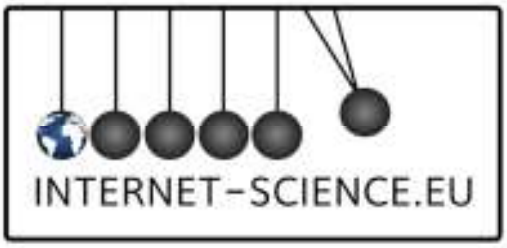
ICT - Information and Communication Technologies



FP7-288021

Network of Excellence in Internet Science

Whitepaper on recommendations for funding agencies

Due Date of Deliverable: 31 January 2014

Actual Submission Date: 7 January 2014

Revision: Draft

Start date of project: December 1st 2011 **Duration:** 42 months

Organisation name of lead contractor for this deliverable: SOTON

Authors: Clare Hooper (SOTON), Nidhi Hedge (TECHNICOLOR), David Hutchison (ULANC), Dimitri Papadimitriou (ALBELL), Andrea Passarella (CNR), Vasilis Sourlas (CERTH), Patrick Wüchner (PASSAU)

Project Information

PROJECT	
Project name:	Network of Excellence in Internet Science
Project acronym:	EINS
Project start date:	01/12/2011
Project duration:	42 months
Contract number:	288021
Project coordinator:	Leandros Tassiulas – CERTH
Instrument:	NoE
Activity:	THEME ICT-20011.1.1: Future Networks

DOCUMENT	
Document title:	Whitepaper on recommendations for funding agencies
Document type:	Report
Deliverable number:	D2.3
Contractual date of delivery:	31 January 2014
Calendar date of delivery:	6 January 2014
Editor:	Clare Hooper (SOTON)
Authors:	Clare Hooper (SOTON), Nidhi Hedge (TECHNICOLOR), David Hutchison (ULANC), Dimitri Papadimitriou (ALBELL), Andrea Passarella (CNR), Vasilis Sourlas (CERTH), Patrick Wüchner (PASSAU)
Workpackage number:	WP2
Workpackage title:	JRA2: Emergence Theories and Design Methodologies
Lead partner:	SOTON
Dissemination level:	PU
Date created:	06 November 2013
Updated:	07 January 2014
Version:	Draft
Total number of Pages:	50
Document status:	Draft

Estimated PMs (DoW):

Estimated PMs Spent:

TABLE OF CONTENTS

1 Executive Summary

This report reviews funding of Internet Science topics at a European and national level, towards producing recommendations for funding agencies. It first examines the EU Horizon 2020 work programmes for 2014 - 2015, considering the individual work programmes and the cross-challenge focus areas. It then examines national research programmes and projects from Belgium, France, Germany, Greece, Italy and the UK. Implications are discussed, leading to the five recommendations of this report:

Recommendation 1: support work identifying the boundaries and synergies between Internet Science and Web Science.

Recommendation 2: support Internet Science activity around cultural heritage, the Digital Humanities and societal issues such as science education, gender equality and research governance.

Recommendation 3: provide a cross-challenge focus area, or equivalent support and signposting, to help Internet Science researchers identify priority research areas.

Recommendation 4: include incentives for rich interdisciplinary collaboration, not limited to "Computer Science plus another discipline" collaborations.

Recommendation 5: provide national level support for interdisciplinary collaboration.

2 Introduction

This document provides recommendations to funding agencies. The approach taken is to systematically review funding relevant to Internet Science, first at the European level and then at the national level: since Internet Science is a) interdisciplinary and b) not an extremely well-known topic, it is often the case that relevant funding is found under other names. For example, topics which can be relevant in Intenet Science include future networks (infrastructure, mobile networks, social networks), digital society, big data, open data, privacy, smart cities, and the Internet of Things. By examining current funding to ascertaining what is currently available and relevant to Internet Science, it is possible to consider trends across Europe and gaps in funding.

Section3 of this document considers European funding programmes, first presenting a review of calls from the Horizon 2020 work programme (2014 - 2015) and then considering cross-challenge focus areas. Section 4 considers national research programmes and projects from Belgium (Section 4.1), France (Section 4.2), Germany (Section 4.3), Greece (Section 4.4), Italy (Section 4.5) and the UK (Section 4.6). Section 5 discusses trends in funding from the previous two sections, while Section 6 provides conclusions and recommendations.

3 Review of European Funding Programmes

The interdisciplinary nature of Internet Science and its broad set of application domains mean that it is to be expected that funding relevant to Internet Science will be distributed throughout various programmes. Although Internet Science is mentioned by name under the CAPS programme (objective 1.7b), it is rarely referred to explicitly throughout European funding programmes. Nonetheless, work programmes frequently encompass objectives that fall within the remit of Internet Science, and it is notable that cross-cutting issues in Horizon 2020 include social sciences and humanities, which are fully integrated into the Horizon 2020 pillars and objectives. Indeed, the general introduction to the Horizon 2020 2014 – 2015 Work Programme [1] notes that the "Internet and the Web have become the key vehicles for innovation and creativity across the economy and society, with the digital sector representing a market of around EUR 3 trillion world-wide and more than 10% of the world's GDP estimated to depend on ICT."

This section first presents an overview of calls from the first Horizon 2020 Work Programmes that are relevant to Internet Science. This section then discusses the cross-challenge focus areas. Implications of European and national funding programmes can be found in Section 5.

Table 1 summarises a review of the 2014 – 2015 European Work Programmes recently published under Horizon 2020 (the full version is in ANNEX I). The following list shows how the work programme is divided (excepting introductory materials and information about communication and dissemination), with the number and type of topics relevant to Internet Science also shown:

1. Future and Emerging Technologies (FETs): 2 FETPROACT topics
2. Marie Sklodowska-Curie actions (MSCA): 0 topics (although of course MSCA-funded researchers may choose to work on Internet Science topics)
3. Research infrastructures (including e-Infrastructures): 2 EINFRA topics, one INFRASUPP topic
4. Introduction to Leadership in enabling and industrial technologies (LEITs): 0 topics
5. Information and communication technologies (ICT): 19 ICT topics
6. Nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology: 0 topics
7. Space: 0 topics
8. Access to risk finance: 0 topics
9. Innovation in SMEs: 1 INNOSUP topic
10. Health, demographic change and wellbeing: 2 PHC topics
11. Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy: 0 topics
12. Secure, clean and efficient energy : 1 SCC topic
13. Smart, green and integrated transport: 4 MG topics
14. Climate action, environment, resource efficiency and raw materials: 1 SC topics

15. Europe in a changing world - inclusive, innovative and reflective societies: 1 EURO, 1 YOUNG, 4 INSO topics
16. Secure societies - protecting freedom and security of Europe and its citizens: 5 DRS topics, 6 FCT topics, 3 DS topics, 1 other action
17. Spreading excellence and widening participation: 0 topics
18. Science with and for Society: 0 topics

In the following tables, all topics of some relevance are shown. Topics with low relevance address topics or use skills that are part of Internet Science, but do not address core Internet Science topics. Topics with medium relevance could be responded to in a way relevant to Internet Science, but also in other respects (e.g. a topic about security that could address offline security, or security in online social media). Finally, topics with high relevance address core Internet Science topics, and one might reasonably expect the majority of responses to these to fall within the remit of Internet Science.

Topic	Further description	Relevance
Future and Emerging Technologies		
FETPROACT 1 - 2014: Global Systems Science	Scientific knowledge to inform policy and societal responses to challenges	Low: Draws on topics (societal impact) and skills (network analysis, big data analysis) of Internet Science
FETPROACT 2 - 2014: Knowing, doing, being: cognition beyond problem solving	Link research on knowing, thinking, doing, being with artificial cognition, robots, smart artefacts	Low: Draws on topics (selfhood, social belonging and culture in the context of online technologies) and skills (in the case of connected robotics and smart artefacts) of Internet Science
Research infrastructures (including e-Infrastructures)		
EINFRA-2-2014 – e-Infrastructure for Open Access	Open access policies	Medium: some responses on open access policies and their interaction with society will certainly be in the remit of Internet Science
EINFRA-3-2014 – Towards global data e-infrastructures – Research Data Alliance	Technological and standardisation decisions in the context of RDA, an open international forum.	High: An Internet Science research topic, examining the interaction of policies and society.
INFRASUPP-7-2014 – e-Infrastructure policy development and international cooperation	e-infrastructure policies at European, national and regional levels	Medium: some responses will certainly be in the remit of Internet Science

Topic	Further description	Relevance
Information and communication technologies (ICT)		
ICT 1 – 2014: Smart Cyber-Physical Systems	Internet of Things (IoT), human aspects, smart societies, social sciences, humanities	High: An Internet Science research topic, considering the interplay between IoT and energy, transport, homes and workplaces.
ICT 5 – 2014: Smart Networks and novel Internet Architectures		Low: Relevant to Internet and networking technologies, but mono-disciplinary
ICT 6 – 2014: Smart optical and wireless network technologies		
ICT 7 – 2014: Advanced Cloud Infrastructures and Services		
ICT 9 – 2014: Tools and Methods for Software Development		
ICT 11 – 2014: FIRE+ (Future Internet Research & Experimentation)		
ICT 12 – 2015: Integrating experiments and facilities in FIRE+		
ICT 14 – 2014: Advanced 5G Network Infrastructure for the Future Internet		
ICT 8 – 2015: Boosting public sector productivity and innovation through cloud computing services	Procurement, trustworthiness, standards and legal aspects	Medium: some responses will certainly be in the remit of Internet Science, e.g. those considering the aspects described to the left.
ICT 10 – 2015: Collective Awareness Platforms for Sustainability and Social Innovation	Collective intelligence for better decision making and empowerment; multidisciplinary consortia	High: An Internet Science research topic, encompassing collective awareness in the context of sustainability, knowledge co-creation, and issues such as anonymity, ethics, and privacy online.

Topic	Further description	Relevance
ICT 13 – 2014: Web Entrepreneurship	Online platforms for entrepreneurship	Medium: some responses will certainly be in the remit of Internet Science, e.g. those considering use of MOOCs to for web entrepreneurship skills and building trusted ecosystems of web entrepreneurs.
ICT 15 – 2014: Big data and Open Data Innovation and take-up	The open data supply chain	High: An Internet Science research topic, e.g. establishing and attracting participation in open data supply chains.
ICT 16 – 2015: Big data - research	Data structures, algorithms etc. for data analytics, quality assessment and improvement, prediction and visualisation	Low: Draws on topics and skills relevant to (but not the focus of) Internet Science (e.g. big data, data analytics, visualisation)
ICT 19 – 2015: Technologies for creative industries, social media and convergence	Address demand for content and experiences with technology adoption: content creation, access, retrieval and interaction	Medium: An Internet Science research topic, if addressing online collaboration, creativity, and user-community interaction.
ICT 20 – 2015: Technologies for better human learning and teaching	Adaptive learning, affective learning, game-based learning and virtual worlds for learning.	Medium: An Internet Science research topic, if addressing online learning across the described modalities.
ICT 21 – 2014: Advanced digital gaming/gamification technologies	Aspects include emergent narrative, learner profiles, emotional models, learning and skills acquisition.	Medium: An Internet Science research topic, if addressed in the context of gaming / gamification online in the areas described left.
ICT 30 – 2015: Internet of Things and Platforms for Connected Smart Objects	The goal is to deliver an Internet of Things extended into a web of platforms for connected devices and objects, supporting smart environments, businesses, services and persons with dynamic and adaptive configuration capabilities.	Medium: some responses will certainly be in the remit of Internet Science, e.g. those addressing topics such as security and privacy on the IoT, and the IoT to impact energy, health, transport, etc.
ICT 31 – 2014: Human-centric Digital	The impact of technologies on	High: An Internet Science

Topic	Further description	Relevance
Age	behaviour, thinking, interactions, socialisation; implications for self, services, entrepreneurship, democracy and governance	research topic, addressing the impact of the internet on societal aspects.
ICT 32 – 2014: Cybersecurity, Trustworthy ICT	User trust of ICT and online services; user ability to detect breaches of security and privacy; user empowerment to control their data and trust relations	High: An Internet Science research topic, addressing issues of security and trust online.
EUB 1 – 2015: Cloud Computing, including security aspects	Development of technologies combining advanced Clouds and Big Data.	Low: Such underlying infrastructures are relevant to but not the focus of Internet Science
EUJ 1 – 2014: Technologies combining big data, internet of things in the cloud	Development of global cloud platform technologies to meet the challenges of big data, mobile and IoT.	
EUJ 2 – 2014: Optical communications	Programmable optical hardware and super-capacity optical transport networks.	
EUJ 3 – 2014: Access networks for densely located users	The realisation of high speed/high capacity dense local networks	
Innovation in SMEs		
INNOSUP 6 – 2015: Capitalising the full potential of online-collaboration for SME innovation support	Trust, relationship building and innovation online	High: An Internet Science research topic addressing the impact of online technologies on trust and relationships.
Health, demographic change and wellbeing		
PHC 21 – 2015: Advancing active and healthy ageing with ICT: Early risk detection and intervention	Earlier detection of risks associated with ageing to address areas such as cognitive impairment, frailty and social exclusion.	Medium: An Internet Science research topic, if addressed in the context of analytics of big internet data and social machines to detect illness
PHC 29 – 2015: Public procurement of innovative ehealth services	Healthcare delivery in remote, sparsely populated, difficult to access regions; ehealth services for mobile patients	Medium: An Internet Science research topic, if addressing the parts of the topic described left
Secure, clean and efficient energy		

Topic	Further description	Relevance
SCC 1 – 2014/2015: Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) projects	Responses to this topic could focus on Internet Science topics, e.g. using and innovating on the Internet of Things as a driving technology.	Medium: An Internet Science research topic, if addressing the parts of the topic described left
Smart, green and integrated transport		
MG.3.5-2014. Cooperative ITS for safe, congestion-free and sustainable mobility	Aspects such as the use (and impact of the use) of internet tools such as dynamic congestion information are relevant, constituting social machines, computational entities governed by computational and social processes..	Medium: An Internet Science research topic, if addressing the parts of the topic described left
MG.5.3-2014. Tackling urban road congestion		Medium: An Internet Science research topic, if addressing the parts of the topic described left
MG.6.3-2015. Common communication and navigation platforms for pan-European logistics applications	Information sharing, trust, and how information is used	Medium: An Internet Science research topic, if addressing the parts of the topic described left
MG.7.1-2014. Connectivity and information sharing for intelligent mobility	Cloud computing, big linked data and social media in combination to address a societal issue.	High: An Internet Science research topic, examining the impacts of internet technologies on society.
Climate action, environment, resource efficiency and raw materials		
SC5-17-2015: Demonstrating the concept of 'Citizen Observatories'	The use of online technologies for citizen input of complex data, to be used for policy, industry and society is very much within the remit of Internet Science	High: An Internet Science research topic, addressing the use of online technologies for citizen input of complex data for use in ways of impact on society.
Europe in a changing world - inclusive, innovative and reflective societies		
EURO-6-2015: Meeting new societal needs by using emerging technologies in the public sector	Semantic web technologies, linked open data, the Internet of Things and social sensor networks to tackle challenges in the public sector. Government as a platform.	High: An Internet Science research topic, examining online technologies to impact the public sector and the way in which governance is conducted.

Topic	Further description	Relevance
YOUNG-5-2014: Societal and political engagement of young people and their perspectives on Europe	ICT to support citizen involvement in political decisions and public policy making.	Medium: An Internet Science research topic, if addressing the parts of the topic described left
REFLECTIVE-6-2015: Innovation ecosystems of digital cultural assets	Use of ICT to share and analyse cultural resources.	Medium: this culturally-relevant topic can involve the use of Internet Science tools (such as big data analysis and collective intelligence).
INSO-1-2014/2015: ICT-enabled open government	Large volumes of publicly available data for new, smart and mobile public services. Citizen-centric public service applications, transparency.	High: An Internet Science research topic, concerning the impact of internet technologies on governance.
INSO-2-2014: Understanding and supporting business model innovation	The online world offers the opportunity for vastly different business models to those of past decades.	Medium: An Internet Science research topic, if addressing the parts of the topic described left
INSO-6-201436: Platform for ICT for Learning and Inclusion	Respondents who focus on the use of internet technologies for inclusion and learning will be dealing with Internet Science issues.	Medium: An Internet Science research topic, if addressing the parts of the topic described left
INSO-9-2015: Innovative mobile e-government applications by SMEs	e-governance; questions of scalability, sustainability, impact and feasibility.	High: An Internet Science research topic examining the impact of internet technologies on governance.
Secure societies - protecting freedom and security of Europe and its citizens		
DRS-1-2015: Crisis management topic 1: Potential of current and new measures and technologies to respond to extreme weather and climate events	Many responses to all of these topics may not touch on topics relevant to Internet Science, but there is great potential for crowd sourcing and citizen science in these different contexts.	Medium: An Internet Science research topic, if addressing topic as described left
DRS-2-2014 Crisis management topic 2: Tools for detection, traceability, triage and individual monitoring of victims after a mass CBRN contamination and/or exposure		

Topic	Further description	Relevance
DRS-4- 2014: Crisis management topic 4: Feasibility study for strengthening capacity-building for health and security protection in case of large-scale pandemics – Phase I Demo		
DRS-12-2015: Critical Infrastructure Protection topic 1: Critical Infrastructure "smart grid" protection and resilience under "smart meters" threats	Online smart metres, robustness against cyber-attacks, network modelling, and implications for the users of such technologies	Low: relevant to Internet Science in topic (cyber security) and tools (from network science), but mono-disciplinary and focused on technology alone.
DRS-14-2015: Critical Infrastructure Protection topic 3: Critical Infrastructure resilience indicator - analysis and development of methods for assessing resilience	Human factors (i.e. radicalisation), security, geo-politics, sociology, economy, etc. and increased vulnerability due to changing threats"	Medium: This topic offers a space for Internet Scientists to work on such topics as security and radicalisation online
FCT-4-2015: Forensics topic 4: Internet Forensics to combat organized crime	Research into organised crime online, its camouflaging and trans-border aspects	High: An Internet Science research topic, concerning online forensics and criminal uses of the Internet.
FCT-6-2015: Law Enforcement capabilities 2: Detection and analysis of terrorist-related content on the Internet	Linking pseudonyms with the original author, handling multilingual content, involving law enforcement bodies, managing personal data	High: An Internet Science research topic that encompasses anonymity, privacy, language and law enforcement online.
FCT-9-2015: Law Enforcement capabilities topic 5: Identity Management	The rise of social media and the IoT have changed identity online. Identity, trust and security are central to this topic	High: An Internet Science research topic, concerning identity, trust and security in the context of the IoT and social media.
FCT-13-2014: Ethical/Societal Dimension Topic 1: Factors affecting (in-) security	Responses to this topic may not consider the digital world, but internet security and how secure (or not) internet users feel is a rich and important research topic	Medium: An Internet Science research topic, if addressing topic as described left
FCT-15-2015: Ethical/Societal Dimension Topic 3: Better understanding the role of new social media networks and their use for public security purposes	The influence of social media on public security planning, and whether use of social media in the public security community is a threat.	High: An Internet Science research topic, addressing the impact of social media in the context of the public security community.

Topic	Further description	Relevance
FCT-16-2015: Ethical/Societal Dimension Topic 4 - Investigating the role of social, psychological and economic aspects of the processes that lead to organized crime (including cyber related offenses), and/or terrorist networks and their impact on social cohesion	Regarding the cybercrime aspects (but not other crime), this is relevant	Medium: An Internet Science research topic, if addressing topic as described left
DS-1-2014: Privacy	Issues include unclear privacy levels and data protection, mistrust of online services, user difficulty evaluating the value of their data	Medium: An Internet Science research topic, if addressing topic as described left
DS-5-2015: Trust eServices		
DS-6-2014: Risk management and assurance models		
Other action 5 - Developing Law Enforcement Tools and Techniques in the Fight Against Cybercrime	Development of tools to gather data on areas such as darknets, flows of digital money in criminal transactions, botnets and malware	High: An Internet Science research topic, concerning criminal use of internet technologies and the impact of this.

Table 1. The relevance of selected topics from the Horizon 2020 Work Programme (2014 - 2015) to Internet Science

In summary, the Inclusive Societies part of the Work Programme includes nine topics of relevance, of which one falls under “Overcoming the crisis”, one under “The Young Generation in an Innovative, Inclusive and Sustainable Europe”, one under “Reflective societies: Cultural Heritage and European Identities” and six under “New forms of Innovation”.

Sixteen topics of relevance exist under the Secure Societies section of the Work Programme: three under “Crisis management”, two under “Critical infrastructure protection”, two under “Forensics”, two under “Law enforcement capabilities”, three under “Urban security”, three under “Digital security”, and finally one within the “Other Actions”.

Putting aside the topics of low relevance, the breakdown of topics in Work Programmes is thus:

- Research infrastructures (including e-Infrastructures): 2 EINFRA topics (1 medium, 1 high relevance), one INFRASUPP topic (medium relevance)
- Information and communication technologies (ICT): 11 ICT topics (6 medium, 5 high relevance)
- Innovation in SMEs: 1 INNOSUP topic (high relevance)
- Health, demographic change and wellbeing: 2 PHC topics (medium relevance)
- Secure, clean and efficient energy: 1 SCC topic (medium relevance)
- Smart, green and integrated transport: 4 MG topics (3 medium, 1 high relevance)

- Climate action, environment, resource efficiency and raw materials: 1 SC topic (high relevance)
- Europe in a changing world - inclusive, innovative and reflective societies: 1 EURO topic (high relevance), 1 YOUNG topic (medium relevance), 4 INSO topics (2 medium, 2 high relevance)
- Secure societies - protecting freedom and security of Europe and its citizens: 5 DRS topics (4 medium, 1 high relevance), 6 FCT topics (2 medium, 4 high relevance), 3 DS topics (medium relevance), 1 other action (high relevance)

The topics of high relevance are thus:

Research infrastructures

- EINFRA-3 Global data e-infrastructures

ICT

- ICT 1 Smart cyber-physical systems
- ICT 10 Collective Awareness platforms
- ICT 15 Big Data and Open Data Innovation and take-up
- ICT 31 Human-centric Digital Age
- ICT 32 Cybersecurity, Trustworthy ICT

Innovation in SMEs

- INNOSUP 6 Capitalising the full potential of online-collaboration for SME innovation support

Smart, green and integrated transport

- MG.7.1-2014. Connectivity and information sharing for intelligent mobility

Climate action, environment, resource efficiency and raw materials

- SC5-17-2015: Demonstrating the concept of 'Citizen Observatories'

Europe in a changing world - inclusive, innovative and reflective societies

- EURO-6-2015: Meeting new societal needs by using emerging technologies in the public sector
- INSO-1-2014/2015: ICT-enabled open government
- INSO-9-2015: Innovative mobile e-government applications by SMEs

Secure societies - protecting freedom and security of Europe and its citizens

- DRS-12-2015: Critical Infrastructure Protection topic 1: Critical Infrastructure “smart grid” protection and resilience under “smart meters” threats
- FCT-4-2015: Forensics topic 4: Internet Forensics to combat organized crime
- FCT-6-2015: Law Enforcement capabilities 2: Detection and analysis of terrorist-related content on the Internet
- FCT-9-2015: Law Enforcement capabilities topic 5: Identity Management
- FCT-15-2015: Ethical/Societal Dimension Topic 3: Better understanding the role of new social media networks and their use for public security purposes;
- Other action 5 - Developing Law Enforcement Tools and Techniques in the Fight Against Cybercrime

Finally, it is of note that the open research data pilot under Spreading Excellence and Widening Participation (which “aims to improve and maximise access to and re-use of research data generated by projects” [2]) is directly relevant to Internet Science.

There are 12 cross-challenge focus areas of Horizon 2020's first Work Programme, which are discussed in turn below.

1. Personalising health and care

Topics PHC 21 and PHD 29 from the healthcare programme are both relevant.

2. Sustainable food security

No relevant topics.

3. Blue growth: unlocking the potential of seas and oceans

Topics MG.3-5 and MG.5-3 are relevant from the transport programme, as is SC5-17 from the climate programme.

4. Smart cities and communities

Topics MG.3-5, MG.5-3, MG.6-3 and MG.7-1 from the transport programme, ICT 30 from the ICT programme and SCC from the energy programme.

5. Competitive low-carbon energy

Topic SCC 1 from the energy programme is relevant.

6. Energy efficiency

Congestion reduction topics such as MG.3-5 and MG.5-3 from the transport call are somewhat relevant.

7. Mobility for growth

Again, the four MG topics are relevant.

8. Waste

No topics are relevant.

9. Water innovation

No topics are relevant.

10. Overcoming the crisis: new ideas, strategies and governance structures for Europe

The six Internet Science-relevant parts of the Inclusive Societies programme are relevant.

11. Disaster-resilience

No Climate action topics are relevant, but the three Crisis Management topics within the Security Programme are relevant, as are the two Critical Infrastructure Protection topics.

12. Digital security

As the introductory document notes [1], "Almost a third of Europeans are not confident in their ability to use internet for banking or purchases. An overwhelming majority also avoid disclosing personal information online because of security concerns". Many of the Security topics that have been identified are relevant, most particularly the Forensics topics addressing cybercrime, FCT-9, FCT-13, FCT-15 and FCT-16. DS-1, DS-5, DS-6 and action 5 are also relevant.

4 Review of National Research Programmes and Projects

This section provides an analysis of national-level research funding programmes and projects, addressing in sequence materials from Belgium, France, Germany, Greece, Italy and the UK. Each section enumerates relevant national funding sources and highlights where relevant large-scale relevant programmes and projects exist. Implications of national level funding, along with European level funding, can be found in Section 5.

4.1 Belgium

National Funders

BELSPO, the Belgian Federal Science Policy Office, is a government institution responsible for coordinating science policy at a federal level. It designs and implements research programmes and networks and manages the participation of Belgium in European and international organisations. BELSPO funds the Interuniversity Attraction Poles (IAP), which aim to support teams of excellence in Belgian research. These teams work as part of a network to increase their contribution to scientific advances and international scientific networks. The IAP programme runs in five year phases: the current phase-VII (2012-2017) has 156 million EUR funding, contains 47 networks of 369 research teams (257 Belgian teams and 112 International partners), spanning the life sciences, exact and applied sciences and the human sciences. The programme represents some 500 researchers and over 2000 publications each year.

The National Fund for Scientific Research (FNRS) is an institution of public interest devoted to the financial support and promotion of basic scientific research in the French-speaking community of Belgium, with an annual budget of 90.5 million EUR. The FNRS manages five associated/specialized funds: IISN (nuclear physics and applications); FRSM (medical science); FRFC (research in all scientific domains covered by the FNRS); FRIA (funding related to cooperation with industry and agriculture); FRESH (humanities research). FNRS funding encompasses work in the engineering sciences, basic sciences, earth sciences, humanities and social sciences, life sciences and medical sciences.

Programmes and Projects

Within the 47 IAP networks, 15 fall under the Exact and Applied Science programme. Seven, as follow, are relevant to Internet Science:

1. Multiscale Modelling of Electrical Energy Systems links with EINS JRA7 (Critical Infrastructure)
2. Developing crucial Statistical methods for Understanding major complex Dynamic Systems in natural, biomedical and social sciences (StUDyS) links with EINS JRA1 (Theory of Internet Science)

3. Dynamics, Geometry and Statistical Physics (DYGEST) partly links with JRA1, notably via its WP1 Nonlinear dynamics and statistical mechanics, and WP2 Dynamical and Integrable Systems
4. Dynamical systems, control and optimisation (DYSCO) links with EINS JRA1, JRA2 (Emergence Theories + Design), JRA3 (Evidence and Experimentation), SEA1 (e-presence, dissemination and awareness raising tools)
5. Belgian network on STochastic modelling, analysis, design and optimisation of COMmunication systems (BESTCOM) links with JRA2, JRA3 (mainly oriented on wireless/radio communication)
6. Combinatorial Optimisation: Metaheuristics and Exact methods links with JRA1
7. Fundamental interactions: at the boundary of theory, phenomenology and experiment links with JRA1, JRA3.

It can be seen that Belgian funding relevant to Internet Science is primarily focused on network modelling and dynamic systems, while the Horizon 2020 programme covers broader topics. Notably, the IAP Networks include relatively strong links with EINS JRA1 (Theory of Internet Science) and do include support for interdisciplinary work (in the StUDyS network).

4.2 France

National Funders

French funding agencies include:

- ANR: the National Research Agency deals globally with fundamental, advanced and applied research projects
- Bpifrance (previously known as Oseo) deals with industrial consortia, targeting applied research
- CdC (Caisse des Dépôts) is a public investor for projects in academia or industry

Programmes and Projects

ANR's 2014 work programme, addresses all scientific communities and public or private players involved in French research and in particular SMEs and very small enterprises. ANR has identified nine major societal challenges, as follow:

1. Efficient resource management and adaptation to climate change
2. Clean, secure and efficient energy
3. Industrial renewal
4. Health and well-being
5. Food security and demographic challenges
6. Sustainable mobility and urban systems
7. Information and communication society

8. Innovative, inclusive and adaptive societies

9. Freedom and security of Europe, its citizens and its residents

Bpifrance has a mission to provide assistance and financial support to French SMEs and VSEs. It manages the Investment d'avenir framework, which devotes 2000m EUR for development of very high speed internet access (including support for less densely populated areas) and 1600m EUR on uses, innovative services and digital content, focusing on cloud computing, scanning and enhancement of cultural content, development of core digital technologies, and new uses of digital technologies (e-health, security, transport, digital city, e-education).

Bpifrance also manage 'pole de competitivité', which has three relevant clusters. The first, Images & Réseaux, has a roadmap for internet infrastructure and content: they issued a whitepaper on Future of Internet and developed a test and experimental lab, ImaginLab. The second, Systematic, examine cloud technologies. These two clusters and a third cluster, Cap Digital, constitute the French node of the KIC ICT lab of EIT, also dealing with the education, research, and innovation triangle towards internet.

Caisse des Dépôts funds projects to support economic development (employment, regional competitiveness, digital infrastructure, the knowledge-based economy), social cohesion (the social economy and solidarity sector, the greying economy and urban planning and development), and the switch to alternative, renewable and more efficient energies. It funds some Investissement d'avenir programs and manages nine projects in the scope of the Investments for the Future programme on behalf of the French State. These projects are coordinated by a specific department and cover the Group's own strategic priorities such as higher education and training, research, industry and SMEs, sustainable development and digital infrastructure.

The topics identified by ANR are not dissimilar to those identified by the Horizon 2020 Work Programmes. Also similar to European funding, it can be seen that French funding includes coverage of technological aspects (e.g. development of high speed internet access) and diverse domain applications (uses, innovative services and digital content, and uses in health, security, transport, etc.). The funding for a test and experimental lab is noteworthy as European funding doesn't explicitly support such environments.

4.3 Germany

National Funders

Significant national-level German funders include:

- The Deutsche Forschungsgemeinschaft (DFG, German science foundation), who fund fundamental research across all scientific areas
- Federal ministries, including the Bundesministerium für Bildung und Forschung (BMBF, Federal Ministry of Education and Research); Bundesministerium für Wirtschaft und

Technologie (BMWi, Federal Ministry of Economics and Technology); Bundesministerium für Kultur und Medien (BKM, Federal Ministry of Culture and Media)

- National foundations, including Alexander von Humboldt-Stiftung; Fritz Thyssen Stiftung; Hans-Böckler-Stiftung; Robert Bosch Stiftung; VolkswagenStiftung

Regional funding sources also exist, such as the Bayerischen Staatsministerium für Bildung und Kultus, Wissenschaft und Kunst (Bavarian State Ministry of Education, Science and the Arts) and Bayerische Forschungsstiftung (Bavarian Research Foundation). Details of these are beyond the scope of this document.

Programmes and Projects

Of the German funding sources, the DFG provides significant programmes most related to Internet Science.

The DFG provides various domain-agnostic funding programmes, for example for individuals (research grants and fellowships) and groups (graduate schools and clusters of excellence). Since these do not target a specific field of research, they could in principle be applied to the field of Internet Science.

The DFG Priority Programmes take an important role. Each Priority Programme receives funding for six years for up to 30 individual projects. As of November 2013, 105 Priority Programmes are running, of which the following are related to Internet Science:

- SPP 1305: “Regelungstheorie digital vernetzter dynamischer Systeme (“Control Theory of Digitally Networked Dynamic Systems”, since 2007, http://spp-1305.atp.rub.de/)
- SPP 1324: “Mathematische Methoden zur Extraktion quantifizierbarer Information aus komplexen Systemen” (“Extraction of Quantifiable Information from Complex Systems”, since 2008, http://www.dfg-spp1324.de/)
- SPP 1335: “Scalable Visual Analytics: Interactive Visual Analysis Systems of Complex Information Spaces” (since 2008, http://www.visualanalytics.de/)
- SPP 1395: “(DFG-Schwerpunkt Informations- und Kommunikationstheorie in der Molekularbiologie” (“Information and Communication Theory in Molecular Biology”, since 2009, http://www.inkombio.de/)
- SPP 1397: “Communications in Interference Limited Networks (COIN)” (since 2009, http://www.coin-dfg.de/)
- SPP 1409: “Wissenschaft und Öffentlichkeit” (“Public Understanding of Fragile or Conflicting Scientific Evidence”, since 2009, http://wissenschaftundoeffentlichkeit.de/DFG-SPP1409)
- SPP 1496: “Reliably Secure Software Systems – RS^3” (since 2010, http://www.reliably-secure-software-systems.de/)
- SPP 1505: “Mediatisierte Welten: Kommunikation im medialen und gesellschaftlichen Wandel” (“Mediatized Worlds: Communication in the medial and social change”, since 2010, http://www.mediatisiertewelten.de/)

- SPP 1505: “Drahtlose Ultrahochgeschwindigkeitskommunikation für den mobilen Internetzugriff” (Wireless ultra-high-speed communication for mobile Internet access, since 2013, www.dfg.de/foerderung/info_wissenschaft/archiv/2012/info_wissenschaft_12_23/).

German funding of relevance to Internet Science offers varied perspectives, although in contrast to European funding it does not appear to offer support for interdisciplinary collaborations.

4.4 Greece

National Funders

Public funding is the main driver of Greek research, which exceeds two thirds of total gross expenditure on R&D. Research programmes are the main funding instruments: two of these are noteworthy in the Internet Science context. First is the Ministry of Education, Religion and Sports’s Operational Program “Education and Life Long Learning”, for which around 376m EUR of funding is provided. Secondly, the Ministry of Education and Religious Affairs, Culture and Sports invested 68.3m EUR on the research programme “Collaboration” which supports collaborative research by private companies and public research organisations.

Programmes and Projects

Projects from the “Education and Life Long Learning” programme include THALES (120m EUR), ARISTEIA (60m EUR) and Archimedes (21m EUR).

The goal of THALES is to support interdisciplinary and inter-institutional research projects in Greek universities. Research areas supported are broad, including Arts and Humanities, Education, Civilisation, Biological and Medical Sciences, Engineering, Informatics and Telecommunication Sciences, Geotechnical, Energy, Environmental and Aerospatiale Sciences, Mathematics, Physics, Chemistry, Social, Administrative and Economical Sciences. More than 40 ICT projects are funded by THALES. One that is relevant to Internet Science is CROWN.

CROWN (Optimal Control of Self-Organized Wireless Networks) is a 3 year, 535k EUR project. Goals are to rethink the foundations of wireless network control and management; understand the fundamental issues and trade-offs in control wireless networks through self-organisation and locally coordinated mechanisms for macroscopic operating network regimes; develop dynamic network feedback for self-awareness; Conduct optimisation based on iterative techniques for primary network operations; network performance assessment; develop delay- and disruption-tolerant wireless networks.

The ARISTEIA programme aims to support highly talented researchers across various fields, and has so far funded 230 clusters of excellence over 45 Greek research institutions. One of its projects is SOFON.

SOFON (Stochastic optimisation framework for architecting complex wireless Networks) is a 3-year, 420k EUR project. Goals are to develop a stochastic resource allocation framework; address

computation and communication complexity; address application relevant performance objectives; investigate novel synergistic schemes of wireless transmissions; deliver a concrete plan for converting the principles of signal interaction, node cooperation and network coding in conjunction with proactive caching, into a holistic approach for the architectural design of wireless networks; explore energy management methodologies; produce prototypes.

The Archimedes programme supports Greek Technological Educational Institutes (TEI), funding interdisciplinary and inter-institutional research. The programme supports research projects in all research fields, but gives emphasis to engineering and ICT.

The Cooperation research programme supports collaboration between Greek enterprises and research organisations through the joint implementation of research and technology projects that promote green growth, competitiveness and extroversion of Greek enterprises and improve the quality of life of Greek citizens. It includes the following ICT topics:

- Electronic games and their education and scientific role
- Green wireless networks: low-energy wireless systems powered by renewable energy
- Wireless sensor networks, energy management for low consumption, interconnection of objects, data synthesis from heterogeneous sensors
- Research and application of business intelligence and knowledge management systems through the use of automations in industry
- Secure communication networks and interoperability, security of exchanges
- Electronic management of health units
- Research into IT applications in the health and welfare sector
- Research into the interoperability of heterogeneous information systems for providing electronic services
- e-commerce
- e-tourism

One Cooperation-funded project is WiSe-PON (Converging FTTx and Broadband Heterogenous Wireless Services over Next-Generation Radio-over-Fiber Passive Optical Networks), a 4-year, 2.5m EUR project. WiSe-PON will demonstrate a novel access network infrastructure capable of converging fixed and mobile connectivity and of delivering heterogeneously wireless and FTTH services. WiSe-PON builds upon the adoption of Passive Optical Networks (PONs) and aims to provide three services over a common PON platform: Broadband Wireless 500Mb/s services at 5GHz RF carriers, Broadband wireless 2.5Gb/s LAN traffic at 60GHz RF carriers, and FTTH services.

Similar to the German situation, although THALES and Archimedes do offer support to interdisciplinary collaborations, current Greek projects relevant to Internet Science do not appear to be interdisciplinary in nature.

4.5 Italy

National Funders

The only funding agency in Italy is the Ministry of Research and Education (MIUR). Funding from MIUR is organised along two lines:

FIRB (Fondo per gli Investimenti della Ricerca di Base) funds fundamental research. It is not organized around pre-determined topics, and covers all areas of research.

PRIN (Progetti di ricerca di interesse nazionale) is a similar programme, but oriented towards all fields of research, both fundamental and applied. It is divided into Life Sciences (15m EUR in 2012), Physical Science and Engineering (15m EUR in 2012) and Social Sciences and Humanities (7.6m EUR in 2012). It is also not organized around pre-determined topics.

A separate programme is the National Operational Programme (NOP) for Research and Competitiveness. This ran 2007-2013 and was co-funded with European Regional Development Fund (ERDF) and National resources, and targets southern Italy. It promoted initiatives and projects for scientific research, industrial competitiveness and innovation in the four Convergence regions, namely Calabria, Campania, Puglia and Sicily. The NOP for "R&C" has an overall budget of approximately 6.2b EUR, of which 50% has been provided by ERDF and 50% by national funding. The NOP had three action lines, with targets to promote scientific-technological networks and incentives for business, to focus on business innovation and development while increasing the ability of local business to adapt their strategies to changes in the business context, and to improve the efficiency of planned measure and record best practices.

Programmes and Projects

Both FIRB and PRIN typically result in a huge number of very small projects, spread across a great breadth of topics and expertise. The funding process typically takes a long time, and little information is publicly available about the funded projects. This makes it very difficult to assess projects' relevance to Internet Science.

The NOP was divided into various areas, within which Smart Cities was most relevant to Internet Science. This was allocated 200m EUR, and resulting projects were expected to improve the services and quality of communities. Areas within Smart Cities included smart mobility, smart health, smart education, cloud computing technologies for smart government, smart culture e-Tourism, renewable energy and smart grid, energy efficiency and low carbon technologies, smart mobility and last-mile logistics, sustainable natural resources (waste, water, urban biodiversity). A short summary of the funded projects under NOP programme (in the area Smart Cities) is presented in ANNEX .

The nature of Italian funding makes it difficult to identify linkages between this funding and other national and European funding.

4.6 United Kingdom

National Funders

The UK Research Councils fund a substantial portion of UK research, investing around £3 billion yearly. They are divided into:

- Arts and Humanities Research Council (AHRC)
- Biotechnology and Biological Sciences Research Council (BBSRC)
- Engineering and Physical Sciences Research Council (EPSRC)
- Economic and Social Research Council (ESRC)
- Medical Research Council (MRC)
- Natural Environment Research Council (NERC)
- Science and Technology Facilities Council (STFC)

In addition to the UK Research Councils, the Technology Strategy Board (TSB) offers funding of relevance, mainly industry-focussed and typically for shorter-term R&D. Sometimes the TSB runs research and development programmes jointly with one of the Research Councils, typically with the EPSRC.

Programmes and Projects

Considering the context of Internet Science, the UK research councils of most relevance are the AHRC, EPSRC and ESRC. In addition, the TSB is relevant. This report therefore considers these funders in turn:

AHRC

The Arts and Humanities Research Council has funded various relevant projects, such as:

- Society of neurons: socially constructed internet sites as interfaces that model emerging brain function (36k)
- The role of the Internet in D/deaf people's inclusion in the information society (133k)
- The regulation of deviant behaviour on the internet: the roles of law and 'policing' as governance (136k)
- UK Museums and the Semantic Web (123k)

Past programs include “Designing for the 21st Century” (which includes a focus on computing and communications) and “ICT in Arts and Humanities Research”, some of which is relevant to Internet Science. Past research centres concerned “Logic, Language, Mathematics and Mind” and “Studies in Intellectual Property and Technical Law”.

Notably, one of the four current funding themes is “Digital Transformations in the Arts and Humanities”, which includes examination of the impact of digital change. Topics include “how we communicate and use knowledge in the context of the ‘infinite archive’”, “the human implications of

the expanded archive, including memory, perception, truth, ethics, and the use of language" and "changes in publishing, notions of authorship, intellectual property, the rights and responsibilities of the individual and the state".

EPSRC

EPSRC initiatives of relevance include the Doctoral Training Centre in Web Science (£6m) and the recently-closed Internet of Things call (with up to £3.5 million available for up to ten projects investigating the Internet of Things for use 'in the wild').

A significant EPSRC project is SOCIAM (The Theory and Practice of Social Machines), a 5-year, £6.2m project. SOCIAM has four goals:

1. Discover how social computing (problem-solving by very large-scale human participation via the web) can emerge, given that society has to undertake much of the burden of identifying problems, designing solutions and dealing with the complexity of the problem solving.

2. Provide seamless access to a Web of Data including user generated data.

3. Understand how to make social machines accountable and to build the trust essential to their operation.

4. Design the interactions between all elements of social machines: between machine and human, between humans mediated by machines, and between machines, humans and the data they use and generate.

The SOCIAM project promises to build a Social Machines Observatory to empirically track, monitor and classify existing social machines and new ones as they evolve, and act as an early warning facility for disruptive new social machines.

ESRC

The ESRC supports a great deal of research relevant to Internet Science, including for example such projects as "How Are Job Markets and Unions Being Changed by the Internet?" (109k), "The Internet and Everyday Rights in Russia" (81k), "European Regulation of Internet Commerce" (41k), "The Geography of Digital Inequality" (159k) and "What we cannot ask: how information poverty manifests on the Internet" (72k). The ESRC is about to run an interdisciplinary residential event intended to generate research ideas and proposals on the topic of Empathy and Trust In Communicating Online.

TSB

The TSB has also identified the Digital Economy as a priority area, alongside ICT, within which big data has been identified as a priority. Initiatives include the Connected Digital Economy Catapult, a technology and innovation centre for businesses, scientists and engineers to work side by side.

The Open Data Institute is a TSB-funded organisation of relevance, recipient of £10 million over five years and with the goal of catalysing the evolution of open data culture.

In addition, the Assisted Living Platforms programme (joint with the EPSRC) has some relationship to the aims of the Internet Science initiative, an example past project being PAL (Personal and Social Communication Services for Health and Lifestyle Monitoring), which involved two EINS partners and aimed to investigate how future healthcare services impact current and future communication infrastructures.

Cross-Council programmes

Of great relevance is the existence of cross-council funding initiatives, designed to address inherently interdisciplinary areas such as Internet Science. Most significant of current cross-council research is the Digital Economy Programme, which aims to realise the transformational impact of digital technologies on aspects of community life, cultural experiences, future society and the economy. Led by the EPSRC, this theme has seen a total investment of £138m. Moreover, the Digital Economy programme has funded four 'networks' with a remit to stimulate interdisciplinary engagement between ICT researchers and those from other disciplines.

In summary, UK funding certainly includes coverage of topics relevant to Internet Science, and in contrast to European funding does include some larger-scale funding specifically devoted to the related discipline of Web Science (the EPSRC funding of approximately £6m apiece for the WebSci DTC and the SOCIAM project).

5 Implications

This section falls into two parts. First is an analysis of the implications of European funding of Internet Science topics. Second is an analysis of the implications of the six sets of national level funding.

5.1 Implications of European Internet Science funding

Firstly, it is of note that the Horizon 2020 programme includes a focus on cross-cutting issues and the integration of the social sciences and humanities: this philosophy is in line with that of Internet Science and bodes well for future support of the interdisciplinary approach taken within Internet Science.

It is not surprising that areas such as the Marie-Curie actions or research into nanotechnologies or space have no topics relevant to Internet Science. It is also unsurprising that the ICT Work Programme is of particular relevance. The "Future Internet" challenge includes specific challenges of particular relevance, although some of these are relevant in a monodisciplinary sense, focusing only on the technological aspects of networking and cloud technologies. Removing these leaves 11 specific challenges of relevance. The "Content Technologies and Information Management" challenge has Big Data and tools for the creative, media, knowledge and learning industries as key topics, and again offers relevant specific challenges. Various ICT Cross-Cutting Activities are relevant, as are some of the EU-Brazil and EU-Japan topics.

The European funding covers a breadth of topics, ranging from infrastructures and big data to e-government and cybercrime. The ICT, inclusive societies and secure societies programmes are those most relevant for Internet Science research, and it is notable that in fact the ICT and secure societies programmes offer an equal number of very relevant topics. One difficulty in Internet Science so far has been in engagement of those from outside Computer Science, so it is heartening to see non-ICT programmes providing reasonable coverage of Internet Science topics.

The analysis of European funding revealed a distribution of topics relevant to Internet Science across various Work Programmes. Such topics were particularly prevalent in the ICT, Inclusive Societies and Secure Societies parts of the Horizon 2020 work programme, with 11, 6 and 16 specific challenges of medium or high relevance respectively. The number of relevant topics in the Secure Societies programme may at first be surprising, but when considering the breadth of that programme, this makes more sense: the relevant topics are distributed relatively evenly between diverse areas within security, such as crisis management, critical infrastructure protection, forensics and urban security. The pervasive nature of the Internet and its high-impact implications for security of course mean that a great many relevant research topics exist.

It is for similar reasons that the Inclusive Societies programme has a relatively high number of Internet Science-relevant topics: the Internet has a huge impact upon our society, and of course with

Internet Science designed to examine and influence that impact, it is no big surprise to see relevance in this programme. Indeed, if anything then more than 6 topics (compared to 11 in ICT and 16 in security) would be expected.

Many of the topics of medium relevance are domain specific, such as the majority of those in the Energy, Health and Transport calls. This reflects the domain agnostic nature of Internet Science applications, and is also reflected in the relevance level being 'medium': most of these domain-specific topics are not core Internet Science, but could be addressed by Internet Science. Relatedly, big and open data, constructs that are very relevant to Internet Science, are a recurring theme across various calls, and indeed open data is also addressed in the open research data pilot. The implementation, uptake and propagation of such data is directly relevant to Internet Science, yet it clearly offers a huge breadth of uses across many domains. This is because Internet Science addresses the interplay between big data, the Internet, and Internet users and communities, offering an approach that can be applied in many areas, even where the Science of the Internet is not the primary focus.

Regarding the twelve cross-challenge focus areas, no Internet Science-relevant topics were found relating to food security, waste or water security. Again, though, at least some relevant topics were found in each of the remaining nine areas, from illness risk detection and ehealth, tackling congestion and using citizen observatories to guide climate policy, smart objects and cities, security calls concerning cybercrime, forensics, and crisis management, and the use of technologies in the public sector to meet societal needs in EURO-6.

EURO-6 is not only highly relevant to Internet Science but also highly important, along with ICT 31 (human-centric digital age), ICT 32 (cyber security, trustworthy ICT), SC5-17 (demonstrating citizen observatories), INSO-1 (ICT-enabled open government), FCT-4, FCT-6, FCT-9, FCT-15 (Internet Forensics to combat organized crime; detection and analysis of terrorist-related content on the Internet; Identity management; understanding the role of social media in public security), and finally action 5 (law enforcement tools and techniques in the fight against cybercrime). Such efforts, focusing on the interactions between Internet technologies and platforms with society and big societal issues, are central to Internet Science.

Other issues of interest include the relevance of the Future Internet section of the ICT programme, issues of Internet Science funding as opposed to Web Science funding, and gaps in the funding programmes.

One might naively expect that the Future Internet section of the ICT programme would be highly relevant to Internet Science, but this is not in general the case. This is because much Future Internet work concerns such areas as internet architectures, cloud infrastructures, and software development: in other words, it involves building the foundational technologies whose impact and implications are the core focus of Internet Science. Such topics are of low relevance to Internet Science, and include: ICT 5 Smart Networks and novel Internet Architectures, ICT 6 Smart optical and wireless network technologies, ICT 7 Advanced Cloud Infrastructures and Services, ICT 9 Tools and

Methods for Software Development, ICT 11 FIRE+ (Future Internet Research & Experimentation), ICT 12 Integrating experiments and facilities in FIRE+, and ICT 14 Advanced 5G Network Infrastructure for the Future Internet. This does not mean that no Future Internet topics have higher relevance: the one about Web Entrepreneurship (ICT 13) could be addressed with Internet Science methods, and so is of medium relevance, while ICT 10 (Collective Awareness Platforms for Sustainability and Social Innovation) is undoubtedly of high relevance. Nonetheless, this relatively low proportion of relevant topics under the Future Internet topic is not a surprise.

Some of the topics discussed in this document could be addressed by the domain of Web Science as well as by Internet Science. As described in EINS D2.1.1 [3] , the precise delineation between Internet Science and Web Science is not clear: one might argue that WebSci is a subset of InternetSci (because web technologies are a subset of internet technologies), while at a 2013 WebSci / InternetSci workshop [4] it was argued that one could in fact view InternetSci as a subset of WebSci. Indeed, one of the challenges to be published in the forthcoming EINS Roadmap concerns the topic of disambiguating between Web Science and Internet Science. For the purposes of this document, we consider the above discussed topics as within the remit of Internet Science, and probably also within the remit of Web Science: it is likely that the actuality of which area a topic lies within is up to interpretation from the respondent. Of the topics reviewed in this document, ICT 13 (Web Entrepreneurship) is the strongest candidate to address Web Science and not Internet Science concerns, yet a response to ICT 13 could easily draw on internet technologies in addition to web technologies (e.g. use of VOIP or IM to connect entrepreneurs, or of P2P to facilitate the sharing of resources between entrepreneurs).

Although topics relevant to Internet Science cover a breadth of domain areas, gaps do exist in the European funding programme. One such gap concerns cultural heritage: the 'reflective' part of the Inclusive Societies programme includes ten topics. None are relevant to Internet Science, excepting REFLECTIVE-6, which concerns only the digitisation of assets: that is, the use of tools relevant to Internet Science, but no actual Internet Science research. Cultural heritage is of huge importance, and is an area where Internet Science could contribute, for example by considering topics (in addition to access to cultural heritage online) such as how online cultural heritage artefacts can promote greater cross-cultural understanding and cross-country experiences of artefacts, how internet and interface technologies can best convey cultural heritage artefacts, and innovation responding to limitations of access to online cultural heritage for people living in remote areas. First steps in this area have been made [5], and of course responses to REFLECTIVE-6 would form a platform to build upon.

Relatedly, links between Internet Science and the Digital Humanities are currently scarce, yet the two communities have much to offer one another, in terms of methods, data sets and ideas.

It is of note that although the work programme on Science With and For Society does not cover topics directly relevant to Internet Science, it does raise issues of relevance. These include science education, gender equality, and integrating society in science/innovation and research governance.

Such areas are a rich resource for Internet Science researchers, who need to address important questions such as whether the Internet supports or hinders gender equality, and whether social machines make good vehicles to support research governance.

Finally, although Internet Science topics and approaches can be found throughout the work programme, it requires a sustained effort to do so. A cross-challenge focus area in Internet Science, signposting the priorities and where to find the topics, would make a huge difference.

In sum, European funding expectations are often in line with the Internet Science philosophy of taking an interdisciplinary approach, and the most support is seen within the ICT, Inclusive Societies and Secure Societies programmes. A real breadth of domains is covered, and Internet Science is somewhat present in many of the cross-challenge focus areas, although there is no focus area on Internet Science itself, and a sustained effort is needed to identify Internet Science funding. A small number of topics are extremely relevant to Internet Science, mostly from the ICT and Secure Societies programmes.

It is not always clear what European topics are relevant to Web Science as opposed to Internet Science, and it is likely that this relevance will most often be determined by the approach taken by bidders responding to calls.

Gaps in European funding include the use of Internet Science to address cultural heritage, collaborate with the Digital Humanities, and address the kinds of societal issues raised in the Science With and For Society programme.

5.2 Implications of National Internet Science funding

In Belgium, support for cross-disciplinary research can be found in the Exact and Applied Science programme. However, no such programmes exist to encompass Exact and Applied Science and Social Sciences. Similarly, links between Exact and Applied Science and Philosophy are few and far between, although some academic programmes link Computer Science and Human Science.

The French funding landscape is changing, and the French Eureka budget may decrease in 2014 while funds for pure research will become more difficult to get. French funding bodies, including ANR, are demanding more valorisation outputs. Programmes with funding of some millions of euros still exist in France for the digital field, including topics such as embedded software and connected objects, cloud computing, big data, digital simulation, and digital security. Funding agencies are interested by the digital economy, and Internet Science is well situated here, particularly when dealing with applied research towards innovation. However, the French funding programmes lack specific calls on topics such as sensors and the Internet of Things.

It is difficult to identify German trends in Internet Science funding, partly because most German programmes are open to a wide variety of topics and partly because it is difficult to discern trends from only a high-level overview of DFG funding. In Germany, the responsibility to foster the research area

of Internet Science can be attributed to the scientists themselves. They need to show the research area is important for development of the German research landscape. For this, topic-open research programmes can be used. Once significance of topics is shown, funding agencies are willing to put strategic focus on such topics, for example by forming a DFG Priority Programme on Internet Science.

Greek research programmes support interdisciplinary research. However, they fail to bring together scientific and participant communities to develop Internet Science as an integrated discipline. This is most obvious from the funded projects, where only scientists from computer science, mathematics and physics participate in consortia. This implies that the current research programmes do not promote the understanding and evolution of the Internet as a societal and technological artefact, nor its transformational influence to disciplines in the humanities and socio-economics. Future national research program calls should strongly promote cooperation between network engineers, technology pioneers and scientists from networking, mathematics, physics, sociology, economics, political science, the humanities, law, social sciences and life sciences to enable understanding of the multifaceted nature of the Internet. This multifaceted understanding of the Internet will enable stakeholders to influence its evolution in a way that maximises benefits to Greek citizens across social and private life, the economy, business and politics. Such an understanding of the Internet is particularly important in Greece, which the EU Digital Agenda scoreboards shows significantly lower than average scores: this is due to the slow penetration of Internet and limited investment in ICT.

Analysis of the Italian NOP Smart Cities projects showed little relation between this programme and Internet Science. Smart Cities projects are mostly focused on innovation, and ICT is seen as the key enabler for new smart technologies that bring innovative services to the citizens. In this respect, this programme is much more aligned with the Horizon 2020 Smart Cities and Communities programme, under the Societal Challenges part of Work Programme 2014-15. There is no planned investigations on interdisciplinary aspects and mutual impact between ICT and non-ICT disciplines, that is core to Internet Science. Even examining similar topics, such as ICT for sustainability, the focus is largely different. For example, EINS is investigating “how to influence the user behaviour” (Task 8.3), “how to be influenced by the users’ behaviour” (Task 8.4) and the social aspects of ICT for sustainability (Task 8.2). In other words, EINS is looking into how societal aspects are influenced by possible Internet solutions for a more sustainable physical environment, and how such solutions can guide the users’ to have a more sustainable behaviour in their daily lives. Projects under the Smart Cities programme, instead, take a much shorter-term perspective, and design solutions based on the Internet as it is now (i.e. as a platform) to integrate systems that make the current physical environment more sustainable. It is currently unknown whether the Italian government will provide follow-up funding on these topics, and therefore difficult to gauge whether the current situation may improve in terms of bringing Internet Science topics into the national funding research agenda.

Various UK Research Councils offer Internet Science-relevant funding, but grants are often relatively small in nature (e.g. see the ESRC funding). Overall, the Digital Economy programme does

provide a useful overall framework and signposting for research related to the development and use of the Internet, but the Digital Economy programme covers a much broader range of topics from fundamental technology development through to business exploitation in conjunction with elements of the TSB (collaborative industrial research) programme. The Digital Economy programme is therefore relevant to Internet Science research but does not specifically support Internet Science, and its scope is not particularly well aligned with research ambitions expressed in EINS. However, the Digital Economy programme does promote interdisciplinary approaches to research, and so is aligned with one of the basic premises behind Internet Science. If only for this reason, Internet Science could flourish in the Digital Economy programme, assuming it continues as a long-term component of the UK research agenda.

6 Recommendations and Conclusions

This section summarises the implications identified in Section 5, offering recommendations and conclusions.

6.1 Recommendations

It can be seen that, in addition to including monodisciplinary funding, European funding is often in line with the Internet Science philosophy of taking an interdisciplinary approach. The most support for Internet Science is seen within the ICT, Inclusive Societies and Secure Societies programmes. A real breadth of domains is covered, and Internet Science is somewhat present in many of the cross-challenge focus areas, although there is no focus area on Internet Science itself, and a sustained effort is needed to identify Internet Science funding. A small number of calls are extremely relevant to Internet Science, mostly from the ICT and Secure Societies programmes.

It is not always clear what European calls are relevant to Web Science as opposed to Internet Science, and it is currently likely that this relevance will most often be determined by the approach taken by bidders responding to calls. This leads to the first recommendation of this report:

Recommendation 1: support work identifying the boundaries and synergies between Internet Science and Web Science.

Strengths in current European funding include the focus on technologies to address societal needs, the impacts of online technologies on human behaviour, cognition and interactions, cyber security in a range of contexts, citizen observatories, and open government.

Gaps in European funding include Internet Science to address cultural heritage, to collaborate with the Digital Humanities, and to address the kinds of societal issues raised in the Science With and For Society programme, such as science education, gender equality, and integrating society in science/innovation and research governance. Such areas are a rich resource for Internet Science researchers, who need to address important questions such as whether the internet supports or hinders gender equality, and whether social machines make good vehicles to support research governance. This leads to the second recommendation:

Recommendation 2: support Internet Science activity around cultural heritage, the Digital Humanities and societal issues such as science education, gender equality and research governance.

Although Internet Science topics and approaches can be found throughout European work programme, it requires a sustained effort to do so. A cross-challenge focus area in Internet Science, signposting the priorities and where to find the calls, would make a huge difference.

Recommendation 3: provide a cross-challenge focus area, or equivalent support and signposting, to help Internet Science researchers identify priority research areas.

Finally, there is some danger in that the ICT work programme was the only discipline-specific programme to dominate Internet Science funding. A previously identified issue in EINS is the prevalence, potentially at cost of diversity, of Computer Science and other technology researchers in Internet Science.

Recommendation 4: include incentives for rich interdisciplinary collaboration, not limited to "Computer Science plus another discipline" collaborations.

The conclusions of the six national-level funding analyses are as follow:

1. Belgium: support for cross-disciplinary research exists in the Exact and Applied Science programme, and for Computer Science and Human Science; there is no support for collaboration between Exact and Applied Science and Social Sciences, or Exact and Applied Science and Philosophy.
2. France: funding (especially for pure research) is decreasing. Digital topics are still funded, particularly embedded software and connected objects, cloud computing, big data, digital simulation, digital security and the digital economy. There is a lack of funding for sensors and the Internet of Things.
3. German trends are hard to discern. German scientists have a responsibility to take advantage of topic-agnostic calls and push Internet Science forwards, with the end goal of forming a Priority Programme on the topic.
4. Greek research programmes support interdisciplinary research but do not bring communities together to develop Internet Science: funded projects seem to favour science and engineering consortia.
5. Italian programmes appear to have little connection with Internet Science. There is a lack of focus on interdisciplinary aspects or the influence of the Internet on society and vice versa.
6. UK Research Councils do fund Internet Science research, but only sparsely and generally with quite small grants. There is a lack of any coherent programme dedicated to Internet Science, though there are interdisciplinary programmes in which some Internet Science could flourish.

From this it can be seen that at a national level across multiple countries there is a strong need for support for interdisciplinary collaborations.

Recommendation 5: provide national level support for interdisciplinary collaboration.

Such collaborations should not be dominated by engineering and science (see Recommendation 4).

There is also a need for the prioritisation of Internet Science, particularly (similar to Recommendation 3) in the context of providing coherent programmes:

6.2 Conclusions

This report has reviewed European and national level funding programmes and identified recommendations for funding bodies. Both European and national level funding programmes offer some opportunities for Internet Science researchers, but such opportunities are rarely if ever presented as part of a coherent programme, and generally researchers must engage in a sustained efforeffort to identify them. There is insufficient support for work in this area, and a lack of emphasis in current funding on interdisciplinary Internet design as envisioned in EINS.

European funding is often in line with the Internet Science philosophy of taking an interdisciplinary approach. The most support for Internet Science in the first Horizon 2020 work programmes is seen within the ICT, Inclusive Societies and Secure Societies programmes, and a real breadth of domains is covered in the first Horizon 2020 work programmes. Internet Science is somewhat present in many cross-challenge focus areas, although there is no focus area on Internet Science itself, and a sustained effort is needed to identify Internet Science funding. Despite this, a small number of calls are extremely relevant to Internet Science, mostly from the ICT and Secure Societies programmes.

National level funding is often patchy when it comes to Internet Science. National funding agencies seem less inclined to support interdisciplinary collaboration, and it is extremely rare for them to prioritise Internet Science as a topic in its own right.

This implies that, although exceptions exist, current research programmes do not usually promote the understanding and evolution of the Internet as a societal and technological artefact, nor its transformational influence on humanities and social science disciplines as well as within science and engineering. Collaboration with professionals, from network engineers and technology pioneers to scientists from networking, mathematics, physics, sociology, economics, political science, the humanities, law, social sciences and life sciences is essential if we are to understand and engineer the multifaceted nature of the Internet.

The five recommendations of this report are as follow:

Recommendation 1: support work identifying the boundaries and synergies between Internet Science and Web Science.

Recommendation 2: support Internet Science activity around cultural heritage, the Digital Humanities and societal issues such as science education, gender equality and research governance.

Recommendation 3: provide a cross-challenge focus area, or equivalent support and signposting, to help Internet Science researchers identify priority research areas.

Recommendation 4: include incentives for rich interdisciplinary collaboration, not limited to “Computer Science plus another discipline” collaborations.

Recommendation 5: provide national level support for interdisciplinary collaboration.

References

European Commission, “Horizon 2020 Work Programme 2014 - 2015 General
1] Introduction,” EC, Brussels, 2013.

European Commission, “Horizon 2020 Work Programme 2014 - 2015: 15. Spreading
2] Excellence and Widening Participation,” Brussels, 2013.

C. Hooper and Trossen, D. (Eds) “D2.1.1 Repository of methodologies, design tools and use
3] cases,” 2014.

S. Fdidia, T. Tiropanis, I. Brown, C. Marsden and K. Salamatian, “1st International
4] Workshop on Internet Science and Web Science Synergies,” Paris, France, 2013.

C. Van Den Akker, M. Van Erp, L. Aroyo, A. van Nuland, L. Van Der Meij, S. Legêne and G.
5] Schreiber, “From Information Delivery to Interpretation Support: Evaluating cultural heritage access on the Web,” in *Web Science 2013*, Paris, France, 2013.

Annexes

6.3 ANNEX I: Analysis of the first Horizon 2020 Work Programme with respect to Internet Science

Excepting introductory materials and information about communication and dissemination, the work programme is divided as follows:

1) Future and Emerging Technologies (FETs)
2) Marie Sklodowska-Curie actions (MSCA)
3) Research infrastructures (including e-Infrastructures)
4) Introduction to Leadership in enabling and industrial technologies (LEITs)
5) Information and communication technologies (ICT)
6) Nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology
7) Space
8) Access to risk finance
9) Innovation in SMEs
10) Health, demographic change and wellbeing
11) Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy
12) Secure, clean and efficient energy
13) Smart, green and integrated transport
14) Climate action, environment, resource efficiency and raw materials
15) Europe in a changing world - inclusive, innovative and reflective societies
16) Secure societies - protecting freedom and security of Europe and its citizens
17) Spreading excellence and widening participation
18) Science with and for Society

This section considers each of the 18 programmes turn by turn

Future and Emerging Technologies (FETs)

Each FET Proactive initiative is either an exploratory initiative or a delivery initiative. Two of the initiatives offer a link with Internet Science: neither directly concerns the study of the Internet and Society, but both certainly draw on the topics and skills required in Internet Science.

FETPROACT 1 - 2014: Global Systems Science (GSS)

This challenge concerns improving how scientific knowledge informs and evaluates policy and societal responses to global challenges. Among other things, it draws on big data and algorithmic game theory, and requires the linking of data, models and policies with societal actors.

FETPROACT 2 - 2014: Knowing, doing, being: cognition beyond problem solving

This challenges involves an interdisciplinary effort to link research on knowing, thinking, doing and being with artificial cognition, robots, and smart artefacts.

Marie Sklodowska-Curie actions (MSCA)

No calls in this Programme are relevant.

Research infrastructures (including e-Infrastructures)

The Work Programme on European research infrastructures includes an Internet Science-relevant focus on e-infrastructures.

EINFRA-2-2014 – e-Infrastructure for Open Access

Open Access policies are relevant to Internet Science, as is work the production of robust infrastructures to support these.

EINFRA-3-2014 – Towards global data e-infrastructures – Research Data Alliance

The technological and standardisation decisions involved in working towards the interoperability of electronic infrastructures, in collaboration with such bodies as the IETF and the W3C, is relevant.

INFRASUPP-7-2014 – e-Infrastructure policy development and international cooperation

This challenge concerns the coordination of e-infrastructure policies (at European, national and regional levels), which like EINFRA-3-2014 is of relevance.

Introduction to Leadership in enabling and industrial technologies (LEITs)

This introductory document offers no direct relevance for Internet Science research.

Information and communication technologies (ICT)

Inevitably, the ICT Work Programme offers a rich set of possibilities for Internet Science:

ICT 1 – 2014: Smart Cyber-Physical Systems

This call is deeply focus on the use of the Internet of Things, including examining human aspects, working towards ‘smart societies’ and drawing on expertise from the Social Sciences and Humanities.

Future Internet

Much of this part of the Work Programme is relevant to Internet Science. Some of the calls are relevant but not interdisciplinary, focusing only on the technological aspects of networks of networks and cloud technologies:

ICT 5 – 2014: Smart Networks and novel Internet Architectures

ICT 6 – 2014: Smart optical and wireless network technologies

ICT 7 – 2014: Advanced Cloud Infrastructures and Services

ICT 9 – 2014: Tools and Methods for Software Development

ICT 11 – 2014: FIRE+ (Future Internet Research & Experimentation)

ICT 12 – 2015: Integrating experiments and facilities in FIRE+

ICT 14 – 2014: Advanced 5G Network Infrastructure for the Future Internet

Other calls are closer to the philosophy of Internet Science, drawing on multiple disciplinary inputs:

ICT 8 – 2015: Boosting public sector productivity and innovation through cloud computing services

This call considers issues including procurement, trustworthiness, standards and legal aspects.

ICT 10 – 2015: Collective Awareness Platforms for Sustainability and Social Innovation

Concerning collective intelligence to enable better decision making and empowerment, and insisting that consortia are multidisciplinary in nature, this call is very relevant to Internet Science.

ICT 13 – 2014: Web Entrepreneurship

Research questions concerning how to build online platforms that support entrepreneurship are relevant to Internet Science.

Content Technologies and Information Management

With Big Data and tools for the creative, media, knowledge and learning industries as two of the four key topics in this call, some of the specific calls are again relevant:

ICT 15 – 2014: Big data and Open Data Innovation and take-up

ICT 16 – 2015: Big data - research

These calls include funding for a collaborative project addressing the open data supply chain (ICT 15) and core research on big data (data structures, algorithms etc. for data analytics, quality assessment and improvement, prediction and visualisation). As with other big data-focused funding, this has some relevance for Internet Science.

ICT 19 – 2015: Technologies for creative industries, social media and convergence

This challenge concerns the combination of increasing demand for high-quality content and new user experiences with the impact of technology adoption, including broadband internet penetration and mobile computing enabling access to content anywhere. Mention is made of areas including social media, user-generated content and community feedback. The challenge focuses on developments related to content creation, access, retrieval and interaction: it can be seen that access to, retrieval of and interaction with internet content will fall into the remit of Internet Science.

ICT 20 – 2015: Technologies for better human learning and teaching

Responses to this call may take an offline approach, but conversely it is possible to approach this call in a way that is grounded in Internet Science. For example, elearning online (either solo or in the context of a MOOC) offers one approach to this challenge.

ICT 21 – 2014: Advanced digital gaming/gamification technologies

Again, it is possible to respond to this call without drawing on internet technologies, or to respond to it using internet technologies as a tool but not a focus of research. Nonetheless, some approaches – for example, those that focus on aspects such as the impact of online versus offline gaming on inclusion and learning, and the implications for policy and governance -- would certainly be relevant to Internet Science.

Various ICT Cross-Cutting Activities are also relevant:

ICT 30 – 2015: Internet of Things and Platforms for Connected Smart Objects

This network-focused challenge applies to various domains (e.g. ehealth, energy, food chain), and concerns, among other things, the semantic interoperability of smart objects.

ICT 31 – 2014: Human-centric Digital Age

This challenge is deeply relevant to Internet Science, and concerns examination of the impact of technologies, networks and new media on people's behaviour, thinking, interactions and socialisation. Issues such as information overload, blurring of online and offline worlds, and norms and behaviours online are all mentioned. Other topics include issues of self, services, entrepreneurship, democracy and governance in this context.

ICT 32 – 2014: Cybersecurity, Trustworthy ICT

Clearly security is relevant to Internet Science, particularly such aspects as those identified by this call: user trust in ICT and online services, users' ability to detect breaches of security and privacy, and empowering users to take control over their data and trust relations.

EU-Brazil and EU-Japan calls

Four EU-Brazil and EU-Japan calls are relevant. The first three are technology-focused and not interdisciplinary:

EU Brazil calls: EUB 1 – 2015: Cloud Computing, including security aspects

EU Japan call: EUJ 1 – 2014: Technologies combining big data, internet of things in the cloud

EUJ 2 – 2014: Optical communications

EUJ 3 – 2014: Access networks for densely located users

Again, security online, big data and the internet of things are all deeply relevant in Internet Science. EUJ2 concerns optical communication networks and EUJ3 focuses on the realisation of high speed/high capacity dense local networks: such underlying infrastructures are relevant to but not the focus of Internet Science.

Nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology

No calls in this Programme are relevant.

Space

No calls in this Programme are relevant.

Access to risk finance

No calls in this Programme are relevant.

Innovation in SMEs

One call in this Programme is relevant:

INNOSUP 6 – 2015: Capitalising the full potential of online-collaboration for SME innovation support

This call involves supporting SMEs in identifying suitable partners for innovation, and responses to the opportunities offered by social media and other online possibilities. Relying not just the transfer of information but also human factors such as trust, relationship building and innovation online, responses to this call will have relevance to Internet Science.

Health, demographic change and wellbeing

Two calls are relevant in this Programme:

PHC 21 – 2015: Advancing active and healthy ageing with ICT: Early risk detection and intervention

It may be that many responses to this will not take an Internet Science-relevant approach, but work on such topics as the analytics of big internet data (e.g. social media updates) to detect the incidence of illnesses such as depression is highly relevant.

PHC 29 – 2015: Public procurement of innovative ehealth services

As with PHC 21, many responses to this may well not be within the remit of Internet Science, nonetheless, the call includes within its scope issues such as the delivery of healthcare in remote, sparsely populated and difficult to access regions, as well as ehealth services for mobile patients.

Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy

No calls in this Programme are relevant.

Secure, clean and efficient energy

SCC 1 – 2014/2015: Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) projects

Responses to this call, focused on the integration of energy, transport and ICT, could be Internet Science-relevant, for example by using and innovating on the Internet of Things as a driving technology.

Smart, green and integrated transport

Internet Science could come into play within the Mobility for Growth calls within this Programme:

MG.3.5-2014. Cooperative ITS for safe, congestion-free and sustainable mobility

MG.5.3-2014. Tackling urban road congestion

Aspects such as vehicle-to-infrastructure communications, online Intelligent Transport Systems, and the use (and impact of the use) of internet tools such as dynamic congestion information are relevant.

MG.6.3-2015. Common communication and navigation platforms for pan-European logistics applications

This challenge calls on researchers to “develop architectures and open systems for information sharing and valorisation, connecting key stakeholders with information and expertise enabling exploitation on the basis of trusted business agreements and with the relevant authorities”: the issues of information sharing, trust, and how that information is used are all relevant.

MG.7.1-2014. Connectivity and information sharing for intelligent mobility

This challenge calls for “new, efficient, affordable, safe, secure and accessible solutions taking advantage of the ever growing connectivity of people and objects, the availability of European GNSS based location, the advances in cloud computing, big, linked and open data and the propagation of Internet and social media, that will help solve the mobility problems European citizens and businesses are facing today.” The use of cloud computing, big linked data and social media in combination to address a societal issue has the hallmark of internet science about it. This call notes issues including big data management, data ownership, user acceptance and privacy concerns, communication network

architectures for real-time information exchange, and integration of social media for data crowd sourcing and increasing user engagement and acceptance.

Climate action, environment, resource efficiency and raw materials

The 'Waste' and 'Water' parts of this Programme have no relevant calls. However, there is a relevant call within the topic of "Growing a Low Carbon, Resource Efficient Economy with a Sustainable Supply of Raw Materials".

SC5-17-2015: Demonstrating the concept of 'Citizen Observatories'

The use of 'citizen observatories' effectively draws on citizen science, and the technologies of relevance are those core to Internet Science: the use of connected smart phones, tablets, laptops and social media. The use of these technologies for citizen input of complex data, to be used for policy, industry and society is very much within the remit of Internet Science.

Europe in a changing world - inclusive, innovative and reflective societies

The following calls within this Work Programme include calls of relevance:

• Overcoming the Crisis: New Ideas, Strategies and Governance Structures for Europe

• The Young Generation in an Innovative, Inclusive and Sustainable Europe

• New Forms of Innovation

The calls are as follow:

EURO-6-2015: Meeting new societal needs by using emerging technologies in the public sector

This call asks how semantic web technologies, linked open data, the Internet of Things and social sensor networks can help tackle challenges in the public sector, and how new technologies can facilitate government in becoming a platform and the creation of services using open data. The call suggests that social and economic sciences researchers will be required, alongside computer scientists, to meet the challenges.

YOUNG-5-2014: Societal and political engagement of young people and their perspectives on Europe

The use of ICT to support citizen involvement in political decisions and public policy making is a relevant part of this call.

INSO-1-2014/2015: ICT-enabled open government

This call includes within its scope pilots on personalised and mobile public services that benefit from "intelligent and innovative use of large volumes of publicly available data for new, smart and mobile public services". The use of open services, citizen-centric public service applications and transparency tools are all relevant.

INSO-2-2014: Understanding and supporting business model innovation

Business online offers the opportunity for vastly different business models to those which have been established in past decades. This call represents an opportunity for economists and technologists to work together to produce contributions relevant to Internet Science.

INSO-6-201436: Platform for ICT for Learning and Inclusion

Although this call focuses on ICT in general, and not online, respondents who focus on the use of internet technologies for inclusion and learning will be dealing with Internet Science issues.

INSO-9-2015: Innovative mobile e-government applications by SMEs

Internet technologies to facilitate e-government are part of Internet Science, and questions of scalability, sustainability, impact and feasibility are all highly relevant.

Secure societies - protecting freedom and security of Europe and its citizens

Calls relevant to Internet Science under 'Disaster-resilience' can be found under Crisis management, Critical Infrastructure Protection, and Ethical/Societal Dimension. Under the 'Fight against crime and Terrorism' call, Forensics, law enforcement capabilities, ethical/social dimension all has relevant calls. The call on Border Security and External Security does not include relevant calls, but the Digital Security call does. The specifics follow:

DRS-1-2015: Crisis management topic 1: Potential of current and new measures and technologies to respond to extreme weather and climate events

DRS-2-2014 Crisis management topic 2: Tools for detection, traceability, triage and individual monitoring of victims after a mass CBRN contamination and/or exposure

DRS-4- 2014: Crisis management topic 4: Feasibility study for strengthening capacity-building for health and security protection in case of large-scale pandemics – Phase I Demo

These calls cover various topics, with DRS-1 focusing on measures and technologies to enhance response capacity to extreme weather and climate events affecting the security of people and assets, DRS-2 examining monitoring of a mass CBRN contamination, and DRS-4 monitoring the spread of a pandemic. Many responses to all of these calls may not touch on topics relevant to Internet Science, but there is great potential for crowd sourcing and citizen science in these different contexts.

DRS-12-2015: Critical Infrastructure Protection topic 1: Critical Infrastructure "smart grid" protection and resilience under "smart meters" threats

The issues here of online smart metres, robustness against cyber-attacks, network modelling, and implications for the users of such technologies are relevant to Internet Science.

DRS-14-2015: Critical Infrastructure Protection topic 3: Critical Infrastructure resilience indicator - analysis and development of methods for assessing resilience

The challenge involves attaining a better understanding of critical infrastructure architecture, with the scope of this calling for a holistic approach that includes addresses "a broad variety of issues

including: human factors (i.e. radicalisation), security, geo-politics, sociology, economy, etc. and increased vulnerability due to changing threats". This call offers a space for Internet Scientists to work on such topics as security and radicalisation online.

FCT-1-2015: Forensics topic 1: Tools and infrastructure for the fusion, exchange and analysis of big data including cyber-offenses generated data for forensic investigation

The development of big data analysis techniques, alongside tools and platforms for analysis of cybercrime is relevant.

FCT-4-2015: Forensics topic 4: Internet Forensics to combat organized crime

Research into organised crime online, its camouflaging and trans-border aspects all fall within the remit of Internet Science.

FCT-6-2015: Law Enforcement capabilities 2: Detection and analysis of terrorist-related content on the Internet

The issue of detecting, categorising, analysing and summarising terrorist-generated content online is no small one, and the techniques involved fall within the remit of Internet Science. Issues include linking pseudonyms with the original author, handling multilingual content, involving law enforcement bodies, and managing personal data.

FCT-9-2015: Law Enforcement capabilities topic 5: Identity Management

The rise of social media and the internet of things have led to a change in how identity is handling online. Identity, trust and security are central to this topic, which falls within the remit of Internet Science.

FCT-13-2014: Ethical/Societal Dimension Topic 1: Factors affecting (in-) security

Responses to this call may not consider the digital world, but internet security and how secure (or not) internet users feel is a rich and important research topic that is relevant to this call.

FCT-15-2015: Ethical/Societal Dimension Topic 3: Better understanding the role of new social media networks and their use for public security purposes

Questions such as "to what extent do social media influence public security planning?" and "should the adoption of social media in the public security community be treated as a threat or a tool for public security?" are relevant.

FCT-16-2015: Ethical/Societal Dimension Topic 4 - Investigating the role of social, psychological and economic aspects of the processes that lead to organized crime (including cyber related offenses), and/or terrorist networks and their impact on social cohesion

Regarding the cybercrime aspects, as with FCT-4 and FCT-6, this is relevant.

DS-1-2014: Privacy

DS-5-2015: Trust eServices

DS-6-2014: Risk management and assurance models

People's reluctance to disclose personal information online is often rooted in privacy concerns. Issues such as low transparency of privacy levels and data protection, mistrust of online services (e.g. e-commerce and online banking), and users being unable to evaluate the value of their data that they assign to 'free' services are all issues of relevance to this call and to Internet Science.

Other action 5 - Developing Law Enforcement Tools and Techniques in the Fight Against Cybercrime

Development of tools to gather data on areas such as darknets, flows of digital money in criminal transactions, botnets and malware fall into the remit of Internet Science.

Spreading excellence and widening participation

The open research data pilot is directly relevant to internet science. It says: "A novelty in Horizon 2020 is the Open Research Data Pilot which aims to improve and maximise access to and re-use of research data generated by projects. While certain Work Programme parts and areas have been explicitly identified as participating in the Pilot on Open Research Data, individual actions funded under the other Horizon 2020 parts and areas can choose to participate in the Pilot on a voluntary basis. The use of a Data Management Plan is required for projects participating in the Open Research Data Pilot. Further guidance on the Open Research Data Pilot is made available on the Participant Portal."

Science with and for Society

This Work Programme has no calls of relevance.

6.4 ANNEX II: Summary of Italian projects in the Smart Cities area

BE&SAVE - AQUASYSTEM – SIGLOD

The project concerns integrated management of the water cycle, use of sustainable resources, energy optimisation, monitoring and control of water quality in water distribution systems and networks for urban drainage. The project aims to develop procedures and technologies that enable the sustainable management of surface and ground water resources, energy optimisation and control of water quality in water supply systems and sanitation. The goal is to ensure not only quality, continuity and safety of the service with the simultaneous reduction of operating costs, but also reduce the environmental impact, resulting in more effective management of resources and reduction of water losses, energy costs, and impact on water bodies.

The project is structured in eight parts: Management Systems Sources of Water Supply; Systems for monitoring and Quantity Water Quality in Distribution Networks; Optimisation of Consumption

and Energy Recovery in water supply systems; Processes and Technologies for Water Saving; Patterns of hydrological forecasting and simulation of hydraulics urban; monitoring and control of quality / quantity in drainage networks; decision support system for safety and management of flood risk in urban areas; Sensors and technologies for continuous monitoring and real-time characteristic parameters of water quantity and quality.

DICET - INMOTO - ORganisation of Cultural HEritage for Smart Tourism and Real-time Accessibility (OR.C.HE.S.T.R.A.)

The project aims to develop tools for development and capitalisation of cultural and environmental resources of a territory, and promotion and marketing for tourism. The two programs aspire to use social networking as a platform for an ecosystem in which companies, public administration, citizens and tourists convene and where services are created by involving all stakeholders via a social innovation approach.

The first area of activity is to define and develop a platform on which to base intelligent services for cultural heritage knowledge for conservation, preservation, and sharing. Overcoming current methods of digitisation of 2D/3D objects, innovative elements are introduced, including extraction and automatic cataloguing of information from the digitised content (images, text, videos, etc.). Information will be standardised, correlated across semantic engines, and published as Linked Open Data. From the point of view of use, a smart open source system will enable personalised and contextualised exploration of artefacts. The second step is to develop an integrated system of services for the creation, certification, organisation, monitoring and promotion of the Touristic and Cultural Offering and a real-time platform to support tourist mobility.

The experimental platform of cultural offerings will be tested in the cities of Lecce, Catania, Agrigento, Siracusa, Centuripe. Each city will define archaeological contexts, museums and sites of interest to be included in the platform. Testing of integrated tourism services will be conducted at the Province and the city of Naples, at several towns in Calabria and at the Union of Municipalities “Hills of Langa of Barolo”.

EDOC@WORK 3.0

The objective is to test innovation in education (school, university and professional) as an approach capable of modelling solutions, governing processes, and drawing experience from field trials. The initiative aims to promote a learning model to overcome cultural, social, and linguistic issues, not by replacing paper, but by providing a new way to learn and teach. Specific attention will be devoted to the development of new digital content and sharing, with forms of virtuous “competition”. Repositories of Learning Objects (LO) can transition learning environments into the virtual reality, augmented or multimedia content, without forgetting underprivileged or disabled children. The project will be delivered via the software-as-a-service cloud paradigm. It will define technical

specifications and implement a prototype of a new mobile device, compliant with international standards, that is the synthesis of an integrated e-reader and a tablet.

i-NEXT

In line with the concept of Smart City (Horizon 2020), the Smart Planning Lab will produce, in the initial phase, context analysis and scenario by proposing appropriate solutions. In an intermediate step, it will act as an "intelligent hub" for a connection with the needs of planning/urban management. It will act as a tool for communication and dissemination of methods and outcomes of the project. The cluster will create a plan for mobility, through the use of a green fleet of vehicles, to bring innovation in logistics through expansion of distribution channels and optimisation services. It aims to achieve a more efficient and sustainable transport system by improving the environmental conditions of the city. Energy production from renewable sources will contribute to the energy needs of the territories of experimentation and produce hydrogen to be used by the fleet. The study and implementation of a computing platform on the analysis of solutions for the communication infrastructure will allow definition of monitoring platforms for intelligent management of energy from renewable energy by harnessing the benefits of Distributed Generation and storage technologies. A study on the carbon footprint, based on evaluations of Life Cycle Assessment, will deliver data on the environmental impact of new energy technologies and eco-design criteria for their application in the design of storage systems.

PRISMA

The project aims to develop an innovative platform for open and interoperable eGovernment cloud computing services. It will produce models and reference implementations in processes that reflect the size of urban and metropolitan local government, and create of a set of vertical applications that are scalable and affordable according to "self service" models. The main features of social, environmental and homeland security are addressed by support of different types of cloud platforms. The platform will allow on-demand provisioning of computing, storage, and application development with a high level of reuse. The system will integrate semantic technologies applied to the publication and reuse of Linked Open Data. Semantic tools will provide sentiment detection via social network environments. The project will determine the innovation of services in e-government homeland security. The platform will allow objective evaluation for emergency planning through implementation of SmartSystems on cloud platforms for monitoring elements of the area, enabling insight almost in real time into the evolution of seismic damage scenarios, road system practicability, and other information through implementation of wireless networks of low-cost sensors.

Smart Energy Master per il governo energetico del territorio - SINERGREEN - RES NOVAE

The project includes research on production systems and energy management, distribution networks and storage on a local scale. The first area involves experimenting with a system for

managing energy flows on the municipal level, to reduce energy costs, enhance multi-generation from renewable sources, reduce environmental impact and increase the energy and environmental awareness in every actor in the community. The second area creates a system of monitoring, decision support, management and planning of production / consumption of energy and other resources (water and gas) in normal and crisis situations. It offers tools to more efficiently manage critical infrastructure (power grids, water and gas). A third module proposes development of systems and models for predictive analysis of consumption, aimed at improving energy efficiency of public buildings with high humanisation and monitoring of energy use in the area.

SMART HEALTH CLUSTER OSDH - SMART FSE -STAYWELL

The objective is to create an innovative Cloud Computing environment on which to develop services with high added value. The system implements a health model based on the paradigm of digital open architecture, to enable development of cooperation models between different application entities in the healthcare sector. This enables the re-engineering of processes, using common semantics for effective and efficient information sharing. Another important objective is the strengthening of cooperation between companies and research institutions. The project will support two advanced training skills to bring innovation in the field of digital health. The first, proposed by University of Bari, will qualify technical and scientific staff in health and social sectors with the aim of creating a new professional profile: the "Healthcare Innovation Manager". The second, proposed by the University of Catanzaro, Catania and Palermo, will train specialists in "the evolution of the Smart Health".

SMART TUNNEL

This project concerns the development of technologies for the control and rationalisation of traffic merchant and passenger ships in the harbour area, the handling and management of containers, and the handling and management of vehicles. Italian port cities are characterised by high levels of air pollution from ships at the dock and traffic congestion as port outputs pass through the urban road network. The theme of the Italian logistics in port areas is a central issue for the sustainable development of coastal urban areas.

The project aims to develop and test ways of integrating the supply chain in global maritime transport and maximising the safety and efficiency of port terminals to facilitate the processes of regionalisation of ports and increase competitiveness of the regional intermodal system. In urban mobility it aims at greater integration of the logistics chain in urban transport of goods via operational models for network design activities (inter-modal and co-modal transport), tools for Intelligent Transport Systems to manage the flow of goods and vehicle fleets, and for route planning.