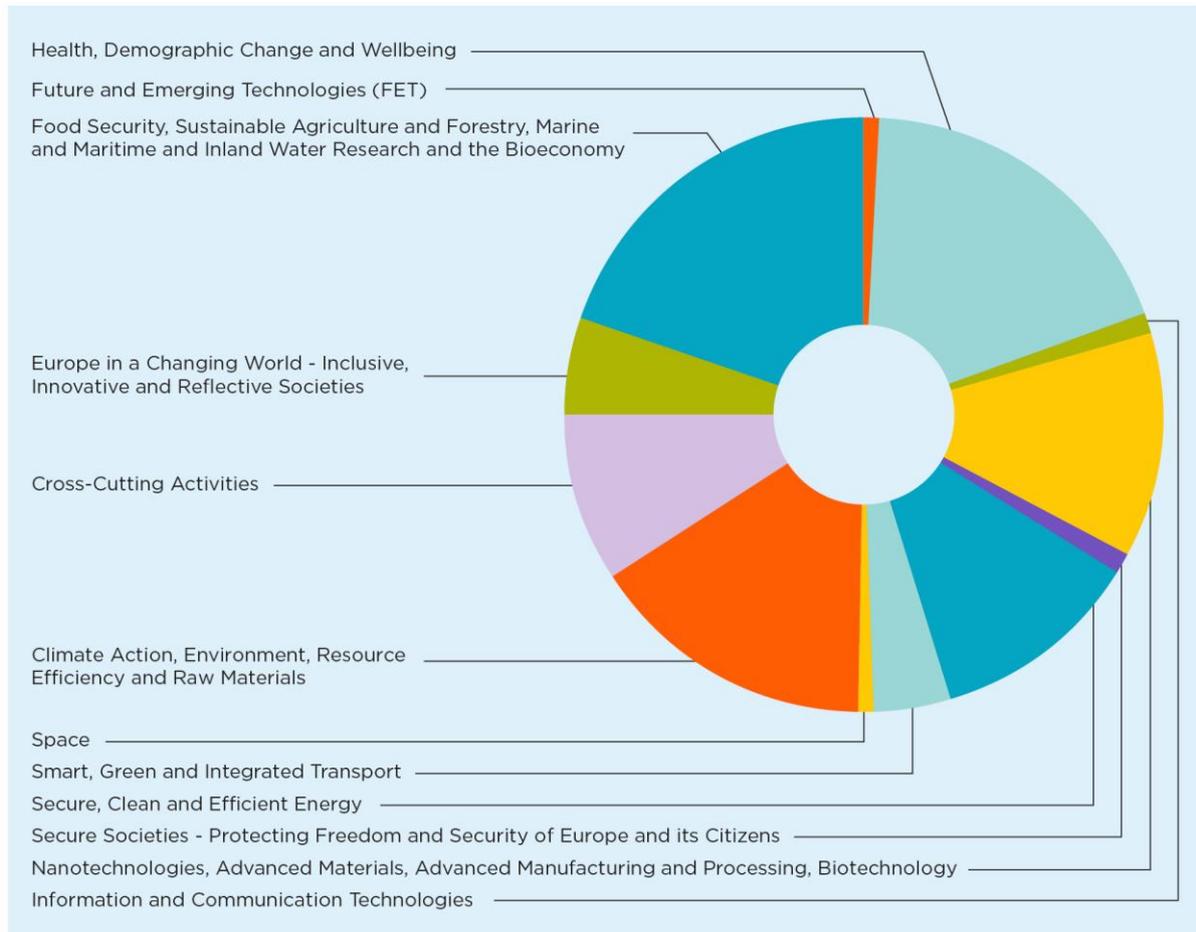
Recommendation 7 – Societal driven R&D and innovation should be strengthened in the Framework programme by introducing and fostering mission oriented approaches and large scale experimental platforms. New modalities to facilitate these approaches capturing a wider range of supply and demand side policy instruments should be utilised.

Appendix A Currently active partnerships

A.1 Public to Public partnerships

A.1.1 ERA-NETs

Total number of ERA-NETs active is 81. The figure below shows the thematic distribution of 90 ERA-NETs and JPIs.



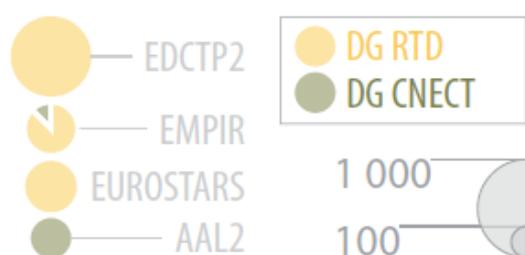
A.1.2 Joint Programming Initiatives (JPI)

- Agriculture, Food security & Climate Change (FACCE)
- Cultural Heritage, Climate Change and Security (JPI CH)
- Health, Food and Prevention of Diet Related Diseases (JPI HDHL)
- The Microbial Challenge - An Emerging Threat to Human Health (JPIAMR)
- Connecting Climate Knowledge for Europe (JPI Climate)
- More Years, Better Lives - The Potential and Challenges of Demographic Change (JPI-MYBL)
- Urban Europe - Global Challenges, Local Solutions (JPI UE)
- Water Challenges for a Changing World (Water JPI)
- Healthy and Productive Seas and Oceans (JPI Oceans)

A.1.3 Article 185 Initiatives

Article 185 initiative	Number of participating countries	EU funding (million €)			National funds (million €)
		FP6	FP7	H2020	H2020
EDCTP	15 MS + 2 AC + 14 TC	200	-	683	683
Eurostars	28 MS + 5 AC + 1 TC	-	100	287	861
AAL	17 MS + 3 AC	-	150	175	175
EMRP/EMPIR	23 MS + 5 AC	-	200	300	300
BONUS	8 MS	-	50	-	-

Source: European Commission (FP7, Horizon 2020) MS: Member State, AC: Associated Country, TC: Third Country.



Source: EPRS, based on European Commission data.

A.1.4 European Innovation Partnerships (EIP)

- Active and Healthy Ageing
- Agricultural Sustainability and Productivity
- Smart Cities and Communities
- Water
- Raw Materials

A.1.5 Future Emerging Technologies (FET)

- FUTURICT The FuturICT Knowledge Accelerator and Crisis-Relief System: Unleashing the Power of Information for a Sustainable Future
- GRAPHENE Graphene Science and technology for ICT and beyond
- GUARDIAN ANGELS Guardian Angels for a Smarter Planet
- HBP The Human Brain Project - Preparatory Study

A.1.6 European Institute of Technology (EIT) Knowledge and Innovation Communities (KIC)³⁶

- EIT Climate-KIC: addressing climate change mitigation and adaptation
- EIT Digital: addressing Information and Communication Technologies
- EIT InnoEnergy: addressing sustainable energy
- EIT Health: addressing healthy living and active ageing
- EIT Raw Materials: addressing sustainable exploration, extraction, processing, recycling and substitution

³⁶ <https://eit.europa.eu/activities/innovation-communities>

- EIT Food: putting Europe at the centre of a global revolution in food innovation and production

A.2 Public-Private partnerships

A.2.1 European Technology Platforms (ETP)

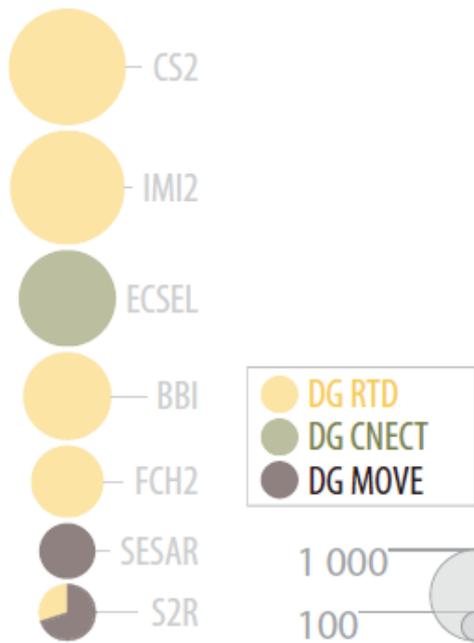
Bio-based economy	Energy	Environment	ICT	Production and processes	Transport
EATIP	Biofuels	WssTP	ARTEMIS	ECTP	ACARE
ETPGAH	EU PV TP		ENIAC	ESTEP	ALICE
FABRE TP	TP OCEAN		EPoSS	EuMaT	ERRAC
Food for Life	RHC		ETP4HPC	FTC	ERTRAC
Forest-based	SmartGrids		euRobotics [AISBL]	Manufuture	Waterborne
Plants	SNETP		NEM	Nanomedicine	
TP Organics	ETIPWind		NESSI	SMR	
	ZEP		Networld 2020	SusChem	
			Photonics 21		
cross-cutting ETP initiatives: Nanofutures, Industrial safety, ConXEPT					

Source: http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=etp

A.2.2 Joint Technology Initiatives (JTI)

JTI	Establishment	EU Budget	Industry contribution	Member States
IMI2	2008	1638	1725	-
FCH2	2008	665	700	-
CleanSky2	2008	1755	2250	-
ECSEL*	2014	1185	2400	1200
BBI	2014	975	1800	-
S2R	2014	450	470	-
JU	Establishment	EU Budget	Industry contribution	Eurocontrol
SESAR	2007	585	500	500

IMI2 = public health (the Innovative Medicines Initiative), CS2 = CleanSky2 = aeronautics and air transport (the Clean Sky Initiative), ECSEL = merger of earlier embedded computing systems (the ARTEMIS Initiative) and nanoelectronics (the ENIAC Initiative), FCH2 = fuel cells and hydrogen (the FCH Initiative), BBI = Bio-Based Industries, S2R = Shift2Rail, SESAR = Single European Sky ATM Research



Source: EPRS, based on European Commission data.

A.2.3 Contractual Public-Private-Partnerships (cPPP)

- Factories of the Future (FoF), to support the manufacturing industry through the development of sustainable production technologies and systems
- Energy-efficient Buildings (EeB), to increase the competitiveness and energy efficiency of the construction industry
- European Green Vehicles Initiative (EGVI), to develop a competitive and resource efficient transport system with significantly less CO₂ emissions Sustainable Process Industry (SPIRE), to make the process industry more resource- and energy-efficient
- Photonics, one of the key enabling technologies for our future prosperity and an essential element of many sectors, from energy and health, to everyday products like DVD players and mobile phones
- Robotics, a key driver of industrial competitiveness and essential to address key societal challenges in areas such as demographic change, health and well-being, food production, transport and security
- High Performance Computing (HPC), which plays a pivotal role in stimulating Europe's economic growth and advancing European science
- Advanced 5G networks for the Future Internet (5G), to stimulate the development of network internet infrastructure to ensure advanced ICT services for all sectors and users³⁷

³⁷ <https://www.era-learn.eu/public-to-public-partnerships/other-instruments-and-other-initiatives/contractual-public-public-partnerships-cppp>

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