SEVENTH FRAMEWORK PROGRAMME

Coordination of the European Future Internet Forum of Member States

D4.4a – Interim Roadmap for ERA-NET+

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1. Introduction

The ceFIMS road-mapping process aims to maximise synergies between EU and Member States (National and Regional), and among Member States' initiatives and investments in Future Internet research. The roadmap documents will foster stronger collaboration among Member States' R&D Programmes with the European Commission R&D programmes in the field of the Future Internet. The process will specifically explore implementation through an ERA-NET+ and/or cooperation via other means, including joint programming, etc.

This document presents a preliminary analysis of the current landscape in European Future Internet research, and sets out a vision of a future involving enhanced cooperation among key Future Internet stakeholders. The current state-of-the-art in Future Internet research, the various stakeholders, existing collaboration instruments, the relevant activity levels of Member States and the policy context acting as a backdrop for all this, are described in detail. The vision of the future describes the modalities of an ERA-NET+, the barriers and challenges that must be overcome, and potential thematic content and approaches that Member States and the EC may have in common. Finally, the next steps required to advance an ERA-NET+ on the Future Internet are outlined.

A further two roadmap documents will be produced by the ceFIMS project: another interim one in September, 2012, and a final one in January, 2013. A Proposal for a Memorandum of Understanding (MoU) will be produced at M30[1]. This current document represents the first steps towards preparing the groundwork for this process. These steps include gathering data on Future Internet projects and initiatives from around Europe, and carrying out initial analysis to identify potential synergies. ceFIMS has also held two thematic workshops (PPP and ETP) and one EU-level workshop (with research councils) to discuss collaboration and synergies in the field of the Future Internet. The outcomes of these workshops have significantly informed this document. ceFIMS work is on-going: data continues to be gathered and analysed, and the project will hold three more workshops during its lifecycle.

The ceFIMS road-mapping process will provide Member States with a clearly-defined and agreed-upon set of objectives and priorities which will decrease fragmentation and support synergies of investment by the Member States. Through the engagement of the key stakeholders (government decisions-makers and the Member States funding agencies) in the roadmap process, ceFIMS will ensure stronger co-ordination of Regional and National funding in the establishment of a Future Internet ERA-NET+. The ongoing dialogue between key stakeholders supported through ceFIMS, will ensure that the outcomes of the road-mapping process will inform future collaboration in the field of Future Internet research.

[1] These documents will take additional account of related roadmaps, such as the FISA Research Roadmap which looks at 2020 and beyond: http://fisa.future-internet.eu/index.php/FIA_Research_Roadmap

2. Current Situation

This chapter outlines the current state-of-the-art in Future Internet research, both in terms of actual projects and initiatives, and in terms of the research agenda set out by the European Commission in FP7. The current situation at FI-PPP level and worldwide is also highlighted. This is followed by a description of the stakeholders who would be involved in an ERA-NET+ on the Future Internet. Existing instruments for funding and collaboration between these stakeholders is outlined, as are the activity levels of Member States with respect to Future Internet-related research. This chapter concludes by describing the policy context against which this work is being carried out.

2.1. Content

This section outlines the state-of-the-art in EU FI research. The information in this section is drawn from a number of sources, including the ceFIMS database, FI-PPP projects, FP7 – Challenge 1, and the FIRE initiative. It also highlights the Future Internet work being undertaken outside of Europe (USA and Asia initiatives).

2.1.1. ceFIMS database

Gathering data on European Future Internet research is a continuous process for ceFIMS. The ceFIMS database[2] currently contains details on 72 different projects and initiatives (EU, national and regional). Each project/initiative in the database is tagged with 3-5 keywords and the resulting *tag cloud* indicates the most frequently occurring Future Internet themes. This tag cloud process has been used to carry out a preliminary examination of European Future Internet research in order to identify potential areas for cooperation. Full details of this analysis are contained in ceFIMS deliverable D3.3 'Report on Potential Synergies'.

Figure 1 is the result of clustering the projects/initiatives in the database around the seven-layer, OSI model of the Internet. As can be seen, roughly half of the projects/initiatives are concerned with the upper layers of the model, possibly indicating a marked interest in services and service-delivery.

[2] http://www.cefims.eu/database/

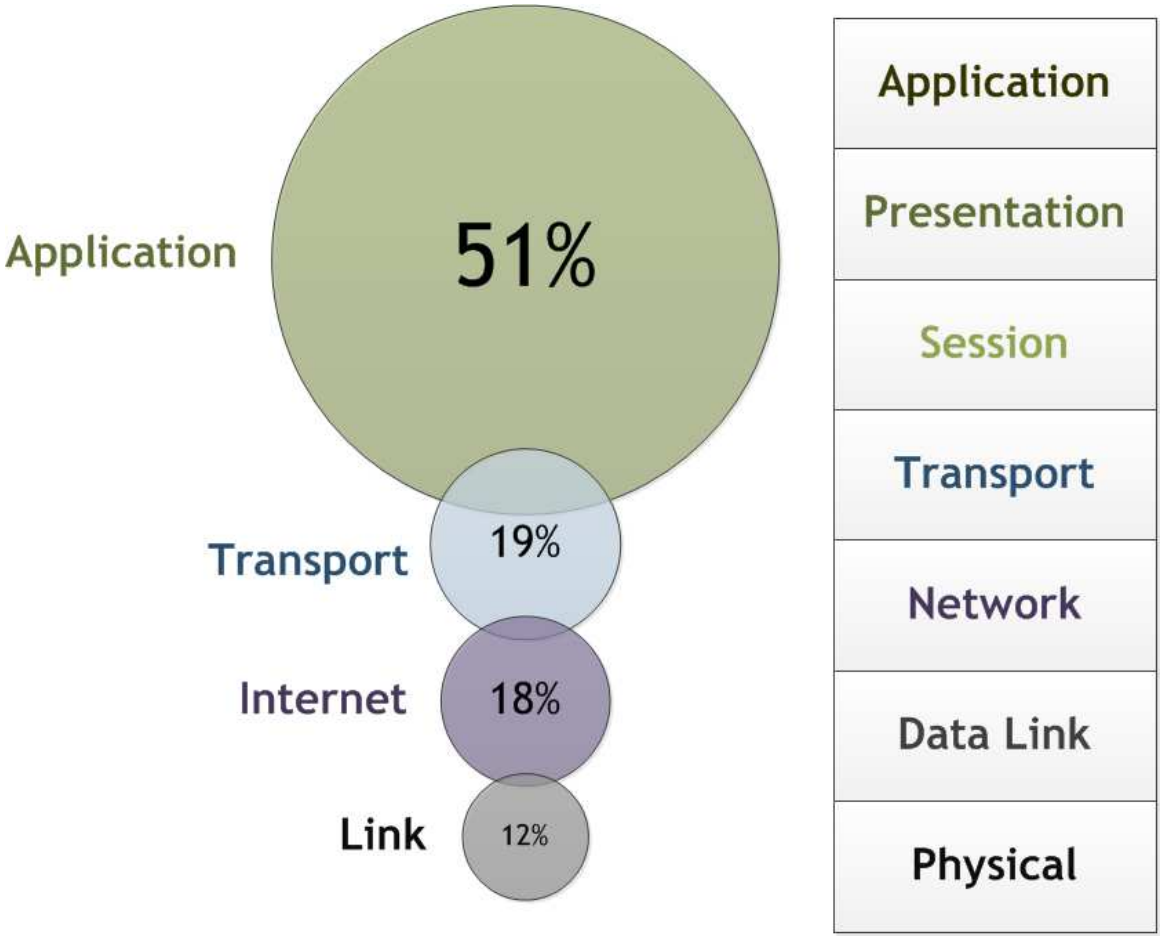

Figure 1 – Mapping Future Internet initiatives onto OSI Model

As well as using this clustering to identify potential complementarities between initiatives—and thus, potential synergies between Member States)—ceFIMS is also examining the initiatives within each cluster to identify potential duplication amongst them.

Table 1 shows popular themes for Future Internet research, as taken from the ceFIMS database, mapped to Member States[3] with projects/initiatives related to those themes. These are the themes resulting from ceFIMS initial analysis and will be used as a "working basis" for the identification of potential thematic areas that could be covered by an ERA-NET+ on the Future Internet.[4] The numbers in brackets indicate more than one project/initiative in that Member State; for example, Hungary has three projects/initiatives related to the field of mobile Future Internet research.

[3] Member States are listed in alphabetical order

[4] This table should not be taken as a complete summary of the current situation. Rather, it acts as a demonstrator of how ceFIMS is analysing the data it has gathered thus far.

	Theme/content					
	Infrastructure	*Mobile*	*Security*	*Services*	*Social Media*	*Testbed*
Member State	EU (4)	France	Finland	EU	Hungary (2)	EU (2)
	France	Hungary (3)	France	Lithuania	Malta	Poland
	Ireland	Ireland	Hungary	Poland (3)	Netherlands (2)	United Kingdom (3)
	Lithuania	Malta	Netherlands	Sweden	Poland	
	Netherlands	Portugal (3)	Poland	United Kingdom (2)	Portugal (2)	
	Poland		Romania		United Kingdom	
	Romania		United Kingdom (2)			

Table 1 – Common Future Internet themes & Member States potentially involved

Both Figure 1 and Table 1 will be updated as ceFIMS continues to gather information on European Future Internet research. These "working topics" will be further defined as ceFIMS progresses from an interim to a final roadmap.

2.1.2. FI-PPP Projects

Another key area for examination in the context of identifying thematic research areas for a Future Internet ERA-NET+ is that of the currently funded FI-PPP projects. Eleven FI-PPP projects were launched in May 2011[5]. This section provides a brief description of each. The thematic areas represented through these projects will inform the process of identifying potential research areas in any Future Internet ERA-NET+.

FI-WARE *(Technology Foundation)* will advance the global competitiveness of the EU economy by introducing an innovative infrastructure for cost-effective creation and delivery of services, providing high QoS and security guarantees.

ENVIROFI *(Use Case)* will specify the requirements, and building conceptual prototypes, of specific enablers for the environmental usage area (observations at local and regional scales using mobile communication devices, computers and sensors) in the Future Internet.

[5] http://www.fi-ppp.eu/

FINEST *(Use Case)* will develop a Future Internet-enabled ICT platform to support optimizing the collaboration and integration within international transport and logistics business networks. This shall be realised as a domain-specific extension of the FI PPP Core Platform.

FINSEY *(Use Case)* will bring together key actors from the ICT and energy sectors to identify the ICT requirements of Smart Energy Systems. This will lead to the definition of new solutions and standards, verified in large-scale pan-European Smart Energy trials.

FI-CONTENT *(Use Case)* will provide a framework to allow transformations of scenarios into technical outputs, as well as project management to ensure this ambitious project succeeds in creating services and experiments.

INSTANT MOBILITY *(Use Case)* will create a virtual "Transport and Mobility Internet"; a platform for information and services which will support radically new types of connected applications for scenarios centred on multimodal travellers (drivers & passengers, passenger transport operators, goods vehicle operators, road operators & traffic manager).

OUTSMART *(Use Case)* will develop five innovation eco-systems, to facilitate the creation of a large variety of pilot services and technologies that contribute to optimised supply and access to services and resources in urban areas.

SAFECITY *(Use Case)* will deal with smart Public safety and security in cities. The main objective is to enhance the role of Future Internet in ensuring people feel safe in their surroundings. The project will collect specific requirements driven by relevant users of the Future of Internet.

SMARTAGRIFOOD *(Use Case)* will focus on three sub-systems of the agri-food sector: smart farming, focussing on sensors and traceability; smart agri-logistics, focusing on real-time virtualisation, connectivity and logistics intelligence; and smart food awareness, focussing on transparency of data and knowledge representation.

CONCORD *(Programme Facilitation & Support)* will coordinate and facilitate the alignment of FI-PPP activities to ensure the relevance, rigor and robustness of the co-created Future Internet concepts, visions and roadmaps.

INFINITY *(Capacity Building & Infrastructure)* will capture and communicate information about available infrastructures and any interoperability requirements and issues, through collaboration with organisations across Europe.

The FI-PPP projects are at an early stage, and their impact is yet to be quantified. As part of its future work, ceFIMS will increase awareness among Member States and the role they can play in PPP and how Member State initiatives and the PPP can be aligned to maximum extent possible. ceFIMS has already held an early workshop (September, 2010) with a PPP forerunner project, and is directly liaising with the INFINITY capacity building project.

2.1.3. FP7 – ICT Challenge 1: Pervasive and Trusted Network and Service Infrastructures

Any ERA-NET+ on the Future Internet would most likely come under FP7's ICT Challenge 1: Pervasive and Trusted Network and Service Infrastructures, from the EC's 2011 Work Programme[6] (Cooperation, Theme 3). The high-level thematic areas covered in this challenge will also inform the content of any Future Internet ERA-NET+. Challenge 1:

> "…covers key technological developments in networking, digital media and service infrastructures. It features a Public-Private Partnership on Future Internet tools and platforms for novel Internet application development and deployment. The focus is on:
>
> — **Future Networks** that support the convergence and interoperability of heterogeneous mobile, wired and wireless broadband network technologies, including notably novel Internet architectures; network management and operation frameworks, wireless and broadband systems and ultra-high capacity all-optical networks.
>
> — **Cloud computing**, Internet of Services and advanced software engineering that emphasise technologies specific to the networked, distributed dimension of software and the access to services and data.
>
> — **Architecture** and technological foundations for Internet-connected sensors, actuators and other smart devices and objects, enabling person/object and object/object communications.
>
> — **Trustworthy ICT** including security in networked service and computing environments; trust, privacy and claims management infrastructures; and data policy, governance and socio-economic aspects of trustworthy ICT.
>
> — **Networked media and search systems**, including digital media delivery platforms, end-to-end immersive and interactive media technologies, and multimedia search technologies.
>
> — **New Paradigms & Experimental facilities** (known as FIRE) for experimentally-driven research on the Future Internet; the facilities will provide larger scale and diversity to test and validate the developments at closer to reality conditions."[7]

[6] ftp://ftp.cordis.europa.eu/pub/fp7/docs/wp/cooperation/ict/c-wp-201101_en.pdf

[7] While FP7 finishes in 2013, it is assumed that the FP8 equivalent of Challenge 1 will address similar themes.

2.1.4. FIRE

Of particular interest is Objective 1.6 'New Paradigms and Experimental Facilities' which strongly contributes to the future of the Internet. The vision behind this ICT objective highlights the importance of an experimentally-driven approach for the development of the Future Internet[8].

The European FIRE 'Future Internet Research Experimentation' initiative makes this vision become a reality. FIRE is building upon the complementarities and strong cooperation amongst all projects addressing Objective 1.6. FIRE is positioned as a cross-cutting initiative able to provide support to all other objectives of Challenge 1. FIRE is therefore emerging as a strategic European initiative ideally positioned to promote peer discussion with similar initiatives worldwide, such as GENI.

2.1.5. International Benchmarking

It is also worth considering other Future Internet initiatives from outside of Europe; in particular, those from leading international competitors – USA, Japan, and East Asia[9].

2.1.5.1. USA

GENI & NetSE

In 2008, the Computing Community Consortium (CCC) charged the Network Science and Engineering (NetSE) Council with developing a comprehensive research agenda that would support the development of better networks[10]. NetSE returned the following recommendations in September, 2009:

Recommendation 1: The funding agencies of the United States government must increase investment in research that will lead to a better Internet or risk a marginal future role.

Recommendation 2: Funding agencies should rebuild the experimental capabilities of networking researchers, through funding individual systems-building efforts, providing adequate and persistent shared experimental infrastructure, and supporting research that leads to continued improvements in experimental methodology. Experimental work is expensive and long-term; typical NSF awards are insufficient, therefore either NSF will need to change its award portfolio or other agencies will have to play a significantly increased role.

Recommendation 3: Funding agencies should foster and support research activities relevant to network design within the theoretical computer science community, the new Network Science community, and other theoretical disciplines.

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[8] http://www.ict-fire.eu/getting-started/future-internet-research-in-the-ict-programme.html

[9] There is also a connection between FIRE and the Asia Future Internet Forum: http://is.gd/fire_asiafi

[10] http://www.cra.org/ccc/netse.php

Recommendation 4: Funding agencies should support a broad array of interdisciplinary research activities related to understanding the current Internet and designing future networks to include the Internet.

FIND Initiative

FIND (Future Internet Design)[11] is a long-term initiative of the USA's NSF NeTS research program. FIND invites the research community to consider: (a) what the requirements should be for a global network in 10-15 years time; and, (b) how could such a network be built if there were no constraints from the current Internet—if it could be designed from scratch.

FIND solicits research across the broad area of network architecture, principles, and mechanism design, aimed at answering these questions. The philosophy of the program is to help conceive the future by momentarily letting go of the present - free from the constraints of the current state of networking. The intellectual scope of the FIND program is wide. FIND research might address questions such as:

- How can we design a network that is fundamentally more secure and available than today's Internet? How would we conceive the security problem if we could start from scratch?
- How might functions like information dissemination, location management or identity management best fit into a new network architecture?
- What will be the long-term impact of new technologies such as advanced wireless and optics?
- How will economics and technology interact to shape the overall design of a future network?
- How do we design a network that preserves a free and open society?

In April, 2009, the FIND Observer Panel Report[12] returned three recommendations to the American NSF (National Science Foundation):

Recommendation 1: Continue.

Recommendation 2: Additional focus on security and network management. Security and network management represent architectural gaps in today's Internet, and the industry's band-aids are inadequate. Foster research to tackle the interdisciplinary and hard problems of getting the network to reach a level of security and robustness expected of critical infrastructure.

Recommendation 3: Integrate. It is time now to ask the community to come up with self-forming teams that integrate a large number of components of the future Internet. This is in addition to the basic research work on components or point solutions. The time is right for members of the networking research community to develop a set of coherent architectural alternatives and to implement them. The panel

[11] http://www.nets-find.net/

[12] http://www.nets-find.net/FIND_report_final.pdf

envisions as many as four to five teams, funded roughly at a level of 10 to 20 million dollars per team over the three-to-four year period.

2.1.5.2. Japan

The AKARI Architecture Design Project[13] aims to implement the basic technology of a new generation network by 2015, developing network architecture and creating a network design based on that architecture. AKARI will research clean slate network architectures, without being impeded by existing constraints. After these new architectures are designed, AKARI will consider the issue of migration from today's conditions.

The AKARI Architecture Conceptual Design Document[14] is the first step towards implementing a new network architecture. It includes:

- Societal requirements
- Future basic technologies
- Design principles for designing network architecture based on those requirements and technologies
- Conceptual design examples of several key parts based on those design principles.

AKARI is designing a new network, using testbeds to evaluate the quality of those designs experimentally. Their most important goals are design principles for an architecture that is comprehensively optimised and stabilised. Until the final design is complete, however, these design principles are not fixed, and can change according to feedback through the design and evaluation process.

The network architecture is balanced between the top-down demands of solving societal problems and the bottom-up conditions of future technologies. Its role is to maximise the quality of life for the entire networked society and to provide it with sustainable stability.

2.1.5.3. East Asia

The Asia Future Internet Forum (AsiaFI)[15] was founded to coordinate Future Internet R&D among countries in Asia as well as with other continents. China, Japan and Korea all participate. AsiaFI carries the following activities amongst others:

- Working Groups: Specific activities such as Future Internet architecture, mobile and wireless networks, and testbeds;

[13] http://akari-project.nict.go.jp/eng/index2.htm

[14] http://akari-project.nict.go.jp/eng/concept-design/AKARI_fulltext_e_preliminary_ver2.pdf

[15] http://www.asiafi.net/

- Events: Conferences and workshops are hosted by AsiaFI, sometimes with other organizations. They also hold co-located workshops during conferences held by ACM, IEEE, etc;
- Education: Short courses called 'AsiaFI School' and semester-long courses are offered by AsiaFI, including School on Architecture & Building Blocks, and School on Mobile & Wireless Networks;
- Research: AsiaFI plans to coordinate joint research among Asian countries as well as with countries in other continents.

The AsiaFI Steering Committee presented the following remarks in March, 2011[16]:

1. AsiaFI activity requires bigger overheads than national activity, and AsiaFI needs to concentrate on areas where return-on-investment is very good. We should also make the AsiaFI effort more productive to offset the overhead.
2. AsiaFI need to look into synergy and symbios among its participants.
3. We may look into fair share on open research on the future internet.
4. Many people are very busy, and we have to take this factor into consideration.
5. Shall AsiaFI give up on the graduate education as it originally planned?

2.2. Stakeholders

This section outlines the different stakeholders who may be involved in an ERA-NET+ on the Future Internet. Stakeholders fall broadly into two categories: those who *fund* research and those who *provide* research.

2.2.1. Research Funders

The stakeholders on the funding side of an ERA-NET+ comprise: Member State Government Ministries and their departments (incl. at regional level); research councils and funding agencies; and the European Commission. Each Member State will have its own structures for supporting research. In general, a Government Ministry decides on the overall budget and policy for research. Ministries then channel that funding through research councils and/or funding agencies who manage research programme(s) – disbursing funds and evaluating results. It is expected that this process would be the same for an ERA-NET+. An ERA-NET differs from an ERA-NET+ in that for the latter, the EC provides additional financial support, based on the potential European added value, to facilitate joint calls for proposals between national and/or regional programmes.

[16] http://www.asiafi.net/ref/AsiaFI20110304ppf.ppt

Between them, the EC and the Member State Ministries and research councils could, with the support of ceFIMS, identify topics and possible budgets[17] for any proposed ERA-NET+ on the Future Internet. Additionally, the following entities may be consulted when defining state-of-the-art research topics:

- Relevant ETPs, (such as those in attendance at the December 2010 ceFIMS workshop)
- National industry initiatives (technology platforms, interest groups)
- Trade and Standards associations (TIA, Eurescom, CENELEC, EUROISPA, GSMA, etc.); also, the CONCORD FI-PPP project
- Governmental and non-governmental organisations (EU-Regulators (IRG), ITUT, ETSI, W3C, IETF, ISOC, RIPE, etc.)

The Future Internet Forum of Member States could also have a role in this regard. Members of the FIF are proposed by their own respective Member State. They are representative of the Future Internet research community in their Member State, and they cover a number of the key stakeholder groups on the funding side, indentified above; i.e. "owners" and "managers" of research programmes. Under the ERA-NET+ scheme, EU, national and regional authorities identify research programmes they wish to coordinate or open up mutually. The participants in these actions are therefore programme "owners" (typically EC Directorates, Member State Ministries or regional authorities who define research programmes) or programme "managers" (such as research councils or other research funding agencies who implement and manage research programmes).

Essentially, the FIF can act as a catalyst between research funders and providers. The FIF members may also play an ambassador role for the Future Internet, in which they represent their national activities to other Member States and the EC, and in turn present "external" activities to stakeholders in their own country.[18]

2.2.2. Research, Development & Innovation Performers

One of the key outcomes of any ERA-NET+ is the issuing of a transnational Call for Proposals. Those who would submit project proposals to such Calls are research, development and innovation performers. The 2010 report on 'Mapping ERA-NETs across Europe'[19] found that, while applied research seems to be the most common type of research covered by the ERA-NETs, the main target groups eligible for funding (i.e. the research performers) are the traditional performers of basic research: Higher Education Institutions (HEIs) and Public Research Organisations (PROs). See Figure 3:

[17] Cash contribution and/or 'in-kind' contribution

[18] A Working Group (GR, LU, IE, UK) was established at FIF Poznan to examine this potential role in detail

[19] Prepared by the Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre (JRC)

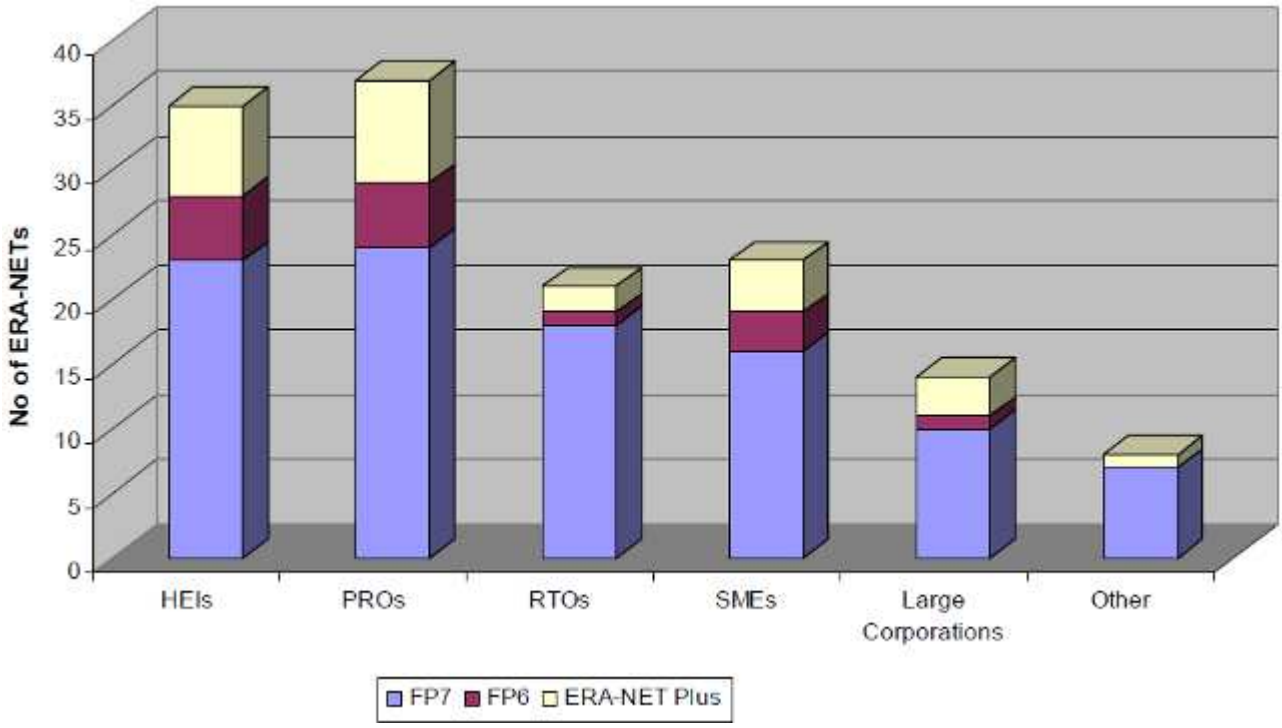

Figure 3 - ERA-NETs' target groups eligible for funding

Though industry involvement (large, medium and small enterprises) is critical to exploit and commercialise research results, they seem less predominant as target groups eligible as beneficiaries of the joint activities of the ERA-NETs. The 'Mapping ERA-NETs across Europe' report states it would be desirable that future ERA-NETs increase the proportion of industry partners involved in performing research, in order to be closer to market necessities and foster the execution of research in public-private partnerships (PPPs). In this regard, the current FI-PPP initiatives could be an interesting source of potential industry partners.

Ultimately, however, the ERA-NET+ funders will set out the criteria for the research performers required. It is expected that targeting industry involvement (large corporations and SMEs) will be important for research funding agencies, with much emphasis on innovation and development. Additionally, large corporations could be leveraged to increase the involvement of SMEs.

2.3. Funding & Collaboration Instruments

There are currently several possibilities for the above stakeholders to collaboration on Future Internet research. Figure 4 shows a number of the various Future Internet initiatives under the umbrella of the European Union:

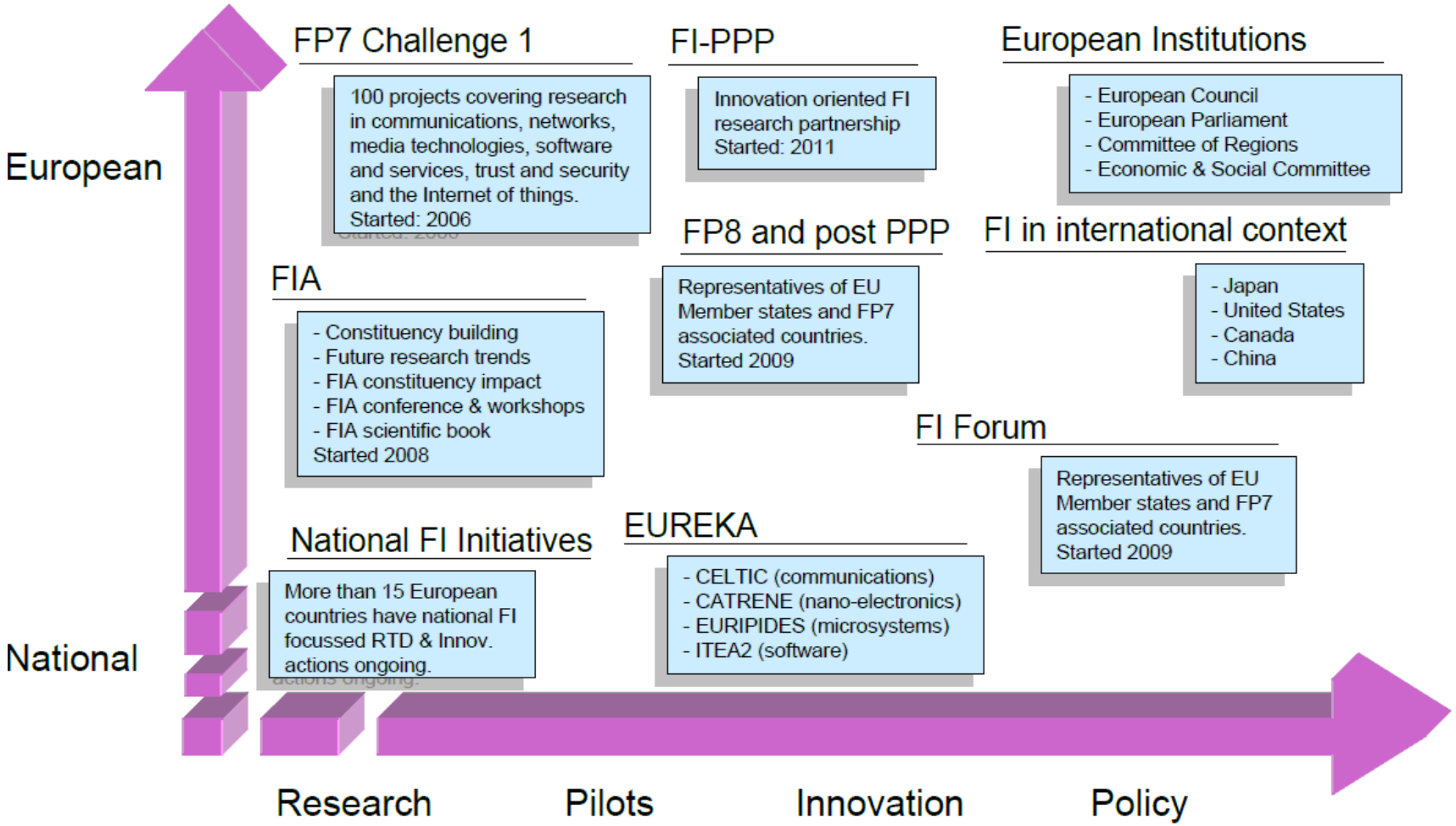

Figure 4 – Landscape of Future Internet Activities in Europe

The following describes some of the key initiatives identified above. These are also covered in D3.3 'Report on Potential Synergies'.

2.3.1. FP7 and FI-PPP

FP7 supports a range of research actions involving the active collaboration of research teams from all sectors, including industry, SMEs, universities and other higher education institutions, research institutes and centres, international European interest organisations, civil society organisations, and any other legal entities. These actions will be implemented through the funding schemes: Collaborative Projects, Networks of Excellence, Research for the Benefit of Specific Groups (in particular SMEs), Coordination and Support Actions, Integrating Activities/Preparatory Phase (Combination of collaborative projects and coordination and Support Actions) and International Research Staff Exchange Scheme (IRSES).

Collaborative Projects can range from small or medium-scale focused research actions, to large-scale integrating projects. When a distinction is made between these two types of projects, it will be based – unless specifically otherwise stated – on the size of the European Union contribution requested. The related thresholds may vary for each Theme, and will be specified in the relevant parts of this work programme. It is important to note that these thresholds will constitute eligibility criteria. Additional qualitative aspects may also be given in the relevant parts of this work programme.

Researchers based in *Associated* countries may take part in the Cooperation programme on the same basis and with the same rights and obligations as those based in Member States[20].

Coming under the remit of FP7 – ICT Challenge 1, the Future Internet public-private partnership (FI-PPP) addresses the need to make public service infrastructures and business processes more intelligent, more efficient, and more sustainable. It will do this through tighter integration with Internet networking and computing capabilities[21]. The specific aims of the FI-PPP are to:

- Increase the effectiveness of business processes and of the operation of infrastructures supporting applications in sectors such as transport, health, or energy;
- Derive possible innovative business models in these sectors, strengthening the competitive position of European industry in domains like telecommunication, mobile devices, soft ware and service industries, content providers and media.

The FI-PPP is based on a three-phased approach, with four related Objectives and two dedicated Calls under the 2011-2012 Work Programme. A third Call is planned under the 2013 Work Programme. As highlighted in **section 3.2.2** above, 11 FI-PPP projects began in May, 2011, and each provides a building block for the overall programme architecture: *(Objective number in brackets)*

[20] FP7 Cooperation Work Programme 2011

[21] http://ec.europa.eu/information_society/activities/foi/library/docs/fi-ppp_work_pgm2011.pdf

- Core Platform *(1.7 -)*: design, develop and implement a generic, trusted and open network and service Core Platform supporting generic enablers with standardised interfaces serving multiple use cases, and making use of and integrating advanced Internet features.
- Use cases and trials *(1.8 -)*: identify trial scenarios and derive the Internet platform requirements for a particular usage area; design, develop and implement a domain-specific instantiation of the core platform building on a selection of core platform generic enablers complemented by domain-specific capabilities; provide a limited scale testing infrastructure; validate the platform through early and large scale trials.
- Infrastructure support *(1.9 -)*: identify existing and future advanced experimental infrastructures across Europe and integrate, federate and upgrade them towards serving large scale trials.
- Programme facilitation and support *(1.10 -)*: Facilitate the development of an overall programme view and collaboration across all FI-PPP projects, support standardisation, SME involvement, link with regulatory and other relevant policy activities, dissemination and awareness raising.

Figure 5 shows a timeline for the overall FI-PPP initiative:

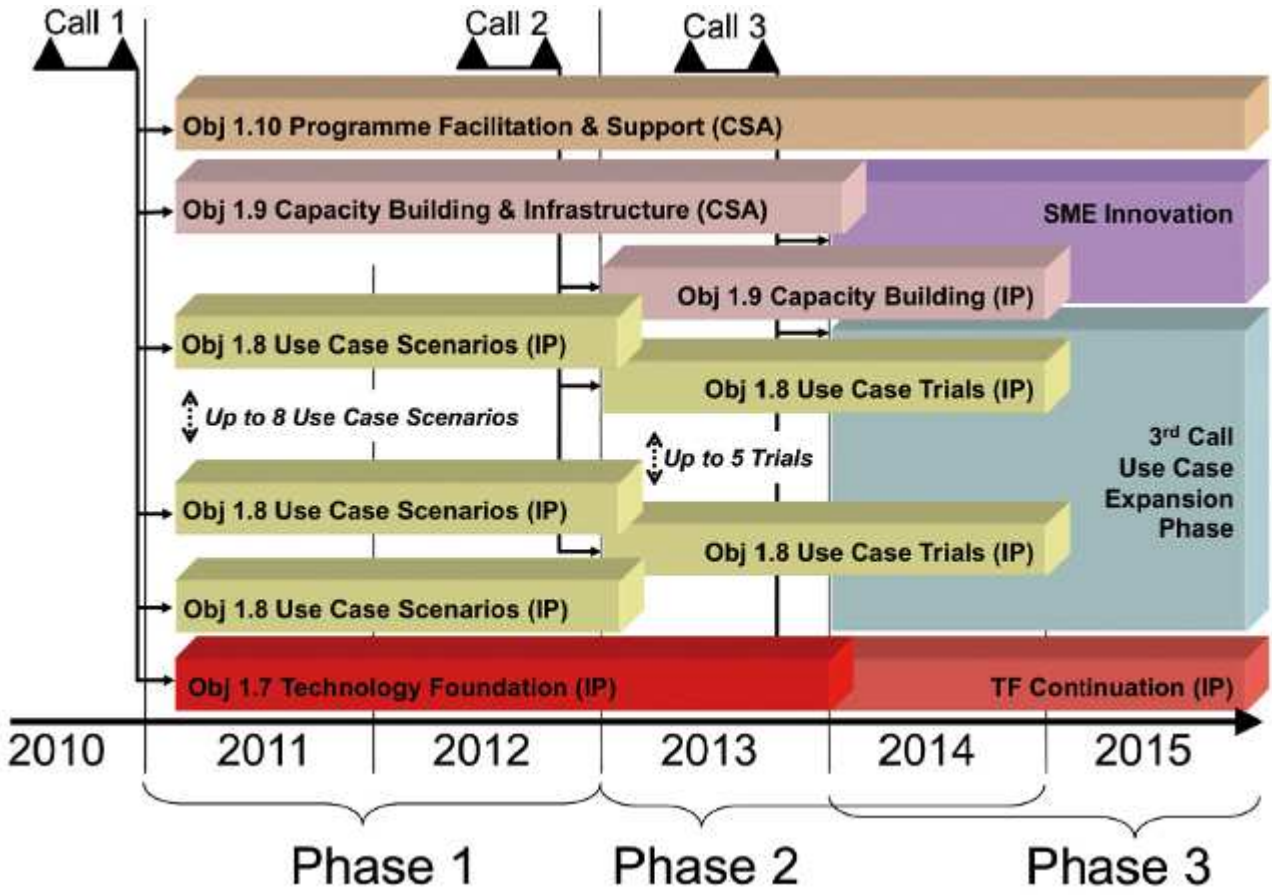

Figure 5 – FI-PPP Programme Architecture

The Call for Proposals in **Phase 2** of the FI-PPP is expected to be published in May, 2012, with the deadline provisionally set for the end of October, 2012. Phase 2 will:

- Ensure the availability of the necessary test infrastructure for the early trials;
- Develop the core platform and the use case specific functionalities, and instantiate them on the test infrastructure;
- Finalise selection, prepare and run early trials for all use cases;
- Prepare large scale trials in terms of SME participation as application and service developers and infrastructure integration across Europe.

2.3.2. Joint Programming

Joint Programming is a new process combining a strategic framework, a bottom-up approach and high-level commitment from Member States. It builds on the experience gained from existing schemes coordinating national programmes. Suitable Joint Programming areas are identified by a High Level Group on Joint Programming ("*GPC*"- from the French "Groupe de Programmation Conjointe") comprising nominees from Member States and the EC, following a thorough consultation of stakeholders.

Based on the result of the GPC, the Council, upon a proposal by the Commission, recommends a limited number of areas in which to implement priority Joint Programming.

From there on, participation of Member States in each initiative—based on voluntary commitments that can lead to partnerships—comprises variable groups of countries. The overall aim of Joint Programming is to pool national research efforts in order to make better use of Europe's precious public R&D resources and to tackle common European challenges more effectively in key areas. These are issues such as climate change, food and energy security. They are subjects that are beyond the capacity of any individual country to resolve, and which would benefit from a co-ordinated approach to research.

Currently, there is no purely Future Internet-related Joint Programming activity. "City of the Future"[22] is probably the most relevant, followed by the "More Years, Better Lives - The Potential and Challenges of Demographic Change"[23].

2.3.3. Joint Technology Initiatives

In its current Framework Programme for research, technological development and demonstration activities, the European Union supports a number of Joint Technology Initiatives[24] (JTIs). In the ICT field,

[22] http://www.era.gv.at/events/13280.html

[23] http://www.jp-demographic.eu/documents/synthesis-paper

the ARTEMIS and ENIAC JTIs were established in 2007 as Joint Undertakings (JUs). These two bodies constitute public-private partnerships between industry, a number of EU Member & Associated States, and the European Union. Their aim is to implement, by means of a budget from both the EU and participating Member States, a research agenda defined by the European research communities (industry and academic/research organisations) in their respective fields. The JTIs thereby seek to strengthen Europe's future growth, competitiveness and sustainable development. Their ambition and scope, the scale of the financial and technical resources that need to be mobilised, and the need to achieve effective coordination and synergy of resources and funding called for action at European level.

2.3.4. Future & Emerging Technology Flagship Initiatives

Transnational collaboration underpins the recently announced *FET Flagship Initiatives*[25]. These Flagship initiatives are centred on ICT future emerging technologies (FETs). The preparatory work currently underway is developing research roadmaps for the flagships and a model for their implementation. These FET Flagships will be much larger than the FET Proactives already in place, and will align European research priorities at EU and national levels with very substantial research funding to address grand scientific challenges which will cut across different national science research programmes and European programmes.

2.3.5. EUREKA & Celtic-Plus Collaboration

EUREKA is an intergovernmental network which supports market-oriented R&D projects, and provides access to national public and private funding schemes[26]. A number of different types of project exist: there are the *EUREKA projects*, which are labelled by EUREKA; *cluster projects*, which are generated by a EUREKA cluster, and the *umbrella projects*, generated under an umbrella. The *clusters* are industrial initiatives that work in close collaboration with national funding authorities. The *umbrellas* are networks that focus on a particular technology or business sector.

Celtic-Plus is the EUREKA cluster in the domain of integrated telecommunications systems[27]. It is an industry-driven research initiative which defines and executes projects in the area of telecommunications, new media, future Internet, and applications & services. Celtic-Plus is financed through public and private funding streams.

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[24] www.artemis-ju.eu/publication/download/publication/1

[25] http://cordis.europa.eu/fp7/ict/programme/fet/flagship/home_en.html

[26] http://www.eurekanetwork.org/

[27] http://www.celticplus.eu/

2.3.6. Collaboration Topics

In addition to the above, the following collaboration mechanism topics can also usefully be considered. These topics (whilst only representing part of the range of cooperation options) were highlighted during discussions at the ceFIMS workshop in May, 2011[28].

— **Member State interaction with PPP**

Though the PPP projects have only recently started, each Member State is monitoring their progression. **Openness** is a keyword, and Member States expect their interaction with the PPP process to evolve as the projects make progress.

— **Making use of Structural Funds**

Using structural funds for ICT research is a recurring topic. One suggestion to achieve this is to ear-mark a portion of structural funds and then establish appropriate metrics to monitor the use of same. For example, sample metrics could include: number of new start-up companies, number of PhD trained, type of products developed, etc. This approach may require EU-level direction, however, and could see the setting up of a pilot national strategic project for **'Future Internet Structural Funds'**.

— **Basic research vs. public-private research**

Some Member States have two separate research funding agencies: one for basic (long-term) research and another for closer-to-market projects. Additionally, some funding agencies for basic research do not set rigid research priorities (outside of smart transport, smart cities, smart grids), but rather set national programmes. This allows them to remain open and react faster to changes in commercial technology advances. In this regard, Strategic Research Agendas are becoming less relevant than **Research Roadmaps**.

Basic research may no longer be a goal in itself, but it may be an enabler for new knowledge and, hence, new technology innovation. The challenge remains to **convert research into new business**. Ultimately, an appropriate balance must be found between basic and public-private research – depending on where priorities/funding lie.

— **New forms of sharing value in projects**

Companies, public institutions and universities are undertaking Future Internet projects in diverse contexts, exploring different angles and thus achieving different types of results. There are various kinds of **intangible assets** that could be shared with increased value to partners besides the common exchange mechanisms defined for tangible assets. In fact, if tangible results are easily accountable, non-financial transactions must be considered for addressing intangible assets

[28] Workshop Report available here: http://www.cefims.eu/files/2011/08/D4.3_WS_INT-1.pdf

such as knowledge and ideas, which are a strong component in the new networks that are being established.

Possible non-financial transactions include **providing value** back to the Member State and generating knowledge from within the project itself (e.g. sharing IPR, influencing standards and regulatory frameworks, sharing testbeds and pilots, sharing Knowledge and experience, etc). New forms of sharing value in common activities should be streamlined, and the correspondent accountability is critical for leveraging the benefits to take out of common activities at European level.

2.4. Activity Levels of Member States

This section addresses the EU/transnational engagement levels of the different Member States, thereby providing context for potential participants in an ERA-NET+ on the Future Internet, and gives an interesting on those most active in Future Internet research and transnational cooperation. A thorough examination of these figures is available in the ceFIMS deliverable **D3.3 'Report on Potential Synergies'**.

The ceFIMS database comprises 72 projects and initiatives in the Future Internet area from across 17 Member States. 11 of these have a transnational element. The remaining projects/initiatives are from the following Member States:

Austria (2)	Ireland (6)	Portugal (2)
Czech Republic (1)	Malta (1)	Romania (2)
France (2)	Lithuania (1)	Spain (2)
Finland (3)	Luxembourg (1)	Sweden (1)
Germany (5)	The Netherlands (3)	UK (9)
Hungary (13)	Poland (6)	

Table 2 – Member States represented in the ceFIMS database (as of October 2011)

The collection of data is an ongoing process within the ceFIMS project. These figures are taken as being a very broad initial indication, rather than being complete.

Complete details on the above projects/initiatives are available in the database on the ceFIMS website: www.cefims.eu/database

As well as there being specific projects and initiatives in the Member States, there also exists national industry initiatives such as Technology Platforms and Interest Groups; for example, *es.INTERNET* in Spain, the Hungarian *Future Internet National Technology Platform*, *Future Internet Austria*, *Ireland's Future Internet Forum*, etc. It is expected that those Member States who have already established initiatives or strategies will be better prepared for transnational cooperation than those who do not. It also maybe points to Member States willingness to contribute funds for collaborating on themes that would benefit industry in their jurisdiction.

2.4.1. Member State participation in ERA-NET & ERA-NET+

A report from the Joint Research Centre (JRC) in 2010 described in detail the level of Member State participation in ERA-NET and ERA-NET+ schemes, in FP6 and FP7 respectively[29]. The report by the JRC also states that similar clusters of countries with different behaviour can be identified in both FP6 and FP7 ERA-NETs:

- Four large countries (France, Germany, Spain and UK) participate extensively;
- A group of smaller countries also have significant participation levels (Austria, Finland, the Netherlands and Belgium). Italy has similar levels of participation, despite its bigger size;
- A diverse group of countries have a medium level of participation, including countries such as Sweden, Poland, and Greece;
- New Member States have a lower degree of participation with Romania and Hungary being the most active of this group.

2.4.2. Member State Engagement at EU Level

The Member States with a high number of proposals in FP7-ICT Calls were: Germany (16.6%), Italy (13.5%), UK (11.9%), France (9.5%), and Spain (9.6%)[30]. Figure 6 shows the average EU contribution to retained projects in the years 2007 – 2009, both per head of population and as a % of GDP[31]. The highest recipients per head were Finland, Denmark, Sweden, Belgium and the Netherlands.

[29] Source: Joint Research Centre Scientific & Technical Reports – EUR24668 - 2010 ("Mapping ERA-NETs across Europe")

[30] Source: SPRERS FP7 project, Deliverable D1.2 Actions for better integration of new Member States at FP7-ICT

[31] Source: Calculations by the Expert Group

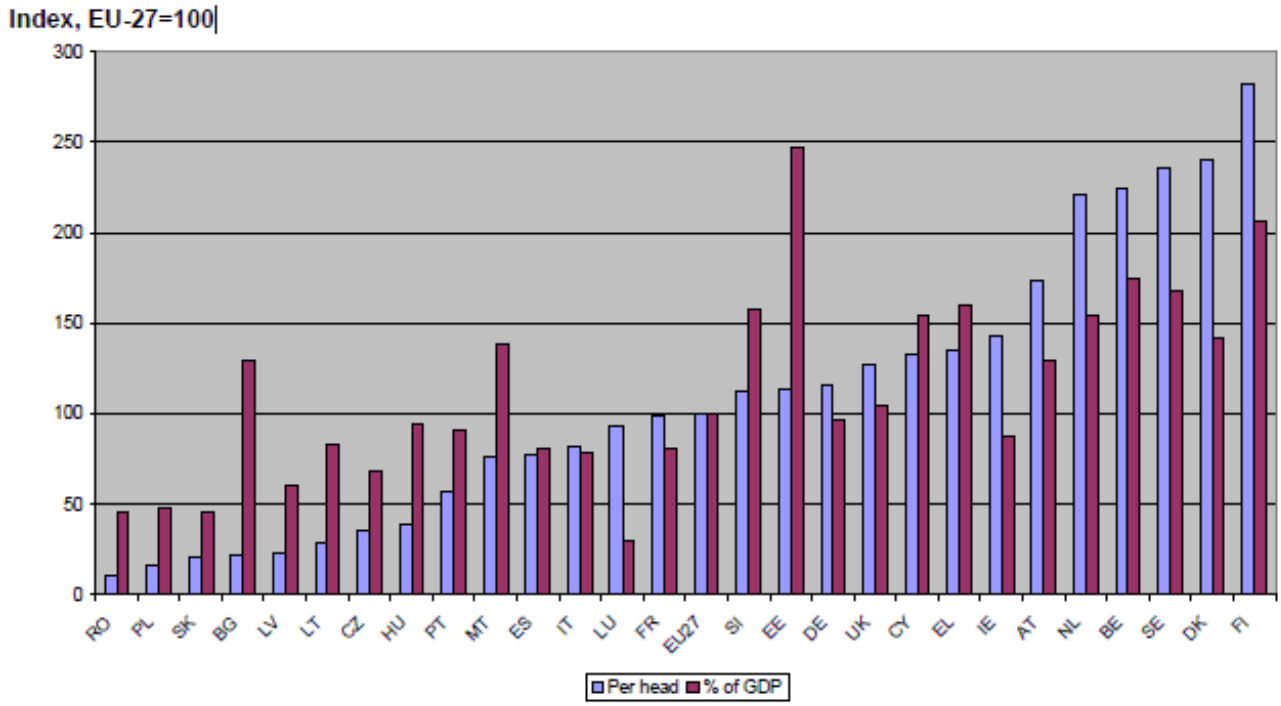

Figure 6 – EU contribution to retained projects

2.5. Policy Context

There has been a major political push in response to the financial crisis and rising joblessness, to focus Europe on stimulating economic growth, creating employment, strengthening Europe's competitive position, creating smarter / more sustainable / greener economic development and tackling grand societal challenges such as healthy ageing, energy security, climate change and environmental protection.

Europe 2020, agreed at the June 2010 European Council is the EU's growth strategy and will set the agenda for the coming decade. The Innovation Union and the Digital Agenda as two of the flagship initiatives of the Europe 2020 strategy, set out the key enabling roles that the use of Information and Communication Technologies and ICT research can play in Europe’s recovery.

The key themes emerging from these important policy documents are:

- Innovation has moved centre stage. For the first time the EU is moving towards a more integrated policy approach between research and innovation. In the future, innovation will be reflected in all policy instruments, measures and funding.
- Innovation is being more broadly defined - it includes not only technological innovation but also innovation in business models, design, branding and services

- Greater focus on more business-oriented research, commercialisation of research and 'getting ideas to market' - ensuring that innovative ideas can be turned into products and services that create growth and jobs
- Importance of industrial participation (particularly from SMEs) and the development of partnerships between education and research, the public sector and business, including business-academia collaborations through 'knowledge alliances'
- The Digital Agenda will require a sustained level of commitment at both EU and Member State levels (including at regional level). This means smart regional specialisation strategies, focusing on regional strengths and greater alignment between EU, national and regional levels, creating a Europe-wide free movement of knowledge (ERA)

These policy drivers will be key determinants of the scale and scope of any Future Internet ERA-NET+.

3. Vision of the Future

This chapter describes the issues to be considered regarding an ERA-NET+ on the Future Internet. It gives details on what an ERA-NET+ entails, the barriers and challenges that must be overcome, and the potential research topics and approaches that Member States and the EC may have in common.

3.1. Modalities of an ERA-NET+

The objective of the ERA-NET scheme is to develop and strengthen the coordination of national and regional research programmes through two specific actions[32]:

- **ERA-NET** actions provide a framework for actors implementing public research programmes to coordinate their activities; e.g. by developing joint activities or by mutually supporting joint calls for transnational proposals.
- **ERA-NET+** actions provide, in cases with high European added value, additional EU financial support to facilitate joint calls for proposals between national and/or regional programmes; i.e. the EC provide an incentive for the organisation of joint calls between national or regional research programmes by 'topping-up' joint transnational funding with *Community* funding.

These joint calls involve awarding grants to third-parties participating in calls for proposals launched under the ERA-NET+ actions. These actions require programme owners or programme managers from at

[32] http://cordis.europa.eu/fp7/coordination/eranet_en.html

least five different Member States (or Associated States) to plan a single joint call, with a clear financial commitment from the participating national or regional research programmes.

The Community contribution will be limited to a maximum of 33% of the total contributions to the joint call budget. The combined national/regional and Community contributions to the joint calls have to reach at least EUR 5 million. Proposals to establish an ERA-NET+ must also meet the following overall eligibility criteria:

- A single joint call should be planned with a clear financial commitment from the participating national or regional programmes.
- A fixed common set of general evaluation/selection criteria (excellence, European added value, etc.) should be part of the common evaluation criteria of the joint call organised by the national programmes.
- A common peer-review mechanism for evaluating the proposals submitted to the joint call shall be foreseen.
- Each project financed out of the joint call shall be transnational (i.e. have a minimum of two partners from different countries).

3.2. Barriers & Challenges

A number of barriers and challenges must be addressed to realise pan-European cooperation models, such as an ERA-NET+. Specifically highlighted by FIF members, research council representatives, EU programme managers and invited experts, at the ceFIMS workshop in May, 2011, were the following:

3.2.1. Multiplicity of Research Programmes

Many Member States have launched national initiatives on the Future Internet (research programmes, technology platforms, interest groups, etc.), demonstrating their activity on a crucial theme for the future of European competitiveness. This multiplicity of different national and regional initiatives is an opportunity to add value to Future Internet pan-European initiatives on the basis of complementarities and synergies. Benefits and efficiency could, thus, be increased if those initiatives cooperated more closely.

Europe's strength lies in its diversity. Care must be taken though to maximise individual national efforts by promoting cooperation at European or bilateral level. Structured coordination is an opportunity to ensure Europe optimises and adds value to its funding and implements complementary and coordinated approaches in targeted areas. Consolidated infrastructure may also result from such coordination.

A lack of dissemination can lead to a number of potential challenges posed to collaborative development, including:

- Member States not seeing value in trans-national collaboration;
- Poor visibility of EU projects and achievements in Member States and vice versa: such awareness could allow Member States to focus on niche areas which complement larger, EU-wide work (e.g. create applications to work on EU-wide platforms);
- Perception of a lack of coordination between EU research and Standards and the USA, Asia;
- Perceived gap between top-down, regulated R&D and grassroots activities;
- Failure to keep track of the state-of-the-art in technology advances.

A formal mechanism to feed research outputs from Member State programmes into the EU framework could help address shortcomings in dissemination. Similarly, a common language or set of definitions could increase data-sharing across Europe.

3.2.2. Bureaucracy & Legislation

To increase research collaboration, a number of bureaucratic and legislative issues must be addressed. Some more obvious issues include cross-border data-sharing agreements and Intellectual Property Rights (IPR). Also, in some instances, regulation time-scales are mismatched with technology developments, meaning that regulators cannot keep pace with (and therefore cannot introduce) new technologies when they appear.

3.2.3. Miscellaneous

Assorted barriers to the development of Europe's Future Internet include:

- A lack of domain expertise in specific instances: this presents an opportunity for a multidisciplinary approach. A mismatch sometimes exists also between domain expertise and decision-makers.
- Cost of network access: this can be prohibitively high and thus, impede research.
- Future budgets not guaranteed: agreement often only exists on specific research themes, but not on the term/availability of the required funding.

3.3. Content & Approaches

As identified in ceFIMS deliverable D3.3 'Report on Potential Synergies', there are a number of possible research topics on which Member States and the EU could collaborate. These are also briefly highlighted in Table 1 above (p. 7). They include: *infrastructures*, *mobility*, *security*, *services*, *social media*, *testbeds*. These topics arose from analysis carried out on the information gathered by ceFIMS in the project database. Additionally, a number of potentially attractive topics and approaches were discussed during ceFIMS first EU-level workshop, held in May 2011:

3.3.1. Underlying/Enabling Technologies

We could usefully revisit the fundamentals of the Internet. This does not necessarily mean a total clean-slate approach, but it does call for a re-examination of primary Internet elements – including security, mobility, languages, etc. Suitable **testbeds** could be used, in this regard, to jointly investigate enablers (e.g. IPv6) and potential applications (e.g. social networks, home environments, health, new media, etc.).

Generating energy in a more efficient manner to power ICT demands is another area that holds high potential. Such **green ICT** would complement many of the smart energy initiatives currently in place, where energy distribution and consumption are monitored by autonomous management systems. This green ICT would require collaboration with a number of research disciplines, including materials science, etc.

3.3.2. Use Cases & Applications

A 'smarter', more dynamic Internet should be able to adopt and evolve as time progresses. Advances in **augmentation, reasoning** and the **semantic web** could lead to programmable architectures that would deliver services-on-the-fly to users. A dynamic approach to contacting applications areas directly (e.g. the oil industry) also offers potential, as do **education services** – where there is scope to develop digital library content and multimedia platforms.

In general, use cases and applications have different potential and support in different Member States. For example, tourism and health in Spain; bio-informatics and ICT-agriculture (sensor networks) in Latvia; energy, sustainability and climate change in Sweden. The following section, conversely, addresses a number of applications whose pan-European appeal renders them high potential.

3.3.3. Pan-European

A number of specific Member State initiatives could be developed and aligned in a pan-European environment. These include: Germany's recently rolled out **e-identity management system**; Hungary's

National Technology Platform, which allows its researchers to engage more easily with their peers in other Member States; Romania's **single sign-on facility**, giving access to their e-infrastructure. **Networked, open data** also has potential, but it must be in an interoperable format to advance current data-sharing efforts.

Europe's diversity presents a number of high potential areas. **Standards**, for example, could be developed and robustly tested across Europe's heterogeneous landscape. Since the Future Internet is a field where new services and applications will be developed, then the standardisation of services could be one relevant area to be specially promoted and encouraged through appropriate reference to the European standardisation work programme.

The **diverse expertise** available across different Member States' Science Agencies could also be taken advantage of, should the EU and/or other Member States require specific consultation. Furthermore, having a large number of Member States means there is potential to develop several small clusters of Member States who could work together on **pilot initiatives** and subsequently report on what issues (barriers, time-scales, objectives, mechanisms, etc.) might need to be resolved at EU level.

3.3.4. Multidisciplinary vs. Technology-only Approach

The **EU 2020 Digital Agenda**, with its commitment to reducing the digital divide, provides the background to the multidisciplinary aspect of this potential collaboration theme. Care must be taken, however, to balance technology-driven and user-driven developments, since too much consultation may lead to inertia and the loss of competitive position. Indeed, a number of Member States express primary interest in technical advances such as infrastructures, testbeds, routing, etc.

Additionally, involving users in a multidisciplinary approach can be difficult. To this end, a non-hierarchal, user-centric framework might be useful. Such a framework could give rise to a two-way interaction between providers and users, and would circumvent traditional approaches, where rigid domains restrict innovation. **Agile development**, for example, could be examined in this regard since it would iteratively take account of user needs.

Finally, a multidisciplinary approach should encompass **sociological culture barriers**, ethics, sector-specific applications and horizontal applications. These are rarely addressed in unison, however, and there is opportunity here (for SMEs) to develop business models to fill this gap.

As well as the traditional balance between technology and user-centric developments, a new **social dimension** is becoming more involved in the innovation process. It is recognised that the social evaluation of research provokes many contradictory perspectives, but success of any RTDI activity should require a check against the social benefits, social acceptance and social value.

3.3.5. Living Labs vs. Testbeds Approach

More information is required on current testbed infrastructures available across Europe. The recently started INFINITY PPP project is addressing this gap in knowledge and it will present its findings in due course. There is a school of thought, however, that says we should actually move away from testbeds (in isolation) and consider the **Internet a living labs testbed** itself. This approach would help involve users and could test the market to identify barriers. Testbeds can again be restrictive or limited in this regard, and, therefore, a living labs approach might better support innovation and new businesses.

Parallels exist between this potential collaboration theme and the 'multidisciplinary vs. technology-only' theme. While a multidisciplinary approach is generally advised, there will be some issues that will only be resolved through technology. Likewise, while a living labs approach may be the ideal in many instances, issues will still arise where testbeds will provide the solutions.

Note however that Europe has a natural advantage with regard to any living labs approach, since it comprises a large number of heterogeneous users.

3.3.6. Traditional vs. Innovation-led Business Models

Novel business models are required to fulfil pan-European potential and move it beyond the domain of Governments and public bodies, both at national and at pan-European level. There is a need to open to market funded initiatives and technology systems under development, in order to constructively advance through the pilot phase and on to the everyday usage. **Novel, flexible market- and services-oriented mechanisms** need to feed into novel business models. These business models should be able to integrate all parties and values of different nature involved in the networked transactions. They should also stimulate openness in the applications market for attracting investment.

For example, smart city projects typically involve a series of new services generated from the large-scale open networks developed. New business models should, thus, be structured in line with that novel structure of data and value transactions. This discussion is to be integrated as a critical component in the effort of taking the most benefit out from complementary and synergetic national Future Internet activities.

4. Next Steps

This report has outlined the major aspects to be considered for establishing an ERA-NET+ on the Future Internet. This final section describes the next steps in advancing this work. It goes without saying that the support of all stakeholders identified in this deliverable is critical for the setting up of any collaborative research on the Future Internet.

4.1. General Framework

In February 2010, an Expert Review Panel was set up by the EC to review the ERA-NET+ instrument[33]. The recommendations returned by the Panel will provide a broad background framework for the next phase of ceFIMS work, with regard to preparing the ground and gaining critical mass for an ERA-NET+ on the Future Internet. The Panel recommended that:

- The instrument remains "agile", and able to respond to specific needs for research within a relatively short timeframe; i.e. not for multiple calls which would require long-term strategies and funding commitments from stakeholders.
- There should be an option to use EC's contribution to help cover management costs throughout the life of the project. And that other lessons learned (formalise agreements, launch calls, evaluate bids, etc.) are recorded and passed on through the ERALEARN project[34].
- The level of funding at the start of the second phase should be the maximum permitted. This would remove further interim payments, and thus, administrative overheads for the EC and other funding partners.
- Resources for networking within an ERA-NET+ action should not be provided, but the action should be "owned" by or have links with established networks.
- The decision to set up an ERA-NET+ should involve weighing up the potential benefits from using the instrument compared with those arising from an open call in the Framework Programme.
- Appropriate criteria should be developed against which the impact of the instrument can be measured.

Another broad measure to prepare the ground for a Future Internet ERA-NET+ is to use all channels available at Member State- and European-level to more efficiently exploit results and identify resources needed to carry out successful research and innovation activities; e.g. examine the stimulus that national technology platforms (or specifically "National Future Internet Forums") can provide to reach critical research mass and preparedness for multilateral and bilateral cooperation.

4.2. Specific Actions

Within the broad actions above, there are a number of specific steps to be taken in order to lay the ground work for an ERA-NET+ on the Future Internet. These include:

[33] ftp://ftp.cordis.europa.eu/pub/fp7/coordination/docs/era-net-plus-review-2010_en.pdf

[34] http://netwatch.jrc.ec.europa.eu/nw/index.cfm/static/eralearn/eralearn.html

STEP 1: On-going gathering and exchange of information (strategic & operational). Establish a comprehensive repository of information on Future Internet initiatives at: EU level, Member State level, Regional level. Gather "annual reports" of ICT expenditure: from EuroStat, OECD, national budgets, etc.

STEP 2: Undertake comparative analysis to identify: common themes/topics, opportunities for cooperation, barriers to cooperation. Examine alliances between different living labs and smart cities initiatives. Deeper analysis of different research council positions with Member States. Analysis of first results emerging from PPP projects (e.g. INFINITY's first draft of infrastructure repository due in March 2012)

STEP 3: Identify areas (topics) where coordination & cooperation can 'add value' to Member State and EU activities (through cooperation frameworks). Use working group (involving key stakeholders) to identify and define thematic areas and funding mechanisms. Contact participants from potential synergies topics: facilitate information flow and exchange of key deliverables, etc. Develop an emphasis map to outline cooperation on different topics which encompasses various variables involved: timing, themes, participants, applications, etc.

STEP 4: Define appropriate cooperation frameworks for:

- *Projects*: Identify potential project clusters and support clustering activities
- *Programmes:* Identify common research priorities and research resources; Define appropriate levels of cooperation and coordination (can vary according to objectives and thematic areas); Define a scale of coordination activities from 'light' to 'heavy' - could include opening up of national research programmes: thematic alignment; Joint Programming: ERA NET+; Develop appropriate structures, governance, financial regimes, IPR and documentation sets[35] (Work Programme, Calls, evaluation criteria, etc.)

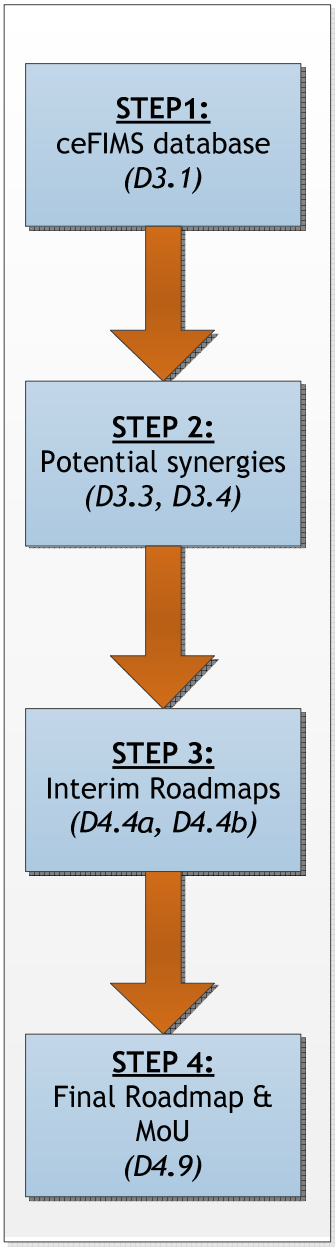

Figure 7 - ceFIMS ERA-NET+ development process

[35] "Provisions for the Preparation of ERA-NET+ Actions & their Practical Implementation": ftp://ftp.cordis.europa.eu/pub/coordination/docs/eranet_plus_issue_paper_v24_dec2006.pdf

All the above broad and specific actions should be considered with the following criteria in mind, to offer the best prospects of achieving European added value[36]:

- Relevance to EU objectives: The field of the potential topic should be of major interest for the Community as a whole
- Relevance to the Framework Programme in terms of enhancing the coordination of national research programmes
- Build on a pre-existing basis or coordination experience between national programmes
- Critical mass: Enable national programmes to address together with the Community programmes research areas, that are better addressed jointly or fields which would/could not have been addressed independently
- Instrument relevance: Demonstration that ERA-NET+ is the most appropriate instrument for achieving the Framework Programme goals with regard to coordination of national research programmes (i.e. avoiding fragmentation, etc.).

[36] "ERA-NET Plus Actions" Provisions for the preparation of ERA-NET Plus actions and their practical implementation. RTD B.1 Coordination of national research programmes. October 2009.