D2.1-European Roadmap Survey

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Report Overview

This European Roadmap survey is an in-depth survey of the European ICT research environment, focusing on current and emerging research and cooperation priorities as well as major European players in the ICT research field. Furthermore this survey addresses the policy level by explaining all important policy aspects of ICT research in Europe. The Report displays information on current opportunities, programmes and initiatives promoting cooperation between Europe and China as initiatives targeting European Chinese cooperation in general but also bilateral initiatives between China and European member states. Through extensive selected expert interviews of coordinators of past European and Chinese FP7 ICT projects, the current state of European and Chinese ICT research has been analysed and an outlook on prospective ICT cooperation priorities has been given and ranked.

Structure of the Report:

The beginning of this Report discusses the global position of the European ICT economy and research. According to external rankings, Europe has a strong ICT industry and is leading in terms of ICT development. Furthermore, Europe's ICT industry focuses heavily on research in manufacturing of electronic components, manufacturing of communication equipment, telecommunications and computer programming. The information is complemented by an overview of regulations in the European information society and recent global ICT consumer trend analysis.

Afterwards, this report explains and summarizes all important aspects of European Research Policy. It explains in detail its overall strategy and targets, it elaborates how European policy targets for ICT are defined and what they are, it introduces the new European Research framework program Horizon 2020, it explains all important aspects of the European Research Area, it discusses current European ICT research priorities and the past Framework program 7, it explains ICT research priorities of different European member states from south, north, east and central Europe and displays achievements and projects reached and conducted in the ICT framework program 7.

The end of the report focuses on international cooperation in ICT research and all important aspects of market driven international research cooperation - included the main drivers and forces - and shows the latest data on international research integration. Furthermore the paper offers explanations of all important issues of the non-market driven establishment of research cooperation by intervention of European policy makers. Subsequently, the report continues with a Euro-centric view on the establishment of research cooperation with China and focuses at the end on European ICT research priorities for cooperation with China and experiences gained out of previous research cooperation with China.

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Preface

- Europe provides a highly developed ICT research environment and offers significant opportunities for cooperation in various fields with China. This European survey - developed in the context of the Open China-ICT project - aims to inform interested Chinese policymakers and researchers about the developments of European ICT sectors and about the opportunities and procedures of public funded European research programs. Furthermore, the report informs about European ICT priorities at the European Union and member states level and identifies some ICT research priorities toward China. This European survey - together with the OpenChina-ICT Chinese survey -, will be the foundation of the OpenChina-ICT Cooperation Plan, which may be used as input for policymakers to develop further Europe-China ICT cooperation programs in ICT research.
- The overall objective of the OpenChina-ICT project is to contribute to the facilitation of ICT-related research cooperation between Europe and China. The achievement of this objective will be supported by the drafting of a concrete EU-China ICT Cooperation Plan, which will detail current and emerging priorities for international cooperation and advise the European Commission and the Chinese Government on how to design effective and mutually beneficial international research cooperation programmes. In the context of the project, one major dialogue conference in Beijing has been carried out to facilitate the policy dialogue between Europe and China on ICT research. Furthermore, two Chinese and one European workshop will be organized to further display European and Chinese survey results and develop the final ICT Cooperation Plan.
- OpenChina-ICT is coordinated by Fraunhofer, Europe's largest and leading applied research provider, and includes the following organizations:
  - Sigma Orionis, France: a private company founded in 1984 and in operation ever since in the Sophia Antipolis Science Park. The company aims to support collaborative research and global innovation in ICT.
  - CECEO/CSTEC, China: a non-profit organization specializing in consultation services and guidance to Chinese research institutions, enterprises, companies and scientists for the participation in the EU Framework Programme. CECO has strong support from the Chinese Ministry of Science and Technology and the EU Delegation in Beijing.
  - CATR, China: a think tank of the Chinese government in the ICT sector, which integrates the functions of research, test, certification and consultancy. It mainly performs decision-making supports for the central government (including MIIT, MOST, NDRC etc.) and the local authorities in areas such as strategy and planning development, policies and regulations and standardization.

- BSEAC, China: a professional knowledge services firm that specializes in providing a full spectrum of client support solutions in the high-tech field, especially in the software/IT and ICT industries. It is also part of the International Cooperation Department of Beijing Software Industry Association (BSIA), which represents over 600 software and IT companies in Beijing.

1 ICT Developments in Europe

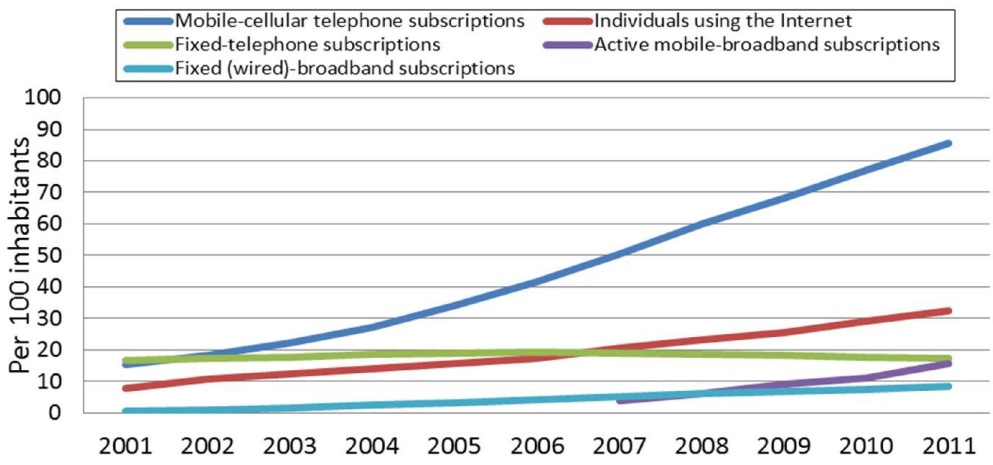
Chapter 1 gives a broad overview on the overall developments in the European and Global ICT (Information Communication Technology) economy, displays current ICT related consumer trends and describes European regulations in the Information society.

Globally it can be expected that mobile devices, cloud services and social technologies are the upcoming trends in ICT technologies and future research should duly address this. Europe is well prepared to contribute to future global ICT research challenges, as it has a foremost position in ICT development in terms of ICT access, skills and usage. The ICT sector represents 4% of the overall GDP in Europe and influences other sectors through positive spill-over in terms of increased labour productivity. About 2.7% of the European workforce works in ICT sectors. The European ICT industry spends annually €25 billion on research and is one of the most research intensive sectors in Europe. Important research subsectors in ICT in terms of their total research spending are: manufacturing of electronic components, manufacturing of communication equipment, telecommunications, and computer programming. Mainly to develop inner European competition, the European Union has implemented some ICT industry regulations related to transmission and content.

1.1 Europe's Position in ICT Development

ICT continues to be significantly important for users all over the world as more people are getting connected globally (Figure 1). Figure 1 also illustrates a rapid growth of users of mobile phone subscribers and a steady growth of individual users of the Internet. Active mobile-broadband subscriptions have constantly increased since its introduction in 2007. The only drop in number of users concerns fixed-telephone subscriptions, mainly due to the rise of mobile users.

Figure 1: Global ICT developments 2001 – 2011 [22]

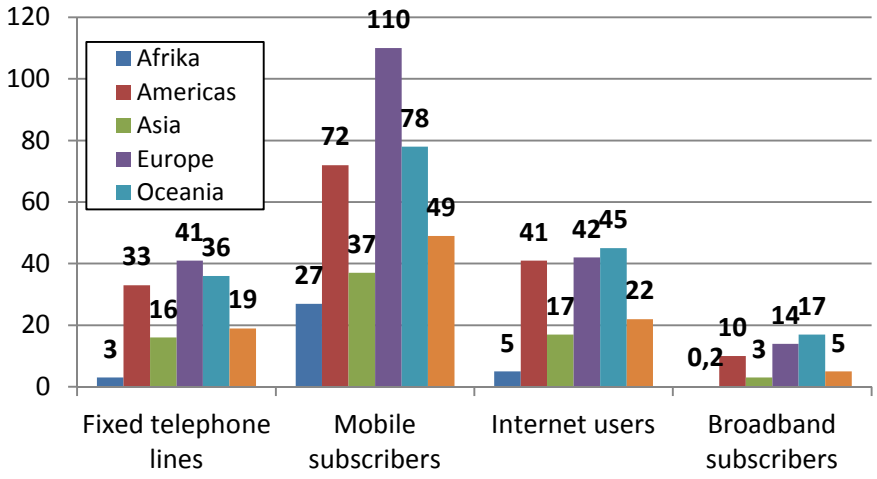


ICT Penetration

Figure 2, a snapshot from 2007 (latest global comparable data available), confirms that global ICT developments are mainly driven by the mobile sector. The ICT penetration rate measured by the usage of mobile phones surpassed the 100% mark in Europe, while in Africa 27% of the population and in Asia 37% of the population own mobile phones.

As in Africa, fixed phone lines are very rare, the development of fixed broadband services is not expected, whereas the mobile broadband sector might be booming. Mobile broadband services are the main focus in the developed world and driven by falling mobile connection prices, which will likely attract more consumers hastily. In Africa, Internet use in general remains low, where only 5% of the population is online, compared to over 40% in Europe, America, and Oceania. Furthermore, fixed broadband penetration is growing rapidly and has reached around 15% and 10% in Europe and America, respectively, apart from Africa, where it stands at less than half a percent [22]. [1]

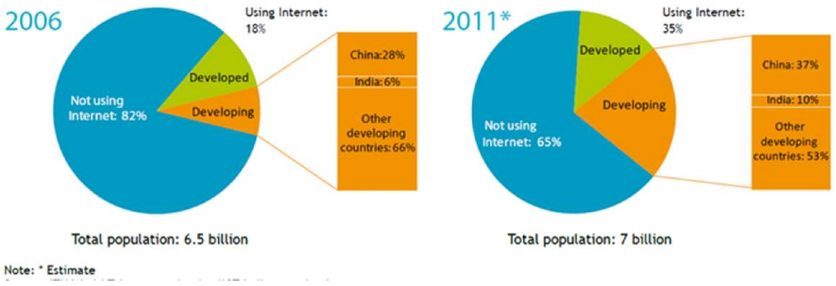
Figure 2: Global ICT penetration rates in per cent in 2007[25]



In a more recent analysis Figure 3 illustrates that one third of the world population issuing the Internet nowadays. Developing countries increased their share of the world's total number of Internet users from 44% in 2006, to 62% in 2011. In the case of China, Internet users represent nearly 25% of the world's total users and 37% of the developing countries Internet users.[22]

[1] http://www.itu.int/ITU-D/ict/statistics/ict/index.html

Figure 3: Share of Internet users in the global population [22]



Generally Europe is globally leading in terms of fixed and mobile broadband penetration, which reached 26% worldwide and 54% in Europe in 2011. Europe leads also in terms of available Internet bandwidth per Internet user, as there was nearly 90'000 bit/s of bandwidth per user in 2011 in Europe, while there was for example only 35000 bit/s in average in the world or 2'000 bit/s per user in Africa. On average in 2011, 75% of European households had a computer; in seven leading European countries more than 90% of households had a computer. [22]

ICT Development [25]

To compare more credible ICT developments in different regions of the world, the International Telecommunication Union publishes annually the IDI (ICT development Index). The last IDI was published in 2012 and covers the period until 2011.

The index combines 11 indicators to compare every country. Those 11 indicators are grouped into 3 main groups called:

- ICT access (fixed-telephone subscriptions, mobile telephone subscriptions, international Internet bandwidth per Internet user, percentage of households with a computer, and percentage of households with Internet access)
- ICT use (percentage of Internet users, fixed (wired)-broadband subscriptions, and active mobile broadband subscriptions)
- ICT skills(adult literacy, gross secondary enrolment and gross tertiary enrolment)

In 2011, the leading ICT country, according to IDI, has been the Republic of Korea. However, the following places are dominated by European countries as places 2 to 7 are filled with Sweden, Denmark, Iceland, Finland, Netherlands, and Luxembourg, respectively. Larger European economies are also in the top list of the rankings, in particular, United Kingdom (9), Germany (16), and France (18).Other larger European economies who have still development potentials are Spain (28), Italy (29) and Poland (31).

The least ICT developed European member states, according to the IDI, are Bulgaria (51) and Romania (52).

According to this Index the most dynamic ICT[2] European Countries are United Kingdom and Estonia. The most dynamic countries in the world are Kazakhstan, Bahrain, and Ghana.

China, according to the IDI, is ranked 78, which indicates that even though China becomes a leading player in some ICT research fields, it is still developing. Special administrative areas of China, such as Hong Kong and Macao, are doing better and are ranked 11 and14, respectively.

If analysing the sub-indexes ICT access, ICT use, and ICT skills, the weakness of China becomes clearer as China is ranked 82 in the ICT access index, 90 on ICT skills index, and 66 on ICT use index. This means that those people, who have access to telecommunication infrastructure in China, also have a high interest to go on the Internet. The shortcomings in China are the lack of widespread education and telecommunication infrastructure. The special administrative regions of China, Hong Kong, and Macao also have leading positions in those sub-indexes. In terms of Internet density and access, Hong Kong is global leader.

1.2 Current Consumer Trends related to ICT technologies

In literature plenty of predictions regarding ICT consumer trends are available. In this subchapter some freely accessible[3] trends are presented. This subchapter therefore just gives an incomplete overview of that which is forecast to happen and is purely descriptive. An interesting analysis of Ericsson Consumer lab is presented here and later verified by other trend forecasts.

The **Consumer Lab of Ericsson** [29] analysed by polling 100,000 individuals in 2012 from over 40 countries and 15 megacities covering the whole world the 10 most relevant consumer trends for the current period. As the number of consumers being questioned is very high it can be assumed that those identified trends are significant. Ericsson identified the following trends as interpretation of the data gained:

1. Cloud reliance reshapes device needs

Consumers will demand and purchase solutions which make all their data and applications available on multiple devices at the same time through the cloud. This

[2]Measured in terms of rank change of the index compared to previous years

[3]Most of such consumer Trend studies are expensive; its purchase cannot be covered with available budgets of OpenChina-ICT.

has been concluded by Ericsson as consumers from the analysed 40 countries and 15 Megacities appreciated the simplicity of having the same apps and data seamlessly available on multiple devices.

2. Computing for scattered mind

Consumers are expected to increasingly turning their back on traditional devices but favour tablet PC and smartphones compared to Laptop and Desktop PC. This gives the consumer the opportunity to use their applications wherever they are and whenever they need it. Ericsson has concluded that the intended purchase of smartphones and tablets are significantly higher than the intended purchase of Laptops and Desktop PC. Leading nations for this trend are Australia, China and Russia.

3. Bring your own Broadband to work

Consumers are expected to use their own Smartphone with a private subscription for work purposes to send e-mails, plan business trips etc. This trend has been concluded by Ericsson as 57% of all smart phone users are working people who use their privately paid smart phone for work.

4. City-dwellers go relentlessly mobile

By accessing the Internet always and everywhere consumers will make Internet truly mobile. Smartphone subscriptions are expected to reach 3.3 billion by 2018. This trend has been concluded as, overall in 18 Mega cities, 67 per cent are satisfied with mobile coverage. In indicators of city life satisfaction or dissatisfaction, making mobile coverage rank among the top 5 out of the 30 aspects has been a growing and ever more pressing feature.

5. Personal social security networks

More and more career opportunities will be realized via online social networks. The establishment of such social networks is therefore driven by consumers. This trend may increase with the continuation of the economic crisis in some parts of Europe and the world as more people are looking for new job opportunities.

6. Women drive Smartphone market

Some figures clearly show that women drive the smartphone market as smartphones are used more widely among women compared to men.

7. Cities become hubs for social creativity

In cities social networks are more widely common than in suburban areas and therefore more widely used. A significant share of smartphone users use the smartphone to connect and exchange ideas which will foster the status of cities as hub for social creativity. This trend has been concluded as inhabitants of urban areas have more friends in social networks than inhabitants of suburban areas. Furthermore 12 per cent of interviewed inhabitants of urban areas are using social

networks to exchange ideas. This number is especially high in Tokyo, Beijing, Cairo and Seoul.

8. On-line shopping

Consumers will combine in store and online shopping aspects, as they will simultaneously like to see products, obtain the relevant information and make purchases online. This consumer trend has been concluded by the combination of things consumers like and dislike about offline and online shopping.

9. TV goes social

A total of 62 per cent of TV viewers are already online in social forums while watching TV. Greater numbers of TV viewers- already 42 per cent of TV viewers - are discussing almost instantly things they just saw on TV on social networks. About 30 per cent of respondents are likely to pay for TV content in a social context.

10. Learning in Transformation

Driven by the wide use of smartphones etc., more and more young people bring their personal technology experience into the classroom, which leads to driving a bottom-up change of thought content in classrooms. Additionally classroom teaching will make more use of available ICT technology driven by the need to use more effective resources (saving resources) while ensuring teaching quality.

Other sources confirm the data on which the conclusions of Ericsson consumer lab are based. For example IDC (International Data Cooperation) predictions[30]that are based on interviews of over 1,000 internal IDC analysts in 2012,forecasts growth in the usage of mobile devices, cloud services and social technologies. Ericsson consumer trends are also partly confirmed in regard to Social networks/media, Smartphone and tablet penetration growth, social usage of TV, usage of private owned smart phones at work by the International Telecommunication Union (ITU)[31], which summarizes identified trends from Analysis Mason, Deloitte, and Informa Telecoms & Media. Other Consumer Trends not covered by Ericsson but mentioned by ITU are related to privacy and security concerns of consumers.

1.3 The European ICT sector and its Research

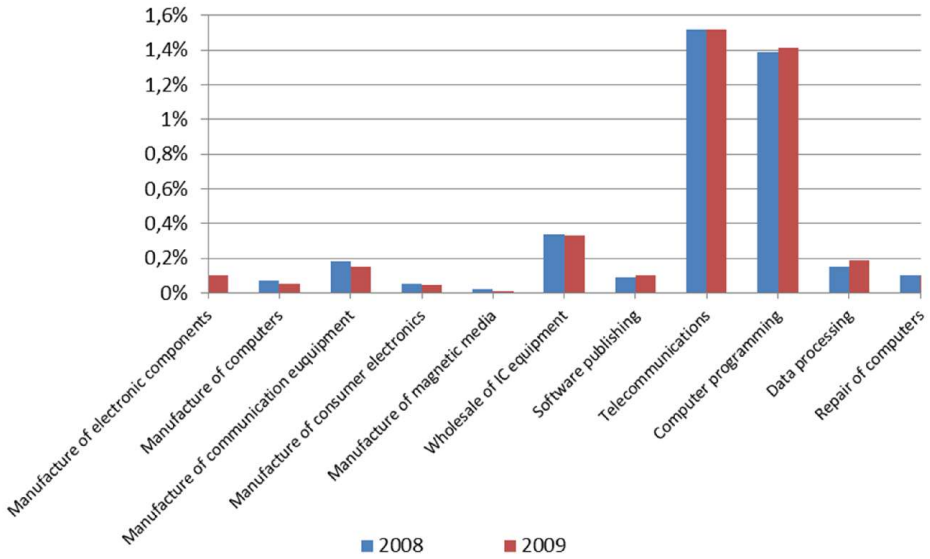
The ICT sector is a major contributor to economic development. The global exports of ICT reached 12 % of overall world merchandise trade. The spill-overs of the ICT sector can be measured in terms of positive influence on labour productivity in other non-ICT sectors. The OECD divides the ICT sector into two broad sub-sectors called ICT manufacturing and ICT services. The manufacturing sector encompasses activities such as manufacturing of electronic goods or manufacturing of electronic

components and boards. The ICT service sector consists of activities such as software publishing, computer programming or data processing. [25]

Sector size in Europe [24]

In 2009 (latest data available), the overall ICT sector in Europe generated €470 billion, which represented a share of 4.0% of EUGDP. ICT services dominated the ICT sector economy with 91.9% of the overall ICT sector contribution to the GDP (ICT Manufacturing 8.1 %). The most important ICT service sub-sectors (see figure 5) were Telecommunications and Computer programming with GDP contributions of €180 billion and €166 billion respectively in 2009. Manufacturing of communication equipment and Manufacturing of electronic components and boards are the two largest ICT Manufacturing sub-sectors in the EU, according to their GDP contribution.

Figure 4: Share of ICT Value Added in GDP by sub-sector [24]



On a member state level, the European ICT Manufacturing sectors are dominated by Germany, which generated a contribution of 22%, followed by Italy contributing 12%. In the service area, France, Germany, Italy, and UK dominate on a member state level.

Figure 5: Comparison of ICT Manufacturing and Services distribution of ICT Value Added among biggest member states contributors (2009) [24]

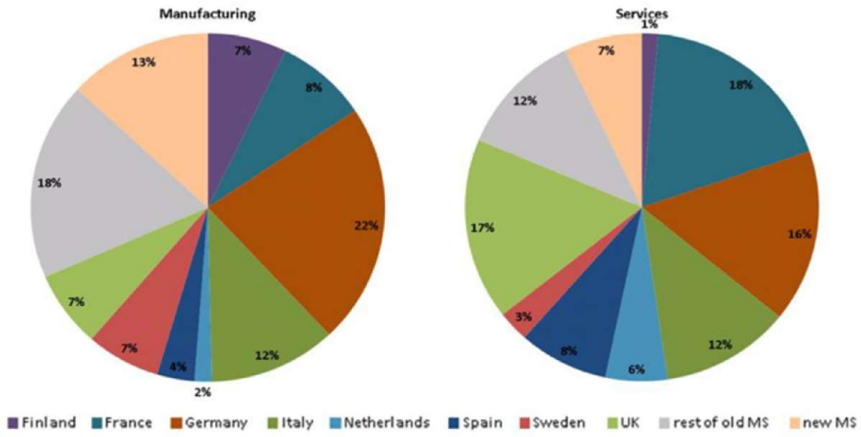


Figure 5 indicates that Germany is the leader in terms of total contributions in both sectors as Germany represents the largest European economy. In Figure 6, the ICT value added contribution to the GDP per member state is illustrated. Figure 6 could also be interpreted as a ranking of European ICT intensive economies. According to the ranking, Ireland and Luxembourg are the most ICT intensive economies in Europe, while Austria and Cyprus are the least ICT intensive economies in Europe. Germany's ICT intensity is below the European average. Some apparent feature in Figure 7 is the drop of ICT intensity in Finland between 2008 and 2009.

Figure 6: Share of ICT Value Added in GDP by member state [24]

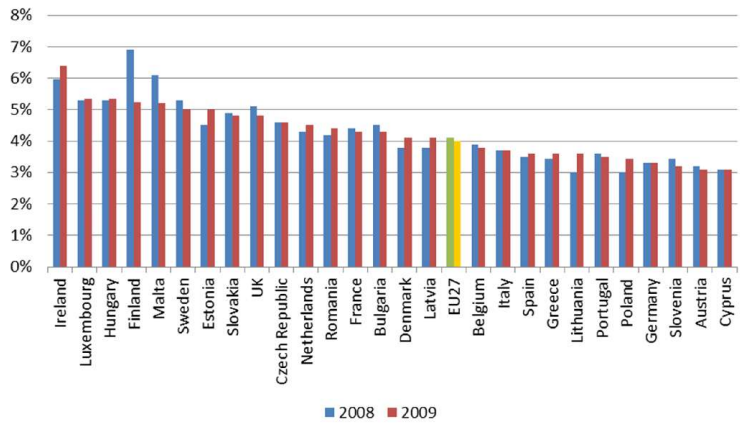
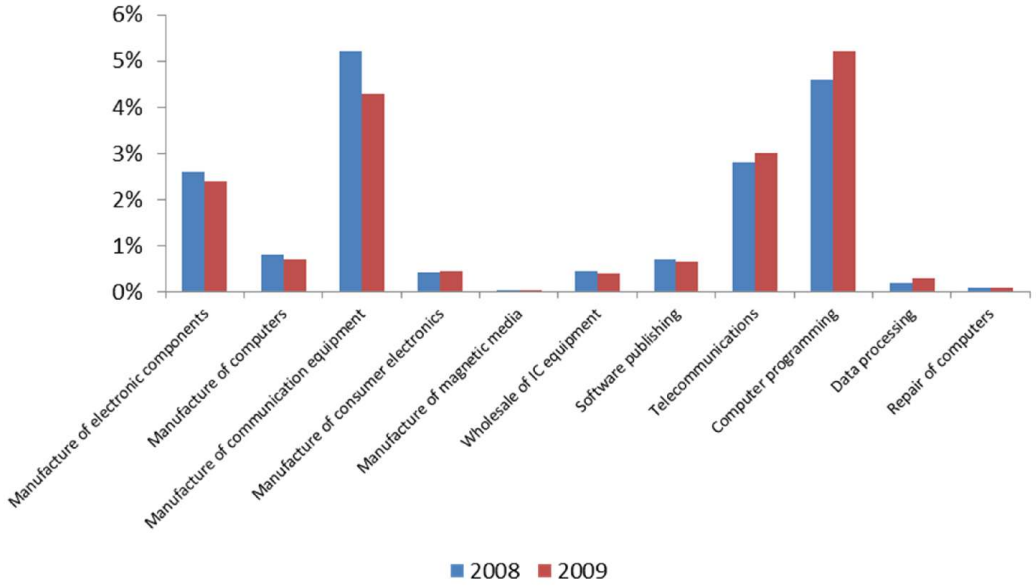


Figure 7: Share of ICT BERD in total BERD by ICT sub-sectors in 2009[24]



Employment [24]

6.1 million People worked in the EU ICT sector in 2009 and represented 2.7% of employment in the European Union. 85% of the people employed in the ICT sector worked in ICT services, while 15% of them worked in ICT Manufacturing. In ICT Service sectors, most employment is provided by computer programming, consultancy, and Telecommunications. ICT employment in ICT Manufacturing is concentrated in manufacturing of electronic components, boards and manufacturing of communication equipment. Labour productivity per person in ICT services in the EU was €84,170 and in ICT manufacturing €41.170. The overall EU ICT labour productivity level in 2009 was €78,000 per person. Luxembourg was the highest in productivity level with €170,000 per person, while Bulgaria has been below €30,000 Euro. In almost all member states, the labour productivity in the ICT sector is higher than in other sectors.

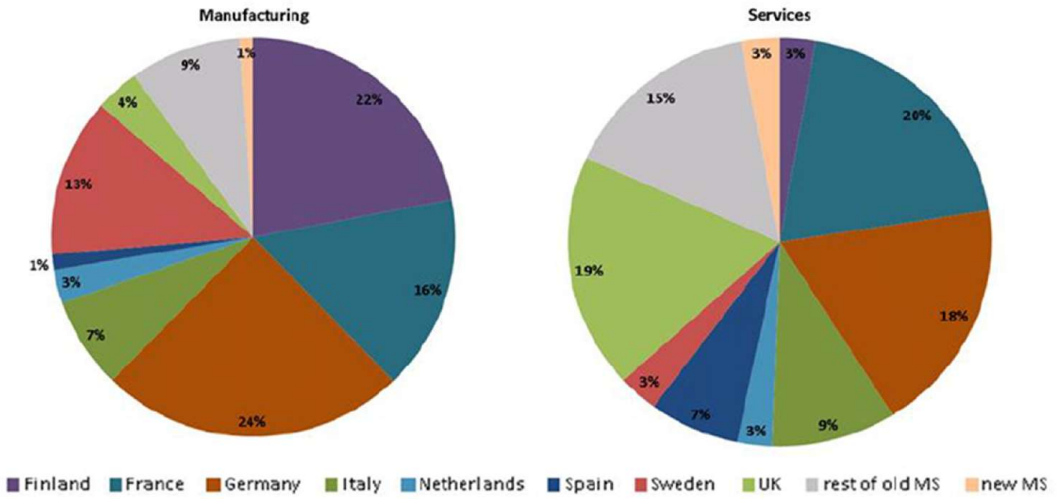
Industry driven research (BERD) [24]

In 2009,BERD (Business Expenditure on Research and Development) in the ICT sector amounted to €25 billion and was equally divided between Services and Manufacturing sectors. Furthermore, 56% of ICT Manufacturing research spending was invested in Manufacturing of communication equipment and 30% in manufacturing of electronic components and boards. Figure 8 shows the ICT research investments in total numbers in Europe. The majority of research spending in ICT

manufacturing sectors took place in the subsectors electronic components, manufacturing of communication equipment, telecommunication services and computer programming services.

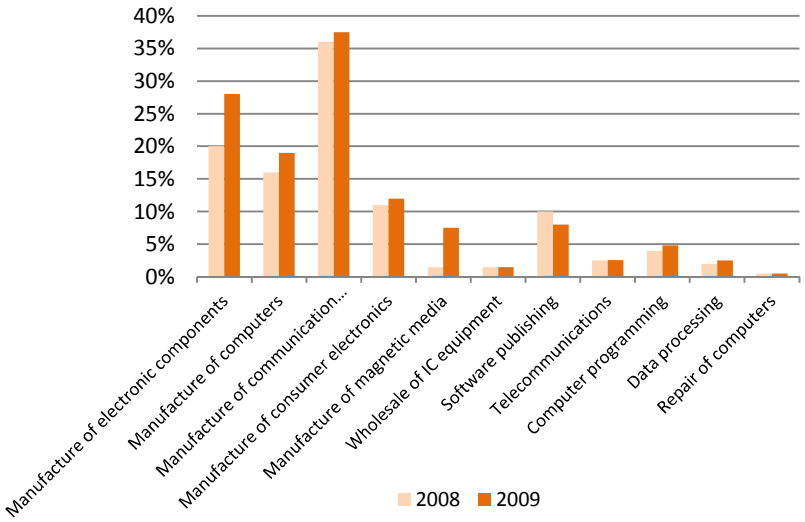
As shown in Figure 8, Germany and Finland have leading positions in the ICT Manufacturing research spending in total numbers, with 24% and 22%, respectively, of EU ICT Manufacturing BERD75% of the total EU ICT Manufacturing research spending was represented by only four countries: Germany, Finland, France, and Sweden. In the ICT Services subsectors, Germany, United Kingdom and France dominated the research spending with 18%, 19% and 20%, respectively.

Figure 8: Comparison of ICT Manufacturing and Services: distribution of ICT BERD among biggest member states contributors (2009) [24]



In the EU economy, the ICT sector is one of the most R&D intensive sectors. ICT services sub-sectors are less R&D intensive than ICT Manufacturing sub-sectors. The ICT BERD intensity (ICT BERD/ ICT Value Added on GDP for sub-sector) is almost ten times lower in ICT Services (3.2%) than it is in ICT Manufacturing (29.6%). Manufacturing of communication equipment and manufacturing of electronic components and boards R&D intensity has been high with 38% and 29%respectively. Within the sub-sector of ICT services, computer programming and software publishing are the most research intensive.

Figure 9: R&D intensity by ICT sub-sector[4][24]



Public research investments in ICT [24]

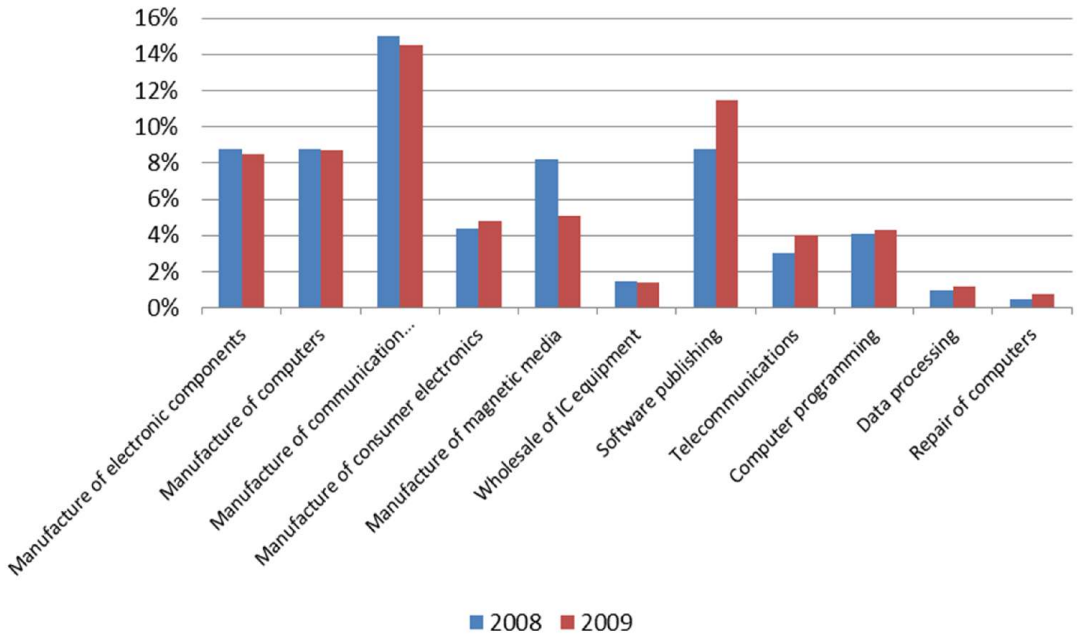
The estimated public funding of ICT R&D in the EU on a member state level amounted to €5.3 billion in 2009. Sweden (0.12%), Finland (0.09%), and Denmark (0.08%) led in terms of public ICT R&D funding intensity as share of overall ICT R&D investments. Germany, UK, Spain, France, Italy, and Sweden provided the largest contributions to total public funding of ICT R&D in the EU and they together accounted for more than 70% of total public funding of ICT R&D in the EU.

ICT R&D employment [24]

ICT researchers and supporting staff made up to 4.7% of total ICT employment in the EU in 2009. As seen before, the manufacturing sector is more research intensive compared to the ICT services sector, therefore, only a smaller share of the ICT service workforce is working on research as compared to the ICT manufacturing sectors (Figure 10). Overall within the EU in 2009, more than 280,000 personnel work on activities related to ICT research and development.

[4]measured by the ratio of ICT BERD in subsector to ICT valueadded in subsector

Figure 10: Share of ICT R&D personnel in total ICT employment by sub sectors (2009) [24]



1.4 Overview of ICT Regulations in Europe

Regulations influencing the Information society in Europe may be divided into regulations related to transmission and content. It can be said, while transmission related regulations are regulating the "pipes", content related regulations are regulating what "flows through the pipes".

Transmission related regulations

The Framework for regulations in the European information society is the "electronic communication regulatory framework" [32] established in 2003 and updated in 2009 and the base for all other directives and policies explained below. The framework is considered to be pro-competitive as it states:

"It is essential that ex-ante regulatory obligations only be imposed where there is no effective and sustainable competition"[5]

This framework covers the regulation of electronic communications networks and services and, of terminal equipment to facilitate access for disabled users and defines

[5]Cfr. [32]page L337/37

the scope and general principles of national regulatory authorities (NRAs) of member states.

Within this given Framework few policies and directives have been established or been followed on a European level. The following are worth mentioning:

1. Radio spectrum Policy Program[33]

This Program identifies general regulatory principles, policy objectives and priorities related to the use of Radio Spectrum. Hereby it aims to increase the efficiency and flexibility of spectrum use and promotes competition. Concrete actions are planned in the following areas[6]:

- 1200 MHz spectrum should be ensured to meet requirements of wireless data traffic
- Enabling spectrum trading throughout the EU
- Fostering different modes of spectrum sharing in Europe
- Providing sufficient harmonized spectrum to enable trade of wireless safety services and civil protection
- Enabling radio spectrum to support more efficient energy production and distribution in Europe
- Finding appropriate spectrum for wireless microphones and cameras
- Detailing the EU's radio spectrum inventory and analysis of the efficiency of spectrum use in the 400 MHz to 6 GHz range
- Member states authorization of the harmonized bands 900/1800 MHz, 2.5-2.69 GHz, 3.4-3.8 GHz for high speed electronic communication services
- Member states authorization of the 800 MHz band for high speed electronic Communication services to cover sparsely populated areas

2. The Radio Equipment and Telecommunications Terminal Equipment (RTTE) Directive[34]

This directive intends to promote internal competition and rapid dissemination of telecommunication equipment within the European Union. It covers radio equipment and telecommunications terminal equipment. It regulates equipment as well - if such devices are to be an integral part of medical equipment, a component or a separate technical unit of a vehicle. RTTE is the framework for common European standards of such equipment. Due to the directive all covered equipment has to fulfil some essential requirements:

[6]See: http://ec.europa.eu/digital-agenda/en/rspp-roadmap-wireless-europe#background-information

- Protection of the health and safety of the user
- Electromagnetic compatibility as defined in other4 directives
- Only use of the allocated spectrum

Furthermore, covered equipment being sold in European markets should demonstrate that they are fulfilling requirements of this directive. The easiest way to the fulfilment is to comply with harmonized standards under this directive, which are updated regularly. The constantly updated list of standards can be reviewed under the reference [35]. Those harmonized standards are developed upon request of the European Commission by the European Telecommunications Standards Institute (ETSI) and the European Committee for Electro-technical Standardization (CENELEC) and enter to force when published in the Official Journal of the European Union.

3. Mobile Roaming Charges Regulatory[7]

The European Commission regulates mobile providers on roaming charges applied to consumers if using their mobile abroad in other member states which are not their home country. This regulatory has been introduced in order to ensure affordable and transparent roaming prices for mobile users when travelling abroad. Within the regulatory maximum prices can be applied by the mobile service providers.

An important transmission related regulation worth mentioning exists also in the field of health related effects of electromagnetic fields [36].

Content related regulations

Regulations of content to be transmitted can be found in many European directives and Frameworks. The following are worth mentioning:

The most relevant content related regulation is the Audio Media Service Directive [37]. The major goal of the Audio Media Service Directive is to ensure free provision of media services and guarantee free access to information throughout Europe. Other important objectives of the Audio Media Service Directive are the provision of rules for content related technological developments, regulations to support the development emerging audio-visual media, the preservation of cultural diversity, the protection of children and consumers, safeguarding media pluralism, avoiding racial and religious discrimination in Audio Media Services and guaranteeing independence of national media regulators.

[7] http://ec.europa.eu/information_society/activities/roaming/regulation/archives/current_rules/index_en.htm

The above mentioned Electronic communication framework [32] also covers and regulates content related fields such as spam, privacy and data protection. Furthermore the European Commission supports the Web accessibility guidelines[8] to ensure a wide web access.[9] Another important content related regulation is the directive on the harmonisation of certain aspects of copyright and related rights in the information society [38], which defines and regulates the principles of reproduction rights, the right of communication and distribution rights.

[8]http://www.w3.org/TR/WCAG20/

[9]http://ec.europa.eu/ipg/standards/accessibility/index_en.htm

2 Research Policy in Europe

Chapter 2 explains in detail the European funded ICT Research landscape and focuses hereby on the overall strategy of European funded research, its policy and innovation targets. Furthermore a structured overview of the upcoming Horizon 2020 program is given, which replaced the past Framework Program Seven (FP7). Strategies of Horizon 2020 for cooperation's with non-European countries are elaborated. Furthermore this chapter describes all the important aspects of the European Research Area and demonstrates the policy mechanism to understand how decisions can be influenced in European research. This is complemented by a description of the past FP7 programs, European ICT research priorities and ICT research priorities of some selected European Union member states from central, southern, eastern and northern Europe.

2.1 Overall Strategy

The European Commission has launched a funding program for research and innovation of the European Union for the period 2014-2020[10]. This new program is named Horizon2020 and will combine all current research and innovation funding as the Framework Programs, the innovation related activities of the Competitiveness and Innovation Framework Programme and the activities of the European Institute of Innovation and Technology.[11] Horizon2020 is at the centre of the Europe 2020 strategy which in general is described by the following keywords: employment, innovation, education, social inclusion, and climate/energy.[12] Horizon 2020 is the successor research program of the closed Seventh Framework Program (2007-2013). The Seventh Framework Program (2007-2013) has been the largest ICT research program funded by the EU since the EU began funding ICT research in 1986. Its ambitious goal has been to support Europe in becoming the most dynamic competitive knowledge-based economy in the world[13]. The EU member states spent a total of €9.1 billion for funding ICT over the duration of FP7, making it the largest research theme in the cooperation program, which is itself the largest specific program of FP7 (with 64% of the total budget).[14] Budgets foreseen in the follow up program Horizon 2020 will increase significantly to €80 billion.[15]The European

[10]http://cordis.europa.eu

[11]http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020

[12]http://ec.europa.eu/europe2020/index_en.htm

[13]http://cordis.europa.eu/fp7/understand_en.html

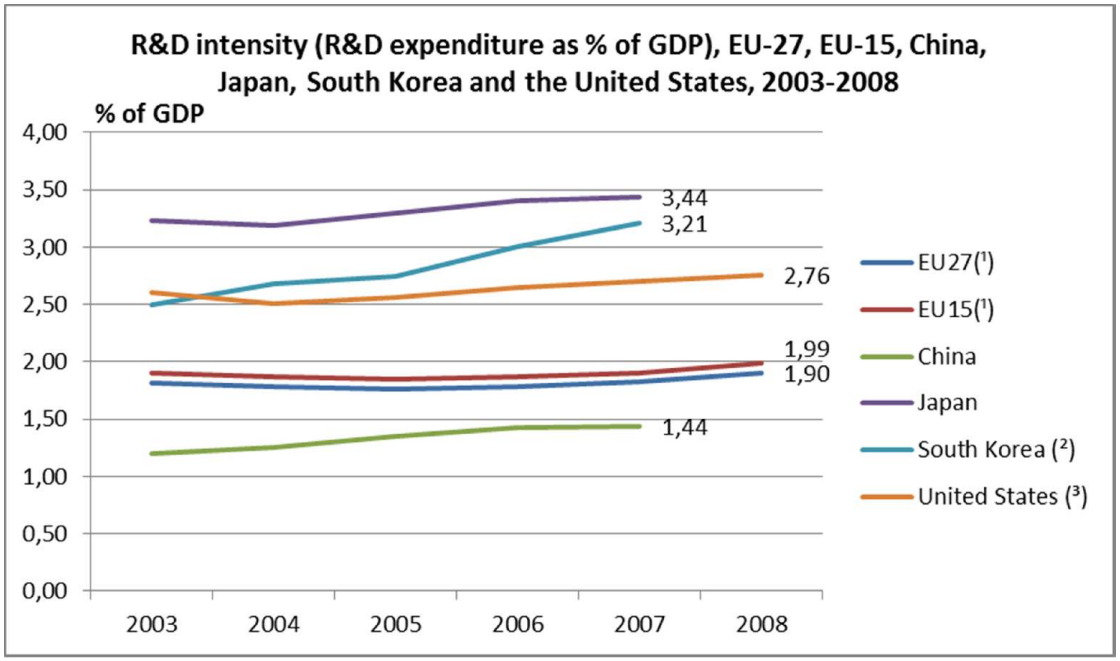
[14]http://cordis.europa.eu/fp7/ict/

[15]http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020

Commission [17] will increase investments in ICT research by 46% under Horizon 2020 and stronger focus will be on riskier ICT research and innovation that can deliver new business breakthroughs.
The outrunning EU's Framework Research Program and the upcoming Horizon 2020 complement national research programs by adding a European added value, which is the trans-nationality of many actions.[16]

The Europe2020 Strategy has included, among its objectives, it's most tangible and measurable aim, which is the increase in R&D spending to 3% of GDP by 2020. This objective has been defined a decade ago and has never been reached. Even if Europe is still ahead of China (see Figure 11), it is lacking behind other industrialized nations, such as USA and Japan. R&D investments in Europe are largely divided, as in Germany the R&D investment share of GDP has been 2.82 % and France 2.23% respectively (2009).The share of R&D investment in Greece has been only 0.58% in 2007, in Italy 1.27% in 2009 and in Spain 1.38% in 2009 (latest data available)[17].

Figure 11: R&D Intensity (latest data available): [11]



(1) EU: Eurostatestimate. (2) Break in series in 2007. (3) Provisional data for 2008; excludes most or all capital expenditure.

The aimed 3% objective can be justified according to the following considerations: It can be shown statistically that the more a country is developed the higher the share of the GDP is being spent on research. [10] In turn, it means the higher the research investments in Europe, the faster the European Union will reach a more satisfying

[16] http://ec.europa.eu/research/fp7/understanding/fp7inbrief/what-is_en.html

[17] http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS

level towards the keywords of Europe 2020: employment, innovation, education, social inclusion, and climate/energy to improve the standards of living in Europe.

2.2 Innovation as Policy Target in ICT

It is widely recognized that innovation in ICT is supporting the EUROPE 2020 strategy as defined by its above-mentioned broad keywords. The World Bank elaborated that ICT enabled jobs are redefining employment markets and offering new income opportunities.[12]For example, the economic effects of innovation in ICT in the field of Broadband Development are being considered to be positive in terms of job creation. Most positive effects will occur via the so-called transformational job creation due to creation of new services and products, which can be measured in the long-run after introducing policies to support broadband development, broadband innovations, and broadband services.[13]The Digital Agenda for Europe defines innovation policy goals of ICT research in detail[18] and consists of 7 pillars:[19]

- Pillar I: Digital Single Market

  Reducing barriers blocking the free flow of online services and entertainment across national borders

- Pillar II: Interoperability & Standards

  Ensuring IT devices, applications, data repositories and services interact everywhere.

- Pillar III: Trust & Security

  Practical solutions, including responses to cyber-attacks and personal data protection

- Pillar IV: Fast and Ultra-fast Internet access

  Stimulating investments and proposing a comprehensive radio spectrum plan.

- Pillar V: Research and innovation

  Maintaining Europe's competitive edge through increased coordination and elimination of fragmented efforts

- Pillar VI: Enhancing digital literacy, skills and inclusion

  Overcoming the Digital divide between older and younger generation

- Pillar VII: ICT-enabled benefits for EU society

[18]http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=home

[19]http://ec.europa.eu/digital-agenda/en/our-targets

Increasing capability to reduce energy consumption, supporting ageing citizens' lives, revolutionizing health services, and delivering better public services

2.3 Horizon2020: Objectives, Technology Areas and International Perspectives

Horizon2020 aims in particular at **three objectives**: excellence of the science base, creating industrial leadership, creating competitive frameworks and tackling societal challenges. Figure 12 illustrates all three objectives and its interrelation to each other.

In detail, Horizon 2020 is to ensure Europe's **excellence of science base** to be able to compete on a global scale. To reach that, Horizon2020 is funding the best ideas to carry out frontier research, collaborative research to open up future and emerging technologies for Europe, the development of European talent by providing excellent training and career opportunities, the provision of research infrastructure and the recruitment of talented individuals from outside European Union borders.[20]

To create **industrial leadership**, activities are supported that are defined by the industries themselves. Additionally access to risk finance and support for innovative SMEs will be provided. A strong exploitation and market focus of most activities supported through Horizon 2020 is contributing as well to the industrial leadership objective.[21]

Horizon 2020 recognizes **societal challenges** of major concern for the citizens in the areas of: health/demographic change and well-being, food security, sustainable agriculture, marine and maritime issues, bio-economy, secure/clean and efficient energy, smart/green and integrated transport, inclusive/innovative and secure societies, climate, resource efficiency and raw materials.[22]

Dissemination and knowledge transfer will be an important cross cutting priority for all Horizon 2020 projects to guarantee a wide use of research results and to interlink with other researchers and projects.

Some direct support within Horizon 2020 is given to the EIT (European Institute of Innovation). The EIT supports the establishment of Knowledge and Innovation Communities, which provide the physical infrastructure to place researchers and innovative businesses on one geographical location (centre).[23]

[20] http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=excellent-science

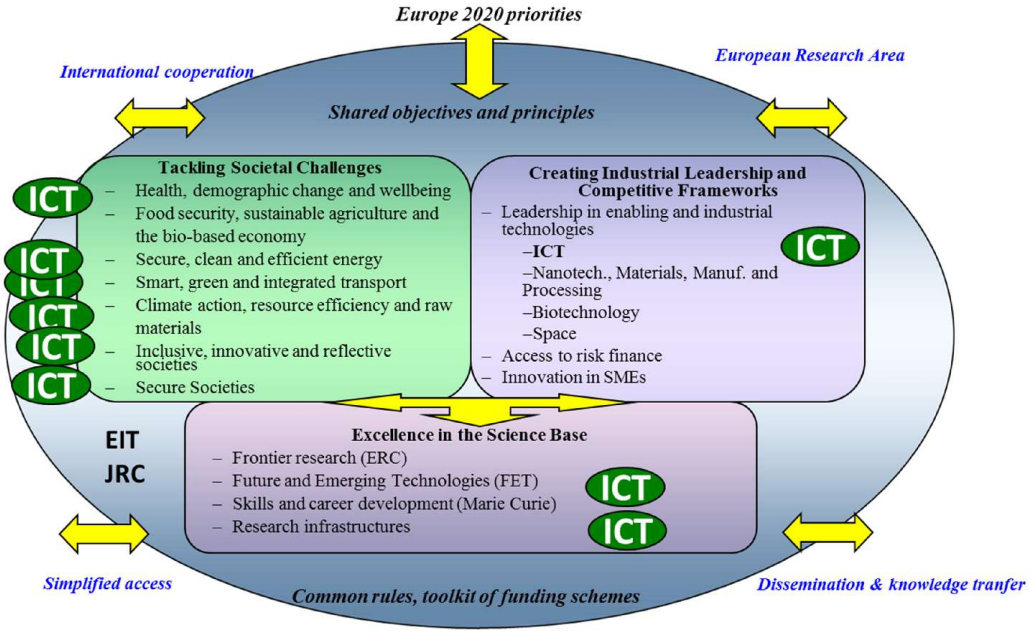
[21] http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=competitive-industry

[22] http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=better-society

[23] http://eit.europa.eu/about-us/

Furthermore some direct support is given to Joint Research Centres (JRC) of the European Commission. The JRC are supporting the European Commission scientifically by defining and implementing their policies. So far seven institutes have been established in different locations all over Europe. Those institutes cover policies in the field of environment, climate change, energy, transport, agriculture, food security, health and consumer protection, information society, digital agenda, safety, security and nuclear.[24]

Figure 12: Overview Horizon 2020[25]



The first ICT work program within Horizon 2020 has been published in December 2013[26] and includes topics such as:

- New generation of components and systems including Micro / nano-electronics and photonics technologies, components and embedded systems engineering
- Next generation computing, Advanced computing systems and technologies
- Infrastructures, technologies and services for the Future Internet

[24] http://ec.europa.eu/dgs/jrc/index.cfm?id=1370

[25] Figure prepared by DG Connect and shown by Morten Moller during OpenChina-ICT Dialogue conference in November 2012 in Beijing

[26] http://ec.europa.eu/research/participants/portal/doc/call/h2020/common/1587758-05i._ict_wp_2014-2015_en.pdf

- Content technologies and information management, including ICT for digital content and creativity
- Advanced interfaces and robots and Robotics and smart spaces

International Cooperation in Horizon 2020

International cooperation contributes to the broader policies of the EUROPE 2020 strategy. Hereby international cooperation with third countries in Horizon 2020 should be in line with the following objectives [14]:

- Strengthening the European Union's excellence and attractiveness in research and innovation as well as its economic and industrial competitiveness

In terms of international cooperation in Horizon 2020, it is understood that international cooperation should create a win-win situation, be of mutual benefit for Europe and allow for the participation of non-European partners – giving Europe access to external sources of knowledge, attracting investments in favour of Europe, creating market access for European technology in new and emerging markets and agreeing in common standards for conducting research and exploiting results.

- Tackling global societal challenges

In terms of international cooperation in Horizon 2020, the term is understood that research with an international dimension should be supported if global challenges are more effectively addressed by using the best talent and knowledge from other world regions.

- Supporting the European Union's external policies

International Cooperation within Horizon 2020 furthermore supports wider policy goals of the European Union's external strategies as enlargement, neighbourhood, trade, Common Foreign and Security Policy (CFSP), humanitarian aid, and development policies. Horizon 2020 is therefore complementing and supporting the European Union's external policies.

In principle, Horizon 2020 will remain open for participation from all over the world. However, not all entities from third-party countries will be eligible for funding. Funding will be restricted according to the gross national income (GNI) per capita in combination with the overall gross domestic income (GDP). In exceptional cases, funding for entities from countries that do not meet these criteria will not be possible. It will continue to encourage reciprocal access to third-party countries

programmes. [14]. China is not having automatic access to Horizon 2020 as it is foreseen that Chinese GDP and GNI per capita will be above the limits.[27]

2.4 The European Research Area

The European Research Area (ERA) is an artificial synonym based on a green paper [19] of the European Commission of all research and development activities, programmes and policies in Europe which have an international character. Together those activity programmes and policies should enable researchers, research institutions and businesses to increasingly circulate, compete and cooperate on a European scale to exploit transnational synergies and complementarities. Therefore the ERA concept encompasses three interrelated aspects:[28]

- A European 'internal market´ for research, where researchers, technology and knowledge can freely circulate
- Effective European-level coordination of national and regional research activities, programmes and policies
- Initiatives implemented and funded at European level (Horizon 2020)

The European Research Area could be distinguished between the pre-ERA phase and the ERA phase. [4]During the pre-ERA phase, i.e. FP1 – FP5 there was, in principle, little interaction between the European funded research and national programme in the sense that programme owners (Research Councils, Government Agencies etc.) were not engaged. The previous Framework programmes were something additional to national programmes. This fact made it fairly easy for the European Commission to prepare the proposal for European funded research.

This does not mean that the European funded research did not have an impact at national level; on the contrary, it has played a major role on the funding structure in different member states [4]. However, with the introduction of the ERA, the rationale being that the European research must act as an important tool in implementing the ERA. This means that already Framework program FP7 interacted more with national programmes and private investments than any predecessor. [29]

Reasons why European Nations work on a European Research Area are similar to those from European funded research to invite non-European researchers into their programmes:[4]

[27]http://ec.europa.eu/research/horizon2020/index_en.cfm?lg=en&pg=faq&sub=results&printfaqs=all

[28]http://ec.europa.eu/research/era/index_en.htm

[29] This text block is a reuse of a deliverable from a previous project called EURASIAPAC

- The need to strengthen research excellence and innovation performance through better access to foreign sources of knowledge and increased global co-operation to develop and exploit this knowledge
- The need to work together with a limited number of other countries to tackle problems of indivisibility, i.e. topics and problems that are too big to tackle alone (many 'big science' initiatives fall into this category)
- The need to work with multiple countries to tackle problems of a truly global nature (e.g. climate change)
- The need to respond to political imperatives and ambitions, e.g. via collaboration designed, in the long run, to strengthen the socio-economic performance of near neighbour countries, or to encourage the development of potential new markets in more distant regions.

As explained in detail above, the ERA concept practically aims to overcome the **fragmentation of research resources** in Europe. During the first 20 years of European funded research, this was mainly done by initiating collaborative projects to generate critical mass and promote mobility of researchers. The Sixth Framework Programme introduced more integrating instruments such as Integrated Projects and Networks of Excellence, which the trend strengthened in the Seventh Framework Programme with the introduction of Joint Technology Initiatives and Public Private Partnership. However, by creating all these new instruments, some type of new fragmentation is created regarding governance of the ERA and research in Europe.[30] By combining all current research and innovation funding of the European Commission, Horizon 2020 aims to overcome this "new" fragmentation.

The **main instrument** of the European Commission to reach a unified European research has been the Framework programme and will be the upcoming Horizon 2020. But parallel to the past framework program, other instruments have been created to support the development of a unified research. Below is a short overview of the most important ERA Instruments[31]:

- The **Framework Program 7 (FP7)** has been divided into a Cooperation Programme, a People Program, an Ideas Program, a Capacities Program and a Nuclear Research Program.[32]
  - The Cooperation Programme had been funded with 32,413 million Euro (9100 Million Euro of it on ICT research) and supports international collaborative research of industry and academia in the following academic

[30] http://www.eubusiness.com/topics/research/era-2

[31] from 2014 most of those Instruments will be covered under Horizon 2020

[32] http://ec.europa.eu/research/era/instruments/instruments/seventh_framework_programme_en.htm

areas: food, agriculture and fisheries; biotechnology; information and communications technologies; nano-sciences, nanotechnologies, materials and new production technologies; energy; environment (including climate change); transport (including aeronautics); socio-economic sciences and the humanities; space and security

  - The Ideas Programme had been funded with 7,510 million Euro and supports frontier research in any area of science
  - The People Programme had been funded with 4,750 million Euro and supports researcher mobility and career development within and outside the European Union. It is implemented via Marie Curie actions.
  - The Capacities Programme had been funded with 4,097 million Euro covers activities such as research infrastructures, research for the benefit of SMEs, Regions of Knowledge, research potential, science in society, and international cooperation.
  - The Nuclear Research and Training Activities Programme supports research, technological development, and international cooperation, dissemination of technical information, and exploitation activities, as well as training.

- **Structural Funds** are provided to overcome the technological divide in Europe to build research and innovation capacities corresponding to their situation and priorities in less developed regions.
- The **Competitiveness and Innovation Framework Programme (CIP)** targets mainly SMEs, offers complimentary support to the Framework programme innovation activities (including eco-innovation), provides better access to finance and brings innovation to the market.
- The **European Institute of Innovation and Technology (EIT)**, which will also have an important role in Horizon 2020, aims to create highly integrated Knowledge and Innovation Communities (KIC).
- For specific fields, some **thematic priorities** have been identified, where additional and special efforts are needed to address major challenges. Such thematic actions are implemented by:

  - Joint Programming pools national research efforts in common European challenges to find more effective better solutions. Joint programming coordinates the national research agendas of the member states in the specific field, while the activities remain funded by the member states. Some examples of the priorities of joint programming are: climate change,

cultural heritage, urban development etc. In the ICT field, important joint programmes are:[33]

- The Ambient Assisted Living (AAL) (www.aal-europe.eu) joint national programme fosters involving SMEs and businesses into market-oriented ageing-well researches, expecting marketable solutions in a short time frame (2-3 years). An important focus of the programme is the standardization of emerging ICT concepts in 5-10 years, as researches require larger scale projects at EU level.
- The Eurostars (www.eurostars-eureka.eu) programme provides sources for market-oriented R&D specifically with the active participation of SMEs in high-tech sectors.

– Joint Technology Initiatives (JTI)support the implementation of the Strategic Research Agendas (SRA) of some industry leads European Technology Platforms (ETP). Their activities may then be supported if the scale and scope of the objectives of those ETP is important that some general support via the ordinary instruments is not sufficient. Within the ICT field two JTI are being supported:[34]

- The ENIAC JTI (www.eniac.eu) focuses on nano-electronics, increasing computing capacity and fostering integration and miniaturization of devices. This initiative addresses to research next generation technologies of computers, accessories and miniaturized systems.
- The focus of ARTEMIS JTI (www.artemis-ju.eu) is the development of embedded systems, which are computer systems designed to perform one or more dedicated functions. The research addresses new concepts, technologies, and tools for the next generation systems, which will consume less energy and will depend less on a given system.

– Strategic Energy Technology Plan (SET Plan) supports the development and deployment of cost-effective low carbon technologies by actions.[35]

– 3 public-private partnerships for green cars, energy-efficient buildings, and factories of the future, created in 2009 to overcome the economic downturn.[36] In 2010, a PPP on Future Internet (FI-PPP) has been established to improve public service infrastructures´ (e.g. water,

[33]http://ec.europa.eu/research/era/areas/programming/joint_programming_en.htm

[34]http://ec.europa.eu/research/jti/index_en.cfm?pg=home

[35]http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm

[36]http://ec.europa.eu/research/industrial_technologies/ppp-in-research_en.html

electricity) integration with internet networking, in order to make them smarter (more intelligent, efficient and sustainable).

- **State Aid for Research, Development and Innovation**: by this instrument, the European Commission controls the state aid given by member states for national research and innovation project, which is not causing unacceptable distortion of competition within the European Union. [18]
- **The Lead Markets Initiative for Europe (LMI)** aims to support financially the development of market potential for innovative goods in health, protective textiles, sustainable construction, recycling, bio-based products, and renewable energies.[37]
- **Public Procurement**: Hereby the European Commission regulates the stimulation of private investment in research and innovation (R&I) by public procurement of innovative solutions.[38]

Those 8 instruments of the ERA are complemented by instruments on a National (member states) and regional level (regions of member states). To improve the coordination of the national research agendas, the European Commission has established ERA-Net and ERA Net plus, which supports this coordination and also bi-national research programmes and projects.

2.5 Policy Mechanism

Each ICT Work programme which defines in detail calls for proposals that lead to real research projects has, in principle, to follow the main objectives defined in the given legal framework as the previous Framework Programme or the upcoming Horizon 2020 and the Digital Agenda. Based on this legal degree of freedom, the European Commission consults while drafting a new work programme with several public and private stakeholders.

[37] http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/

[38] http://ec.europa.eu/research/era/instruments/instruments/public_procurement_en.htm

Some Important stakeholders Involved:

Strategic Forum for International S&T Cooperation (SFIC)

The Strategic Forum for International S&T Cooperation (SFIC) is composed of high-level representatives of the member states and of the European Commission. Its objective is to facilitate the further development, implementation, and monitoring of the international dimension of ERA. In practice, this means sharing information and consultation between the partners (member states and the European Commission) with a view to identifying common priorities, which could lead to coordinated or joint initiatives. While advising the European Commission on the priorities and development of European research programs, the SFIC forum is focusing on activities, which cannot be addressed on national level. This guarantees that the European research is complementary to national research.[39]

IST Advisory Group (ISTAG)

The ISTAG has been established by the European Commission to advice on the overall strategy to be followed in carrying out the IST thematic priority within the European Union funded research programmes. ISTAG members are from ICT industry and research. The ISTAG reflects and advises on the definition and implementation of a coherent policy for research in ICT in Europe. Members of the ISTAG provide consistent and consolidated advice to the European Commission services regarding the Theme Information and Communication Technologies (ICT) of the Cooperation Specific Programme. [40]

European Technology Platforms (ETPs)

ETPs are industry led and define research priorities and action plans on a number of technological areas where achieving EU growth, competitiveness, and sustainability requires major research and technological advances in the medium to long term. Some European Technology Platforms are loose networks that come together in annual meetings, but others are establishing legal structures with membership fees. In the field of ICT, nine European technology platforms exist covering all fields of ICT research, which are of interest for the European industries. Details of all ICT related ETP can be reviewed on: http://cordis.europa.eu/technology-platforms/individual_en.html.[41]

[39]http://www.consilium.europa.eu/policies/era/sfic

[40]http://cordis.europa.eu/fp7/ict/istag/about_en.html

[41]http://cordis.europa.eu/technology-platforms/home_en.html

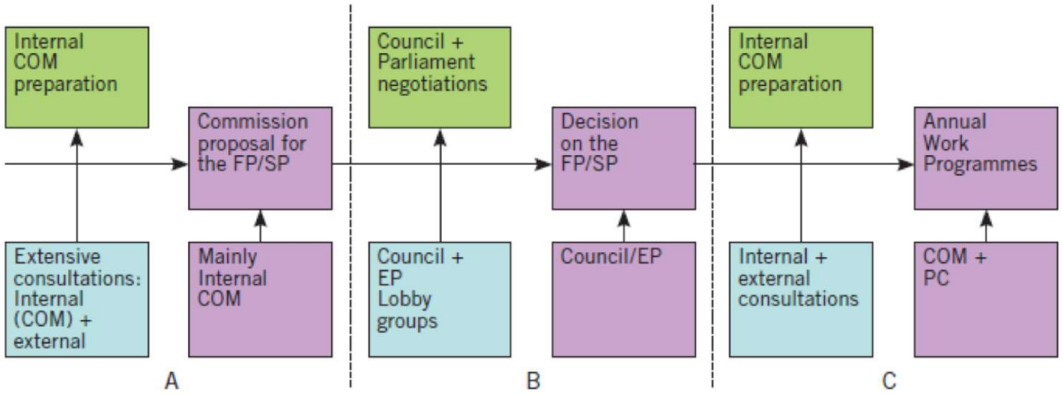
Three different processes can de distinguished in determining thematic priorities in the Framework Programme or the upcoming Horizon 2020 programme [4]:

A. The internal process within the European Commission to prepare the formal proposal

B. Negotiation with and between the Council and the Parliament leading to the decision

C. Implementation of the Framework Programme through the annual Work Programme.

Figure 13: Thematic decision process[4]



The legal decision process to define the legal framework (process A and B) is currently (since 2007) determined by the Lisbon treaty and is not changing between different research programmes as Horizon 2020 or the past Framework programmes. The European Commission adopts annual Work Programmes based on the overall objectives given by the Framework programme or Horizon 2020, which sets out detailed topics. The above-mentioned SFIC Forum is involved right from the beginning in Step A to prepare a formal proposal.

The European Commission has been setting some principles [16] on how such work programmes in Horizon2020 are to be developed regarding external advice and cross cutting issues*:*

- For the detailed programming in Horizon 2020, **external advice** and inputs are provided by advisory groups of independent and high level experts set up by the European Commission, dialogue structures created under international science and technology agreements, targeted public consultations and transparent and interactive processes that ensure responsible research and innovation. Furthermore, input provided by European Technology Platforms, Joint Programming Initiatives, and European Innovation Partnerships should be followed.

- Every detailed Work Programmes in Horizon 2020 should address **crosscutting issues** such as relevant key enabling and industrial technologies, bridging research from discovery to market applications, cross-disciplinary research and innovation, social and economic sciences and humanities, fostering the functioning and achievement of the ERA, cooperation with third countries or gender issues.

2.6 FP7 and European ICT Research Priorities

ICT Work Programmes define priorities according to the general legal context of the Framework Program 7 and the main ICT policy priorities of the Digital Agenda. They are furthermore based on the input of the ICT Programme Committee and Advisory Group, the European Technology Platforms and additional detailed consultations with the main stakeholders from the ICT industry and research.[42] The ICT research under FP7 has been divided into eight "challenges," with the additional area for ICT research for technologies called, Future and Emerging Technologies, which has not been included in the challenges. Furthermore, horizontal actions, such as international cooperation and pre-commercial procurement, have been supported by this research initiative[43]-[44]:

- C**hallenge 1: pervasive and trusted network and service infrastructures**

  The main goal of this challenge is to develop new Internet applications and services, so to research the Future Internet. Important areas are cloud computing, digital media, security and bandwidth in service infrastructure.

- C**hallenge 2: cognitive systems and robotics**

  Challenge 2 concerns pre-programmed robotics, and artificial cognitive systems, which are important in the field of security, logistics and manufacturing. The objective is to improve the functionalities of the robotic systems and the capabilities of cognitive systems, or rather, foster the cooperation between these two systems.

- **Challenge 3: alternative paths to components and systems**

  Challenge 3 focuses on the further development of photonic technologies like LED's, lasers, optical fibres, and photovoltaic panels. It also aims foster development for nano-materials, biochemistry and miniaturization.

- **Challenge 4: technologies for digital content and languages**

  This challenge tries to bridge language barriers in order to create value and digital content. Another objective is to scale up data analysis in order to account for growing data volumes.

[42] The last FP7 ICT Work program with all detailed call descriptions can be reviewed under: http://cordis.europa.eu/fp7/ict/docs/ict-wp2013-10-7-2013-with-cover-issn.pdf

[43] See: http://cordis.europa.eu/fp7/ict/programme/home_en.html

[44] While setting up the OpenChina-ICT project, detailed ICT priorities of Horizon2020 had not been published and known. Therefore the Project had to follow in its methodology ICT research priorities of Framework programm 7.

- **Challenge 5: ICT for health, ageing well, inclusion and governance**

  The main focus is on health; it aims to prevent illnesses by developing early diagnosis technology for diseases and more effective methodologies to restore health with minimal side effects. Moreover, this challenge aims to help individuals who are ageing or disabled to stay independent and healthy for longer durations, and to develop ICT tools to support policy modelling and predict policy-decision impacts.

- **Challenge 6: ICT for a lower carbon economy**

  Challenge 6 concentrates on improving water and energy efficiency through ICT research, reducing the fuel consumption of vehicles and improving the safety of the transportation industry. In addition, the goal of this challenge is to procure fully electric vehicles.

- **Challenge 7: ICT for the Enterprise and Manufacturing**

  The main objective of challenge 7 is to explore the factory of the future, which is meant to be highly automated, flexible and energy efficient. The challenge also includes initiatives to conduct research of product life cycle management (PLCM), in order to make it possible to plan and follow the life of a product from the market introduction until the saturation.

- **Challenge 8: ICT for learning and access to cultural resources**

  Challenge 8 is funding projects that attempt to improve the efficiency at which people learn and retain the new information. An important goal is to study how to compensate for cultural differences by developing technologies which use resources regardless of their form, location or cultural background.

Future and Emerging Technologies

This initiative seeks to foster research of new information and communication technologies. Areas in collaboration with other disciplines, like biology, nano-sciences etc, are important since researching these fields can result in better synergies and alternative concepts or ideas.

International Cooperation

The ICT Program international cooperation aims to (a) support European competitiveness of the European ICT industry by gaining know-how from third countries and (b) to jointly address, with third countries, issues of common interest and mutual benefit. Overall, ICT international cooperation projects should always support general EU policies (sustainable development, environmental protection, disaster response, security).

Pre Commercial Procurement

If public procurers act as first buyers of new technology, innovation can be driven forward. In addition to improving the quality and effectiveness of public services, this can help create opportunities for companies to take international leadership in new markets. In this manner, the European Commission may support competitive advantages of the European ICT industry.

Objectives defined in the Work Programme are derived from the above-described challenges. Based on the objectives in the Work Programme, interested researchers can submit proposals–which upon favourable evaluation - will become projects. The following are the likely types and funding schemes of projects to be seen submitted[45]:

- **Collaborative Projects (CP)** is object-driven and result-oriented; research is done by consortia with participants from different countries aimed at developing new knowledge, new technologies, products and/or processes. The size of a project and internal organization depend on the respective field, and the requirements of the object for research can range from relatively small research projects to very large, integrated project consortia. Projects can be aimed at specific target groups, such as SMEs and other smaller stakeholders. Collaborative projects are divided into large integrated projects (IP's with 8-20 partners, 2-4 years in duration and a budget of 4-12 million euros), and comparable small specific targeted research projects (STREP's, projects with 5-9 partners, 2-3 years in duration and a budget of 1-4 million euros).
- **Networks of Excellence (NoE)** are the structuring and integrating fabric of research. Funding is provided for a common work programme by multiple research facilities. These research facilities integrate their activities in a specific research area with the intention of a long-term cooperation to create a virtual centre of excellence in which the project partners can systematically combine, share and utilise their competencies and research efforts (with 8-12 partners, 4-5 years in duration, and a budget of 3-10 million euros).
- **Coordination / Support Actions (CSA)** support research activities and strategies (networking, exchange, cross-border access to research infrastructures, studies, conferences, etc.), (With 1-8 partners, one-half to 3 years in duration and a budget of 0.5-1.5 million euros).

[45] http://ec.europa.eu/research/fp7/understanding/fp7inbrief/funding-schemes_en.html

Impact of European funded ICT Research

According a study conducted by the European Commission, consisting of interviews from FP6 participants[46]and few additional independent experts,[20]FP6 effectively enhanced European ICT competitiveness by reducing fragmentation and increasing the interoperability of technologies in Communication & Network Technologies, Software, Middle-ware & Distributed Systems, Computing Architectures & Embedded Systems, and Information & Content Management Technologies, Intelligent Interfaces and Bioinformatics. Industrial R&D capabilities were developed in digital convergence. The strongest economic and scientific impacts are seen in semantics and knowledge management technologies, which are embedded and distributed in software.

2.7 ICT Research Priorities of European Union Member states

In this chapter ICT research priorities of some selected European Union member states are discussed. The last available ICT research priorities of the overall European Union are represented above through the research challenges of Framework programme 7.

As the European Commission and its member states spend enormous efforts to prepare a guiding ICT research programme it can be assumed the ICT challenges presented above and defined in the Framework Programme 7 are the most recent known priorities of overall Europe in ICT research. The relevance of these priorities appears credible if understood that in preparation of such Research Programme all possible stakeholders from industry, research and politics are involved.

Nevertheless, Europe is a diverse community with different cultures, economies, interests and priorities. Therefore, ICT priorities of different member states are not always similar to ICT priorities of the overall union and priorities of some selected member states covering Eastern, Northern, Southern and Central Europe are presented in the following:

Estonian ICT Priorities

Estonia - one of the smallest member states of the European Union - defines and implements its ICT research goals via the Arengufond, a fund of the Estonian government which acts as venture capitalist and is also funding ICT development and Research Projects. The fund by itself defined its research and development priorities in ICT via an ICT Foresight study in 2009. The Fund is supporting projects according the results of the Foresight study[40]. The following recommendations could be made as a result of the study:

[46] An Impact analysis of FP7 isnotyetavailable.

- Higher education in ICT has to be upgraded to an internationally attractive level.

The authors recognized that Estonia has ICT weaknesses in various field s as Internet of Services, GRID, integrations of communication systems, microelectronics, bio and nanotechnologies, cognitive systems etc. and suggest upgrading Estonian universities in those fields by international Professors to attract more international students who may drive in a later stage the Estonian ICT economy.

- Strengthening international business management skills in ICT companies

It could be identified that Estonian ICT companies lack specialists to drive international product development and sales. Therefore programs should be developed to train managers of Estonian ICT companies.

- Development of Roadmaps for the application of ICT in target areas

In the study six target areas have been identified for the application of ICT in Estonia, derived from Estonian ICT competence and expected development of world markets. These are ICT in **Education, Health care, manufacturing, energy, financial services and security.** The Estonian development fund is supporting ICT development and research projects within those target areas.

Danish Research Priorities [41]

Denmark's current research funding program - opened in 2012 - is called RESEARCH2020 and is not defining clear ICT research priorities but is instead defining for Denmark emerging societal challenges/themes to which proposers for projects can respond with proposals giving them freedom for a wide area of possibilities of unexpected ideas and original ways of handling the societal challenges with cross disciplinary approaches. The following societal challenges have been defined as being relevant for Denmark:

1. A society with a green economy

The challenge is searching for technological and knowledge-based solutions to great global challenges related to natural resources, environment, energy, climate, and food with a focus on future energy technologies and systems, resources to competitive technologies and solutions, climate and climate adaptation for the future, bio-resources, food and other biological products.

2. A society with health and quality of life

The challenge is searching for solutions of life, where individualised treatment of diseases and a cost-effective health care and care sector will improve quality of life with a focus on effective prevention, diagnostics and treatment of diseases and the healthcare and care sector of the future.

3. A high-tech society with innovation capacity

This challenge is aiming at innovation capacity with a focus on strategic growth technologies, digital solutions and new production systems.

4. An efficient and competitive society

This challenge is targeting solutions for an efficient and competitive society to prevent disease and social problems, to strengthen labour market affiliation, productivity development and competitiveness, and transport systems reducing pollution and congestion.

5. A competent, cohesive society

This challenge wants to help to create a competent, cohesive society with a high level of education to prepare Denmark with knowledge, cultural understanding and cross-cultural competences for global competition.

Austrian ICT Priorities[47]

Austria's general goal is to become a leading nation of the knowledge economy. The country has set as its driving goal to develop further in communication/information processing and software technologies. National funding is made available for research and development of new methods in industrial manufacturing, as well as for optimization of information systems, development leading to improved energy efficiency, or increased security and reliability of IT systems. Special national funding programmes are currently open for:

- Embedded Systems
- Semantic Systems and Services
- Systems on Chip
- Trust in IT Systems
- Visual Computing

[47] http://www.oesterreich.gv.at/site/6497/Default.aspx

British ICT priorities [48][5]:

- **Priority 1: Common infrastructure**

  The main goal of this priority is to create a common, secure and flexible platform available and integrated in every area of the public sector. To achieve this, sub-tasks have been created:

  A telecommunication infrastructure is necessary, providing data and voice communication.

  Large data centres must be developed together with the so-called Government Cloud and Government Applications Store resulting in the storage of all databases in these centres, and the use of applications through the network. All the necessary data will be available everywhere via the same platform. This process significantly increases information security and assurance costs.

- **Priority 2: Common standards**

  All the services must be based on common standards for data sharing security purposes. The public sector is using on-the-shelf software, but these cannot be modified for given administrative tasks.

  The British Government tends to increase the usage of open source applications in order to make it available for specialized tasks and for re-use.

  ICT releases significant amount of greenhouse gas. Due to the British ICT strategy the public sector is committed to reduce energy consumption and carbon emissions, and as a result, deliver significant cash savings.

- **Priority 3: Common capability**

  The Report declares that the whole ICT strategy can only be delivered with more and better-qualified IT specialists than are currently available.

  Professional staff will not only increase the performance of IT, it would also reduce IT spending by half by 2020.

  A significant portion of Government ICT is already outsourced, and although this has brought savings and efficiency, the communication is not always fluent. The objective of supply management is to step forward in the effectiveness of outsourced Government ICT.

[48]The priorities have been defined in 2010 and there has been no update since then. The text explaining the British priorities has been taken from a previous report in the Project EURASIAPAC.

German ICT Priorities [49][21]

- **Priority 1: Growth and Jobs through digitalization**

  The goal is to reactivate ICT based entrepreneurship and to create 30.000 workplaces in the ICT sector by 2015. Standardization on the European level is also an important goal, as this is necessary to reduce the current fragmentation of the ICT sector in the EU. ICT solutions must be applied in the power system in order to integrate renewable energy sources – which are not operating constantly –into the network.

- **Priority 2: Digital Network of the Future**

  The second priority aims at the development of broadband networks, both in speed and accessibility. This includes the upgrading of e-Governance, so as to improve online public services.

- **Priority 3: Digital trust and security**

  It is important to improve digital security in order to increase user's trust in online services, so governmental efforts on improving online public services are not vain. Due to this priority, intellectual property protection must be regularized at the European level.

- **Priority 4: R&D for the digital future**

  This priority is about improving general Internet knowledge, so that companies can better use/offer online services and reach new markets and customers.

  Developing 3D technologies and maximum performance computing systems are also goals of this priority.

- **Priority 5: Education, media literacy and integration**

  ICT innovations can and must be applied in education and in further training, as it makes lifelong learning more effective and interesting for students. It means making working hours and workplaces more flexible, and helping digital integration of disabled groups of the society.

- **Priority 6: Digital solutions for the challenges of the society**

  The point in this priority is to improve governmental online services, to help electronic administration and create more efficient data communication between economy actors and government. ICT solutions have to play an important role in decreasing the polity's energy consumption, and improving e-Justice.

[49] German ICT Priorities have been updated last time in November 2010. The text presenting the priorities has been taken from a Deliverable of a project called EURASIAPAC.

Spanish ICT Priorities [6][50]:

Avanza was the first plan that has been a real commitment of the Government for the Development of Information Society. Avanza declared that ICT becomes a strategic sector, an engine of development of other sectors. In order to strengthen the milestones of Avanza, the 'Avanza2 Plan' was proclaimed after evaluating the results achieved so far. One of the main objectives of the Avanza2 Plan is to contribute to the country's economic recovery by intensive and widespread use of ICT, with special attention to projects that balance sustainability and energy conservation. Avanza2 initiatives are grouped into five strands:

- **Priority 1: Development of ICT sector**

  The objective is to support companies developing new products, processes, applications, contents and ICT services that promote basic thematic priorities the Spanish industrial participation in building the Future Internet and in development of digital content. Within this axis there will be funded innovation programs linked to the Information Society (IS) that enable further progress in improving the competitiveness of the ICT sector and set the economy on an international scale. SMEs will be strengthened as primary beneficiaries of the initiatives that receive public grants.

- **Priority 2: ICT Training of Citizens / SMEs**

  Aims to add and detain citizens and businesses in the Information Society, with a focus more strongly on SMEs and their workers. Within this axis will be reinforced the priority of joining the Information Society (IS) of special groups, people with disabilities and elders.

- **Priority 3: Digital Public Services**

  The quality of services provided by public online administrations must be improved, with special emphasis placed on support to Local Authorities and the development of Electronic ID, which Spain is pioneer at an international level. Also, this line will support the creation of new platforms and contents in the field of education and healthcare from Avanza achievements, which have placed the country in a leading position in both fields.

- **Priority 4: Infrastructure**

  Providing additional impetus to the development and implementation of the IS local environments, improving the delivery of electronic public services to citizens and businesses through the use of ICT. It will also extend the adoption of DTT

[50]Spanish ICT Priorities have been published in July 2010 and have not been updated since then. The text in this Report has been taken from a Deliverable of a previous project called EURASIAPAC.

(digital terrestrial television) and fully replace analogue with digital TV under the National Plan for Transition to DTV (digital television).

- **Priority 5: Trust and Safety**

  It has the twofold aim of strengthening confidence in ICT among citizens and businesses through public policy of information security, and with an increase the accessibility of ICT services. Moreover, it places importance on protection of privacy and children on the Internet, and combating online fraud.

French ICT Priorities

Source: « National Strategy of Research and innovation 2009 » by Ministry of Higher Education and Research France. [51]

- **Priority 1: Health, welfare, food and biotechnology**

The French demand regarding the health research is constantly increasing, which represents important economic development opportunities for French companies, both in the pharmaceutical and in the new health technologies sectors. These areas of research are the first French ICT priority, which is organized around the following objectives:

  - Characterize living beings in genome-ecosystem, to improve our understanding of its complexity
  - Focus on the most important issues of public health
  - Disease prevention through better nutrition and increasing of food traceability to ensure its safety. Food covers other elements of well-being, such as environment protection, sensory aspects, and cultural identity
  - Liaise with the basic research to create powerful medical applications. Within this objective, translational research needs to be strengthened to establish an effective and sustainable link between academic or industrial researchers and clinician scientists.

- **Priority 2: Environmental emergency and environmental technologies**

  While the impacts of human activity on the planet are now becoming visible, it is urgent to innovate to ensure more sustainable development for the civilization. Besides the overall challenges, there are huge development opportunities for

[51]The French Ministry confirmed on January 14th per phone that those Priorities defined in 2009 are still the actual ones. France may update its ICT priorities in end of 2013. The summarizing text in this report has been taken from a previous Project Deliverable of the Project EURASIAPAC.

companies. France should make environmental technology a national priority through the following actions:

- Understand and better follow the climate and biodiversity change, using means of measurement (especially satellite) and performing simulation (supercomputers)
- Develop environmental technologies and eco-design to create competitive products and services with a low or no environmental impact throughout their life cycle
- Ensure a carbon-free future energy with a stability between nuclear research and research on renewable energy in order to preserve the environment
- Develop services and technologies for cities and increase sustainable mobility

- **Priority 3: Information, communication and nanotechnology**

  While information and communication technologies are the source of a third industrial revolution that has transformed our everyday lives, some people already announce the fourth industrial revolution regarding the presence of nanotechnology in the area of product manufacturing. Our companies are under pressure to succeed in this challenge, which gives the opportunity to fight against exclusion and develop carbon-free technologies. However, to ensure the safety and freedom of all citizens, the use of these technologies should be examined and the appropriate regulations adapted. The main challenges of this pillar are:

  - Development of new technical options for Future Internet or Internet of Things in order to influence international standards, which is the core of the business competitiveness
  - Development of efficient framework fully integrating aspects of hardware and software in order to increase functionality, availability and reliability
  - Strengthening of the competitiveness of our service industries (banking, media, education and lifelong learning...) and of the high technology (car industry, aircraft industry, etc.) by a high capacity for efficient editing software
  - Strengthening of our position in the entire software chain. Software security is a major social and economic challenge, in particular in regard to the electronic transactions and the use of digital nomad technologies;
  - Succeeding in the nanotechnology revolution, especially in the fields of electronics, materials and technologies for health and in the renewable energy area

Findings

UK, Germany and Denmark are following some general development paths towards green technologies in order to reach global competitive advantages in the field of energy saving. Greener information technologies are therefore included in the country's ICT priorities. The trends seen towards the ageing population open interesting new business fields; Germany and Denmark in particular take this population into account in its ICT priorities. Other analysed countries are not focusing on this field, which could be explained by the fact that Germany and Denmark are affected by an ageing population to a stronger degree than other counties considering that Germany and Denmark have one of the lowest fertility rates in Europe.[52]In regard to the IT security trend, it has become a critical issue, as most economies are concerned about cyber-attacks, cyber spying etc. In fact, this trend is included in most analysed member states' ICT priorities.

A clear indicator that the European Research Priorities address overall European Union's challenges is that cultural and language barriers are not foreseen in any of the member states priorities. Such barriers rather appear in an overall European Union context but not on a member state level and can be better addressed through trans-European cooperation.

2.8 Highlights and Projects of Europe's ICT Research

According to the size of Europe's funded ICT research there are many results and success stories that could be presented. Some selected outcomes are presented below: [17]

- **Mobile phones and broadband: 3G and 4G**

  European phone technologies and standards are used worldwide. Over 600 Million phones use the European 3G standard. This standard has been developed in Europe with an investment of €120 million by the European Commission 10-15 years ago. A market of €250 billion for products and services related to 3G telecom equipment has been created as a result of the aforementioned investment. Furthermore, thanks to the EU support the first concept of 4G has been developed. It can be expected that within 10 years 4G will be a global standard and, a market of several hundreds of billions of Euro for 4G-related products and services may emerge.

[52] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Total_fertility_rate,_1960-2009_%28live_births_per_woman%29.png&filetimestamp=20111130165651

- **Improving life for the elderly**

  An eldercare social robot has been developed with support of the European Research Program, which can help to perform daily tasks such as lifting or cooking, or set off an alarm if an in-built camera registers that a person has fallen. Such type of robot can cut health care costs by 30% and therefore such development makes the healthcare industry more efficient and can create innovative business.

- **Digital media standards**

  The Digital Video Broadcasting (DVB) standard has been developed with support of European Research funds and is used today in 500 million devices in over 70 countries

- **Energy efficient lighting**

  New OLED's (Organic Light Emitting Diodes) have been developed with the support of European research funds and are at least 5 times more efficient than conventional lighting. This promising new market is expected to grow to around €70 billion by 2020.

- **Micro components**

  Developed by European Research, almost every smart phone contains European manufactured micro-components.

European funded research projects always directly or indirectly contribute to one of the keywords of the EUROPE 2020 strategy: employment, innovation, education, social inclusion and climate/energy as those criteria's are during the selection process evaluated.
To illustrate what types of projects are being executed in the FP7 ICT challenges, the following introduces projects for each challenge.[53] Even if this represents only a partial view on existing activities, it may give a better understanding of what European Research is about and what in reality might be implemented.

- **Challenge 1: pervasive and trusted network and service**

  The EARTH project[54] aimed to improve energy saving by enhancing the energy efficiency of mobile broadband systems. The target of EARTH was to reduce the energy consumption of mobile systems by 50% by providing high capacity and uncompromised QoS. EARTH focused on mobile cellular systems of LTE and its evolution LTE-A. The following results have been achieved:

[53] For the selection of projects highlight projects as indicated by the European Commission unit responsible for each challenge have been chosen. If a unit has not identified highlight projects the introduced project is selected randomly.

[54] https://www.ict-earth.eu/

- Definition of Energy efficient deployment strategies
- Development of Energy efficient network architectures
- Creation of a new network management mechanisms,
- Provision of Innovative component designs
- Development of new radio and network resource management protocols for multi-cell cooperative networking

- **Challenge 2: cognitive systems and robotics**

  The project V-Charge,[55] funded within challenge 2 is targeting new ways of mobility to reduce CO2 emissions. Therefore, the project is working on new concepts for optimal methods of public and individual transportation, including the introduction of electrical cars that need recharging. Within the project a smart car system is to be developed that allows for autonomous driving in designated areas (e.g. valet parking, park and ride) and can offer advanced driver support in urban environments. The focus within the project is on the development of machine vision systems based upon close-to-market sensor systems (such as stereo vision, radar, ultrasonic etc.) and the integration and fusion of each sensors data into a detailed world model describing static and dynamic world contents by means of online mapping and obstacle detection and tracking.

- **Challenge 3: alternative paths to components and systems**

  The OpEneR project[56] (Optimal Energy Consumption and Recovery) addresses the limited driving range of Fully Electric Vehicles (FEV), as it has been proven that long and dependable driving ranges are more important than the cost of ownership. OpEneR targets the driving range by the development of an intelligent energy management and recovery system, integrating existing subsystems with on-board and off-board sensors. The system to be developed will provide advanced driver support based on a networked architecture comprising battery management, e-machine, regenerative braking, satellite navigation, dashboard and displays. A vehicle stability controller and environmental sensing care will be integrated. The final driver support will include functions on the estimation of braking distance, recuperation capability visualization, braking tips based on traffic flow / navigation data and predictive cooperative information's as car-to-car (c2c) and car-to-infrastructure (c2i).

- **Challenge 4: technologies for digital content and languages**

  The SHAMAN project[57] aims to develop reliable preservation solutions to keep the future value of digital assets as they currently stand. Hereby, SHAMAN will create

[55] http://www.v-charge.eu/

[56] http://www.fp7-opener.eu/index.php/project.html

[57] http://www.shaman-ip.eu/node/6

a technology environment, which may be used to manage the storage, access, presentation, and manipulation of digital data. Therefore, SHAMAN will contribute to reduce losses of socially valuable digital assets and to minimize costs of poor digital content management. Furthermore, it is targeted to enable productivity gains in records management and to generate new value-added services by re-use of preserved content and engender new services.

- **Challenge 5: ICT for health, ageing well, inclusion and governance**

  BCI's with Rapid Automated Interfaces for Non-experts (BRAIN)[58] aims to develop Brain-Computer Interfaces (BCI's) into practical assistive and ICT tools to include a range of different disabled users. BRAIN wants to improve BCI's reliability, flexibility, usability, and accessibility while minimizing dependence on outside help. Brain wants to reach these improvements by focusing on signal acquisition, operating protocol, signal translation, and application.

- **Challenge 6: ICT for a lower carbon economy**

  The AmI-MoSES project[59] aims to optimize energy efficiency by realizing innovative, beyond state-of-the-art solutions for manufacturing companies. This happens by improving energy consumption monitoring by introducing Ambient Intelligence parameters that implement a decision support system for the Energy Management Systems. This is developed by the complementation of Classical energy consumption data by different data from Ambient Intelligence systems – environment ambiance and process ambiance, and processed within a service-oriented-architecture based platform.

- **Challenge 7: ICT for manufacturing & factories of the future**

  The Manufacturing Service Ecosystem project (MSEE)[60] focuses on end-to-end integrated ICT solutions that enable innovation and higher management efficiency in networked enterprise operations. MSEE aims to create a new Virtual Factory Industrial Model, where service orientation and collaborative innovation will support a new renaissance of Europe in global manufacturing.

- **Challenge 8: ICT for learning and access to cultural resources**

  The Project Adaptive Learning via Intuitive/Interactive, Collaborative and Emotional systems (ALICE)[61] aimed to define models, methodologies and prototype software components to solve problems of previous e-learning systems and tools, such as:

[58] http://www.brain-project.org/

[59] http://www.ami-moses.eu/

[60] http://www.msee-ip.eu/project-overview

[61] http://www.aliceproject.eu/

- Lack of Interaction: most of the time, the only interaction available is to click on “next” button to step through the material presented
- Lack of Challenge: unchallenging material makes the learning experience unattractive and discourages progression
- Lack of Empowerment: the learner expects to control the learning experience, while, often, the learning experience controls and limits the learner
- Lack of Social Identity: the learner is often isolated from his/her peers reducing the collaboration and the learning achieved through social interaction.

These issues have been approached with an innovative adaptive learning environment that combined personalization, collaboration and simulation aspects with an affective/emotional based approach. ALICE results have been evaluated with real users in real learning and training settings.

3 International Cooperation in Research

The third chapter analyses in detail the important aspects of Research internationalization. In the beginning it focuses on market driven international research cooperation and features what drives private enterprises to locate research activities abroad. This is followed by an in-depth discussion of all important policy aspects (non-market driven) of internationalization of European research programs. At the end of this chapter, European Research policy and European ICT research priorities towards China are explained and analysed.

3.1 Market driven establishment of international cooperation in Research

This sub-chapter explains the development and reasons for international research cooperation. It focuses on the drivers for international cooperation, the impact for international cooperation and presents some available data of the international research integration for Europe and China.

Drivers

In recent years research is becoming more and more internationally integrated. There are two types of players who drive this process. On one side there are public institutions such as the European Commission that funds research centres and enterprises to conduct international research, and on the other hand, there are private enterprises that invest into research abroad. Motives for public subsidized international research abroad are the result of political decisions, which have been described, in the previous chapter (see [14]). Private driven international research follows economic decisions. In the literature, various principles of international R&D investments can be identified. A report prepared by the Austrian Institute of Technology and the Vienna Institute for International Economic studies in 2012[26] differentiates drivers between the Industry level, firm level and the country level, while analysing the reasons for international R&D investments.

<u>Country level:</u>

- Countries with high income and growth attract R&D investment at an exponential higher rate than other countries as R&D investments often follow Foreign Direct Investments and are therefore an extension of existing overseas production and marketing activities.

- An important attractor of foreign R&D investments is a skilled workforce and education quality.
- The evidence that a low labour cost of the R&D workforce also attracts R&D from abroad is weak. Economic studies see only a modest influence of the cost advantage on R&D location decisions. It may only become important if firms have to choose between two similar locations for their R&D investments
- Geographic proximity between host and home country leads to higher cross border R&D investments and is explained by lower costs of coordination, costs of transferring knowledge and a loss of economic scales when R&D becomes too distanced from the home country. Other factors for choosing nearby locations are additional cultural and institutional barriers in distanced locations. Furthermore it may be more difficult to become embedded in informal networks if the potential R&D location is too distanced.
- If a country wants to attract foreign R&D investments, there is evidence it should provide a healthy business environment with political stability, good public infrastructure, reasonable tax rates, a stable legal system, and respect IPR. Furthermore, domestic policies should be adjusted to stimulate the creation and diffusion of new knowledge. Empirical studies conclude that public subsidies to foreign firms to relocate their R&D activities are not an appropriate instrument.

Industry level:

The degree of internationalization of R&D activities depends on the sector, as there are large differences between sectors and their internationalization behaviour in terms of foreign-direct investment. Furthermore, R&D processes between sectors differ. Industry determinants that influence the internationalization of R&D per sector are explained below.[26]

- The tacit level of a sector's knowledge base influences international behaviour. Therefore, if the cognitive knowledge of a certain industry is difficult to communicate and to explain, then a sector is tacit and this is an obstacle for the internationalization of R&D.
- If future innovation success depends strongly on knowledge that has been developed in the past, then the sector usually centralizes its R&D activities. This can be an obstacle to the internationalization of R&D activities. Within the ICT sector this can be seen for telecommunications and electronics.
- If knowledge in a sector is difficult to protect, firms active in this sector often decide against internationalization of R&D.
- If a sector is integrated in global supply chain, suppliers may be forced to internationalize their R&D as they need to be close to main clients.

Firm level

Firms may approach their R&D internationalization with different methods, even if they are from the same country and the same industry. Determinants are described below: [26]

- Firms who are leaders in their sector due to higher productivity, as competitors tend to export more and tend also to internationalize their R&D activities
- Larger firms typically have a higher R&D intensity and tend to internationalize their R&D activities

A firm's strategy to internationalize their R&D activities on a management level is determined by costs of decentralized organization of R&D, which is defined by forgone economies of scale from specialization, tighter control of core technologies, higher costs of coordination, cost of transferring knowledge and costs of forgone embedding into the innovation system of the home country. These costs are balanced on a management level with the benefits of internationalization of R&D as the support of overseas production by local market adaptations and the access to new knowledge abroad.

Impact of Research Integration

Even if it can be assumed to have a fortunate dimension, the impact of the internationalization of R&D cannot be quantified exactly as there are no exact data available that quantify in detail the internationalization of R&D and its effects for national and global GDPs. Nevertheless, the impact of internationalization of R&D activities can be summarized theoretically as follows: [26]

The receiving country or **host country** increases its aggregated R&D and innovations expenditure, improves knowledge diffusion, increases the demand for skilled human capital and may have positive structural effects. While it risks losing control over domestic innovation capacities, it may mainly focus on adapting research, but lack strategic research, and the access of domestic firms to resources may be limited.

The sending country or **home country** may improve its R&D efficiency, may receive reverse technology transfer from the host country and may improve the market access/ expansion of its domestic firms. On the risk side, the home country may lose jobs, may host less R&D and innovation activities, and may lose technology.

Data of Research Integration between Europe and other World regions[26]

The overall inward R&D intensity[62] is much different between European countries. In 2007 for example, in Ireland more than 70% of Research expenditures were foreign driven, while in France only 20 % came from abroad. In general, it can be said that smaller countries receive proportionally more inward BERD than larger countries. For the overall EU it can be estimated that the inward BERD from non-European Firms was 21 Billion Euros in 2007. Main sender countries have been Switzerland and the US. In general, it can be said and measured that inward R&D expenditures have been increasing over the last years globally.

Outward R&D of European countries is difficult to measure on a European level, as only a few countries in Europe record such data[63]. Leading sender countries in Europe are Sweden and Germany.

Detailed data on the internationalization of R&D activities for separate sectors are also very rare. In the ICT sector, data are available for manufacturing electrical and optical equipment inclusive computing machineries, electrical machinery, TV and communication devices and optical instruments. The R&D internationalization level of this ICT manufacturing sector is relatively low, as only approximately 10 % of the European R&D investments in this sector have been initiated from abroad as 2007 data shows. The sector with the most internationalized R&D activities in Europe is the Pharmaceutical sector; 30%, in 2007, of its R&D expenditure in Europe came from abroad.

Data on the overall R&D foreign investment flows is also limited. It can be concluded that the most significant partner country of the European Union for incoming and outgoing R&D investment flows is the USA. Europe received R&D investments of 9.5 billion Euros from the USA and sent R&D investments of 13.2 billion Euros to the USA.

The R&D investment integration of Europe and China is apparently growing. If companies are surveyed to identify priority future R&D investment destinations, China is usually top ranked. Vice versa, the R&D investment flows of China into Europe are growing, even though it is at a slower pace. But it can be seen and empirically validated that those Chinese R&D investments target predominantly high-tech manufacturing sectors in Europe and introduce more new technologies to Europe than R&D investors from other countries.

[62]Measured as share of the overall R&D investments in a country

[63]Large countries in Europe without data are France, Netherlands and Spain

3.2 Non-Market driven establishment of international research cooperation by intervention of European policy makers

As in the Impact section of the previous sub-chapter summarized, there is clear economic and econometric evidence that the development of international research cooperation is beneficial for all participating economies. This understanding justifies an intervention of policy makers to support the development of further international research cooperation with third countries. In practise policy intervention of European policy makers is driven by the criteria as detailed in subchapter 2.3 under international perspectives of Horizon 2020. In the following it is described how policies, strategies and instruments for third country research cooperation's are being developed in the European Union, what obstacles of previous cooperation could be identified and what the international dimension of the past Framework program 7 has been.

Policy, Strategies, Instruments

Beside the possibility for third country entities to participate in project proposals according to the regulations explained in chapter 2and as conditioned in Horizon 2020, there are more options for third country collaborations, such as coordinated calls, joint calls or even joint programs to be agreed upon by program owners of the European Commission, interested member states, associated countries and third countries.

Before the European Commission starts any legal process as explained in subchapter 2.5 to reach a funding or program decision toward a third country, it receives consulting by the Strategic Forum for International S&T Cooperation (CREST), which contains high level member state representatives and representatives from the European Commission. The tasks of the CREST Forum are as follows: [27]

- Systematically sharing and structuring information on the S&T cooperation activities and objectives
- Pooling relevant knowledge concerning third countries
- Identify objectives and common priorities in terms of S&T cooperation with third countries
- Coordinating activities of a similar nature implemented by member states and the community
- If necessary, proposing initiatives to be implemented with appropriate ways and means
- Networking of member states and the European Commission's scientific advisors in key third countries.

It can be said that this Forum is the most important starting point in European research for third countries such as China to develop common S&T activities. Regarding Horizon 2020, the European Commission has identified criteria, which have to be followed when European Union funded international cooperation is planned**.** The CREST forum published its last **recommendations** in 2012 and suggested the following based on reviews of previous past international cooperation activities: [28]

- Europe should develop an integrated strategy to strengthen European attractiveness as research and innovation hubs as Europe must move to the forefront of international cooperation in Science and Technology
- As international cooperation of EU funded research currently adheres to some method of country picking, the forum suggests that the method should be of problem-oriented prioritization, rather than a geographic prioritization
- International perspective should be more integrated in research funding programs
- Horizon 2020 should be truly open to the best brains of the world
- Targeted initiatives to strengthen cooperation should be designed
- Third country cooperation should focus more on firms and innovation to make Europe a global lead market for innovations
- Instruments for third country cooperation should be more flexible
- Started initiatives should require more evidence-based analysis before it comes to funding decisions

Taking into account recommendations from the CREST forum it is envisaged in Horizon 2020 that programs with third countries are developed where appropriate with national funding from the third country. The following funding **instruments** are considered: [14]

- Research and innovation projects with participation of third country entities during evaluation
- Softer forms of cooperation, such as funding for networking between European and third countries on project levels, clusters and program managers
- Joint initiatives as parallel evaluated coordinated calls, commonly evaluated joint calls, contributions from EU to third country programmes to cover the participation of European entities in third country programmes, specific initiatives requiring joint funding

Also based on the input given by the CREST forum, the European Commission defined **criteria** to be analysed once developing third country cooperation programs:[14]

- Capacity in terms of research, investments, output (publications, patents) human resources and infrastructure
- Risks of and opportunities for markets access
- Contribution to the unions international commitment
- Legal administrative framework inclusive lessons learned from previous cooperation.

Looking at individual third countries, international S&T formal agreements provide a legal basis for research cooperation and policy dialogue. The agreements are in general based on the principles of equal partnership, common interest and mutual benefit. They usually define the scope and instruments for cooperation, the general framework and the establishment of appropriate steering structures. In addition, issues like the mutual access to each other's national research programs might be agreed upon through S&T agreements. Since 1998, the EC has entered into S&T agreements with altogether 21 third countries, including China.[64]

Obstacles

If analysing European public funded research with third countries, a number of obstacles can be observed and have to be addressed to make research funding effective [65][42]:

- **Lack of knowledge in Europe on the S&T situation in third countries**

  To improve cooperation with third countries more first-hand knowledge about the R&D position of a country would be necessary. Especially in regard to emerging countries that might have great potential, it is often tedious to collect enough information to establish a solid basis for successful cooperation and to develop adequate policy measures on the EU side. This ranges, for example, from general policy aspects to programmes, rules and regulations, institutions, trends and intercultural aspects.

[64]http://ec.europa.eu/research/iscp/index.cfm?lg=en&pg=countries

[65]The text mentioning the obstacles of public funded research in third countries have been reused from a previous deliverable of a project called EURASIAPAC

- **Lack of knowledge in third countries on the S&T situation in Europe**

  To build a fair ground for S&T cooperation and for placing the EU and its member states and associated countries as key partners, it is necessary to spread information on European research and cooperation opportunities in third countries. This is especially important in the light of the desired increase of participation of third countries in the EU RTD Framework Programme and the possible opening of research programmes of member states and associated countries for third countries. Therefore, the respective knowledge in various regions of the world should be improved.

- **Missing standards for the management and the protection of intellectual property**

  Significant discrepancies between national regulatory frameworks, policies and practices, as well as varying standards in the management of intellectual property hamper international cooperation.

  What is therefore needed are comparable rules and practices that allow equitable access to intellectual property generated through international cooperation and ensure mutual benefit for all research partners.

- **Insufficient visa regimes and social security arrangements for scientists and their families**

  Insufficient visa regimes as well as unclear and disadvantageous social security arrangements often prevent international research cooperation with researchers from third countries.

- **Insufficient advanced national joint funding schemes with third countries**

  One hindrance to research collaboration may be the non-existence of advanced competitive national funding schemes in third countries, especially as existing bilateral funding schemes are usually often restricted to mobility programmes. Building on the experience of some member states/associated countries even in cases where such funding opportunities exist at national level; trans-national differences between the funding systems may prevent the efficient implementation of joint projects.

- **Difficulties with transferring scientific equipment and samples or with getting access to research sites**

  This problem relates to the existing different rules and regulations for the exchange or transfer of research equipment, material and samples (marine, geological, biological etc.) across country borders and the restrictive or complicated access to respective research sites in third countries. International cooperation with third countries is often hindered by administrative legal provisions or by a lack of knowledge of the implementation of respective regulations.

- **Incompatible legal frameworks for joint institutions and infrastructures**

  When it comes to institutional cooperation, different countries specific legal frameworks (regulating, for example, the participation/accession of foreign institutions in/to legal entities of third countries, tax issues, money transfer, etc.) often prevent closer R&D cooperation or the setting up of joint institutions and infrastructures.

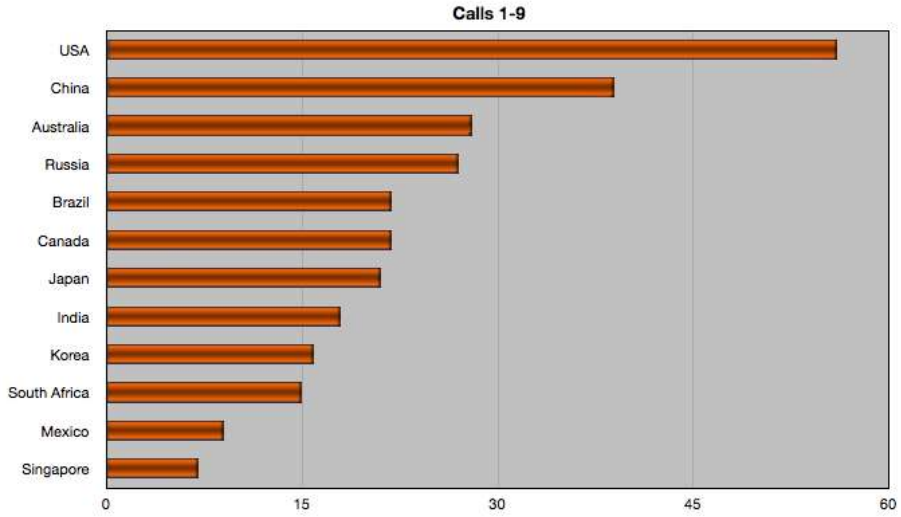
- **Insufficient S&T infrastructure and expertise in third countries**

  Finally, one obstacle for international S&T cooperation, especially in regard to emerging or developing countries, is the non-existing or insufficient local S&T infrastructure in these countries as well as a lack of human resources (e.g. because of 'brain-drain'). This comparative disadvantage is linked to the still existing deficits in the coordination of education, research and development policies at national and EU level.

International Dimension of FP7 ICT research

International cooperation in ICT aims at developing R&D cooperation with third countries to identify and address major challenges if added value is expected to be gained. The ICT area of the past Framework Programme 7 has been intensively encouraging third country participation in their research projects. Participants came from all over the world. The figure below illustrates the number of projects with third countries participation in FP7 ICT by the country of origin. Chinese participation ranks second. All Chinese projects funded under FP7-ICT are listed in Annex I of this Report.

Figure 14: Third country participation FP7-ICT[66]



[66]This figure has been presented by Morten Moller during OpenChina-ICT Dialogue conference in November 2012 in Beijing reflecting FP7-ICT calls 1-9.

3.3 Policies and cooperation with China

China has undergone major changes since it opened to the outside world in 1978 and became a major trading nation. EU-China trade changed in recent years and China is now the biggest source of imports for Europe and in turn also an important export market. China and Europe trade well over €1 billion a day. [67]
EU imports from China are dominated by machinery and transport equipment, and manufactured articles, while exporting to China are dominated by machinery and transport equipment, manufactured goods and chemicals. Overall, the EU faces a large trade deficit with China. But if analysing member states of Europe towards its trade pattern with China, it can be said that Europe is largely divided as some countries have a rather balanced trade balance with China or even a surplus and all other member states have large trade deficits with China.[68]

China is now increasingly engaged in worldwide affairs and reaching an important global political status. The EU's China Policy can be summarized as follows[69]:

- To engage China further, both bilaterally and on a worldwide stage, through an upgraded political dialogue.
- To support China's transition to an open society based upon the rule of law and respect for human rights.
- To encourage the integration of China in the World economy through bringing it fully into the World trading system, and supporting the process of economic and social reform that is continuing in China.
- To raise the EU's profile in China

A Science and Technology Cooperation Agreement[70]between EU and China was signed in 1998, and legally assured the free access of researchers from both sides to the RTD programs of both EU and China. This includes, the 973 National Basic Research Programme and the 863 National High Tech Research Programme. But in reality the participation of EU researchers in China's national RTD programme is much smaller compared with that of Chinese participation in the EU Framework Programme. (See Annex I for Chinese participation in FP7 ICT).

[67]http://ec.europa.eu/trade/creating-opportunities/bilateral-relations/countries/china/

[68]http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/6-18092012-AP/EN/6-18092012-AP-EN.PDF

[69]http://eeas.europa.eu/delegations/china/eu_china/political_relations/index_en.htm

[70]Agreement for scientific and technological cooperation between the European Community and the Government of the People's Republic of China. Official Journal of the European Communities, 11.01.2000, L 6/40-45

The EC DG CONNECT is presently involved in two on-going policy dialogues with China[71]:

- The Dialogue on ICT Research with the Ministry of Science and Technology (MOST), focused on mutual access to EU's Framework Programme and China's 863 and 973 R&D programmes.
- The Dialogue on Information Technology, Telecommunications and Informatisation [72] with the Chinese Ministry for Industry and Information Technology (MIIT) focusing on the Internet of Things, Ipv6 electronic communications and Internet security.

Furthermore the European Commission and Chinese Ministries (MIIT and MOST) have recently created different EU China Expert Groups on Future Internet/IPv6, Internet of Things and green smart cities that aim to provide inputs to their on-going dialogue for promoting cooperation in ICT between China and Europe.[73]

It should also be mentioned, that cooperation has also recently expanded through joint programs between China and EU member states as China puts much emphasis on bilateral cooperation.[74]

R&D cooperation between EU and China in general has expanded in the last years via the coordination of joint calls through the EU sponsored CO-REACH initiative[75] in social sciences. Furthermore, the S&T Fellowship Programme is attracted European researchers to China, and involves funding from both the European Union and China.[76]

Nevertheless as already strived in subchapter 3.2, due to its scope the past EU FP7 has been the core program for funding of research cooperation between Europe and China.[77]The access of European researchers to funding from Chinese programmes, as the 863 High Technology Programme and the 973 Basic Science Programme, seems to

[71]http://ec.europa.eu/information_society/activities/internationalrel/dialogue_coop/china/index_en.htm

[72]

http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=7722&utm_campaign=isp&utm_medium=rss&utm_source=newsroom&utm_content=tpa-6

[73] Source: CATR

[74]http://ec.europa.eu/research/iscp/pdf/eu-ms-activities-with-china_en.pdf

[75] http://www.aka.fi/en-GB/A/Academy-of-Finland/Media-services/Press-releases/Academy-news/CO-REACH-opens-call-for-proposals-on-social-science-collaboration-between-Europe-and-China/

[76]http://www.access4.eu/_media/D12_-_Strategy_Paper_for_enhancing_reciprocity_in_EU-China_ST_Cooperatio....pdf

[77]http://www.access4.eu/_media/D12_-_Strategy_Paper_for_enhancing_reciprocity_in_EU-China_ST_Cooperatio....pdf

be extremely limited[78]. Additional funding opportunities not yet mentioned from European Union, China and Member states exist mainly for researcher's mobility purposes.[79]A complete frequently updated list and overview of trilateral and bilateral research funding opportunities from China, European Union and European member state can be reviewed on the webpage of the EC Delegation to China.[80]

3.4 Reasons for Europe to do Research with China compared with others

If comparing different non-European Union countries as the potential target country to develop Research cooperation, plenty of selection criteria may be important and their significance depends on the individual cooperation need and will be case by case different.

If developing political frameworks for the establishment of research cooperation, significant criteria have to be used that can be applied in general for all countries and not only for an individual cooperation case. Such criteria have been described in subchapter 3.1 of this Report and are represented by the market drivers of the country level[81].

Using market driven criteria for this analysis supports that policy decisions on preferred research cooperation countries should be congruent with industry needs. But in reality policy makers have to also review wider policy goals such as the implementation of democracy, security etc.

In the following section China is going to be compared according those criteria/drivers with other important potential and emerging research destinations as Brazil, Russia and India.

[78]http://www.access4.eu/_media/D12_-_Strategy_Paper_for_enhancing_reciprocity_in_EU-China_ST_Cooperatio....pdf

[79]http://ec.europa.eu/research/iscp/pdf/funding-guide-for-european-researchers-china_en.pdf

[80]www.eu-in-china.com

[81]As indicated in 3.1 is the evidence that low labour costs drive R&D FDI is low, therefore labour costs in R&D are not analysed.

- Countries with high income and growth attract exponentially more R&D investments

Ranking according Income measured in GDP per capita in 2012[82]		
Rank	Country	GDP per capita
1.	Russia	17 700 US-Dollar
2.	Brazil	12 000 US-Dollar
3.	China	9 100 US-Dollar
4.	India	3 900 US-Dollar

Ranking according real GDP annual growth rate in 2012[83]		
Rank	Country	GDP growth rate
1.	China	7,8%
2.	India	6,5%
3.	Russia	3,4%
4.	Brazil	1,3 %

Results of both quantitative comparisons are contradictory, as European policy makers in regard to the development of research cooperation should prioritize Russia taking into account the GDP per capita criteria and should prioritize China taking into account the growth rate criteria.

- Skilled workforce and education quality attracts foreign R&D investments

To compare the education quality and skills of local workforce with international comparable standards, it might be wise to use the OECD PISA assessment as proxy, as no other international education assessment is available covering the four analysed countries.

The OECD is performing every 3 years, a Programme for International Student Assessment (PISA[84]). PISA is assessing the quality and performance of the educational system of more than 70 countries. It is analysing via tests on reading skills, math skills and science capability of 15 -16 years old students of randomly selected schools. The last published PISA test dates back to 2009. Among our target countries PISA covers Brazil and Russia overall but covers India and China only partially. In India the Regions TamilNadu and Himachal Pradesh are covered while in China, only the cities of Shanghai, Hong Kong and Macau are covered. Comparing these target countries via PISA results leads to the following result[85]:

[82] Source: CIA Worldfactbook

[83] Source: CIA Worldfactbook

[84] Source: http://www.oecd.org/pisa/faqoecdpisa.htm

[85] http://www.oecd.org/pisa/pisaproducts/pisa2009/

Pisa Rank	Country
1.	China
2.	Russia
3.	Brazil
4.	India

The City of Shanghai even reached the top rank of all analysed countries/ regions worldwide, while Brazil, Russia and India reached rather low scores.

According to the criterion skilled workforce and education quality, China is therefore the most preferred one as potential research cooperation country. When taking this result into account, it should be kept in mind in that, in China and India, only few areas have been analysed while the majority of the regions of those countries are not covered by PISA.

- Geographic proximity

As explained in 3.1, geographic proximity is a good indicator for higher cross border Research cooperation. Comparing the four analysed countries according to the geographic proximity to Europe, the ranking is very obvious.

Rank	Country
1.	Russia
2.	India
3.	China
4.	Brazil

Russia is the country with the closest geographic proximity to Europe, while India and China are farther and Brazil is the farthest country. If following the geographic proximity criteria, Russia should be the most preferred research cooperation country for Europe.

- Healthy Business environment

As discussed in 3.1, a healthy business environment makes a country attractive for companies to relocate their R&D activities. In literature several rankings are available

who measure and compare issues related to the business environment of different countries. A well-known ranking with large country coverage is the "World Competitiveness Report"[39] of the World Economic Forum, which is published annually and creates a competiveness index.

This Index is based on 12 pillars, including Institutions (quality of the institutions of a country), Infrastructure (how developed is the infrastructure of a country), Macroeconomic environment (how stable is the macroeconomic environment of a country as measured by inflation rate, interest on public debts etc.), Health and primary education (how healthy and educated is the workforce of a country), Higher education and training (how developed are the educations systems of a country as evaluated by the local business community), goods market efficiency (as how developed are domestic markets for goods), labour market efficiency (allowing shifts between industries and wage fluctuations), financial market development (allowing allocation of resources to their most efficient use), technical readiness (agility with which an economy adopts existing technologies), market size (in order to exploit economies of scale to what markets have domestic firms access), business sophistication (quality of a country's overall business networks and the quality of individual firms' operations and strategies), and Innovation (capability of a country to approach new frontiers of knowledge). All 12 pillars are weighted following common statistical analysing methods to reach an overall index.

According to this competitiveness report index from 2013, the following ranking for the four analysed countries can be gained:

Rank	Country
1.	China
2.	Brazil
3.	India
4.	Russia

China has, according to this analysis, the most healthy business environment of all 4 discussed countries. If following the "healthy business environment" criteria to select the most preferred country to develop research cooperation, China would be the most preferred one.

Findings

As it is not feasible within the context of this report to develop a weighting system for all analysed criteria only a qualitative summary of the results will be given.

It is apparent that China seems to have a leading position in most of the analysed criteria. China fails only in the geographic proximity and GDP per capita criteria while it is the leader of the four countries in terms of growth rates, education and healthy business environment. In conclusion, there are good reasons that China should be the most preferred country to develop research cooperation for Europe among the four reviewed countries. This result is supported by other data not yet analysed as China is world leading in terms of produced patents[86],is increasing exponentially its spending on R&D year by year and is world leading in the number of employed R&D staff.[87]

If China would be compared with more economically matured countries such as Japan or USA as research cooperation partner, the result may not be so obvious as those countries have lower growth rates but therefore a much higher GDP per capita, a similar geographic proximity, acceptable PISA results and also healthy and competitive business environments.

In reality as outlined in 3.1, the USA is the main European research partner but China's importance as research partner is growing.

[86]It can be assumed the number of patents of a country are strongly correlated to the quality of the education system

[87]http://www.chinadaily.com.cn/business/2013-03/02/content_16269593.htm

3.5 European entities who would profit from extended cooperation with China in ICT research

There are a large number of ICT enterprises active in Europe with major operations in Research and Business. Some randomly selected enterprises worth mentioning are: Microsoft, Hewlett-Packard, Polycot eBay, Oracle, DELL, Capgemini, Dassault Systèmes, ST Microelectronics, Motorola, LG Electronics, Atmel, IBM, NXP Freescale, Nokia, Siemens, Philips, Atos Origin, SAP etc. Most active players within European funded ICT research can be reviewed in Annex II of this Report, where Top 100 frequent participant according to their received budgets are listed. Due to this list the top participant in EU funded ICT research is Fraunhofer Gesellschaft from Germany.

As indicated in subchapter 3.4, China is a leading country with which European research related entities may develop Research cooperation. In subchapter 3.1, it is indicated that such cooperation are especially interesting for firms who are leaders in their sector due to higher productivity and larger firms as they typically have a higher R&D intensity and tend to internationalize their R&D activities. Somehow these two principles may also be transferred or applied to non-firm entities such as research labs or Universities.

European ICT leaders are non-exclusively represented by the EIT ICT Labs[88], one of the first Knowledge and Innovation Communities (KIC) set up by the European Institute of Innovation and Technology (see Chapter 2),as an initiative of the European Union. Its partners represent Europe's leading organisations, universities, research institutes and companies in the field of ICT.[89]Some randomly selected partners are:

- Nokia[90]: "Nokia is the world leader in mobility, driving the transformation and growth of the converging Internet and communications industries. Nokia combines advanced technology with personalized services that enable people to stay close to what matters to them. Today, Nokia is integrating its devices with innovative services through Ovi, including music, maps, apps, email and more. Nokia's NAVTEQ is a leader in comprehensive digital mapping and navigation services, while Nokia Siemens Networks provides equipment, services and solutions for communications networks globally."
- INRIA[91]: "INRIA is a public research establishment under the supervision of the French Ministries of Research and Industry entirely dedicated to information and

[88]http://www.eitictlabs.eu/

[89] Its core partner can be reviewed here: http://www.eitictlabs.eu/about-us/partners-of-eit-ict-labs/core-partners/

[90] See: http://www.eitictlabs.eu/about-us/partners-of-eit-ict-labs/core-partners/article/nokia/

[91]http://www.eitictlabs.eu/about-us/partners-of-eit-ict-labs/core-partners/article/inria

communication science and technology. For more than 40 years, INRIA has supported the economic and social transformations linked with the dissemination of digital technologies. As such, together with its academic and industrial partners, it conducts at the highest international level an increasingly influential activity in fundamental research and technology development. “

- Engineering[92]: “Engineering is a global player and Italy's largest systems integration group and a leader in the provision of complete integrated services throughout the software value chain: design, development, outsourcing services, products and proprietary vertical solutions, IT and strategy consultancy, tailored to the business models of our clients in all markets. With 6.500 employees and 43branch offices, Engineering is present throughout Italy, has a direct commercial presence in the EU, in Ireland and Belgium, and outside the EU in Brazil, Latin America and Delaware (USA).”
- SAP[93]: “As market leader in enterprise application software, SAP helps companies of all sizes and industries run better. From back office to boardroom, warehouse to storefront, desktop to mobile device – SAP empowers people and organizations to work together more efficiently and use business insight more effectively to stay ahead of the competition. SAP applications and services enable more than 183,000 customers (includes customers from the acquisition of Sybase) to operate profitably, adapt continuously, and grow sustainably.”

  Other Partners[94]EIT ICT Labs and therefore leading in European ICT industry and research are: Fraunhofer Gesellschaft, Ericsson, Phillips, Swedish Royal Institute of Technology, Alcatel Lucent, Siemens, VTT Technical Research Centre of Finland etc.

In general it can be said that extended Frameworks for the facilitation of ICT research cooperation with China will support many capable ICT related entities from Europe by increasing their Business opportunities and know how base. In the context of this report it is not practicable to analyse in detail what the individual advantages for single entities might be, as this depends on individual business cases.

[92]http://www.eitictlabs.eu/about-us/partners-of-eit-ict-labs/core-partners/article/engineering/

[93]http://www.eitictlabs.eu/about-us/partners-of-eit-ict-labs/core-partners/article/sap-ag/

[94]http://www.eitictlabs.eu/about-us/partners-of-eit-ict-labs/core-partners/

3.6 Priorities and experiences of ICT Research with China

It has been shown that China is a preferred research partner for Europe. To develop effective common research collaborations programs in ICT with China, more information' on European Research priorities of ICT sub-themes towards China are needed.

Methodologies to find Priorities

The most reliable and significant way to identify European ICT research priorities for China is to analyse R&D investments of European ICT sectors in China. Policymakers would need to support the existing R&D investment flows by creating additional programmes in dedicated ICT fields and establishing effective and sustainable ICT collaborative research programmes with China, thereby maximizing social welfare. Unfortunately, sufficient data is not available to support this approach.

Another approach to identify ICT research priorities of European industries would be to interview European managers of multinational enterprises about their ICT research investment plans in China, thereby formulating an idea of the European ICT research priorities. This approach may lead to significant results, but it is difficult to implement as it is generally difficult to approach managers of large enterprises for interviews in sufficient scope, and it would be even more difficult to identify and approach those who have ICT R&D investments plans in China. In literature is also mentioned that for strategic reasons such managers would not answer honestly and disclose their investment plans (also known as Moral Hazard phenomena see [26]).

In the OpenChina-ICT project, three approaches have been identified as feasible possibilities to identify European ICT research priorities for collaborations with China: Consensus approach, Proposal approach and Questionnaire approach.

Priorities

The **Consensus approach**[95] is followed by the European Commission when making any prioritization in research programmes. The consensus process has been roughly explained in the policy part of this report. To analyse ICT research priorities for China the European Commission followed the consensus process. Identified priorities should reflect the interests of certain European lobbyists who have some motivation for doing ICT research in China. The disadvantage is that it is unclear what those motivations are and if they are connected to European industry and citizen needs. The identified priorities are:

[95] Those priorities have been presented by Morten Moller during the OpenChina-ICT Dialogue conference in November in Beijing.

- Challenge 1: pervasive and trusted network infrastructures with a focus on future networks, Internet of Things and cloud computing
- Challenge 2: Cognitive systems with a focus on robotics, whereby EC stakeholders are most interested in standardization aspects, safety, benchmarking and possibly certification
- Challenge 6: ICT for low carbon economy (smart energy cities)

The **proposal approach**[96] simply counts the number of retained and not retained proposals received by the European Commission on FP7 ICT calls 1-9 per challenge, with Chinese participation. The **advantage** is that it can be assumed that where a demand exists for projects; there could be a supply in terms of more focused policy actions to develop those priorities for cooperation with Chinese partners. The **limitations** of this data is that the demand per challenge for Research projects in the market is heavily influenced or interfered by the following factors: different budget distribution between challenges[97], mentioning of China in the text of the call[98], influential behaviour by the European Commission's staff to encourage or to discourage submitting proposals with Chinese partners[99], and hazard networks of European proposers with Chinese partners.[100]

[96]data provided by European Commission DG-Connect

[97]This cannot be solved by weighting those data according the budget shares of each challenge as different challenges represent different types of technologies which are by its nature either more Budget intensive or not.

[98]If China has been explicitly mentioned in the call text is this an result of an EC internal and/ or external consultation process which has been explained above and makes the quality of this data similar to the priorities identified in the consensus approach

[99]Even if the evaluations of proposals should be independent, there is always a degree of informal feedback potential proposers collect from responsible EC staff before submitting an proposal. This may influence proposers either to include Chinese partners or not no matter what is written in the call text.

[100] The degree of interference by this factor can be understood if European entities are analysed who participate in European research (not done in the context of this survey). In general it can be said, participating entities do not reflect the European ICT industry as few entities repeatedly participate in European funded research while others have no realistic access.

Challenge	Number of proposals received with Chinese partners in FP7 ICT call 1-9	Rank
Challenge 1: Pervasive and Trusted Network and Service Infrastructures	70	1
Challenge 2: Cognitive Systems and Robotics	6	7
Challenge 3: Alternative Paths to Components and systems	18	4
Challenge 4: Technologies for Digital Content and Languages	30	2
Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance	11	5
Challenge 6: ICT for a low carbon Economy	11	5
Challenge 7: ICT for the Enterprise and manufacturing	8	6
Challenge 8: ICT for creativity and learning	26	3

Only proposals targeted at one specific ICT challenge have been taken into account. Proposals that have been targeting ICT challenges and non-ICT research fields in combined calls have not been counted. It can be concluded there seems to be a strong demand in the field of pervasive and trusted network and service infrastructures for cooperation with Chinese partners. Also the field of technologies for digital content and languages is apparently prioritized. According to this approach, ICT for enterprises and manufacturing, and ICT for cognitive systems and robotics are not prioritized.

Questionnaire approach

Within the questionnaire approach, coordinators of funded FP7 ICT projects with Chinese participation have been interviewed by phone. The questionnaire used can be reviewed in Annex II of this Report and is divided into two parts. In a first part,

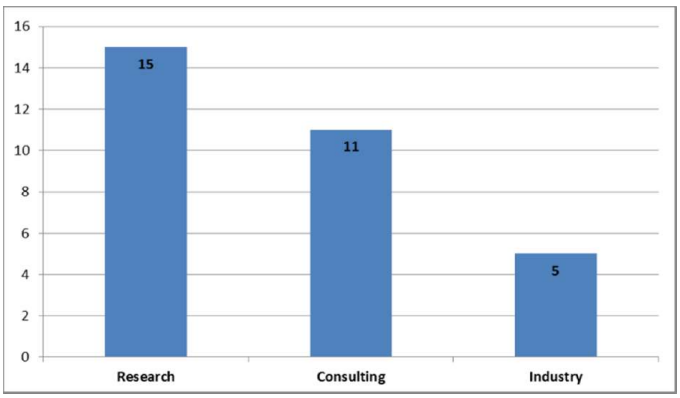
interviewed coordinators were asked to prioritize each challenge for cooperation with Chinese partners. In a second part, coordinators were asked to answer open questions related to their experiences out of this cooperation.

- The advantage of this approach is that the coordinators are experienced in conducting research with Chinese partners, and therefore knowledgeable to answer questions related to priorities and cooperation experiences with China. If randomly selected researcher would have been interviewed, the quality of the answers would have been questionable as most of the interviewed ICT researcher would be not qualified to answer questions regarding China.

- The limitations are similar to the limitations explained for previous approaches and are related to informal networks in European projects. Another limitation is that each coordinator may only be knowledgeable in the challenge related to its project. Furthermore can be said that the group of interviewed entities/ projects is not necessarily representative for all European researchers active in ICT.

As indicated in Annex I of this Report there have been 39 projects funded in FP7 ICT with Chinese participation. For the OpenChina-ICT survey, 32 projects could be reached via phone and 31 projects have been interviewed.[101] The coordinator of the projects, Multicube, Ness, Logistics for life, LARKC, EFIPSANS, GRIFS and Helium 3d could not be reached. The majority of coordinators had also research-oriented functions within their projects.

Figure 15: Type of business of interviewed projects

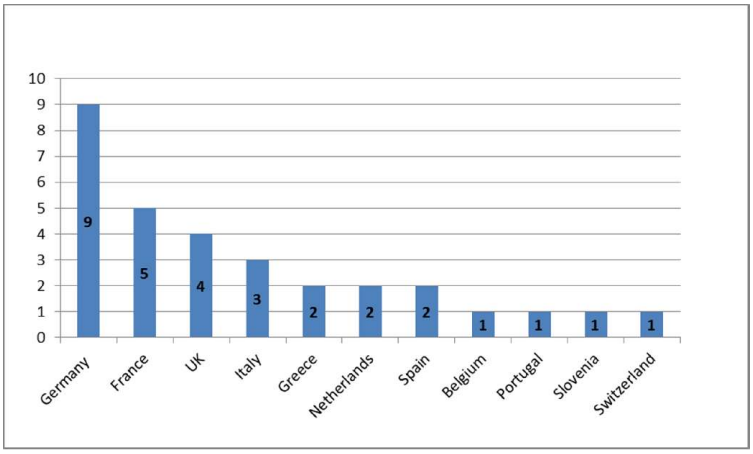


[101]The Project Fupol refused to participate as this is against the company policy of the coordinator.

The low participation of industry coordinators could lead to the conclusions that industry/ market needs are not reflected in ICT research cooperation with Chinese partners, but that most of the consortia have industry partners.

The majority of project coordinators came from Germany, while other important China coordinating FP7 ICT countries were France and UK.

Figure 16: Country of origin of interviewed coordinators

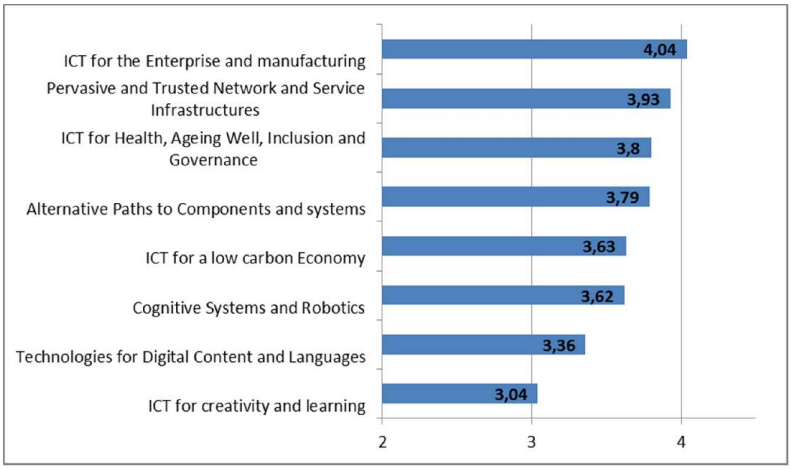


This inner European countries distribution reflects the economic strengths and size within Europe and also the economic integration with China in ICT sectors; Germany is the main trading partner of China within the European Union. Except Scandinavian Countries[102] all major European country groups are somehow represented even if Eastern Europe is involved only through the participation of Slovenia.

Most of interviewed projects as analysed in the **first part** of the survey are either focused on FP7-ICT horizontal support activities similar as OpenChina-ICT or on challenge 1: pervasive and trusted network and service infrastructures. A limited number of projects are focused on challenge 2: cognitive systems and robotics and challenge 5: ICT for Health, Ageing Well, Inclusion and Governance.

[102]One existing Euro-China initiative coordinated by an Finish company – EFIPSANS project could unfortunately not be reached.

Figure 17: Ranking of Challenges towards ICT cooperation's with Chinese partners



Interviewed coordinators could give a mark from 1 to 5 for each challenge (1 = not relevant; 5 = very relevant).

Findings

An interesting result of this survey is that most coordinators of previous FP7 ICT projects believe that challenge 7, ICT for enterprise and manufacturing, seems to be most suitable for ICT research cooperation with China. This is especially interesting as none of the previous priority approaches focused on this challenge. A reason for this could be the strong manufacturing focus of China and the European firms seeking to either sell manufacturing solutions to China (market access) or to partake in Chinese manufacturing technology (know-how transfer).[103]

The importance of challenge 1 on pervasive and trusted network and service infrastructures is not surprising as this challenge is the most active in China; this result is in line with the previous priority finding approaches.

Priority differences between competing challenges are rather small as most coordinators interviewed apparently feel that research cooperation with China in ICT sectors is in general useful for Europe.

In the **second part** of the OpenChina-ICT survey, general questions with open answers to collect gained experiences have been asked. Questions were related to strengths/ weaknesses of on-going or past cooperation experiences and general risks/chances of such cooperation in FP7 ICT projects. A detailed qualitative and quantitative analysis of the result of the second part of the survey will be included into the cooperation

[103]In the upcoming deliverable cooperation Plan of OpenChina-ICT the Analysis of this result will be deepened.

plan to be developed in the context of the OpenChina-ICT project. Below, a summary for each asked question is provided:

Benefits for European side arising from European Chinese Research Cooperation:

- Most European coordinators appreciated know-how inflow coming from Chinese partners, which has been sometimes complementary and not available in Europe.
- Some European project coordinators took advantage of cheaper research services available in China.
- Many projects appreciated the possibility of wide spread dissemination in China and potential market access.
- Few projects made use of and appreciated testing possibilities not available in Europe.
- For some projects a benefit has been the implementation of European standards in China improving market access of European enterprises in China.
- All project coordinators gained a better understanding of the Chinese research system that they may use for further cooperation.

As a weakness on the European side in terms of being prepared for ICT research cooperation with Chinese partners, the following issues have been raised:

- In some projects different work cultures lead to irritations, delays and significant communication and management efforts
- Europeans felt it is difficult to understand Chinese organizational structures and Chinese hierarchy, leading to irritations and work delays.
- One project mentioned that Europeans should be better prepared to make dissemination in China more effective.
- Unclear import/ export rules for know-how intensive goods in Europe caused problems in one project

When having research collaborations with Chinese partners the following general risks have been identified:

- Unwanted know-how transfer to China while Chinese organisations better protect their technology
- Quick assimilation of new knowledge in China

- Competitive disadvantage as Chinese can exploit commonly developed ideas cheaper and quicker
- Violation of IPR
- Limited law enforcement possibilities of European entities in China

When doing research projects with Chinese the following general chances have been identified:

- Market access for European technology
- Access to qualified labour/ improvement of European research quality
- Improvement of European Innovations system by learning from China
- Quicker development of technology in the benefit of Europe
- Influencing Chinese civil society with European democratic standards
- Chinese respect Europeans more than Americans and this advantage should be used for common developments

Findings

Project coordinators of past and on-going FP7 ICT projects with China identified several general benefits as for example know-how transfer to Europe, access to know-how not available in Europe, dissemination and market access possibilities. When developing future strategies those benefits or strengths of China as a research partner in ICT should be developed further to make more use of them.

Harmful factors for a successful conduction of bilateral ICT research projects have been, amongst others, different working cultures between Europe and China, complex organizational structures in China and unclear informal hierarchical levels in China. When developing future strategies for ICT research cooperation with China, the above-mentioned factors have to be overcome and limited.

Some external risks which are identified and assumed by the interviewed project coordinators are, amongst others, related to the protection of European know-how and a cheaper and quicker technology uptake in China. These risks have to be applied and limited if developing future strategies for common research cooperation.

External opportunities identified and assumed by the interviewed coordinators are among others market access potentials, making use of qualified Chinese researchers and research infrastructure in China to improve quality of research and research conduction time. Those potential opportunities should be considered when developing future strategies for research cooperation with China.

4. Conclusion

Europe is leading in the ICT industry sector, and has strong ICT research capabilities. However, the European Union's overall research intensity, in terms of R&D expenditure, is below its objectives of 3% and below the research intensity of main competitors such as the USA, Japan and South Korea. Even through the European Union has followed its innovation path and invested significant resources to stimulate research activities in Europe, overall it has not reached its goal to spend 3% of the GDP for research and development. Nevertheless, there exist several success stories of the European Union's research programmes. Although, not laid out in full in the European Commission impact analysis of previous research programmes, it might be assumed that research stimulation in the long term in terms of generated value of GDP is higher than the funds spent.

Supporting evidence that internationalization of R&D activities stimulates the economy and increases its share of overall GDP can be found in literature. Therefore, European policymakers do follow a strategy that encourages and supports international R&D collaboration in ICT. However, European policymakers have outlined new conditions for the Horizon 2020 programme, if international cooperation is to be supported by European funds. Those conditions are focusing mainly on the benefit for Europe. The definition of those new conditions has been supported by the CREST forum, which is suggesting that Europe should start such activities with clearer strategies and more well-defined targets.

As analysed in the report, China is a cooperation partner of interest for ICT research due to its rapid development, technology provisions, and market access opportunities. In the past Framework Programme 7, China has been a significant participant in European funded research, and this participation should continue to be encouraged.

Therefore the OpenChina-ICT project undertook efforts to support policymakers when creating the framework for a European research strategy with China. Part of these efforts has been to analyse European ICT research priorities for China. Within this survey three approaches have been selected to identify European ICT research priorities for China. Some important European priorities for ICT cooperation with China are ICT for enterprise and manufacturing, pervasive and trusted network, and service infrastructures. When defining a new research strategy for ICT research with China, previous cooperative experiences have to be taken into consideration. Therefore some strengths, weaknesses, risks and opportunities of cooperation with Chinese partners have been identified. If all those findings are combined with upcoming consumer trends as detailed in this report, a sustainable ICT research cooperation mechanism may be develop.

Identified priorities and experiences have been further analysed in the OpenChina-ICT Cooperation Plan, which has been developed in the context of the OpenChina-ICT project.

European priorities in combination with Chinese priorities also served as input for the OpenChina- ICT Thematic workshops:

- 1st OpenChina-ICT Thematic Workshop on Smart and Sustainable Cities - May 31, 2013 in Guangzhou, P.R. China

- 2nd OpenChina-ICT Thematic Workshop on Internet of Things and Future Internet - August 23, 2013 in Beijing, P.R. China.

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Annex I: List of Chinese Participants and Projects in FP7 ICT funded Research[104]

Name	Number Of Projects	Total EC Contribution
TSINGHUA UNIVERSITY	9	815 814,00 €
BEIJING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS	7	618 234,00 €
INSTITUTE OF COMPUTING TECHNOLOGY, CHINESE ACADEMY OF SCIENCES	6	604 950,00 €
BEIJING FRANCE TELECOM R&D COMPANY LIMITED	1	561 483,00 €
SOUTH CHINA UNIVERSITY OF TECHNOLOGY	1	480 110,00 €
BEIHANG UNIVERSITY	5	447 977,00 €
BEIJING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS	5	436 274,00 €
THOMSON BROADBAND R&D (BEIJING) CO., LTD	1	282 215,00 €
SHANDONG UNIVERSITY	1	257 168,00 €
SHANGHAI JIAO TONG UNIVERSITY	3	246 900,00 €
BEIJING FRANCE TELECOM R&D COMPANYLIMITED	1	240 250,00 €
BEIJING MUNICIPAL OFFICE OF INFORMATISATION	1	218 000,00 €
YANTAI ZONGHE XINXI ZHONG XIN	1	201 150,00 €
TSINGHUA UNIVERSITY	3	197 199,00 €
BEIJING SOFTWARE INDUSTRY ASSOCIATION	1	183 093,00 €

[104]Source:EuropeanCommission, November 29th, 2012

INSTITUTE OF HIGH ENERGY PHYSICS CHINESE ACADEMY OF SCIENCES	3	181 900,00 €
HUAWEI TECHNOLOGIES CO LTD	1	170 580,00 €
PHILIPS (CHINA) INVESTMENT CO LTD	1	168 561,00 €
TSINGHUA UNIVERSITY	1	165 040,00 €
HUAWEI TECHNOLOGIES CO. LTD	2	164 000,00 €
Lanzhou University	1	160 334,00 €
UNIVERSITY OF SCIENCE AND TECHNOLOGY BEIJING	1	156 000,00 €
Tsinghua University	1	153 165,00 €
AGRICULTURAL INFORMATION INSTITUTE OF CHINESE ACADEMY OF AGRICULTURAL SCIENCES	1	150 000,00 €
CHINA INTERNATIONAL TELEVISION CORPORATION	1	147 500,00 €
NOKIA SIEMENS NETWORKS LIMITED BEIJING	2	143 013,00 €
BEIJING SOFTWARE ENTERPRISE ADVISORY CENTER	1	134 070,00 €
BEIJING BAMC INVESTMENT AND DEVELOPMENT CENTER CO LTD	1	133 750,00 €
BEIJING SOFTWARE ENTERPRISE ADVISORY CENTER	2	133 487,00 €
RED FLAG SOFTWARE CO., LTD.	1	131 130,00 €
Institute of Agricultural Resources and Regional Planning CAAS	1	129 158,00 €
CHINA-EU SCIENCE AND TECHNOLOGY COOPERATION PROMOTION OFFICE	1	125 480,00 €
THE STATE INFORMATION CENTRE, PR CHINA	1	120 000,00 €
PEKING UNIVERSITY	2	117 619,00 €
CITY UNIVERSITY OF HONG KONG	2	117 351,00 €

CHINA-EU SCIENCE AND TECHNOLOGY COOPERATION PROMOTION OFFICE	1	116 340,00 €
NATIONAL UNIVERSITY OF DEFENSE TECHNOLOGY	1	115 700,00 €
TSINGHUA UNIVERSITY	2	111 997,00 €
INSTITUTE OF SOFTWARE, CHINESE ACADEMY OF SCIENCES	1	110 400,00 €
RESEARCH INSTITUTE OF TELECOMMUNICATION TRANSMISSION – CHINA TELECOMMUNICATION TECHNOLOGY LABS	1	108 600,00 €
COMPUTER NETWORK INFORMATION CENTER CHINESE ACADEMY OF SCIENCES	3	108 020,00 €
CHINA MOBILE GROUP DESIGN INSTITUTE CO., LTD.	1	106 800,00 €
ORACLE SOFTWARE RESEARCH AND DEVELOPMENT CENTER (BEIJING) CO., LTD	1	104 497,00 €
CHINA ACADEMY OF TELECOMMUNICATION RESEARCH OF MINISTRY OF INFORMATION INDUSTRY	4	103 525,00 €
THE CHINESE UNIVERSITY OF HONG KONG	2	99 700,00 €
SUN MICROSYSTEMS (CHINA) Co. Ltd	1	98 732,00 €
WUXI SMART SENSING STARS COMPANY LTD	1	96 900,00 €
BEIJING UNIVERSITY OF TECHNOLOGY	1	95 616,00 €
BEIJING SOFTWARE INDUSTRY ASSOCIATION	1	95 554,00 €
TELECOMMUNICATION METROLOGY CENTER OF MII	1	90 590,00 €
FUDAN UNIVERSITY	1	90 216,00 €
PEKING UNIVERSITY	3	89 620,00 €
Hangzhou Normal University	1	85 600,00 €
SHANGHAI ASTRONOMICAL OBSERVATORY – CHINESE ACADEMY OF SCIENCES	1	85 100,00 €

BII GROUP HOLDINGS LTD.	1	78 286,00 €
HIGH TECH RESEARCH AND DEVELOPMENT CENTER	1	78 000,00 €
China – European Union Science & Technology Cooperation Promotion Office	1	76 270,00 €
STMICROELECTRONICS (BEIJING) R&D CO LTD	1	72 205,00 €
China Science and Technology Exchange Center	1	70 406,00 €
SHANGHAI DEVELOPMENT CENTER OF COMPUTER SOFTWARE TECHNOLOGY	1	66 600,00 €
CHINA ACADEMY OF TELECOMMUNICATION RESEARCH OF MINISTRY OF INFORMATION INDUSTRY	2	65 365,00 €
CHINA HI-TECH TRANSFERT CENTER	1	63 480,00 €
CHINA TELECOM CORPORATION LIMITED BEIJING RESEARCH INSTITUTE	1	63 000,00 €
Tianjin University	1	60 837,00 €
COMPUTER NETWORK INFORMATION CENTER CHINESE ACADEMY OF SCIENCES	1	60 000,00 €
BEIJING SOFTWARE ENTERPRISE ADVISORY CENTER	1	58 593,00 €
CHINA AVIATION INDUSTRY CORPORATION II SCIENCE & TECHNOLOGY COMMITTEE	1	54 620,00 €
Anhui Institution for Economic Research	1	54 319,00 €
NATIONAL METEOROLOGICAL INFORMATION CENTRE	1	53 120,00 €
SHANGHAI INSTITUTE OF MATERIA MEDICA, CHINESE ACADEMY OF SCIENCES	1	53 120,00 €
JIANGSU ACADEMY OF AGRICULTURAL SCIENCES * JAAS	1	52 364,00 €
STMICROELECTRONICS (BEIJING) R&D CO LTD	1	52 000,00 €

INSTITUTE OF AUTOMATION CHINESE ACADEMY OF SCIENCES	1	51 450,00 €
HUAZHONG UNIVERSITY OF SCIENCE AND TECHNOLOGY	1	50 000,00 €
CHINA BROADCAST NETWORK CO., LTD	1	48 200,00 €
SHANGHAI MEDIA GROUP	1	46 200,00 €
CHINA DTV MEDIA INC., LTD.	1	45 100,00 €
NATIONAL SUPERCOMPUTER CENTER IN TIANJIN	1	43 363,00 €
BEIJING TRANSVIDEO DIGITAL TECHNOLOGY CO., LTD.	1	42 700,00 €
ACADEMY OF BROADCASTING SCIENCES , THE STATE ADMINISTRATION OF RADIO, FILM AND TELEVISION	1	42 000,00 €
SKILLNET MANAGEMENT & INVESTMENT CONSULTANT (SHANGHAI) CO LTD	1	41 538,00 €
SHENZHEN FAHUA MULTIMEDIA COMMUNICATION CO., LTD	1	40 600,00 €
CHINA RADIO INTERNATIONAL	1	39 300,00 €
ARTICLE NUMBERING CENTER OF CHINA (ANCC, GS1 CHINA)	1	38 589,00 €
AUTONAVI SOFTWARE CO LTD	1	38 400,00 €
FRANCE TELECOM R&D BEIJING COMPANY LIMITED	1	38 400,00 €
SHANGHAI ORIENTAL PEARL TRAANSMISSION CO., LTD	1	37 200,00 €
HONG KONG SCIENCE AND TECHNOLOGY PARKS CORPORATION	1	35 979,00 €
SIASUN ROBOT & AUTOMATION CO., LTD.	1	35 650,00 €
BII GROUP HOLDINGS LTD	1	34 582,00 €

BEIJING HYDRAULIC RESEARCH INSTITUTE	1	34 202,00 €
ELECTRONIC INDUSTRY STANDARDIZATION INSTITUTE OF MINISTRY OF INDUSTRY AND INFORMATION TECHNOLOGY	1	33 544,00 €
FRANCE TELECOM RandD BEIJING COMPANY LIMITED	1	32 500,00 €
HUAZHONG UNIVERSITY OF SCIENCE AND TECHNOLOGY	1	32 258,00 €
WUXI SMART SENSING STARS COMPANY LTD	1	32 175,00 €
ZTD CORPORATION	1	32 100,00 €
PHILIPS (CHINA) INVESTMENT CORPORATION LTD	1	31 900,00 €
TSINGHUA UNIVERSITY	1	30 626,00 €
TELECOMMUNICATION METROLOGY CENTER OF MIIT	1	30 269,00 €
NANJING UNIVERSITY	1	28 480,00 €
CHINA RADIO & TV EQUIPMENT INDUSTRIAL ASSOCIATION	1	27 600,00 €
SHANGHAI SUNLINE CO LTD	1	26 340,00 €
NOKIA (CHINA) INVESTMENT CO. LTD.	1	26 100,00 €
CIMS ENGINEERING RESEARCH CENTER	1	25 500,00 €
BEIJING NORMAL UNIVERSITY	1	25 500,00 €
BEIJING JOLON DIGITAL MEDIA BROADCASTING CO., LTD	1	24 000,00 €
CHINA SATELLITE NAVIGATION AND COMMUNICATIONS CO., LTD	1	24 000,00 €
GUANGDONG MOBILE TELEVISION MEDIA CO. LTD	1	24 000,00 €
BEIJING ZHONGKE HOPE SOFTWARE CO., LTD.	1	22 400,00 €
CHINA HARVEST DEVELOPMENT LIMITED	1	22 400,00 €

BEIQI FOTON MOTOR CO., LTD	1	22 261,00 €
MOTOROLA (CHINA) ELECTRONICS LTD	1	21 600,00 €
CHINA UNICOM LIMITED CORPORATION SHANGHAI BRANCH	1	21 000,00 €
NEOTRIDENT TECHNOLOGY LTD	1	20 120,00 €
BEIHANG UNIVERSITY	2	20 000,00 €
COMPUTER NETWORK INFORMATION CENTER CHINESE ACADEMY OF SCIENCES	2	20 000,00 €
TSINGHUA UNIVERSITY	1	20 000,00 €
COSCO NETWORK E LOGISTICS CO LTD	1	19 902,00 €
CHINA STANDARD SOFTWARE CO., LTD	1	17 400,00 €
INSTITUTE OF BOTANY, CHINESE ACADEMY OF SCIENCES	1	16 371,00 €
SIEMENS LIMITED CHINA	2	16 087,00 €
ANSHAN IRON STEEL CORPORATION	1	14 000,00 €
XIAN JIAOTONG UNIVERSITY	1	11 100,00 €
SHANGHAI INSTITUTE OF MICROSYSTEM AND INFORMATION TECHNOLOGY, CHINESE ACADEMY OF SCIENCES.	1	10 000,00 €
BEIJING UNIVERSITY OF AERONAUTICS	1	7 800,00 €
HARBBIN INSTITUTE OF TECHNOLOGY	1	7 800,00 €
NANJING UNIVERSITY OF SCIENCE & TECHNOLOGY	1	7 800,00 €
ADVANCED SYSTEMS DEVELOPMENT CORPORATION (BEIJING) LTD	1	0,00 €
BEIJING ALL MEDIA AND CULTURE GROUP CO. LTD	1	0,00 €
BEIJING LINGTU SOFTWARE CO. LTD.	1	0,00 €

BEIJING STONE BOYUN SOFTWARE TECHNOLOGY COM. LTD.	1	0,00 €
BEIJING STONE INTELLIGENT TRANSPORTATION SYSTEM INTEGRATION CO. LTD.	1	0,00 €
BEIJING UNIVERSITY OF AERONAUTICS AND ASTRONAUTICS	1	0,00 €
CAPINFO COMPANY LIMITED	1	0,00 €
CAPINFO COMPANY LIMITED	1	0,00 €
CHINA ACADEMY OF TELECOMMUNICATION RESEARCH OF MINISTRY OF INFORMATION INDUSTRY	1	0,00 €
CHINASOFT NETWORK TECHNOLOGY CO., LTD	1	0,00 €
CHINESE ACADEMY OF SCIENCES – INSTITUTE OF ATMOSPHERIC PHYSICS (IAP, CAS)	1	0,00 €
CHINESE ACADEMY OF SCIENCES – INSTITUTE OF AUTOMATION	1	0,00 €
CHINESE ACADEMY OF SCIENCES – INSTITUTE OF REMOTE SENSING APPLICATIONS	1	0,00 €
COMPUTER NETWORK INFORMATION CENTER CHINESE ACADEMY OF SCIENCES	1	0,00 €
CONTINENTAL AUTOMOTIVE SYSTEMS MANAGEMENT (SHANGHAI) CO., LTD	1	0,00 €
GUANGZHOU ECONOMIC & TECHNICAL DEVELOPMENTS AREA HONGDI TECHNOLOGY COM. LTD	1	0,00 €
NATIONAL GEOMATICS CENTER OF CHINA	2	0,00 €
NOKIA (CHINA) INVESTMENT CO. LTD.	1	0,00 €
NOKIA (CHINA) INVESTMENT CO. LTD.	1	0,00 €
NOKIA SIEMENS NETWORKS TECHNOLOGY (BEIJING) CO LTD	1	0,00 €

NORTHERN JIAOTONG UNIVERSITY	1	0,00 €
REDLAND TECHNOLOGY NC.	1	0,00 €
SHANGHAI HUAWEI TECHNOLOGIES CO. LTD	1	0,00 €
SHANGHAI INNSTITUTE OF MICROSYSTEM AND INFORMATION TECHNOLOGY, CHINESE ACADEMY OF SCIENCES	1	0,00 €
SHENYANG NEUSOFT CO., LTD.	1	0,00 €
SIEMENS LIMITED CHINA	1	0,00 €
SIEMENS LIMITED CHINA	1	0,00 €
TELECOMMUNICATION METROLOGY CENTER OF THE MINISTRY OF INFORMATION INDUSTRY	1	0,00 €
WUXI SENSINGNET INDUSTRIALIZATION RESEARCH INSTITUTE	1	0,00 €

Annex 2: List of FP7 ICT project with Chinese Partners [105]

Project	Partner
OPENCHINA-ICT - Opening European Chinese Cooperation on ICT Research (http://openchina-ict.eu/) From 2012-01-01 to 2013-12-31	Coordinator: FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) Participants: 1. SIGMA ORIONIS (France) 2. CHINA ACADEMY OF TELECOMMUNICATION RESEARCH OF MINISTRY OF INFORMATION INDUSTRY (China) 3. CHINA SCIENCE AND TECHNOLOGY EXCHANGE CENTER (China) 4. BEIJING SOFTWARE ENTERPRISE ADVISORY CENTER SHAREHOLDING PRIVATE (China)
E-AGRI - Crop Monitoring as an E-agriculture tool in developing countries (http://www.e-agri.info/index.html) From 2011-02-01 to 2014-01-31	Coordinator: VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V. (Belgium) Participants: 1. INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE (Marocco) 2. ANHUI INSTITUTION FOR ECONOMIC RESEARCH (China) 3. JRC -JOINT RESEARCH CENTRE-EUROPEAN COMMISSION (Belgium) 4. INSTITUTE OF AGRICULTURAL RESOURCES AND REGIONAL

[105] Source: www.cordis.lu

	PLANNING CAAS (China) 5. UNIVERSITA DEGLI STUDI DI MILANO (Italy) 6. JIANGSU ACADEMY OF AGRICULTURAL SCIENCES*JAAS (China) 7. STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK (Netherlands) 8. MINISTRY OF ENVIRONMENT AND 9. MINERAL RESOURCES (Kenya)
SCC-COMPUTING - Strategic collaboration with China on super-computing based on Tianhe-1A (http://mts.tju.edu.cn/) From 2012-01-01 to 2013-12-31	Coordinator: UNIVERSITY OF SURREY (United Kingdom) Participants: 1. ASSOCIATION "NATIONAL CENTRE FOR SUPERCOMPUTING APPLICATIONS (Bulgaria) 2. TIANJIN UNIVERSITY (China) 3. SUPERCOMPUTER CENTER IN TIANJIN (China)UNIVERSIDAD DE ZARAGOZA (Spain) 5. UNIVERSITETET I STAVANGER (Norway) 6. UNIVERSITA DELLA SVIZZERA ITALIANA (Switzerland)
PROBE-IT - Pursuing ROadmaps and BEnchmarks for the Internet of Things (http://www.probe-it.eu/) From 2011-10-01 to 2013-09-30	Coordinator: INNO AG (Germany) Participants: 1. UNINOVA - INSTITUTO DE DESENVOLVIMENTO DE NOVAS TECNOLOGIAS (Portugal) 2. CHINA ACADEMY OF TELECOMMUNICATION RESEARCH OF MINISTRY OF INFORMATION INDUSTRY (China) 3. CENTRE D'ETUDES ET DE RECHERCHES DETELECOMMUNICATION (Tunisia)

	4. UNIVERSITE DE RENNES I (France) 5. BEIJING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS (China) 6. UNIVERSITY OF SURREY (United Kingdom) 7. PERCEPTION COMERCIO E SERVICOS DE INFORMATICA LTDA (Brazil) 8. EASY GLOBAL MARKET SAS (France)
MULTICUBE - Multi-objective design space exploration of multi-processor soc architectures for embedded multimedia applications (http://www.multicube.eu/) From 2008-01-01 to 2010-06-30	Coordinator: POLITECNICO DI MILANO (Italy) Participants: 1. ENGIN SOFT - TECNOLOGIE PER L'OTTIMIZZAZIONE SRL (Italy) 2. STMICROELECTRONICS (BEIJING) R&D CO LTD (China) 3. ENGINSOFT SPA (Italy) 4. UNIVERSITA DELLA SVIZZERA ITALIANA (Switzerland) 5. STMICROELECTRONICS SRL (Italy) 6. INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM VZW (Belgium) 7. UNIVERSIDAD DE CANTABRIA (Spain) 8. INSTITUTE OF COMPUTING TECHNOLOGY,CHINESE ACADEMY OF SCIENCES (China) 9. DISENO DE SISTEMAS EN SILICIO S.A. (Spain)
E3 - End-to-end efficiency (E3) (https://ict-e3.eu/) From 2008-01-01 to 2009-12-31	Coordinator: ALCATEL-LUCENT DEUTSCHLAND AG (Germany) Participants: 1. NEC TECHNOLOGIES (UK) LIMITED (United Kingdom) 2. TOSHIBA RESEARCH EUROPE LIMITED (United Kingdom) 3. INSTITUT DE L'AUDIOVISUEL ET DES

	TELECOMMUNICATIONS EN EUROPE – IDATE (France) 4. FRANCE TELECOM SA (France) 5. THALES COMMUNICATIONS SA (France) 6. ERICSSON AB (Sweden) 7. UNIVERSITY OF PIRAEUS RESEARCH CENTER (Greece) 8. BUNDESNETZAGENTUR FUER ELEKTRIZITAET, GAS, TELEKOMMUNIKATION, POST UND EISENBAHNEN (Germany) 9. VRIJE UNIVERSITEIT BRUSSEL (Belgium) 10. NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS (Greece) 11. UNIVERSITY OF SURREY (United Kingdom) 12. DEUTSCHE TELEKOM AG (Germany) 13. TELECOM ITALIA S.P.A (Italy) 14. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 15. AGENTSCHAP TELECOM (Netherlands) 16. OFFICE OF COMMUNICATIONS (United Kingdom) 17. AGENCE NATIONALE DES FREQUENCES (France) 18. NOKIA OYJ (Finland) 19. BEIJING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS (China) 20. UNIVERSITAT POLITECNICA DE CATALUNYA (Spain) 21. TELEFONICA INVESTIGACION Y DESARROLLO SA (Spain)
EAR-IT - Experimenting Acoustics in Real environments using Innovative Test-beds From 2012-10-01 to 2014-09-30	Coordinator: UNINOVA - INSTITUTO DE DESENVOLVIMENTO DE NOVAS TECNOLOGIAS (Portugal) Participants:

	1. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 2. WUXI SMART SENSING STARS COMPANY LTD (China) 3. MANDAT INTERNATIONAL ALIAS FONDATION POUR LA COOPERATION INTERNATIONALE (Switzerland) 4. LULEA TEKNISKA UNIVERSITET (Sweden) 5. UNIVERSIDAD DE CANTABRIA (Spain) 6. EASY GLOBAL MARKET SAS (France)
NESS - Non-Equilibrium Social Science in ICT and Economics (http://www.nessnet.eu/) From 2011-11-01 to 2014-10-31	Coordinator: UNIVERSITE DE FRIBOURG (Switzerland) Participants: 1. THE OPEN UNIVERSITY (United Kingdom) 2. HANGZHOU NORMAL UNIVERSITY (China) 3. INSTITUTO UNIVERSITARIO DE LISBOA (Portugal) 4. UNIWERSYTET WARSZAWSKI (Poland) 5. UNIVERSITA POLITECNICA DELLE MARCHE (Italy) 6. VOLTERRA PARTNERS LLP (United Kingdom)
BRAVEHEALTH - Patient Centric Approach for an Integrated, Adaptive, Context Aware Remote Diagnosis and Management of Cardiovascular Diseases From 2010-03-01 to 2014-02-28	Coordinator: LABOR S.R.L. (Italy) Participants: 1. UNIVERSITY OF HULL (United Kingdom) 2. STMICROELECTRONICS SRL (Italy) 3. KLOPMAN INTERNATIONAL SRL (Italy) 4. UNIVERSITY OF SOUTHAMPTON (United Kingdom) 5. CONSORZIO PER LA RICERCA NELL' AUTOMATICA E NELLE

	TELECOMUNICAZIONI C.R.A.T. (Italy) 6. THE UNIVERSITY OF BIRMINGHAM (United Kingdom) 7. OULUN YLIOPISTO (Finland) 8. TSINGHUA UNIVERSITY (China) 9. KATHOLIEKE UNIVERSITEIT LEUVEN (Belgium) 10. AZIENDA OSPEDALIERA CAMILLO FORLANINI (Italy) 11. PORTUGAL TELECOM INOVACAO SA (Portugal) 12. ISTITUTO NAZIONALE PER LE RICERCHE CARDIVASCOLARI CONSORZIO INTERUNIVERSITARIO (Italy) 13. UNIVERSITA DEGLI STUDI DI PADOVA (Italy) 14. UNIVERSITEIT TWENTE (Netherlands) 15. TELBIOS S.P.A. (Italy) 16. GDANSKI UNIWERSYTET MEDYCZNY (Poland)
X-LIKE - Cross-lingual Knowledge Extraction (http://www.xlike.org/) From 2012-01-01 to 2014-12-31	Coordinator: INSTITUT JOZEF STEFAN (Slovenia) Participants: 1. TSINGHUA UNIVERSITY (China) 2. INTELLIGENT SOFTWARE COMPONENTS S.A. (Spain) 3. KARLSRUHER INSTITUT FUER TECHNOLOGIE (Germany) 4. SLOVENSKA TISKOVNA AGENCIJA DOO (Slovenia) 5. SVEUCILISTE U ZAGREBU (Croatia) 6. UNIVERSITAT POLITECNICA DE CATALUNYA (Spain)
EINS - Network of Excellence in Internet Science	Coordinator: CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS (Greece)

(http://www.internet-science.eu/) From 2011-12-01 to 2015-05-31	Participants: 1. LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE (United Kingdom) 2. UNIVERSITY OF ESSEX (United Kingdom) 3. SIGMA ORIONIS (France) 4. ALMA MATER STUDIORUM-UNIVERSITA DI BOLOGNA (Italy) 5. UNIVERSITY OF SOUTHAMPTON (United Kingdom) 6. EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZURICH (Switzerland) 7. FUNDACION IMDEA NETWORKS (Spain) 8. LANCASTER UNIVERSITY (United Kingdom) 9. NATIONAL ICT AUSTRALIA LIMITED (Australia) 10. UNIVERSITY OF WATERLOO (Canada) 11. NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS (Greece) 12. UNIVERSITE PIERRE ET MARIE CURIE - PARIS 6 (France) 13. UNIVERSITE DE SAVOIE (France) 14. UNIVERSITETET I OSLO (Norway) 15. STOCKHOLMS UNIVERSITET (Sweden) 16. ALCATEL-LUCENT BELL NV (Belgium) 17. KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY (Republic of Korea) 18. POLITECNICO DI TORINO (Italy) 19. TECHNISCHE UNIVERSITAET MUENCHEN (Germany) 20. ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (Switzerland) 21. TECHNISCHE UNIVERSITEIT DELFT (Netherlands) 22. UNIVERSIDAD AUTONOMA DE MADRID (Spain) 23. CONSIGLIO NAZIONALE DELLE RICERCHE (Italy) 24. THE CHANCELLOR, MASTERS AND

	SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE (United Kingdom) 25. UNIVERZA V LJUBLJANI (Slovenia) 26. INTERDISCIPLINARY INSTITUTE FOR BROADBAND TECHNOLOGY (Belgium) 27. INSTITUTE OF COMPUTING TECHNOLOGY,CHINESE ACADEMY OF SCIENCES (China) 28. THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD (United Kingdom) 29. KONINKLIJKE NEDERLANDSE AKADEMIE VAN WETENSCHAPPEN – KNAW (Netherlands) 30. THE UNIVERSITY OF WARWICK (United Kingdom) 31. TECHNICOLOR R&D PARIS SNC (France) 32. UNIVERSITÄT PASSAU (Germany)
FUPOL - Future Policy Modeling (http://www.fupol.eu/) From 2011-10-01 to 2015-09-30	Coordinator: CELLENT AG (Austria) Participants: 1. PIN SOC.CONS. A R.L. - SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE (Italy) 2. XEROX SAS (France) 3. INTERFUSION SERVICES LIMITED (Cyprus) 4. BETRIEB FUR INFORMATIONSTECHNOLOGIEBREMERHAVEN BIT WIRTSCHAFTSBETRIEBDER STADT BREMERHAVEN (Germany) 5. GRAD ZAGREB (Croatia) 6. BARNSLEY METROPOLITAN BOROUGH COUNCIL (United Kingdom) 7. SOCIOTEHNISKO SISTEMU INZENIERIJASINSTITUTS VIDZEMES AUGSTSKOLAS AGENTURA (Latvia) 8. ZAVOD ZA INFORMATICKU

	DJELATNOST HRVATSKE DOO ZA INFORMATICKI INZENJERING (Croatia) 9. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 10. YANTAI ZONGHE XINXI ZHONG XIN (China) 11. UNIVERSITAT AUTONOMA DE BARCELONA (Spain) 12. ACTIVE SOLUTION INGENIEURBURO AG (Austria) 13. THE MUNICIPALITY OF PEGEIA (Cyprus) 14. COMUNE DI PRATO (Italy) 15. UNIVERSITATEA ROMANO-AMERICANA ASOCIATIE (Romania) 16. QUALYSOFT RESSOURCE UND ENTWICKLUNGFUR INFORMATIONSTECHNOLOGIE GMBH (Austria)
ICORE - Internet Connected Objects for Reconfigurable Ecosystems (http://www.iot-icore.eu/) From 2011-10-01 to 2014-09-30	Coordinator: CREATE-NET (CENTER FOR RESEARCH AND TELECOMMUNICATION EXPERIMENTATION FOR NETWORKED COMMUNITIES) (Italy) Participants: 1. TELECOM ITALIA S.P.A (Italy) 2. TEKNOLOGIAN TUTKIMUSKESKUS VTT (Finland) 3. INNOTEC21 GMBH (Germany) 4. SIEMENS PROGRAM AND SYSTEM ENGINEERING SRL (Romania) 5. CENTRO RICERCHE FIAT SCPA (Italy) 6. UNIVERSITY OF SURREY (United Kingdom) 7. THALES COMMUNICATIONS & SECURITY SA (France) 8. UNIVERSITY OF PIRAEUS RESEARCH CENTER (Greece) 9. ATOS SPAIN SA (Spain) 10. JRC -JOINT RESEARCH CENTRE-

	EUROPEAN COMMISSION (Belgium) 11. NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK – TNO (Netherlands) 12. SOFTWARE AG (Germany) 13. AMBIENT SYSTEMS B.V. (Netherlands) 14. TECHNISCHE UNIVERSITEIT DELFT (Netherlands) 15. ZIGPOS GMBH (Netherlands) 16. ALCATEL - LUCENT BELL LABS FRANCE (France) 17. WUXI SENSINGNET INDUSTRIALIZATION RESEARCH INSTITUTE (China) 18. ALCATEL-LUCENT BELL NV (Belgium)
TEFIS - TEstbed for Future Internet Services (http://www.tefisproject.eu/) From 2010-06-01 to 2012-11-30	Coordinator: THALES SERVICES SAS (France) Participants: 1. UNIVERSITY OF SOUTHAMPTON (United Kingdom) 2. FUNDACAO DE APOIO A UNIVERSIDADE DE SAO PAULO (Brazil) 3. ACTIVEEON (France) 4. LULEA TEKNISKA UNIVERSITET (Sweden) 5. ENGINEERING - INGEGNERIA INFORMATICA SPA (Italy) 6. SOFTWARE QUALITY SYSTEMS SA (Spain) 7. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 8. SHANGHAI DEVELOPMENT CENTER OF COMPUTER SOFTWARE TECHNOLOGY (China) 9. THALES COMMUNICATIONS SA (France) 10. INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN

	AUTOMATIQUE (France)
CASAGRAS2 - Coordination and Support Action for Global RFID-related Activities and Standardisation-2 (http://www.iot-casagras.org/) From 2010-06-01 to 2012-05-31	Coordinator: AIM UK LTD (United Kingdom) Participants: 1. GLOBAL ICT STANDARDISATION FORUM FOR INNOVATION (India) 2. STEPHEN GEOFFREY HALLIDAY (United States) 3. EUROPEAN MULTIMEDIA FORUM LTD (United Kingdom) 4. INSTITUT EUROPEEN DES NORMES DE TELECOMMUNICATION (France) 5. ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE (Republic of Korea) 6. YOKOSUKA TELECOM RESEARCH PARK KABU SHIKI GAISHA (Japan) 7. PAUL GERARD JOSEPH CHARTIER (united Kingdom) 8. STIFTELSEN SINTEF (Norway) 9. RESEARCH INSTITUTE "SITRONICS LABS" (Russian Federation) 10. BIRKBECK COLLEGE - UNIVERSITY OF LONDON (United Kingdom) 11. FUNDACAO DE APOIO A UNIVERSIDADE DE SAO PAULO (Brazil) 12. UNIVERSITY OF BRADFORD (United Kingdom) 13. ELECTRONIC INDUSTRY STANDARDIZATION INSTITUTE OF MINISTRY OF INDUSTRY AND INFORMATION TECHNOLOGY (China) 14. CUSTOMMEDIA SDN BHD (Malaysia) 15. FEIG ELECTRONIC GMBH (Germany)
GSDP - Global Systems Dynamics and Policy (http://www.gsdp.eu/)	Coordinator: EUROPEAN CLIMATE FORUM E.V. (Germany) Participants:

From 2010-10-01 to 2013-09-30	1. THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD (United Kingdom) 2. UNIVERSITAT AUTONOMA DE BARCELONA (Spain) 3. THE OPEN UNIVERSITY (United Kingdom) 4. UNIVERSITY COLLEGE LONDON (United Kingdom) 5. EÖTVÖS LORÁND TUDOMÁNYEGYETEM (Hungary) 6. POTSDAM INSTITUT FUER KLIMAFOLGENFORSCHUNG (Germany) 7. UNIVERSITA CA' FOSCARI VENEZIA (Italia) 8. EIDGENÖSSISCHE TECHNISCHE HOCHSCHULE ZÜRICH (Switzerland) 9. CHALMERS TEKNISKA HOEGSKOLA AB (Sweden) 10. FONDAZIONE ISTITUTO PER L'INTERSCAMBIO SCIENTIFICO (I.S.I.) (Italy) 11. UNIVERSITE PARIS I PANTHEON-SORBONNE (France) 12. BEIJING NORMAL UNIVERSITY (China)
TABULA RASA - Trusted Biometrics under Spoofing Attacks (http://www.tabularasa-euproject.org/) From 2010-11-01 to 2014-04-30	Coordinator: IDIAP (FONDATION DE L'INSTITUT DALLE MOLLE D'INTELLIGENCE ARTIFICIELLE PERCEPTIVE) (Switzerland) Participants: 1. UNIVERSITY OF SOUTHAMPTON (United Kingdom) 2. STARLAB BARCELONA SL (Spain) 3. MORPHO (France) 4. KEYLEMON SA (Switzerland) 5. UNIVERSIDAD AUTONOMA DE MADRID (Spain) 6. BIOMETRY.COM AG (Switzerland) 7. OULUN YLIOPISTO (Finland)

	8. CENTRE FOR SCIENCE, SOCIETY AND CITIZENSHIP (Italy) 9. INSTITUTE OF AUTOMATION CHINESE ACADEMY OF SCIENCES (China) 10. UNIVERSITA DEGLI STUDI DI CAGLIARI (Italy) 11. EURECOM (France)
MOSQUITO - Mobile software and services, Standardisation, Quality, Interoperability, Testing, Open source (http://www.mosquito-fp7.eu/) From 2010-09-01 to 2012-08-31	Coordinator: INNO AG (Germany) Participants: 1. TELECOMMUNICATION METROLOGY CENTER OF MIIT (China) 2. FUNAMBOL S.R.L. (Italy) 3. FRANCE TELECOM SA (France) 4. INTERDISCIPLINARY INSTITUTE FOR BROADBAND TECHNOLOGY (Belgium) 5. INSTITUT EUROPEEN DES NORMES DE TELECOMMUNICATION (France)
OMELETTE - Open Mashup Enterprise service platform for LinkEd data in The TElco domain (http://www.ict-omelette.eu/home) From 2010-10-01 to 2013-03-31	Coordinator: INFORMATICA GESFOR SA (Spain) Participants: 1. UNIVERSITA DEGLI STUDI DI TRENTO (Italy) 2. UNIVERSIDAD POLITECNICA DE MADRID (Spain) 3. TECHNISCHE UNIVERSITAET CHEMNITZ (Germany) 4. HUAWEI TECHNOLOGIES CO LTD (China) 5. THE UNIVERSITY OF BOLTON (United Kingdom) 6. TIE NEDERLAND B.V. (Netherlands) 7. T-SYSTEMS MULTIMEDIA SOLUTIONS GMBH (Germany) 8. SAP AG (Germany)
MYFIRE	Coordinator:

- Multidisciplinary networking of research communities in FIRE (http://www.my-fire.eu/) From 2010-06-01 to 2012-05-31	INNO TSD SA (France) Participants: 1. INSTITUTO DE PESQUISAS TECNOLOGICAS DO ESTADO DE SAO PAULO SA (Brazil) 2. THE UNIVERSITY OF EDINBURGH (United Kingdom) 3. BII GROUP HOLDINGS LTD (China) 4. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 5. ERNET INDIA (India) 6. INSTITUT EUROPEEN DES NORMES DE TELECOMMUNICATION (France) 7. SAINT PETERSBURG STATE UNIVERSITY OF INFORMATION TECHNOLOGIES, MECHANICS AND OPTICS
WHERE2 - Wireless Hybrid Enhanced Mobile Radio Estimators - Phase 2 (http://www.ict-where2.eu/) From 2010-07-01 to 2013-06-30	Coordinator: DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (Germany) Participants: 1. INSTITUTO DE TELECOMUNICACOES (Portugal) 2. SIGINT SOLUTIONS LTD (Cyprus) 3. ACORDE TECHNOLOGIES S.A. (Spain) 4. TELEFONICA INVESTIGACION Y DESARROLLO SA (Spain) 5. UNIVERSITY OF ALBERTA (Canada) 6. NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS (Greece) 7. EURECOM (France) 8. SIRADEL (France) 9. AALBORG UNIVERSITET (Denmark) 10. HELLENIC TELECOMMUNICATIONS ORGANIZATION S.A. - OTE AE (ORGANISMOS TILEPIKOINONION TIS ELLADOS OTE AE) (Greece)

	11. MITSUBISHI EL ECTRIC R&D CENTRE EUROPE B.V. (Netherlands) 12. UNIVERSITY OF SURREY (United Kingdom) 13. UNIVERSIDAD POLITECNICA DE MADRID (Spain) 14. UNIVERSITE DE RENNES I (France) 15. COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (France) 16. CITY UNIVERSITY OF HONG KONG (China)
ALICANTE - Media Ecosystem Deployment Through Ubiquitous Content-Aware Network Environments (http://www.ict-alicante.eu/public/) From 2010-03-01 to 2013-02-28	Coordinator: CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (France) Participants: 1. P.CABLE NET - A. PENTESPITIS & ASSOCIATES (Greece) 2. VIOTECH COMMUNICATIONS SARL (France) 3. ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (Switzerland) 4. TDF (France) 5. UNIVERSITAET KLAGENFURT (Austria) 6. THOMSON GRASS VALLEY FRANCE SA (France) 7. NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS" (Greece) 8. BEIJING FRANCE TELECOM R&D COMPANYLIMITED (China) 9. UNIVERSITATEA POLITEHNICA DIN BUCURESTI (Romania) 10. PORTUGAL TELECOM INOVACAO SA (Portugal) 11. BSOFT SRL (Italy) 12. OPTIBASE LTD (Israel) 13. TISCALI ITALIA SPA (Italy) 14. INESC PORTO - INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES DO PORTO

	(Portugal) 15. BANDWD LTD. (Israel) 16. TECHNOLOGICAL EDUCATIONAL INSTITUTE OF CRETE (Greece)
OPTIMI - Online Predictive Tools for Intervention in Mental Illness (OPTIMI) (http://www.optimiproject.eu/) From 2010-01-01 to 2012-12-31	Coordinator: EVERIS SPAIN SL (Spain) Participants: 1. UNIVERSITY OF BRISTOL (United Kingdom) 2. ULTRASIS PLC (United Kingdom) 3. UNIVERSITAT JAUME I DE CASTELLON (Spain) 4. XIWRITE SRL (Italy) 5. UNIVERSITAET ZUERICH (Switzerland) 6. EIDGENÖSSISCHE TECHNISCHE HOCHSCHULE ZÜRICH (Switzerland) 7. UNIVERSITAETSKLINIKUM FREIBURG (Germany) 8. LANZHOU UNIVERSITY (China) 9. UNIVERSIDAD POLITECNICA DE VALENCIA (Spain) 10. MA SYSTEMS AND CONTROL LIMITED (United Kingdom)
LOGISTICS FOR LIFE -Logistics Industry Coalition for Long-term, ICT-based Freight Transport Efficiency (http://www.logistics4life.eu/) From 2010-01-01 to 2012-06-30	Coordinator: INSIEL - INFORMATICA PER IL SISTEMA DEGLI ENTI LOCALI S.P.A. (Italia) Participants: 1. FACHHOCHSCHULE VORARLBERG GMBH (Austria) 2. DIEVROPAIKI ETAIRIA SYMBOULON METAFORON ANAPTIXIS KAI PLIROFORIKIS AE (Greece) 3. BLG LOGISTICS GROUP AG & CO KG (Germany) 4. TEKNOLOGIAN TUTKIMUSKESKUS VTT (Finland) 5. INTEL PERFORMANCE LEARNING

	SOLUTIONS LIMITED (Ireland) 6. COSCO NETWORK E LOGISTICS CO LTD (China) 7. SEARAIL OY (Finland) 8. DEUTSCHE POST AG (Germany) 9. BIBA - BREMER INSTITUT FUER PRODUKTION UND LOGISTIK GMBH (Germany) 10. STIFTELSEN SINTEF (Norway) 11. KUEHNE+NAGEL SOCIETE ANONYME FOR TRANSPORTS & LOGISTICS (Greece) 12. GEBRUEDER WEISS GESELLSCHAFT M.B.H. (Austria) 13. VOLVO TECHNOLOGY AB (Sweden) 14. MARLO AS (Norway) 15. CHALMERS TEKNISKA HOEGSKOLA AB (Sweden)
COMPLEX - Co-design and power management in platform-based design space exploration (http://complex.offis.de/) From 2009-12-01 to 2012-11-30	Coordinator: OFFIS E.V. (Germany) Participants: 1. INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM VZW (Belgium) 2. EUROPEAN ELECTRONIC CHIPS & SYSTEMS DESIGN INITIATIVE (France) 3. EDALAB SRL (Italia) 4. MAGILLEM DESIGN SERVICES SAS (France) 5. CHIPVISION DESIGN SYSTEMS AG (Germany) 6. UNIVERSIDAD DE CANTABRIA (Spain) 7. STMICROELECTRONICS (BEIJING) R&D CO LTD (China) 8. SNPS BELGIUM NV (Belgium) 9. POLITECNICO DI TORINO (Italia) 10. THALES COMMUNICATIONS SA (France) 11. GMV AEROSPACE AND DEFENCE SA UNIPERSONAL (Spain)

	12. POLITECNICO DI MILANO (Italia) 13. STMICROELECTRONICS SRL (Italia)
4D4LIFE - Distributed dynamic diversity databases for life (http://www.4d4life.eu/) From 2009-05-01 to 2012-04-30	Coordinator: THE UNIVERSITY OF READING (United Kingdom) Participants: 1. AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (Spain) 2. LEIBNIZ-INSTITUT FUER MEERESWISSENSCHAFTEN AN DER UNIVERSITAET KIEL (Germany) 3. ROYAL BOTANIC GARDEN EDINBURGH (United Kingdom) 4. DEUTSCHES KREBSFORSCHUNGSZENTRUM (Germany) 5. UNIVERSITEIT VAN AMSTERDAM (Netherlands) 6. KOBENHAVNS UNIVERSITET (Denmark) 7. UNIVERSITEIT UTRECHT (Netherlands) 8. THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD (United Kingdom) 9. CARDIFF UNIVERSITY (United Kingdom) 10. NATIONAL UNIVERSITY OF IRELAND, GALWAY (Ireland) 11. WAGENINGEN UNIVERSITEIT (Netherlands) 12. UNIVERSITAET WIEN (Austria) 13. UNIVERSITA DEGLI STUDI DI PADOVA (Italia) 14. NATURAL HISTORY MUSEUM (United Kingdom) 15. STICHTING EXPERTISECENTRUM VOOR TAXONOMISCHE IDENTIFICATIES (Netherlands) 16. CHINESE ACADEMY OF SCIENCE

	(China) 17. BOTANIC GARDENS CONSERVATION INTERNATIONAL (United Kingdom) 18. LAND OBEROSTERREICH (Austria) 19. BAYERISCHE STAATSMINISTERIUM FUR WISSENSCHAFT, FORSCHUNG UND KUNST (Germany) 20. TSJ BVBA (Belgium) 21. SPECIES 2000 (United Kingdom) 22. SMITHSONIAN INSTITUTION NATIONAL MUSEUM OF NATURAL HISTORY (United States) 23. NARODNI MUZEUM (Czech Republic) 24. MUSEUM AND INSTITUTE OF ZOOLOGY - POLISH ACADEMY OF SCIENCES (Poland) 25. VLAAMS INSTITUUT VOOR DE ZEE VZW (Belgium) 26. NATIONAL MUSEUM WALES (United Kingdom) 27. STICHTING NATIONAAL NATUURHISTORISCH MUSEUM NATURALIS (Netherlands) 28. CENTRO DE REFERENCIA EM INFORMACAO AMBIENTAL (Brazil) 29. INSTITUT ROYAL DES SCIENCES NATURELLES DE BELGIQUE (Belgium) 30. COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION (Australia) 31. MUSEUM FUR NATURKUNDE - LEIBNIZ-INSTITUT FUR EVOLUTIONS- UND BIOVERSITATSFORSCHUNG AN DER HUMBOLDT-UNIVERSITAT ZU BERLIN (Germany) 32. MUSEUM NATIONAL D'HISTOIRE NATURELLE (France) 33. LANDCARE RESEARCH NEW ZEALAND LTD (New Zealand) 34. ROYAL BOTANIC GARDENS KEW (United Kingdom) 35. INTERNATIONAL TRUST FOR ZOOLOGICAL NOMENCLATURE

	(United Kingdom) 36. CAB INTERNATIONAL (United Kingdom) 37. INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT (France)
ROLE - Responsive open learning environments (http://www.role-project.eu/) From 2009-02-01 to 2013-01-31	Coordinator: FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) Participants: 1. THE OPEN UNIVERSITY (United Kingdom) 2. UNIVERSITAET KOBLENZ-LANDAU (Germany) 3. IMC INFORMATION MULTIMEDIA COMMUNICATION AG (Germany) 4. TECHNISCHE UNIVERSITAET GRAZ (Austria) 5. SHANGHAI JIAO TONG UNIVERSITY (China) 6. KATHOLIEKE UNIVERSITEIT LEUVEN (Belgium) 7. U&I LEARNING NV (Belgium) 8. UNIVERSITY OF LEICESTER (United Kingdom) 9. UPPSALA UNIVERSITET (Sweden) 10. FESTO LERNZENTRUM SAAR GMBH (Germany) 11. ZENTRUM FUER SOZIALE INNOVATION (Austria) 12. RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN (Germany) 13. ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (Switzerland) 14. THE BRITISH INSTITUTE FOR LEARNINGAND DEVELOPMENT LBG (United Kingdom) 15. WIRTSCHAFTSUNIVERSITAT WIEN (Austria)

CONNECT - Emergent connectors for eternal software intensive networked systems (https://www.connect-forever.eu/) From 2009-02-01 to 2012-07-31	Coordinator: INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE (France) Participants: 1. DOCOMO COMMUNICATIONS LABORATORIES EUROPE GMBH (Germany) 2. CONSIGLIO NAZIONALE DELLE RICERCHE (Italia) 3. UPPSALA UNIVERSITET(Sweden) 4. LANCASTER UNIVERSITY (United Kingdom) 5. THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD (United Kingdom) 6. PEKING UNIVERSITY (China) 7. UNIVERSITA DEGLI STUDI DELL'AQUILA (Italy) 8. TECHNISCHE UNIVERSITAET DORTMUND (Germany) 9. THALES COMMUNICATIONS SA (France)
CASAGRAS - Coordination and support action for global RFID-related activities and standardisation From 2008-01-01 to 2009-06-30	Coordinator: AIM UK LTD (United Kingdom) Participants: 1. ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE (Republic of Korea) 2. FEIG ELECTRONIC GMBH (Germany) 3. INSTITUT EUROPEEN DES NORMES DE TELECOMMUNICATION (France) 4. HONG KONG SCIENCE AND TECHNOLOGY PARKS CORPORATION (China) 5. Q.E.D. SYSTEMS (United States) 6. AIDC UK LTD (United Kingdom)

	7. YOKOSUKA TELECOM RESEARCH PARK KABU SHIKI GAISHA (Japan)
WHERE - Wireless hybrid enhanced mobile radio estimators (http://www.ict-where.eu/) From 2008-01-01 to 2010-06-30	Coordinator: DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (Deutschland) Participants: 1. INSTITUTO DE TELECOMUNICACOES (Portugal) 2. CITY UNIVERSITY OF HONG KONG (China) 3. UNIVERSITY OF ALBERTA (Canada) 4. SIRADEL (France) 5. SIGINT SOLUTIONS LTD (Cyprus) 6. MITSUBISHI ELECTRIC R&D CENTRE EUROPE B.V. (Netherlands) 7. AALBORG UNIVERSITET (Denmark) 8. UNIVERSITY OF SURREY (United Kingdom) 9. UNIVERSIDAD POLITECNICA DE MADRID (Spain) 10. COMMISSARIAT A L' ENERGIE ATOMIQUE (France) 11. EURECOM (France) 12. ACORDE TECHNOLOGIES S.A. (ACORDE TECHNOLOGIES S.A.) (Spain) 13. UNIVERSITE DE RENNES I (France)
FLOSSINCLUDE - Free/Libre and open source software: International cooperation development roadmap (http://www.flossinclude.org/) From 2008-02-01 to 2010-01-31	Coordinator: UNIVERSITEIT MAASTRICHT (Netherlands) Participants: 1. IT FOR CHANGE (India) 2. TSINGHUA UNIVERSITY (China) 3. UNIVERSIDAD REY JUAN CARLOS (Spain) 4. UNIVERSITY OF THE WESTERN CAPE (South Africa) 5. FUNDACION PARA EL DESARROLLO DE LA CIENCIA Y LA TECNOLOGIA EN

	EXTREMADURA (Spain) 6. CANONICAL LIMITED (United Kingdom) 7. FUNDACION PARA LA DIFUSION DEL CONOCIMIENTO Y EL DESARROLLO SUSTENTABLE VIA LIBRE (Argentina) 8. GHANA INDIA KOFI ANNAN CENTRE OF EXCELLENCE IN INFORMATION AND (Ghana) 9. CENTRE FOR THE STUDY OF DEVELOPING SOCIETIES (India) 10. OPEN INSTITUTE (Cambodia)
EFIPSANS - Exposing the features in IP version six protocols that can be exploited/extended for the purposes of designing/building autonomic networks and services (http://www.efipsans.org/) From 2008-01-01 to 2011-03-31	Coordinator: OY L M ERICSSON AB (Finland) Participants: 1. TECHNISCHE UNIVERSITAT BERLIN (Germany) 2. FUJITSU LABORATORIES OF EUROPE LIMITED (United Kingdom) 3. GREEK RESEARCH AND TECHNOLOGY NETWORK S.A. (Greece) 4. BUDAPESTI MUSZAKI ES GAZDASAGTUDOMANYI EGYETEM (Hungary) 5. UNIVERSITE DU LUXEMBOURG (Luxembourg) 6. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 7. ERICSSON AB (Sweden) 8. ERICSSON MAGYARORSZAG KOMMUNIKACIOS RENDSZEREK K.F.T. (Hungary) 9. TELCORDIA POLAND SP. Z O.O. (Poland) 10. WATERFORD INSTITUTE OF TECHNOLOGY (Ireland) 11. POLITECHNIKA WARSZAWSKA (Poland) 12. BEIJING UNIVERSITY OF POSTS AND

	TELECOMMUNICATIONS (China) 13. VELTI ANONYMOS ETAIRIA PROIONTON LOGISMIKOU & SYNAFON PROIONTON & YPIRESION (Greece) 14. TELEFONICA INVESTIGACION Y DESARROLLO SA (Spain) 15. INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS (Greece) 16. ALCATEL - LUCENT BELL LABS FRANCE (France)
OASIS - Open architecture for accessible services integration and standardisation (http://www.oasis-project.eu/) From 2008-01-01 to 2011-12-31	Coordinator: FIMI S.R.L. (Italy) Participants: 1. POLIS - PROMOTION OF OPERATIONAL LINKS WITH INTEGRATED SERVICES, ASSOCIATION INTERNATIONALE (Belgium) 2. EWORX YPIRESIES ILEKTRONIKOU EPICHEIREIN ANONYMOS ETAIREIA (Greece) 3. ATAF SPA (Italy) 4. DOMOLOGIC HOME AUTOMATION GMBH (Germany) 5. MULTITEL ASBL (Belgium) 6. CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS (Greece) 7. FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS (Greece) 8. ANONYMOS ETAIREIA ANTIPROSOPEION EMPORIOU KAI VIOMICHANIAS (Greece) 9. UNIVERSITAET BREMEN (Germany) 10. INSTITUTO TECNOLOGICO Y DE ESTUDIOS SUPERIORES DE MONTERREY (Mexico) 11. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (Germany) 12. VODAFONE OMNITEL N.V. (Italy)

	13. FUNDACION PARA LA PROMOCION DE LA INNOVACION, INVESTIGACION Y DESARROLLO TECNOLOGICO EN LA INDUSTRIA DE AUTOMOCION DE GALICIA (Spain) 14. ASOCIACION DE EMPRESAS TECNOLOGICAS INNOVALIA (Spain) 15. AGE PLATFORM EUROPE AISBL (Belgium) 16. MARIE CURIE ASSOCIATION (Bulgaria) 17. EFARMOGES EXYPNOU LOGISMIKOU KYKLOFORIAS & METAFORON AE (Greece) 18. MIZAR AUTOMAZIONE SPA (Italy) 19. ANONYMI EMPORIKI ETAIRIA ANAPTYXISKAI YPIRESION KAI PROIOTON SE TOMEIS YPSILIS TECHNOLOGIAS (Greece) 20. INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS – ITACA (Spain) 21. UNIVERSIDAD POLITECNICA DE MADRID (Spain) 22. PTV PLANUNG TRANSPORT VERKEHR AG. (Deutschland) 23. BLUE POINT IT SOLUTIONS SRL (Romania) 24. CENTRO RICERCHE FIAT SCPA (Italy) 25. INTERNATIONALES INFORMATIONSZENTRUM FUR TERMINOLOGIE (Austria) 26. UNIVERSITY OF NEWCASTLE UPON TYNE (United Kingdom) 27. UNIVERSITA DI PISA (Italy) 28. WESTPFALZ-KLINIKUM GMBH (Germany) 29. TSINGHUA UNIVERSITY (China)
LARKC - Large scale semantic computing semantic Web technologies distributed reasoning probabilistic reasoning web-scale inference	Coordinator: UNIVERSITAET INNSBRUCK (Austria)

information retrieval (http://www.larkc.eu/) From 2008-04-01 to 2011-09-30	Participants: 1. CENTRE INTERNATIONAL DE RECHERCHE SUR LE CANCER (France) 2. BEIJING UNIVERSITY OF TECHNOLOGY (China) 3. SALTLUX INCORPORATED (Republic of Korea) 4. ASTRAZENECA AB (Sweden) 5. CYCORP, RAZISKOVANJE IN EKSPERIMENTALNI RAZVOJ D.O.O. (Slovenia) 6. SIEMENS AG (Germany) 7. UNIVERSITAET STUTTGART (Germany) 8. MAX PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN E.V. (Germany) 9. VERENIGING VOOR CHRISTELIJK HOGER ONDERWIJS WETENSCHAPPELIJK ONDERZOEK EN PATIENTENZORG (Netherlands) 10. THE UNIVERSITY OF SHEFFIELD (United Kingdom) 11. INFORMATION RETRIEVAL FACILITY SOCIETY (Austria) 12. ONTOTEXT AD (Bulgaria) 13. CEFRIEL - SOCIETA CONSORTILE A RESPONSABILITA LIMITATA (Italy)
GRIFS -Global RFID interoperability forum for standards (http://www.grifs-project.eu/) From 2008-01-01 to 2009-12-31	Coordinator: GS1 AISBL (Belgium) Participants: 1. INSTYTUT LOGISTYKI I MAGAZYNOWANIA (Poland) 2. GS1 UK LIMITED (United Kingdom) 3. INSTITUT EUROPEEN DES NORMES DE TELECOMMUNICATION (France) 4. COMITE EUROPEEN DE NORMALISATION (Belgium) 5. GS1 RUSSIA (Russian Federation) 6. GS1 KOREA (Republic of Korea) 7. GS1 INDIA (India)

	8. GS1 HONG KONG (Hong Kong) 9. GS1 US (United States) 10. GS1 JAPAN (Japan) 11. GS1 SOUTH AFRICA (South Africa) 12. GS1 BRASIL (Brazil) 13. GS1 SINGAPORE (Singapore) 14. GS1 CHINA (China)
HELIUM3D - High efficiency laser-based multi-user multi-modal 3D display (http://www.cse.dmu.ac.uk/~mutedusr/) From 2008-01-01 to 2010-12-31	Coordinator: DE MONTFORT UNIVERSITY (United Kingdom) Participants: 1. FRAUNHOFER IAF (Germany) 2. KOC UNIVERSITY (Turkey) 3. UNIVERSITY COLLEGE LONDON (United Kingdom) 4. NANJING UNIVERSITY (China) 5. TECHNISCHE UNIVERSITEIT EINDHOVEN (Netherlands) 6. PHILIPS CONSUMER ELECTRONICS BV (Netherlands) 7. BARCO NV (Belgium)
N-CRAVE - Network coding for robust architectures in volatile environments (http://www.n-crave.eu/) From 2008-01-01 to 2010-12-31	Coordinator: CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS (Greece) Participants: 1. ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (Switzerland) 2. TECHNICOLOR (France) 3. THE CHINESE UNIVERSITY OF HONG KONG (China) 4. TELEFONICA INVESTIGACION Y DESARROLLO SA (Spain) 5. TECHNISCHE UNIVERSITAET MUENCHEN (Germany) 6. 6. INSTITUTO DE TELECOMUNICACOES (Portugal)
WALTER	Coordinator:

- Wireless alliances for testing experiment and research (http://www.walter-uwb.eu/) From 2008-01-01 to 2009-12-31	INNO AG (Germany) <u>Participants:</u> 1. COPSEY TELECOMMUNICATIONS LIMITED (United Kingdom) 2. CSR PLC (United Kingdom) 3. INSTITUT EUROPEEN DES NORMES DE TELECOMMUNICATION (France) 4. TELECOMMUNICATION METROLOGY CENTER OF MII (China) 5. AT4 WIRELESS, S.A. (Spain) 6. JRC -JOINT RESEARCH CENTRE-EUROPEAN COMMISSION (Belgium) 7. WISAIR LTD (Israel)
<u>HEARTCYCLE</u> - Compliance and effectiveness in HF and CHD closed-loop management (http://www.heartcycle.eu/) From 2008-03-01 to 2012-02-29	<u>Coordinator:</u> PHILIPS ELECTRONICS NEDERLAND B.V. (Netherlands) <u>Participants:</u> 1. ARISTOTELIO PANEPISTIMIO THESSALONIKIS (Greece) 2. INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS – ITACA (Spain) 3. LINKOPINGS UNIVERSITET (Sweden) 4. SERVICIO MADRILENO DE SALUD (Spain) 5. TEKNOLOGIAN TUTKIMUSKESKUS VTT (Finland) 6. CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT (Switzerland) 7. MEDTRONIC IBERICA SA (Spain) 8. RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN

	(Germany) 9. POLITECNICO DI MILANO (Italy) 10. EMPIRICA GESELLSCHAFT FUER KOMMUNIKATIONS- UND TECHNOLOGIEFORSCHUNG MBH (Germany) 11. CLOTHING PLUS OY (Finland) 12. UNIVERSIDAD POLITECNICA DE MADRID (Spain) 13. PHILIPS TECHNOLOGIE GMBH (Germany) 14. LOTHIAN HEALTH BOARD (United Kingdom) 15. T-SYSTEMS ITC IBERIA SA (Spain) 16. UNIVERSIDADE DE COIMBRA (Portugal) 17. THE CHINESE UNIVERSITY OF HONG KONG (China) 18. UNIVERSITY OF HULL (United Kingdom) 19. UNIVERSITAETSKLINIKUM HEIDELBERG (Germany)

Annex II Top 100 European Participants in European funded ICT Research in FP7[106]

	LEGAL NAME	Country	Overall FP7 ICT BUDGET
1	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE	192.124.755
2	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	FR	88.907.843
3	SAP AG	DE	74.510.932
4	INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM VZW	BE	60.872.431
5	TEKNOLOGIAN TUTKIMUSKESKUS VTT	FI	55.115.950
6	TELEFONICA INVESTIGACION Y DESARROLLO SA	ES	51.464.480
7	EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZURICH	CH	48.155.298
8	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FR	47.976.182
9	ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE	CH	47.830.666
10	CONSIGLIO NAZIONALE DELLE RICERCHE	IT	44.995.142
11	STIFTELSEN SINTEF	NO	40.115.460

[106]Source: EuropeanCommission, March 18th, 2013

12	INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE	FR	39.762.095
13	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK - TNO	NL	39.476.215
14	TECHNISCHE UNIVERSITAET MUENCHEN	DE	37.934.357
15	KATHOLIEKE UNIVERSITEIT LEUVEN	BE	35.946.165
16	UNIVERSITY COLLEGE LONDON	UK	35.813.644
17	CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS	GR	34.379.135
18	KUNGLIGA TEKNISKA HOEGSKOLAN	SE	34.172.072
19	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	GR	33.372.643
20	UNIVERSITY OF SURREY	UK	33.013.527
21	TECHNISCHE UNIVERSITEIT DELFT	NL	32.944.491
22	UNIVERSITEIT TWENTE	NL	31.051.332
23	IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE	UK	30.845.410
24	THALES COMMUNICATIONS & SECURITY SAS	FR	29.787.139
25	THE UNIVERSITY OF EDINBURGH	UK	29.698.345

26	UNIVERSITY OF SOUTHAMPTON	UK	29.657.278
27	ATOS SPAIN SA	ES	28.723.700
28	PHILIPS ELECTRONICS NEDERLAND BV	NL	27.560.459
29	DEUTSCHES FORSCHUNGSZENTRUM FUER KUENSTLICHE INTELLIGENZ GMBH	DE	26.866.749
30	TECHNISCHE UNIVERSITEIT EINDHOVEN	NL	26.808.013
31	IBM ISRAEL - SCIENCE AND TECHNOLOGY LTD	IL	26.782.797
32	THE UNIVERSITY OF SHEFFIELD	UK	26.643.768
33	CHALMERS TEKNISKA HOEGSKOLA AB	SE	26.639.498
34	FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS	GR	26.203.555
35	RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN	DE	26.124.368
36	TECHNISCHE UNIVERSITAET DRESDEN	DE	25.938.908
37	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DE	25.858.365
38	POLITECNICO DI MILANO	IT	25.767.205
39	UNIVERSIDAD POLITECNICA DE MADRID	ES	25.201.288
40	TECHNISCHE UNIVERSITAET WIEN	AT	24.605.188

41	UNIVERSITAET STUTTGART	DE	24.380.043
42	TECHNISCHE UNIVERSITAT BERLIN	DE	23.465.151
43	SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO SANT'ANNA	IT	23.284.873
44	UNIVERSITAT POLITECNICA DE CATALUNYA	ES	23.031.459
45	KARLSRUHER INSTITUT FUER TECHNOLOGIE	DE	22.810.347
46	CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT	CH	22.207.796
47	STMICROELECTRONICS SRL	IT	21.978.839
48	TECHNISCHE UNIVERSITAET GRAZ	AT	21.910.206
49	SIEMENS AG	DE	21.161.799
50	FRANCE TELECOM SA	FR	21.113.627
51	THE CHANCELLOR MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	UK	20.749.117
52	IMINDS VZW	BE	20.166.558
53	FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA	IT	19.423.973

54	UNIVERSITY COLLEGE CORK NATIONAL UNIVERSITY OF IRELAND CORK	IE	19.267.872
55	AALTO-KORKEAKOULUSAATIO	FI	18.102.466
56	AALBORG UNIVERSITET	DK	18.024.057
57	CENTRO RICERCHE FIAT SCPA	IT	18.001.682
58	THE CHANCELLOR MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE	UK	17.542.483
59	NEC EUROPE LTD	UK	16.617.001
60	ALCATEL-LUCENT DEUTSCHLAND AG	DE	16.472.969
61	FONDAZIONE BRUNO KESSLER	IT	16.472.818
62	UNIVERSITAET INNSBRUCK	AT	16.377.571
63	UNIVERSITAT POMPEU FABRA	ES	16.305.838
64	FUNDACION TECNALIA RESEARCH & INNOVATION	ES	16.239.958
65	IBM RESEARCH GMBH	CH	16.113.910
66	THE UNIVERSITY OF BIRMINGHAM	UK	15.669.964
67	ALMA MATER STUDIORUM-UNIVERSITA DI BOLOGNA	IT	15.577.132

68	Institut Mines-Telecom	FR	15.550.400
69	ERICSSON AB	SE	15.018.267
70	INFINEON TECHNOLOGIES AG	DE	14.923.824
71	TELECOM ITALIA SpA	IT	14.881.893
72	UNIVERSITAET ZUERICH	CH	14.766.505
73	INSTITUT JOZEF STEFAN	SI	14.606.498
74	UNIVERSITA DEGLI STUDI DI TRENTO	IT	14.580.442
75	UNIVERSITA DI PISA	IT	14.553.743
76	MAX PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN EV	DE	14.184.654
77	UNIVERSITEIT VAN AMSTERDAM	NL	14.180.092
78	KING'S COLLEGE LONDON	UK	14.154.374
79	UNIVERSITAT POLITECNICA DE VALENCIA	ES	14.109.863
80	GOTTFRIED WILHELM LEIBNIZ UNIVERSITAET HANNOVER	DE	13.879.723
81	JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH	AT	13.766.499

82	UNIVERSITE PIERRE ET MARIE CURIE - PARIS 6	FR	13.398.911
83	THALES SA	FR	13.337.291
84	UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA	IT	13.080.645
85	UNIVERSITAET DUISBURG-ESSEN	DE	13.021.918
86	ENGINEERING - INGEGNERIA INFORMATICA SPA	IT	13.014.537
87	TECHNISCHE UNIVERSITAET DARMSTADT	DE	12.977.978
88	ROBERT BOSCH GMBH	DE	12.940.926
89	EURECOM	FR	12.873.126
90	NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS	GR	12.867.619
91	UNIVERSITAET BREMEN	DE	12.866.604
92	LUNDS UNIVERSITET	SE	12.682.196
93	UNIVERSITE DE GENEVE	CH	12.367.795
94	NATIONAL CENTER FOR SCIENTIFIC RESEARCH DEMOKRITOS	GR	12.282.419
95	VOLVO TECHNOLOGY AB	SE	12.172.386
96	THE OPEN UNIVERSITY	UK	12.065.742

97	PHILIPS TECHNOLOGIE GMBH	DE	12.052.776
98	POLITECNICO DI TORINO	IT	11.753.233
99	AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	ES	11.740.249
100	EUROPEAN ROAD TRANSPORT TELEMATICS IMPLEMENTATION COORDINATION ORGANISATION SCRL	BE	11.667.312

Annex III: Survey Questionnaire

Questionnaire:

Name of your organisation:
Type of Business:
E-mail address and contact information:
Project name:

In the FP7framework, how would you rate each challenge in terms of being important for research cooperation between Europe and China? (5= very important, 1 = not important)

Challenge/ Points	1	2	3	4	5	No Idea
Pervasive and Trusted Network and Service Infrastructures						
Cognitive Systems and Robotics						
Alternative Paths to Components and systems						
Technologies for Digital Content and Languages						
ICT for Health, Ageing Well, Inclusion and Governance						
ICT for a low carbon Economy						
ICT for the Enterprise and manufacturing						
ICT for creativity and learning						

SWOT Questions with open answers:

In your opinion, what are the benefits for you or for Europe when collaborating with Chinese entities in ICT Research projects? (max 3 open answers)	
1	
2	
3	

In your opinion, which shortcomings or weaknesses do you see within your organisation or in Europe that hinders effective cooperation with Chinese entities? (max 3 open answers)	
1	
2	
3	

In your opinion, what type of risks do you think Europe faces when doing research with Chinese researchers? (max 3 open answers)	
1	
2	
3	

In your opinion, what opportunities do you see for your organisation or for Europe when doing ICT research with Chinese entities? (max 3 open answers)	
1	
2	
3	

Annex IV: Phone Interviewed Persons for each Project

No.	Project	Name
1	OpenChina-ICT	Kay Matzner
2	E-Agri	Ria de Breuker
3	SCC-Computing	Jianmin Jiang
4	Probe-IT	Annabelle Kaage
5	E3	Karl Schattauer
6	EAR-IT	Adolfo SteigerGarcao
7	Bravehealth	Cristina Torrisi
8	X-Like	JadranLenarcic
9	Eins	EvangeliaPerperi
10	ICORE	Pro Riccardo
11	TEFIS	Gregory Lopez
12	Casagras2	Ian Smith
13	GSDP	Carlo C Jäger
14	Tabula Rasa	Valerie Devanthery
15	Mosquito	Peter Heydebreck
16	Omelette	Salvador Valle
17	MY FIRE	Frank Le Gall
18	Where2	Alexander Haidt
19	Alicante	DaniellNegrue
20	OPTIMI	Francisco Javier Abedellaneda

21	Complex	Wolfgang Nebel
22	4D4LIFE	Sarah Page
23	Role	Martin Wolpers
24	Connect	Valerie ISSARNY
25	Cassagras	Jane Willington
26	Where	Steffi Kamgang
27	Flossinclude	Rishab Gosh
28	OASIS	Silvio Bonfiglio
29	N-Crave	ConstantinosKiparissides
30	Walter	Marie Beucot
31	Heartcycle	Patrick Keuer