



## EUROPE

CHILDREN AND FAMILIES  
EDUCATION AND THE ARTS  
ENERGY AND ENVIRONMENT  
HEALTH AND HEALTH CARE  
INFRASTRUCTURE AND  
TRANSPORTATION  
INTERNATIONAL AFFAIRS  
LAW AND BUSINESS  
NATIONAL SECURITY  
POPULATION AND AGING  
PUBLIC SAFETY  
SCIENCE AND TECHNOLOGY  
TERRORISM AND  
HOMELAND SECURITY

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis.

This electronic document was made available from [www.rand.org](http://www.rand.org) as a public service of the RAND Corporation.

Skip all front matter: [Jump to Page 1](#) ▼

### Support RAND

[Browse Reports & Bookstore](#)

[Make a charitable contribution](#)

### For More Information

Visit RAND at [www.rand.org](http://www.rand.org)

Explore [RAND Europe](#)

View [document details](#)

### Limited Electronic Distribution Rights

This document and trademark(s) contained herein are protected by law as indicated in a notice appearing later in this work. This electronic representation of RAND intellectual property is provided for non-commercial use only. Unauthorized posting of RAND electronic documents to a non-RAND Web site is prohibited. RAND electronic documents are protected under copyright law. Permission is required from RAND to reproduce, or reuse in another form, any of our research documents for commercial use. For information on reprint and linking permissions, please see [RAND Permissions](#).

This product is part of the RAND Corporation technical report series. Reports may include research findings on a specific topic that is limited in scope; present discussions of the methodology employed in research; provide literature reviews, survey instruments, modeling exercises, guidelines for practitioners and research professionals, and supporting documentation; or deliver preliminary findings. All RAND reports undergo rigorous peer review to ensure that they meet high standards for research quality and objectivity.

# Towards a competitive European Internet industry

A socio-economic analysis of  
the European Internet industry  
and the Future Internet  
Public-Private Partnership

Stijn Hoorens, Dieter Elixmann, Jonathan Cave,  
Man Sze Li, Gabriella Cattaneo

Prepared for European Commission, Information Society and Media  
Directorate-General



EUROPE



This report was prepared for the Commission of the European Communities, Information Society & Media Directorate-General. SMART 2009/0044.

The views expressed in this publication are those of the authors and do not necessarily reflect the official European Commission's view on the subject. Any mistakes in this publication should be attributed to the authors.

RAND Europe is an independent, not-for-profit research organisation whose mission is to improve policy and decision making for the public good. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors.

**RAND**® is a registered trademark.

© Copyright 2012 European Communities

Reproduction is authorised provided the source is acknowledged.

Published 2012 by the RAND Corporation  
1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138  
1200 South Hayes Street, Arlington, VA 22202-5050  
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665  
Westbrook Centre, Milton Road, Cambridge CB4 1YG, United Kingdom  
RAND URL: <http://www.rand.org>  
RAND Europe URL: <http://www.rand.org/randeurope>  
To order RAND documents or to obtain additional information, contact  
Distribution Services: Telephone: (310) 451-7002;  
Fax: (310) 451-6915; Email: [order@rand.org](mailto:order@rand.org)

## Executive summary

---

**The Internet has become a fundamental enabler of economic development and growth, but Europe lags behind other countries in capturing its benefits.**

The Internet has fundamentally changed the way we stay in touch with friends and relatives, search for and purchase products and services, entertain ourselves and participate in society. It has also transformed the way we do business.

However, Europe has been slower than the US, Korea or Japan to develop and capture the full benefits of Internet-based innovation. This makes it a follower, rather than a leader in the global Internet industry. As a result, the European Commission determined that the Future Internet and innovation are crucial components of the EU 2020 growth strategy and its flagship initiatives, the Digital Agenda for Europe and the Innovation Union.

A Future Internet Public-Private Partnership (FI PPP) initiative was officially launched on 3<sup>rd</sup> May 2011, in which the European Commission and the European Internet industry sought to join forces to lay the foundations for the Future Internet in Europe. The FI PPP seeks to advance Europe's competitiveness through the development and deployment of advanced "Future Internet" technologies, systems and services and thereby to support the creation and uptake of enhanced applications of social and economic relevance.

**This report examines the potential impacts of the technologies, services and applications being developed by the FI PPP.**

This report is the final phase of a study (FI3P) designed to analyse the challenges facing the European Internet Industry and the mechanisms by which the FI PPP is addressing them. An earlier report (Cattaneo *et al.* 2011) characterised the key segments and the main players of the European Internet industry. This report builds on that analysis to explore the current and future role of the European Internet industry in, and for, the European economy.

This report explores the role of the **EU Internet industry** in, and for, the European economy of the Future

We approach this exploration from various perspectives in order to examine how the European Internet industry may grow and develop in the near future. We explore how the economy may develop in

various scenarios and how those developments are likely to be affected by the success or failure of the core platform and use cases being developed by the FI PPP. This report addresses the following issues:

- the determinants of growth and competitiveness of the European Internet industry;
- the potential future contributions of the European Internet industry to Europe's economy and society;
- the economic impacts of the technologies, services and applications pursued by the current FI PPP and its potential successor; and
- other barriers that may affect the uptake of these Future Internet elements and the competitiveness of the European Internet industry.

**European firms dominate the more mature, slower-growing segments of the Internet industry, while higher growth segments remain relatively untapped.**

The European Internet industry (EUII) can be divided into three components: 1) a “core” providing Internet IT and network products and services; 2) a linking component providing Internet telecom services; and 3) a fast-emerging “web ecosystem” whose actors provide web-based applications, services and content in close and innovative relationships with users and traditional players.

**60%** of the revenues in the EU internet industry come from telecom services

The core Internet industry tends to be dominated by global IT players based in the US, while Internet telecom services are led by the predominantly European telecom suppliers, who gain the lion's share

of the EUII's revenues (58% in 2012). This is a natural consequence of the geographic localisation of telecom networks and their historical origins as national and natural monopolies. Our estimates of EUII's revenues include only sales of Internet-related technologies and services and exclude general purpose IT, such as PCs. Web ecosystem revenues do not depend on technologies, but on other services, such as e-commerce, advertising, or subscriptions, which were not included in the EUII's revenues.

In the globalised Internet industry, Europe is also relatively strong in network equipment and smart handheld devices, but faces tough competition from its Asian counterparts.

Europe has only limited presence in the new and rapidly-growing areas of software and IT-services and the web ecosystem, at home or abroad. In particular, business models based on advertising or data mining —characteristic of many successful players in the web ecosystem— are only sparsely represented among the European players in the European Internet industry.

**Revenue growth is projected to vary widely across different parts of the Internet industry.**

Looking ahead to 2015, software and IT services are expected to be the most dynamic components of the EUII, driven by the diffusion of cloud computing, mobile apps and innovative applications such as big data analytics, at rates of 12-13% annually. The telecom services and network equipment and operations businesses are projected to grow at a modest 5%.

Significantly, even growth in the network aspects has held up during the current recession; thus the Internet Industry can be expected to lead the recovery of the ICT market from the economic crisis. It is not evident that the rest of the economy will follow, or that these growth rates can be sustained if growth does not spread beyond the Internet industry.

Demand for Internet-related technologies and services is estimated to grow rapidly in all business and consumer segments, but particularly in those sectors where European suppliers are currently lagging behind in the intensity of IT usage. This includes: utilities (12.7%), healthcare and education (9.7%), business services (8.4%) and distribution (8.2%). As a result, on current trends Europe's dependence on foreign IT suppliers at home will grow and her share of lucrative global technology markets will shrink.

**The next decade will be crucial for the European Internet industry.**

Sustaining competitiveness and innovation will require different strategies for the EUII's players who face an increasingly convergent market from very different starting points. European IT players—in majority small and close to local markets—will have to become bolder, find new financial and human resources to invest in innovation, look for new clients and possibly test their mettle beyond the EU borders. Or else, they might be wiped away by emerging players stealing their market. One example: Amazon's revenues from its cloud-based services are expected to reach US\$1 bn in 2012, in direct competition with the IT industry.

But perhaps the greatest challenge lies with Europe's leading players (from the likes of Nokia and SAP to the former telecom monopolies) who must adapt or renew their business models and need unprecedented levels of investment, even at a time of austerity.

Europe's leading players  
must adapt or renew their  
**business models**

The strategic assets that once sustained a relatively small number of dominant market players, particularly in the telecom sector—for example fixed line subscriptions—are becoming less important due to different and sometimes disruptive technological and market trends.

**These challenges can be met in different ways.**

One is for incumbents to gain a new lease of life by vertical integration and diversification into the IT and service layers ('facilities-based competition'). Another is a layered competition structure. At the base of this structure, both communications and network services are provided as utilities, sustaining a common platform on which the web ecosystem can thrive. In any case, the industry will have to find ways to support the continued development and deployment of (open) network infrastructures without restricting the flow of rapidly evolving Internet-based applications and services generating value for end-users. Each path has its own requirements: openness requires interoperability and standardisation to allow a competitive web ecosystem to flourish. Moreover, innovation is slower and offers more general benefits in communications and IT services. It is faster and easier in the applications and user services domain, but benefits are more localised to the innovators themselves and their customers.

In order to sustain useful networks, innovative applications and services and adaptive business model and markets innovation, unprecedented and risky investments are required. The risks range from technological R&D risk, infrastructure deployment risk and/or market risk facing new services or products. The public nature of the benefits and the unwillingness of (esp. European) capital markets to take long-term, systemic and novel risks might be seen to justify large-scale public funding. However, at the moment governments are more committed to austerity than to growth, while businesses are flush

with capital but lack attractive investment opportunities. Neither traditional industrial policy consultation nor efficient capital markets seem able to clarify and appropriately allocate these risks or fund necessary investment.

Clearly, Europe's Internet Industry needs access to suitable financing, mechanisms to clarify and reallocate risk and efforts to stimulate entrepreneurial activity, including support for start-ups.

In the process, governments will have to move from picking winners to sustaining competition. Large and small businesses alike must open their innovation, production, delivery and value chains to suppliers and users on much more equal terms. Agile and small-scale enterprises and user-led innovation are especially important to the Internet industry. Therefore, industry should embrace flexible business arrangements and lower adoption costs in order to encourage end users to exploit the potential of new Internet-based services and applications.

**The future economic contributions of the EUII depend critically on the evolution of the global technological, economic and societal context.**

The potential contributions of the Internet industry were assessed in three different scenarios for the period 2015-2020, based on plausible assumptions about the future magnitude and trends of key variables summarised in Box A.

| Box A. Three scenarios for the future EU Internet industry  |   |  |  |  |
|---|---|--|--|--|
| Recovery begins at home, but SMEs still struggle.   | Dynamic recovery is led by agile, self-organising networks of small firms.  | Prolonged economic malaise prompts myopia and retrenchment.  |  |  |
| The <b>Realistic</b> scenario represents intermediate economic prospects, a modest pace of innovation and a homogeneous pattern of Future Internet deployment and exploitation. This situation leads to continuing volatility and a weak position for small firms and potential innovators. European firms are more competitive within the EU Single Market than at a global level. | The <b>Tipping Point</b> scenario provides the scope for realising the potential benefits of the Future Internet. Economic growth is demand-led with rapid and balanced recovery from the financial crisis. It is characterised by a good mix of pre-competitive and intra-European co-operation and coordination, with service competition on open platforms and in world markets. | The <b>Slow Motion</b> scenario is dominated by faltering economic recovery, which strikes first at consumers and the home sector. Adoption of Internet-based innovation is slow, top-down and limited across all sectors. The EU Internet industry fails to keep pace with technological developments and invest in foreign markets and gradually loses competitiveness abroad. |  |  |

We estimated the economic contributions of the Internet industry (which we call the Internet economy) as the aggregation of BtoC e-Commerce, that is consumption over the Internet, plus private and public investments in Internet technologies and services (the Internet market). Between 2015 and 2020, the Internet economy is projected to grow, depending on the scenarios, between 7% annually in the Slow Motion scenario and 15% annually in the Tipping Point scenario. In the Realistic scenario, which falls between these two, the EU Internet economy should reach € 1,474 bn by 2020. In the best scenario, the size of the European Internet economy would grow from €884 bn in 2015 to €1,877 bn in 2020. These economic contributions are higher than in the Realistic scenario, due to positive feedback between innovation and growth and the greater scope for exploiting and extending Future Internet services provided by a strong economic recovery. Note that

recent macroeconomic developments seem closer to the Slow Motion scenario; however, the continuing volatility and domestic competitiveness of European firms and the modest pace of innovation are consistent with a slightly slower version of the Realistic scenario.

Our projections for the European Internet market suggest that the balance of economic activity will gradually shift to the end of the value chain: away from telecommunications towards Internet services, applications and end-user sectors. In the Tipping Point scenario,

Between 2018 and 2022 changes associated with the Future Internet PPP are predicted to **reduce employment**

this shift happens faster than in the other two scenarios, due to an accelerated diffusion of advanced services into previously immature Internet-using sectors. This downward shift is also caused by a rapid diffusion of cloud computing, which is expected to enable business actors to implement more easily Internet-based new services, particularly SMEs. Faster adoption of innovation by SMEs is indeed one of the distinguishing features of the

Tipping Point scenario, which assumes overcoming legal, cultural and economic barriers which slow down SMEs in the other scenarios.

SMEs fall behind in the Slow Motion scenario. They struggle for access to the Future Internet innovations and many of the sectors in which they are most active are slow to reap the benefits as well.

The growth of the Internet industry generally leads to an increase in employment in the Internet industry itself. However, the fast pace of innovation and the increasing demand for a new range of e-skills applied to business sectors is likely to lead to a mismatch of demand-supply across Europe, with scarcity of skilled personnel in many countries and regions, particularly affecting innovative SMEs, accompanied by unemployment of personnel with obsolete skills. Research suggests there is a risk that by 2015 the European ICT industry will not be able to fill between 86,000 and 384,000 jobs, depending on the pace of growth of the economy. Many of the new jobs created come at the cost of job losses elsewhere. In the rich ecosystem of highly dynamic and networked SMEs under the Tipping Point scenario, the Internet industry is more likely to produce high-quality employment than in the other two scenarios.

**Successful, widespread and generative adoption across a broad range of sectors of the core platform and generic enablers sought by the current FI PPP can have substantial impacts across the scenarios.**

The effect on GDP is potentially positive, significant and driven by productivity improvements. Full deployment, uptake and exploitation of the outputs of the current FI PPP is expected to increase investment, private household purchases of goods and services and labour productivity. Productivity enhancements appear to have a particularly significant impact on EU GDP growth. Under ideal conditions, the spillover effects across the economy unleashed by the FI PPP could raise annual European real GDP by €28 bn (0.24%) in 2020.

However, the distribution of these positive impacts varies among Member States. Overall, the proportionate effect tends to be higher in new Member States, possibly as a result of

the rapid pace of modernisation since these countries joined the Union in 2004 and existing pools of skilled and underemployed labour. In gross terms, however, the impacts projected for 2020 are largest in the largest economies, being €8 bn in Germany, €5 bn in the UK €4 bn in France.

While the changes potentially associated with the FI PPP are projected to increase employment in the European Internet industry, many of those jobs are displaced. The positive employment effect associated with success of the current FI PPP initially peaks at 42,000 jobs in the year 2016. Its eventual positive impacts are even greater, but only after a transitional period of increased unemployment from 2018 to 2022 as real wages catch up with the initial boost to productivity.

A successful potential follow-on PPP could contribute between **€37 and €58 bn** to EU-27 GDP in 2025.

**A successful follow-on Future Internet PPP could have even greater positive GDP impacts.**

The analysis recognises that the full uptake and exploitation of the core platform, the spread of generic enablers and associated advanced services throughout the economy as a whole and sustained stimulus to innovation and investment are likely – particularly in the face of a delayed or weak European recovery, to require a potential follow-on initiative (FI PPP+). Note, however, that the associated changes might be produced by other means (e.g. private sector initiative) if the pump is sufficiently primed by a successful FI PPP.

A successful FI PPP+ is therefore expected to produce longer and stronger stimuli to investment behaviour, private household purchases and (labour) productivity. Although they vary considerably per scenario, our estimates show an annual increase in European real GDP peaking at €48 bn (0.4%) in 2025 under the most favourable conditions. This would increase the importance of the European Internet economy, raising its direct GDP contribution by a further 10%.

The rate of recovery from the economic crisis is an important factor in real GDP growth. In the Tipping Point scenario, changes associated with FI PPP+ account for €58 bn of the projected €460 bn rise in European real annual GDP by 2025. At the other end of the scale, real annual GDP is forecast to fall by €570 bn by 2025 in the Slow Motion scenario, although changes associated with FI PPP+ make this €37 bn higher than it would otherwise have been.

The employment effects of a successful FI PPP+ are also potentially larger. Employment in the Realistic scenario is expected to grow until 2017, fall as real wages rise, and gradually recover, reaching a maximum after 2025.

Europe has many reasons to seek rapid economic recovery, but fewer hopeful avenues for achieving it. The role of the Future Internet in this recovery is potentially in both respects. The Internet industry is one of the few buoyant sectors in the current situation, and may thus lead the recovery. Conversely, economic recovery could enable the development of a web ecosystem that can enrich the lives of Europeans in non-financial ways. For instance, by lowering the cost and increasing the effectiveness of counter-cyclical employment, health, educational and industrial policies, a successful European Future Internet platform could make Europe more resilient to future macroeconomic shocks. It appears that

European policy can improve the positive impacts of changes associated with a successful FI PPP+ program if it improves investor expectations and willingness to invest and reduces cost pressures on Member States. Conversely, should it fail to do so, the expected benefits might disappear, or even reverse.

**But equivalent stimuli in the US or Japan would have larger effects on their GDP.**

Whatever Europe does regarding the Future Internet will not occur in a global vacuum. Other advanced economies are undertaking their own FI initiatives.

High-growth BRIC economies have yet to reap the full potential of the Internet, but are their export-led growth and rapid Internet development put them in a very strong position. While the Internet's main contribution to developed economies' GDP comes from private consumption, foreign trade accounts for the majority of the Internet's contribution to GDP in India and China. Hence stimulus programmes in these countries may operate through foreign trade, especially if their exports recover more rapidly than domestic production in the developed economies.

Even other developed countries may be better positioned to benefit from comparable initiatives. Compared to Europe, studies suggest that US investments in ICT generally produce higher direct returns. Our projections suggest that the GDP multiplier effects of US or Japanese stimuli equivalent to those of a successful FI PPP are also larger. This probably reflects Europe's relatively more fragmented and rigid markets, as well as barriers to innovation and to the adoption and diffusion of Internet innovations, both of which have been long-standing European concerns.

**The European single market still faces barriers to competitiveness.**

The success of the EU 2020 growth strategy and in particular, the EC's Digital Agenda, will depend on the extent to which the European Internet industry is able to compete internationally. While a number of EU countries are world leaders in Internet contribution to GDP, the EU as a whole lags its international counterparts in the US and Japan and has few global players as measured by market capitalisation.

The Future Internet PPP is one initiative to encourage firms to invest in Internet-related R&D. However, despite the introduction of the European Single Market, the potential contributions of the European Internet industry to economic progress and prosperity still face serious competitiveness barriers.

These can be broadly divided among: access to inputs; obstacles to innovation; effectiveness of market competition and cooperation.

The most important barriers identified by our analysis are lack of access to skilled and flexible human and financial capital; insufficient or poorly-formed R&D investment; inadequate market access for innovative business and service models; weak coordination between the Internet industry and other sectors; and economic, cultural and legal barriers that weaken both competitive incentives and the prospects for cooperation. The Future Internet PPP can address many of these, but not in isolation.

The effects on GDP of an FI PPP equivalent in the US would be **twice as large** as in the EU

**Making effective use of Europe's labour resources is more important than meeting today's skill needs.**

Actions are needed to generate and nurture useful and relevant skills to balance general ICT and Internet-related skills that citizens increasingly acquire through life experience and to exploit the capacity of ICTs to improve labour mobility.

Much of Europe's human and social capital goes unused or underused through barriers to participation based on training, gender, age, location and disability. This is a paradoxical failure of coordination. Businesses struggle to find the skills they are accustomed to needing, while workers struggle to find fulfilling employment for skills they already possess, which erode through lack of use.

Migration within and across Europe's borders is important; the (bi-directional) brain drain could be transformed into "brain circulation" as part of efforts to improve the mobility and flexibility of labour and the alignment of skills to jobs.

**Engaging Europe's youngest and oldest citizens in Future Internet-based industries can transform a drain on public and private finance into a unique competitive strength.**

Many European populations are ageing, though some (United Kingdom, for example) are rapidly becoming younger. At the same time, citizens at both ends of the working age distribution are underemployed, especially in the current economic climate. Suitable measures are needed to facilitate the employment of both groups, and to stimulate the emergence of new businesses that can uniquely benefit from the combination of skills, experience and ambitions they offer.

Present measures aim at increasing the employment of young people (mostly in existing jobs) and in increasing e-participation among the elderly. National and EU policymakers can act together with existing employers to join up these measures, and national governments could take steps to facilitate the emergence of new forms of employment by using a portion of the resources devoted to economic recovery to support start-ups on an initially non-commercial and 'enterprise 2.0' basis.

This will be no more expensive than current employment policies, but potentially more productive in the medium term and an indirect stimulus to other start-ups, and to the acquisition of e-life skills among those approaching traditional retirement age.

**Europe does not lack money so much as access to suitably-structured finance.**

Capturing the fruits of the Future Internet requires expansion and risk-taking by SMEs and start-ups at one end of the value chain and providers of high-speed infrastructures at the other. Both struggle for venture capital and lag in nurturing organisational capital, despite the general surplus of liquidity in many quarters.

Access to capital is particularly important for the generic enablers and service infrastructures of the Future Internet PPP, which are needed to strengthen an application-led and dynamic web ecosystem. Ecosystems by their nature are robust-yet-fragile; business failure is as important as success to overall competitiveness, but the costs of failure in Europe are higher than the costs of trying.

One problem is the general perception that investment into highly innovative products and services is *inherently* very risky. Mechanisms that facilitate investment into a balanced

portfolio of risky and less-risky investments through public risk capital participation and/or targeted regulatory relief, could promote greater investment in innovation.

Public financial support may be needed to drive the universal roll-out of high and ultra-high broadband coverage without destroying openness and affordability. This can draw on methods developed for other networks, such as telephony or electricity.

New assets and financial partnership models are needed to support the transformation of Europe to a leading competitive player in the emerging, Internet- and service-based global economy.

Europe's financial sector is currently failing to finance start-ups and innovative business models and services adequately. Prevalent current financing vehicles contain structural incentives that inhibit collaboration, long-run success and "sharing."

Regulatory clarity is needed from the EU and Member States to reduce 'policy risk'. Entrepreneurship and innovation can also be enhanced by risk capital participation by public bodies and the financial sector earmarked specifically for Future Internet enterprises. This might involve new financial assets offered by private sector financial institutions to public as well as private investors and adapted to the needs of companies whose success metrics may derive from market share, third-party monetisation of value creation or licensing/reuse of intellectual property, and who may have to move rapidly in order to realise and sustain these advantages.

**Europe's global rivals in the Internet economy are finding tax incentives a useful way to encourage R&D and other firms of innovation.**

Europe's international competitiveness relies on a vigorous, diverse and resilient domestic economic environment. Fiscal innovation incentives are necessary to compensate for restricted access to capital, especially for new firms, services and business models. Such measures are currently being pursued by Europe's main global rivals; the initiative, once lost, cannot easily be regained during the next phase of the global business cycle. Member State governments should implement favourable tax treatment for R&D, for new forms of partnership and for revenues to early-stage offerings (for example via deferrals). This can provide far more cost-effective medium-term stimuli than untargeted austerity or subsidy measures. To prevent costly and destabilising tax competition, such measures must be harmonised or at least balanced at European level.

**The barriers to innovation and competitiveness are not only financial.**

Many initiatives have sought to make Europe friendlier to innovation. In the Future Internet context, it is particularly important to give stakeholders throughout the value network the space and resources needed to explore possible innovations in tolerant platforms for innovation and collaborative working where inspiration and initiative are not foreclosed. Actions to provide such an environment include: common access to high-performance ICT and other resources; tax policies to promote investment, recruitment and collaboration; regulations that facilitate mergers and acquisitions; a suitable legal status for SMEs on their own and self-organised into agile (and temporary) networks; public procurement aimed at innovative solutions and small suppliers; and incentives to foster the growth of technology clusters.

Small firms, start-ups and enterprises in remote regions often lack access to increasingly-necessary computing (storage, processing) and service (e.g. identity, security, privacy, data curating) resources. As the Future Internet economy develops, this will become increasingly important: European competitiveness depends on near-universal access to such resources. Cloud computing provides one way to level the playing field. Member States and established users of such services should use targeted procurement and other measures to stimulate cloud development, while Member States should consider requiring such sources of strong scale economies to be made available to all economic stakeholders on a fair, reasonable and non-discriminatory (FRAND) basis under commercially viable terms and conditions.

**National and European infrastructure initiatives must be “joined up” to encourage pro-innovation and pro-competition investment and growth by all sizes of firm and all sectors of the European Internet economy.**

Europe's communications (and computing) infrastructures are growing, but gaps in coverage and inequalities in speed, quality of service and affordability are restricting access and producing uneven growth across sectors, regions and business sizes. Because the growth 'hot spots' include the most keenly contested areas of the global economy, this concentration threatens to undermine competitiveness.

A high-quality, affordable and 'dense' infrastructure would be a trans-European public good. The European Commission's Connecting Europe Facility (CEF) should be actively used to “join up” existing regional, national and European infrastructure measures and to ensure—through funding conditionality and regulatory changes at Member State level where necessary—that the resulting networks remain open, affordable and of uniformly high capability, security, etc. This is particularly timely because such measures may be threatened by public austerity programmes, at least in some countries.

The CEF creates opportunities at European level that can reinforce such initiatives and ensure their balanced progress. Various new models are available, especially when orientated to how the infrastructures are used (for example private, enterprise, community clouds; use of shared data centres to justify fibre investment, etc.).

**The Digital Single Market continues to provide a unifying vision, but is in need of defragmentation.**

The Internet economy is characterised by fault lines, for example technology (ICT versus user/service sectors), size (big versus small), localisation (localised versus agile or globalised firms), language, etc. Such divisions are not wholly counterproductive; they provide protective environments in which innovation and prosperity can flourish, and incentives to escape from market niches can be profoundly productive. But they can also inhibit development and growth, especially if the divisions become too wide or permanent.

A range of economic, cultural and legal measures are needed to narrow the gap. These include making markets more accessible to newcomers, establishing a consistent, Europe-wide understanding of net neutrality, and promoting customer mobility so that they can access more advanced services easily.

Defragmenting the market will necessitate a common framework and harmonised rules, monitoring and enforcement in such areas as data protection, service delivery, warranties, quality of service contracts, dispute resolution, data location and information recovery. On

the business side, in addition to those factors listed for consumers above, cross border retail, VAT, recycling rules and special measures such as copyright levies for blank media will also need to be harmonised. Especially important is uniform treatment of on-line and off-line commerce.

Addressing these considerations through a certification approach has benefits and drawbacks. While certification can provide a high level of trust, it also requires a high degree of monitoring and transparency to protect against corruption, and possibly cross-border co-regulation regarding e.g. data ownership and privacy.

**FI PPP use case projects in food and agriculture, environment, energy, public safety, transport and logistics can shed further light on sector-specific obstacles to innovation**

While the relative immaturity of many potential applications does not permit a thorough life-cycle analysis of competitiveness or market barriers, the relatively low uptake of advanced Internet services in these sectors does highlight the importance of innovation barriers at this stage. Initiatives to push efficiency and drive change in sectors such as food and agriculture, energy and transport should involve large numbers of SMEs. They will be the most innovative application and service adopters, in many parts of the value chain and regions. Useful innovation may arise at any point. The key challenge is the aptitude, readiness and ability of these diverse SMEs to invest in innovative solutions. Resistance to change is also evident from established players. This inertia is reinforced by current practices, business models and contractual forms. It inhibits large-scale adoption of promising solutions. Moreover, these entrenched attitudes are not well-suited to the dynamic and open culture of the Future Internet.

**These barriers will not be removed by a unified Grand Strategy, but by self-organised co-ordination among many independent actors.**

It is both unrealistic and inappropriate to attempt a grand synthesis of all actions, stakeholders and objectives. The Future Internet is sufficiently complex, and the critical uncertainties sufficiently important, that this may be ineffective or even counterproductive. To make progress, a looser form of coordination might be preferred.

This should be based on open collection and exchange of information, flexible governance arrangements and clear principles. European institutions have a particular role to oversee important elements of common structure binding the Digital Single Market that underpin European regional competitiveness. But they should also provide leadership by opening up new areas of separate—or even coordinated—activity where progress is retarded by coordination problems.

It seems appropriate to build on the Europe 2020 initiative to create the basis for a partnership that will subsume the current PPP within a wider and looser framework. It should offer constant engagement, the possibility for effective action and a reliable basis in the form of a clear set of principles and institutional frameworks, to allow participants to undertake individually risky medium to long term initiatives that interact to reduce future risks.

**Value-creating Future Internet innovation is likely to move closer to user applications.**

Europe has traditionally struggled to convert its scientific excellence into successful market products. It lags its global rivals in business model and service innovation. These factors will become more important as the global economy recovers.

Europe's scientific strength is matched by diversity and inventiveness near the user application end of the value chain; its small enterprises and its population.

Many of the actions suggested here will make it easier for European Internet users to refine, tweak and build upon the technologies, enablers and services directly or indirectly encouraged or enabled by the outputs of the FI PPP. They will encourage the development and employment of Europe's human capital, entrepreneurial energy and inventive spirit. They should also stimulate development in use case sectors whose potential benefits from Internet services remain largely unrealised, reduce formal barriers that have marginalised small start-ups and limited consumer sovereignty, and open up closed models of technology and service provision to wider modification and customisation. This will involve enabling service providers to fit their offers to user needs (user-driven or user-centric innovation). It will also increasingly encourage current trends towards user-created innovation: app development; construction of community- or sector- specific "smart infrastructures" using generic FI technologies; customising a common platform such as FI-WARE for specific uses; and users themselves implementing generic services. Taken together, this will enable Europe as a whole to produce globally competitive offers, especially as quality, utility, trust and engagement become increasingly necessary for market growth and consumer loyalty.