The Digital World in 2025
Indicators for European Action
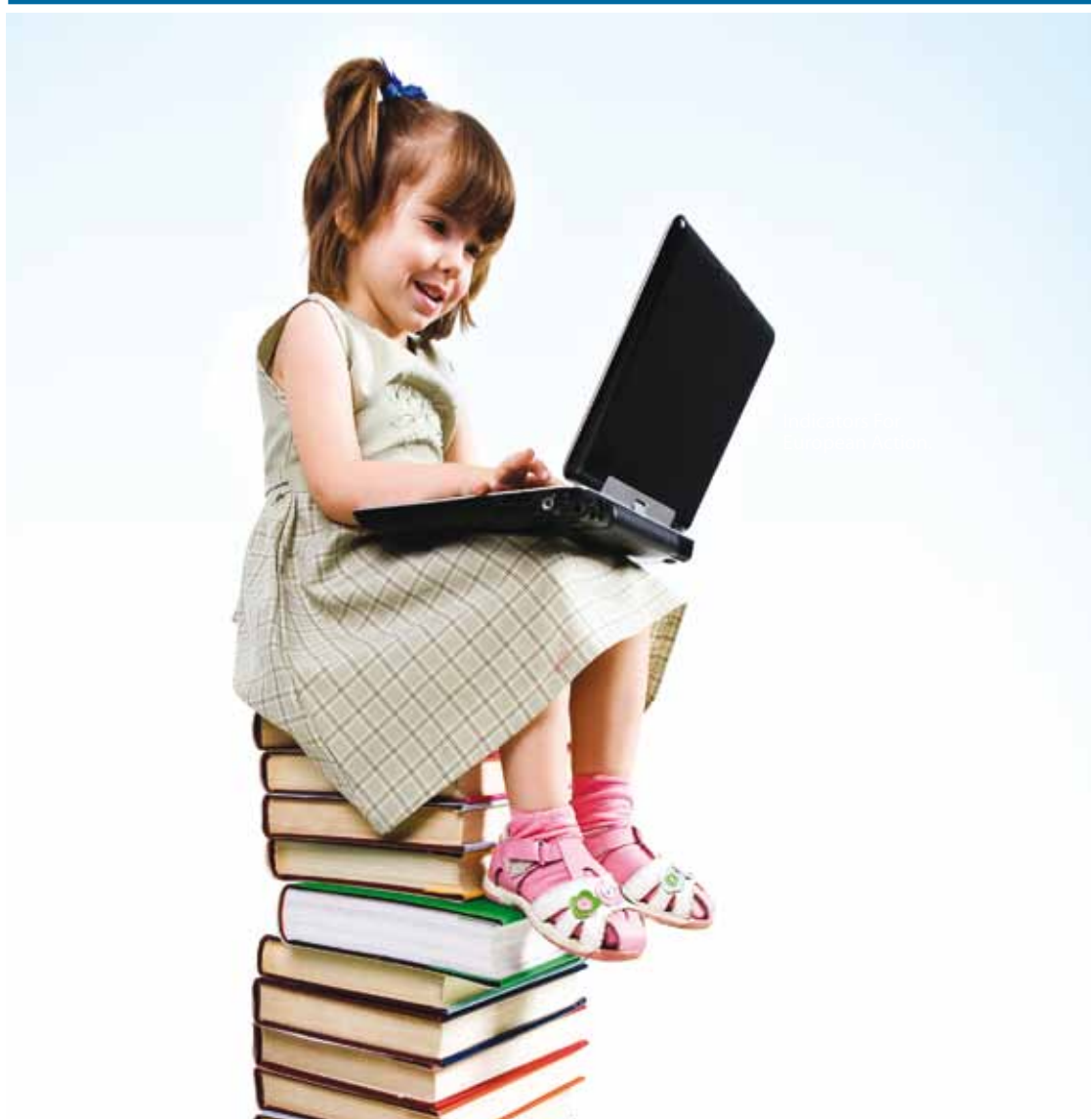
About EIF

The mission of the European Internet Foundation is to help provide European political leadership for the development of European public policies responsive to the political, economic and social challenges of the worldwide digital revolution. Our purpose is to help ensure that Europe remains at the forefront of this revolution – and benefits fully from it through enhanced global competitiveness and social progress.

We focus primarily on issues and actions arising from the treaty-based competences, internal and external, of the European Union. We pursue our mission primarily through a continuous programme of live debates, focused around three broad priorities:

> The EU policy and legislative agenda bearing directly on digital technologies, markets, industries, and primary stakeholders.
> Outreach and partnership with other communities of interest in the development and uptake of digital technologies (including priority third countries).
> Stimulating wide European awareness and debate of longer-term trends in digital technology and network society.

The Foundation does not itself take positions on specific issues.

EIF contacts:
Tel: +32 (0)2 286 11 59   Email: secretariat@eifonline.org
Fax: +32 (0)2 230 98 32   Website: www.EIFonline.org

About 'The Digital World in 2025'

The European Internet Foundation launched the project "The Digital World in 2025" with a major conference in Brussels on November 13th 2008. This was followed by a full programme of events over the first four months of 2009 (see back cover), during which key themes and issues were further developed and debated.

This report evolved in parallel to this programme, through successive drafts. Along the way, EIF members were invited to make suggestions on the evolving text directly to the editors, and many did. EIF members met again on May the 6th in Strasbourg to review the first full draft, and members were invited to make final comments during two final rounds thereafter.

This report intends to be a faithful reflection and synopsis of this rich input from EIF members and guests. Its contents are the entire responsibility of its editors, and do not necessarily reflect the views of any individual EIF member.

"The Digital World in 2025" can also be downloaded from EIF's website: www.EIFonline.org.

Peter Linton
peter.linton@eifonline.org

Paul Schuchhard
paul.schuchhard@eifonline.org

September 2009

Preface

Few would deny the futility of trying to accurately predict what the world will look like in 2025 – let alone the "digital" world. So let us be clear from the outset:

> > What follows is not a forecast or a prediction. Rather, it is a collective analysis by members of the European Internet Foundation of probable outcomes, based on trends observable today.

> > Our purpose is to challenge European political leaders and policy-makers to put Europe's place in the digital world of 2025 at the centre of their preoccupations and priorities today. We therefore also identify key policy areas and issues (see inside back cover) which will increasingly dominate the political landscape, and where action – or inaction – over the next five years will prove decisive for Europe's economic and social well-being in the digital world of 2025.

Where will the digital revolution have taken Europe and the rest of the world 15 years from now? This report can be no more than a first, modest effort to address that question – a point of departure, not a final destination.

We hope and expect that many others will now use EIF's independent, politically-led, non-partisan multi-stakeholder platform to challenge our thinking with their own views, and to help us spread much wider understanding of what is at stake. It is not an exaggeration to say that Europe's future depends on it.

The Board of Governors of the European Internet Foundation

Pilar DEL CASTILLO *MEP, EIF Chair*
James ELLES *MEP, EIF Vice Chair*
Alexander ALVARO *MEP*
Malcolm HARBOUR *MEP*
Edit HERCZOG *MEP*

Arlene McCARTHY *MEP*
Bill NEWTON DUNN *MEP*
Angelika NIEBLER *MEP*
Catherine TRAUTMANN *MEP*
Lambert VAN NISTELROOIJ *MEP*

With special thanks to
Erika MANN *(Former MEP, Former EIF Chair)*
Reino PAASILINNA *(Former MEP, Former EIF Governor)*

Table of contents

Introduction

2025 may seem like a long way off. The pressing issues of today necessarily preoccupy European leaderships. But consider this reality: youngsters who are 10 years old today (2009) will be entering the prime of life by 2025. Many millions of 10-year-olds in Europe and around the world are already "digital natives" – born and raised in a world of digital communications. Behind them will come wave upon wave of youngsters, particularly in today's young emerging societies and economies, with increasing numbers growing up with ever-more powerful digital tools.

Indeed, given current trends any distinction between "the digital world" and any other worlds will have become largely academic by 2025. Over the past 15 years digital communications have already transformed the way ever-increasing numbers of us behave individually and collectively in our working and social lives. But this is just the beginning as the pace of change itself accelerates.

This report proceeds in four sections. The first proposes a central paradigm for trying to envision the digital world of 2025, and summarizes what are likely to be key features. The second sets out and analyses observable trends in the evolution of the technologies driving the digital revolution. The third turns to observable economic trends, and the fourth to political and social trends.

None of these sections pretends to be comprehensive. Rather, they reflect the issues, ideas and trends EIF members and guests have chosen to highlight over the course of this project.

A VISION OF THE DIGITAL WORLD IN 2025

Central paradigm

While by no means comprehensive, the trends identified in this report serve to reveal the breadth, depth, speed and complexity of digitally-driven change in our economies and societies. We therefore propose at the outset a central, unifying paradigm to try to capture their common character and more clearly envision the world they are likely to create by 2025.

The paradigm we propose is that of a world driven by mass collaboration – enabled by the ubiquitous availability of highspeed, high-capacity digital communications networks, systems, tools and services, connected by the Internet.

> *The paradigm we propose is that of a world driven by mass collaboration*

For the purposes of this exercise please think of "mass" collaboration as a highly scalable and conditional concept. Online collaboration among groups of highly variable size already typifies a wide range of human activity in many parts of the world[1].

By "collaboration" we mean not simply online "connection" or even "interaction", but rather *interaction with the intent to create economic or social goods and effects.* It is the inexorable spread of such *purpose-driven* online collaboration that takes us beyond the domain of the enabling technology and into the domain of public policy, politics and politicians.

> *Purpose-driven online collaboration takes us beyond the domain of the enabling technology and into the domain of public policy, politics and politicians*

Will digitally-driven mass collaboration have become pervasive in 15 years' time? It is difficult to imagine what might stop it. Around the world and across the spectrum of human endeavor we see a rapidly-growing array of such collaboration, enabled by the relentless development and deployment of technologies and tools *specifically intended* to facilitate, amplify and expand our individual ability to collaborate with others anywhere, on any scale.

This said, we have as yet no models for a global economy dominated and driven by mass collaboration, no models for social structures and behaviour shaped primarily by mass collaboration, no models for politics and government based on mass collaboration.[2] Nor has mass collaboration yet become so pervasive as to have produced widespread, irreversible structural change in the economic, political and social spheres. The challenge of this exercise is to imagine how, by 2025, it will have – as real-time, borderless, digitally-enabled collaboration becomes the dominant paradigm of human activity at any scale, worldwide.[3]

---

1 One of the world's best examples of how the net-generation is using digital technologies to collaborate to transform the world around them is TakingITGlobal: http://www.tigweb.org
2 There is however a school of thought which holds that the digital world will be impossible to model.
3 In doing so, we would do well to beware "macromyopia", the well-proven tendency to overestimate the short-term impact and under-estimate the long-term impact of new technology.

2025: major features

Given the trends identified in the body of this report, major features of the 2025 world of mass collaboration bearing directly on Europe's political priorities for 2009 – 2014 look likely to include:

> **The economic power of emerging economies:** "In terms of the size, speed, and directional flow, the global shift in relative wealth and economic power now under way – roughly from West to East – is without precedent in modern history."[4] This shift is increasingly powered by the accelerating development and use in economic life of the digital tools and technologies of mass collaboration in – often younger – emerging economies and societies. The only way for aging Europe to remain economically strong and globally competitive in 15 years will be as a collaborative, digitally-enabled society and outward-looking technology leader and partner for the rest of the world.

> **Smart systems, smart growth:** By 2025, economic growth and competitiveness everywhere will depend on the presence of smart systems at the core of major economic and social sectors, including notably energy, transport, health care, environmental management and public services. The continued development and operation of such smart infrastructure will itself also remain a driver of new growth and employment – provided that it is itself environmentally sustainable. It will also prove a vital condition for managing climate change and its effects.

> **Human resources, education and training:** Europe's prosperity and societal well-being in the digital world of 2025 will depend in large measure on our pool of human talent, skills and creativity able to exploit the limitless global potential of the digital world. 70% of Europe's workforce of 2025 is already part of our workforce today, while we are increasingly competing with much younger societies whose pools of digitally-empowered talent will eventually out-number ours under any demographic scenario. Europe has no choice. We will need to be as good as or better than the best anywhere. Our schools and universities won't be the biggest so they will have to be the best, which means they will have to become leaders in what by 2025 looks like becoming a global eco-system of collaboration among educators and educational institutions.

> *70% of Europe's workforce of 2025 is already part of our workforce today*

> *Our schools and universities won't be the biggest so they will have to be the best*

> **A data-driven world:** Because virtually all of our digital acts can be captured and stored in databases, by 2025 our ability to capture, measure and analyse our collective, collaborative behaviour will itself have become a defining feature, driving force and economic engine in the digital world. That prospect dramatically raises the importance of issues we already confront today, notably those awkward twins privacy and security, and even more profoundly, e-identity.

---

4 *Global Trends 2025: A Transformed world, National Intelligence Council (US), 2008.*

> **Digital infrastructure:** Technology trends today give rise to a 2025 scenario in which the Internet has become the world's dominant, converged infrastructure for the transmission of digital communications services. This scenario supposes that network operators can benefit from conditions which attract private investment today in next-generation networks. It also supposes that the technical performance of the Internet becomes steadily more reliable than it is today, that it will accommodate more languages, and that its use becomes safer from harm.

By 2025, the "digital arms race" between those intent on harm and those collaborating to prevent it will have become a central feature of our justice and law-enforcement systems

> **New risks:** As with most of mankind's inventions, the digital technologies and tools of mass collaboration are morally neutral. They can be, will be and already are used for good or ill. By 2025, the "digital arms race" between those intent on harm and those collaborating to prevent it will have become a central feature of our justice and law-enforcement systems. But even beyond the clearly criminal and proscribed, the current financial crisis arguably demonstrates the destructive potential and power of mass collaboration even in the absence of criminal intent or conduct. How are we to organize and manage a world in which everybody is connected (directly or indirectly) to everybody, with the result that vast numbers of individuals receive the same stimuli at the same moment, and respond in the same way?

> **Smart culture?** The world of culture – broadly defined as the performing, visual and literary arts – looks certain to remain in the vanguard, not to say the vortex, of the digital revolution for the simple reason that most cultural production can be produced, reproduced, mixed and widely transmitted in digital form. By 2025 it will be much easier for many more collaborators to do so. We are just beginning to appreciate the scale of the economic, societal and political repercussions of this technological reality in the cultural sphere. What will "smart culture" look like in 2025?

What will "smart culture" look like in 2025?

> **Internet governance, regulation and control:** We may expect that issues of governance, regulation and control of what people actually do on the Internet will remain constants as purpose-driven or interest-driven networks of all sizes proliferate and collaborate in the years to come. Open access and self-organization with self-governance is still considered by some to be the most desirable model for Internet activity. But government efforts and regulatory rules are already apparent around the world to control on-line access or on-line conduct deemed – by democratic processes or not as the case may be – to be illegal, threatening or troublesome. It is by no means clear what regulatory or control models and for which purposes, will have emerged by 2025 in our democratic societies – and elsewhere.

> **Power to the people:** By 2025, digitally-enabled, purpose-driven mass-collaboration on the "demand" side may well have swept away many – if not most – inward-looking economic and political institutions whose power has been built on the control of information or distribution channels or of a specific technology. Many if not most markets, whether for products or ideas, will have become "conversations" between consumers and producers in which permanent direct engagement and powers of persuasion will be needed to prevail.

> *Digital politics and government:* By 2025, digitally-enabled mass-collaboration will have long-since become the dominant paradigm of electoral politics – indeed many would argue that it already has. Transferring digital campaigning models and tools to government and governance, or creating new ones, looks no less ineluctable as empowered citizens demand ever-greater transparency and collaboration in public life. These trends point to a blurring of the line between direct and representative democracy, and a new role for government as mediator between empowered, engaged stakeholder communities.

> *Digital society:* Arguably the most important question we have confronted in this exercise is also the most difficult to answer: over the next 15 years, will the digital technologies and tools of mass collaboration draw human society closer together through common understanding and purpose, or will they rather fragment our societies into myriad self-conscious, self-communicating, self-absorbed, self-collaborating communities of special interest or specific identity, with unpredictable social, political and economic consequences?

Will the digital technologies and tools of mass collaboration draw human society closer together?

What digital world do we want?

The fundamental political question Europe's democratic societies and political leaders must confront today is, quite simply, what place do we want Europe to occupy in the digital world of 2025, and what public policies do we need – starting today – to make it happen?

The foreseeable spread of digitally-enabled mass collaboration into most human activity takes this question way beyond digital technology and "ICT" sector policies themselves. *Every* policy area will have to address it – the sooner the better.

Every policy arena will have to address this question

The last section of this report (see inside back cover) offers an indicative list - particularly for the attention of the incoming European Parliament and European Commission - of policy areas in which the trends identified in this report need to be further examined and acted on, and where action – or inaction – over the next five years will prove decisive for Europe's economic and social well-being in the digital world of 2025, and beyond.

THE TECHNOLOGIES DRIVING MASS COLLABORATION

Overview

Tomorrow's digital technologies will be the result of today's R&D investments. The trend is very clear: at every level of the value-chain from computer processing power and data storage to network capabilities, software tools, intermediate applications and digital content, R&D investments are increasingly driven by the prospect and promise of exploding worldwide demand for the ability of individuals (and now also "things") to communicate and collaborate with each other online, *en masse*.

The aggregate effect must surely be to shift mass collaboration into a much higher gear by 2025: more people will be connected, with mobile devices to connect to the Internet anywhere at any time; user interfaces to access the network will be simplified and more intuitive; many new intermediate tools, applications and services will be part of the network or available through the network to manage and make sense of vast volumes of data; and much content will itself be built on new technologies and tools of mass collaboration.

Not your grandmother's microchip

The opening shot in the digital communications revolution was the invention in 1958 of the microchip. Ever since we have witnessed a relentless exponential explosion in the processing power of these components, even as their physical size has shrunk. This phenomenon was famously postulated in 1965 by Intel Corporation co-founder Gordon Moore, who predicted that the computing power of microchips would double every two years. Since then there has been continual debate over how long "Moore's law" can continue to apply. Astonishingly, the industry view today is until at least the 2020s! By then, a single chip could well be able to replace today's biggest supercomputer. How?

> *Manycore[5] processors:* Instead of putting a higher number of transistors on the core of a single chip, new designs work with several cores within a single chip. This is called a *"manycore processor"*. Such processors excel in handling multimedia, speech recognition and networking applications because they can run processes in parallel and can "serve"

A single chip could well be able to replace today's biggest supercomputer

a high number of users simultaneously. But even with *manycore* technology, our need for computing power already often exceeds what is available. This has led to the development of *distributed computing*.

---

5 A manycore processor, sometimes also called a multi-core processor, combines two or more independent processing cores into a single package composed of a single integrated circuit (IC). A dual-core processor contains two cores, and a quad-core processor contains four cores etc.

> **Distributed computing:** In *distributed computing* a program runs simultaneously on multiple computers or any other devices with an embedded central processing unit (like game stations) that communicate over a network. The main goal of a distributed computing system is to connect users to computer power in a scalable way. Although *manycore processors* allow for the creation of very powerful computers, network transmission speeds and bandwidths are increasing much more rapidly than computer processing speeds. This makes it more efficient to increase computing power by networking computers together to combine their capacity "on demand".

> *It is more efficient to increase computing power by networking computers together*

> **Customised chips:** As chips grow ever more powerful, they may also become more specialized. By 2025 – indeed well before by some accounts – there could be dedicated chips for a wide-range of applications, operating at speeds vastly higher than today, provided that the volume of demand creates the necessary production economies of scale and that enhanced performance justifies any price premium compared with ever-evolving generic chips.

Faster, fatter pipes

> **Terabit Networking:** The investment trends tell us that the telecommunications industry is rapidly developing technologies to transport far greater volumes of digital communications bits at much faster speeds through much bigger "pipes" – what the industry calls "terabit networking", because they will be able to transport many terabits per second. A terabit is one trillion bits. To get a sense of how much data that is, consider this: when 7.7 million people simultaneously watched Barack Obama's inauguration online on January 20, 2009, this led to a peak of 3.5 terabits of data per second transmitted over the Internet. In the mass collaboration world of 2025, much greater volumes will no longer be exceptions but the norm.

Combined with massively increased computer power, massively increased network speed and capacity will turbo-charge a world of mass collaboration, particularly by enabling ubiquitous, instant two-way video communications on both fixed and wireless networks.

Internet everywhere

> **Next Generation Networks (NGN):** Communications services such as radio, TV, fixed telephone, wireless telephone and Internet connection are still typically made available through a variety of network infrastructures, technologies and standards, including copper wire, coaxial cable, fiber optics, Internet protocol (IP), and Digital Terrestrial Broadcasting. Now, major investment by network operators and telecom equipment manufacturers is focused on the development and deployment of *Next Generation Networks* exclusively based on the Internet Protocol (IP) and thus capable of transporting any and all digital communications and services over the Internet. This is often called the "IP everywhere" model[6] based on "high leverage" all-IP multi-service, fully converged, scalable wireline and wireless networks. These networks will feature constant innovation in broadband and optic technologies to transport and deliver traffic more reliably and efficiently, and to enable new applications and business models.

> **Getting everybody connected:** The specific choice of network technology by a network operator willing to serve a specific geographic area will be influenced by many factors, such as expected demand and population density. Getting everybody connected to broadband networks, allowing full participation in the digital world of 2025, must be Europe's aim.

Getting everybody connected to broadband networks must be Europe's aim

> **Convergence of networks and services:** From the user's perspective, the "IP everywhere" model amounts to a *convergence of networks and services*, opening up the possibility of access to all digital communications services through any single device connected to the Internet.

The Internet of everything

> **The Internet of Things:** Today we connect people and computers to one another via the Internet. In the future, the Internet will also be able to connect everything and anything, including inanimate objects, sensors, and actuators. These are called "cyber-physical systems", or more popularly *The Internet of Things*. They will enable the mass collaboration of things with things, and things with people.

In the future, the Internet will be able to connect everything and anything

– **RFID:** A key enabling technology for the Internet of things is Radio Frequency Identification, or RFID. An RFID tag is basically a microchip that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves.

– **IPv6?:** For this vision to become reality, however, billions of individual "things" will first need to be given a unique Internet address, just as human beings and computers are today. Today's "Internet Protocol version 4 (IPv4)" – the system of software standards underlying the Internet – does not have enough address capacity to do this. The more recent "IPv6" protocol may help eliminate this barrier, but by 2025 much more address capacity will be needed.

---

6 For example, all digital television infrastructures including cable, satellite and terrestrial broadcast are moving rapidly from MPEG toward unified, all Internet-protocol transport.

Calling all cars

> *Smart spectrum management:* To connect to the Internet of everything, many things will incorporate a radio, autonomously transmitting and receiving signals, in order to collaborate with other things and people. Some experts foresee a worldwide population of up to 7 trillion radio-enabled devices by 2025. But it is quite simply beyond the wit of man to allocate radio spectrum for trillions of radios, as we have done since the invention of radio transmission itself to prevent interference between different categories of users. Indeed, we are already running up against the political impossibilities of making sufficient spectrum available for everybody – let alone every thing.

> *Some experts foresee a worldwide population of up to 7 trillion radio-enabled devices by 2025*

> *Could new technology break the spectrum constraint once and for all?* Some on the leading edge think so. They are working on intelligent – or "cognitive" – radio devices that would be able to negotiate continuously and autonomously among themselves in any given locality to make sure all have sufficient spectrum to operate without causing interference. Toward a 2025 world of mass collaboration among trillions of radios, to further enable the mass collaboration of people and things via the Internet of everything? Stay tuned.

Cloud 9?

> *The Cloud:* What, we may fairly wonder, will it all add up to – all this hyper computing power, linked to hyper-connectivity, delivering any and all IP-based services, accessible anytime, anywhere? "The Cloud", say some, searching for an appropriate metaphor to describe a disembodied digital world in which we no longer need to acquire and carry around with us all of our own personal computing hardware and software tools, but rather can access and use them anytime, anywhere, safely and securely through the Internet – from on-line providers whose location is irrelevant.

The metaphor of *the Cloud* does seem to capture a scenario made possible by current technology trends (although there is no single agreed definition[7]). But at least as plausible is a world of 2025 in which *the Cloud* has become part of a much broader, seamless software platform that also spans more powerful and applications-rich PCs, as well as a wealth of smaller devices. The most powerful device in many homes today is not a PC but a game station.[8]

> *The most powerful device in many homes today is not a PC but a game station*

> *Cleaner mobile pipes and smarter networks?* The promise of the Cloud is driving R&D in the telecommunications sector too – beyond faster, fatter pipes, toward cleaner mobile pipes and smarter networks, able to:
> – Identify the type of content being transmitted, and thus provide flawless, content – specific services (as for example intellectual property protections);
> – Ensure security in the network, not just on the end-points of a connection;
> – Operate with any mobile Internet platform.

---

7 Wikipedia defines it as 'a style of computing in which resources are provided "as a service" over the Internet to users who need not have knowledge of, expertise in, or control over the technology infrastructure ("in the Cloud") that supports them.'
8 The total capacity of the thousands of game stations networked in the Folding@Home grid project led by Stanford University is an order of magnitude larger than Road Runner at Los Alamos, the world's largest computer.

> *A more reliable Internet?* The Internet will also have to provide much more reliable and instantaneous data transmission than it does today if it is to become the world's dominant digital infrastructure. That will require massive investment in new next-generation networks and in additional layers of software in the core network, as well as in local access installation and maintenance.

> *The race is on:* If the history of new technologies teaches us anything, it is that the demand side – human beings responding to the resulting products and services on offer – will ultimately dictate their success or failure.[9] Whether or not any or all of these added-value network functions end up primarily as in-built services of the Internet itself, or rather as capabilities of PCs, servers, and other devices connected to the Internet, or some mix of both, the mass collaboration world of 2025 will demand global digital communications capability which is converged and interoperable, instantaneous, scalable, secure, content-aware, reliable and survivable. The race is on within and between ICT sectors, and around the world, to deliver that vision. Call it *the Cloud*.

So much power, so little software

What, we would do well to ask, is the world of 2025 actually going to do with all that vastly expanded computing and transmission capacity, beyond expanding its availability to many more of the 75% of humanity not yet connected? Good question. The answer in one word: software. Software is what will turn that raw digital power into economic and social goods, and as that power continues to expand exponentially, the opportunities for software become as limitless as the human imagination.

> *Software is what will turn raw digital power into economic and social goods*

> *"Re-booting" the software industry:* Will software actually develop fast enough to fill the computer and network capacity foreseeable by 2025? Software industry leaders point out that today the industry is still in its infancy. Creating software able to exploit the emerging "parallelism" of the digital infrastructure – and especially to deliver the complexity, "concurrency" and security at scale necessary for far more ambitious software applications, will require a fundamental change in software engineering tools and techniques, not just incremental progress, while at the same time the Internet itself becomes a programming environment and no longer just a publishing environment. Here again, the race is on – to create the tools to create the next generations of software that will power a user-driven world of mass, software-assisted collaboration.

> *Software as a service:* The possibilities of *the Cloud* likewise create new challenges and opportunities for the software industry. The prospect of "software as a service" delivered over the Internet challenges existing software architecture built for on-premise, server-based software deployment. New architectures will be needed for data management in *the Cloud*, and integration of Cloud-based applications.

---

9 *PEW Internet memo on Cloud Computing Applications and Services: Today, 69% of online Americans have used Cloud computing. 51% of these Internet users who have done a Cloud computing activity say a major reason they do this is that it is easy and convenient. 41% of Cloud users say they use online applications because they want to be able to access their data from any computer. 39% quote ease of sharing information as a major reason they use applications in cyberspace or store data there.*

> *Beyond "click and point":* Along the way, this race promises to take us way beyond the "click and point" model of the man/machine interface, toward active, empowered interfaces able to transform machines from tools to intelligent, networked human helpers for non-critical tasks. And instead of a mouse and keyboard, input devices will move into our physical space, in 3D, making them far easier to use than today's tools.[10]

Drowning by data

The Internet is producing unprecedented growth in the amount of data we are generating, capturing, replicating and storing. The volume of Internet traffic in 2012 will be 100 times greater than it was in 2002. In 2007, the amount of data generated already surpassed our capacity to store it. By 2010 digital data is already expected to double every few days. But in a typical

The volume of Internet traffic in 2012 will be 100 times greater than it was in 2002

organization today, only 25% of retained data is structured in a way that can be used to extract knowledge, and very few workers have the extraction skills necessary to do it. The ability of software to manage and extract intelligence from our ever-growing data sinks will become a major competitive advantage in the digital world of 2025 – and essential to save us from drowning in our own tsunami of undigested, undigestible data.

And that's not all on the technology front...

The scope of scientific research, technological development and product innovation based on digital communications technologies is today virtually limitless. Here are just a few of the most important and promising for a 2025 scenario of mass collaboration.

> *Load-adaptive control:* The digital world of 2025 will contain unimaginable numbers of microchips, all consuming minute quantities of electric power and thus emitting heat and in many cases (indirectly), greenhouse gases. Already today data centers in the U.S. alone consume about 2 percent of the power supply, and that figure is expected to roughly double by 2011[11].

> But here again, technological help is on the way. Already super-computers can be water-cooled rather than air-cooled, reducing $CO2$ emissions. New microchips are under development that will be able to conserve energy by rationing their own internal power consumption. This is called *load-adaptive control*, whereby a single microchip is able to turn itself on and off from microsecond to microsecond depending on the job it has to do, thereby reducing significantly its total electric power consumption.

> *Wireless sensor networks:* New microchips under development will be able to continuously sense different physical states and send this information to the IP network. Moreover, users will be able to more easily programme wireless sensor networks

---

10 For instance, user interfaces could be intelligent surfaces that will allow us to move information around with our hands without using mechanical input devices like a mouse.
11 Gartner Group study on Green computing: Gartner predicted recently that nearly 50 percent of data centers worldwide would have trouble finding the electricity to power and cool their computing equipment. And the EPA states that over the next five years, power failures and limited availability will stop operations at more than 90 percent of data centers.

themselves, without having to depend on service providers. Performance features and applications now foreseen include:

- The ability to scavenge energy directly from the surrounding environment, with no need to be connected to an electric power source; freed of this constraint, such sensors could be placed just about anywhere;

Sensors will scavenge energy directly from the surrounding environment, with no need to be connected to an electric power source

- Incorporation in medical products that patients use regularly, for example to measure irregularities in a heart rhythm, or enable a central monitoring and inference system to maintain a patient under permanent remote surveillance;
- DNA sequencing chips able to perform a complete individual human gene sequence in a matter of minutes;
- Measurement of atmospheric and pollution conditions in any local environment;
- Limitless extension and intensification of geo-positioning systems.

DNA sequencing chips will be able to perform a complete individual human gene sequence in a matter of minutes

> **The Immersive Web:** One vision of how we will interface with the *Internet of Things* is often called the "Immersive Web". The foreseeable progress in the quality of optical sensors will lead to cameras that will have a resolution close to that of the human eye. This, together with developments in High Definition displays, will enhance our virtual experience in a world of lifelike two-way hyper broadband video. It will feel much more realistic than today's small and less than smooth webcam video picture quality.

> **The Semantic Web:** Today, Internet search engines identify documents containing the words we put in them. But work is underway on software algorithms enabling machines to answer questions beginning "why", "how" or "what", to search for, share and combine information on the web in ways that provide relevant information in context, and allow machines to talk to machines to perform these tasks. Tim Berners-Lee has called this "The Semantic Web".[12]

A word of caution

Let's not forget that we are still in the infancy of the digital revolution. The Law of Accelerating Returns cautions us that over the next 100 years we will see as much technological progress as we have seen in the last 20,000 years. And even over the next 15 years – the horizon of this exercise – we will undoubtedly see the emergence of digital technologies and capabilities we have not yet imagined.

But whatever the uncertainties there appears to be no going back. The Internet is becoming the key communications infrastructure of the world. In that sense then, the vision of a digital world in 2025 driven by mass collaboration is not really vulnerable to technological surprises. Whatever they turn out to be, they will be surprising only if they do not accelerate our headlong rush into that massively collaborative future.

---

12 http://www.w3.org/2001/sw/ : Berners-Lee is a co-creator of the world wide web.

TOWARD THE DIGITAL ECONOMY OF 2025

Overview

As we have seen, by 2025 we may expect to inhabit a world of digitally-enabled mass collaboration built on "fast, fat mobile pipes and smart networks", connected by the Internet to limitless computing power and – most importantly – to billions of human beings and inanimate objects.

To assert that, as a consequence, the "traditional economy" will by 2025 be radically transformed, superseded by a "global digital economy", is already to repeat no more than conventional thinking. Indeed, it is self-evident that digital communications are already changing traditional models of production, supply and demand at every level of the value chain for ever increasing numbers of economic sectors and actors.

On the other hand, can anybody yet say with any authority what the sum of countless such micro-economic revolutions will add up to by 2025 in macro-economic and structural terms? Steel will still be steel, and humankind will still need to eat. One way to try to wrap our minds around this may be to ask ourselves:

> In the digital economy of 2025, who will be prepared to pay for what?
> Looked at from the other end of the value chain, who will be prepared to invest in what? Who will be offering what value added, and through what structures?
> What will be the role of government?

Contributions to this EIF project do not and cannot provide perfect vision on these questions. But they do help focus on certain themes and trends which look likely to shape the digital economy of 2025. Below we summarize those examined during this project.

Smart systems, smart – sustainable – growth

In the digital economy of 2025, digital intelligence will be embedded not just in individual things, but across entire systems, and systems of systems, notably those constituting the core infrastructures that enable our societies to function. Smart infrastructure – including transport, energy and other utilities, environmental management and public services – will therefore become not just a source itself of new growth and employment, but also the necessary foundation for economy-wide "smart growth" and competitiveness.

This prospect is not without its own sustainability challenges. A smart world of smart growth could lead to exponential consumption of electrical power by digital devices running far richer software, as well as exponential hardware waste. Smart solutions for both these potential environmental constraints will also need to have become features of the digital economy of 2025.

The web-enabled enterprise

In a scenario where "the real economy" of remunerated goods and services produced by business remains the central value-creating mechanism of the global 2025 economy, much digitally-enabled collaborative transformation will be internal within enterprises. The successful enterprises of 2025 will be those that exploit rather than resist digitally-enabled external market forces acting from both the demand and supply sides, and internal demand for enhanced operational and social ways of working. This may be thought of as the "web-enabled enterprise".

The successful web-enabled enterprise of 2025 will also be a participant in collaborative global networks with other enterprises, all seeking to benefit from the experience and capabilities of each other. Many will also be internally "unbundled" – with functions such as central management, R&D, product design and development, and production spread around the world to exploit specific local conditions.

> *The successful enterprises of 2025 will exploit rather than resist digitally-enabled external market forces*

The virtual enterprise

From the web-enabled enterprise it could be a short jump in some sectors to "the virtual enterprise" which no longer exists in the conventional sense but uses the Internet to operate its business. A VE could be set up by a single individual or it might be an ad hoc partnership between businesses or individuals to exploit a market opportunity. In a scenario where Internet enabled and empowered individuals will be able to easily group, regroup, associate with one another, and break those associations, social networking skills and tools may come to prove decisive for success.

We have no established policy frameworks for a world of VEs. The speed at which VEs could be formed or dissolved is in principle only limited by the time it takes to get your web-based systems up and running. A VE can operate without creating a new legal entity. It can be created for the short or long term and be geographically dispersed. It is, in a conventional statutory sense, invertebrate.

Bye-bye Bismarck?

An industrial fabric woven by the global collaboration of countless web-enabled, if not virtual, enterprises – many internally spread across the globe – bears little resemblance to the 19th century industrial bedrock upon which Otto von Bismarck constructed the world's first social security systems[13]. New collaborative models and structures may well need to evolve over the next 15 years to maintain Europe's levels of social security in the digital world of 2025.

> *New models may be needed to maintain Europe's levels of social security in the digital world of 2025*

Skills and education

There is a clear and obvious need for ensuring that current and future generations will be Internet-literate in a world where the Internet has become the dominant economic and social platform. A child entering school this year (2009) will enter the workforce in

> *A generation of school teachers with self-taught e-skills will not prove adequate to prepare youngsters for the digital economy of 2025*

about 2025. A generation of school teachers with self-taught e-skills, often also ill-equipped, will not prove adequate to prepare youngsters for the digital economy of 2025. The key to success, now clearly demonstrated wherever adopted around the world, is to redesign education itself around participative, digitally-enabled collaboration within and beyond the individual educational institution. By 2025 this will have become the dominant worldwide educational paradigm underlying the economic strength of every successfully society.

But while this educational revolution will prove necessary to prosper in the digital economy of 2025, it will not in itself prove sufficient. Beyond widespread Internet literacy,

> *The development of globally-competitive professional IT skills throughout the productive economy will prove decisive*

the development of globally-competitive professional IT skills throughout the productive economy will prove decisive. This will be particularly crucial for Europe in the service sector, which already represents close to 70% of our economy (broadly defined). But even beyond technical skills, the digital economy of 2025 will demand a flexible workforce, with a mindset of continual change and the capacity to change and adapt in response to the complexity of the global economy. 70% of Europe's workforce of 2025 is already part of our workforce today. This capacity for change is itself a personal skill which can and must be developed and nurtured at all levels of education and professional life.

---

13 Bismarck's program *"included Health Insurance; Accident Insurance (Workman's Compensation); Disability Insurance; and an Old-age Retirement Pension, none of which were then currently in existence to any great degree."* http://en.wikipedia.org/wiki/Otto_von_Bismarck

Regulatory rules for the digital road

A 2025 paradigm of mass collaboration enabled by digital networks and services, converged through the Internet, pre-supposes a stable and predictable policy environment for the "telecommunications" sector which creates attractive conditions for the billions of Euros of necessary private investment in both. Today we speak of the need for investments of hundreds of millions of Euros in Europe's "next-generation networks". By 2025 we will be speaking of the "next-next-generation".

Intellectual Property

There is no doubt that success in the digitally-driven economy of 2025 will increasingly depend on innovation and creativity, and that intellectual property rights (primarily patents, copyrights and trademarks) will therefore become increasingly important drivers of growth and competitiveness. By the same token, the growing vulnerability of protected intellectual property to unauthorized exploitation in the digital world is a particular threat to the advanced economies and sectors most dependent on intellectual added-value.

The future character and enforcement of intellectual property rights will remain one of the central public policy issues

The future character and enforcement of intellectual property rights will thus certainly remain one of the central public policy issues, if not the central economic policy issue, for IPR-dependent industries in any 2025 scenario, with intense debate over statutory IPRs and enforcement frameworks in Europe and elsewhere.

Given current thinking and trends, it is reasonable to speculate that by 2025 the IPR environment will include new digital tools – including new collaborative tools – for more effective and efficient creation, management and enforcement of IPRs, as well as greater use of business models based on the voluntary offer by rights holders of licensing terms and conditions tailored to appeal to particular markets.

From social networking to economic mainstream

Much of the digitally-driven economic transformation we have already seen boils down to the facilitation, extension and disintermediation of existing business processes and models. This trend will certainly continue to expand and accelerate. But it is no longer the only digitally-rooted transformational force acting on economic life.

The migration of social networking models and tools (Web 2.0)[14] into economic life is also gathering momentum. In a number of areas this has already gone beyond early trial and error to demonstrate the power of personalized, people-centric, community-based economic collaboration.[15] This trend is arguably ripe with transformational economic power because it harnesses to economic processes and business structures the most deep-seated human motives and emotions at almost any scale of collaboration, as well as cultural and other societal values specific to any particular community of economic interest.

Time alone will tell how deeply such socially-rooted collaborative digital paradigms will penetrate and contribute to the transformation of economic life. But we can already glimpse its potential today.

14 Wikipedia defines "Web 2.0" as the second generation of web development and web design that facilitates information sharing and collaboration on the World Wide Web. The advent of Web 2.0 led to the development and evolution of web-based communities, hosted services, and web applications. Examples include social-networking sites, video-sharing sites, wikis, blogs, etc. Web 2.0 does not refer to an update to any technical specifications, but rather to cumulative changes in the ways software developers and end-users use the Web.

Community-based consumer empowerment

A new balance of power is already evident in certain markets where consumers increasingly exploit the power of mass collaboration. The further adaptation and spread of social-networking tools and models looks certain to accelerate this trend.

We are not talking here just about far greater market transparency, such as the ability to compare prices or the ability to by-pass traditional retail channels, although that has already become an important Internet-based enhancer of individual consumer power in many product and service markets. It is also the collective power of a given community of shared consumer interests which may increasingly drive supply side strategy from the earliest stages of product conception through to final purchase and after-sales life.

Unsurprisingly, this trend is most apparent and advanced today in digital product markets. In these sectors, consumers have themselves already become generators, in some cases co-producers, co-creating the world's largest free encyclopedia, writing non-commercial software and widely sharing and building on shared digital content. The degree to which such consumer-generated or co-produced content will by 2025 compete with the products and services of traditional media industries (music, movies, books and other print media) is unclear. Concerns over quality and reliability could well draw some consumers back to more traditional, professionally produced and paid-for intellectual products offered on-line, and perhaps combining the two models[16]. (What is clear however is that consumer generated on-line content based on or incorporating the unauthorized use of copyright-protected work is a growing concern for copyright owners.)

Beyond media sectors, consumer collaboration is already making the market for consumer products competitive as never before. Before booking a hotel you can look at customer reviews. If you see a new product advertised, you only have to type the make and model number in a search engine to instantly find out whether it has frequent hiccups or is a good buy. And if you are in doubt whether to go to a movie based on the trailer from the publisher, you can find websites reporting the opinions of thousands of people who have been rating the film.

> *Consumer collaboration is already making the market for consumer products competitive as never before*

There is every reason to believe that this phenomenon is only in its infancy, if only because consumer habits and behaviour patterns do not evolve as rapidly as the networking tools and services available to them. But as the next generations of digital natives mature, this dynamic, changing balance of power between consumers and producers looks certain to become a defining force in the digital economy of 2025.

Empowered consumers and market transparency may not, however, mean the end of market and social segmentation, to be replaced by one global, level playing field for every participant in the new Internet economy – in short, a world where everyone is connected and therefore "equal". Indeed, the socialization of the Internet could well have an opposite effect, reinforcing individual identity within existing social groups and communities, and raising the barriers to full "membership" and participation in them. In this scenario, markets become much more sharply segmented and consumer power much more tightly focused.

---

15 For example: http://corporate-marketing-branding.suite101.com/article.cfm/branding_with_social_media
16 See for example http://www.wired.com/epicenter/2008/06/ency/

Social production

At an even more informal level, we see a steady increase in what can be called the "social production" of economic goods. We see that people are willing to make an encyclopedia for free or develop software purely because they enjoy the process and seeing their knowledge and creativity recognized by peers. Many successful "Web 2.0" projects have resulted from people creating Internet tools to solve problems they encountered themselves, such as keeping track of all the blogs on the Internet or sharing video and photos online. We have seen that such tools, products or services clearly represent an economic force and economic value, whether monetized or not.

> *People are willing to make an encyclopedia for free or develop software purely because they enjoy the process and seeing their knowledge and creativity recognized by peers*

To value social production as an economic component is not easy. There are several obstacles to overcome. In economics one normally ought to wait a number of years to gather historical data. In the case of social production however we are still unfamiliar with how to create the metrics for measuring and valuing social production, particularly when there is no pricing signal. One way to further our insights in this matter may be to base such metrics on social production patterns or user-centric innovation processes and measures of utility. It may also be argued that estimates of value-destruction in sectors vulnerable to un-remunerated social production should be deducted from estimates of added-value. It is likewise unclear whether collaborative social production will improve or dilute the quality of output, depending on the level of professionalism.

Monetizing models: all advertising, all the time?

"Markets are conversations" has become a widely-repeated Web 2.0 mantra to describe how sellers now have the possibility to converse directly with their own customers, and to target consumers with offerings through context-sensitive advertising on established third-party Internet platforms. Free search engines, social websites and consumer review/feedback sites as well as most news sites are today monetized through paid advertising and links, not through payment for access. At the same time, the increasing power of digital tools and systems to collect and process vast amounts of data raises important questions of principle and practice concerning the use of

> *"Markets are conversations" has become a widely-repeated mantra*

personal information. On the one hand, it is personal. On the other, it can be valuable for targeting or personalizing advertising – often with benefits for consumers.

It is reasonable to expect that by 2025 this advertising-based business model will have become an integral, widely-understood and accepted form of collaboration between web-based commercial or social platforms and consumers, operating with much more precise targeting tools and within clear rules (legislated or market-imposed). In this scenario, the advertising model looks likely to remain a primary Internet monetization model, thereby also continuing to multiply channels for SMEs to enter the market through affordable, targeted, user-friendly advertising.

That said, some market participants doubt that there will be sufficient demand for advertising to fully sustain all social and commercial on-line media by 2025. There is some evidence already that social networks could become so intrinsic to the fabric of society, "like air", that their users will become oblivious at best, hostile at worst to the presence of advertising. Other market participants point out that the advertising model itself is not necessarily adapted to all business models and products – notably in the cultural sector.

If Internet consumers used to "free" remain unwilling to pay, but become less susceptible to advertising, while some producers cannot apply the advertising model anyway, then indeed who will be prepared to pay for what? If the answer turns out to be that nobody will pay for anything, the digital world of 2025 will be a far different economic beast that anything we have imagined in this report.

Identity and privacy

As noted above, the ability of commercial interests to better target consumers on-line on the basis of observed or reported interests and previous purchases has understandably sparked intense and growing debate about the on-line acquisition and use of personal information. Already companies often offer free access to specific services in exchange for more details about ourselves. Some say that willingly parting with personal information will become an established way we knowingly help advertising revenue compensate for free Internet services, notably free access to online media.

Current trends seem to converge on one important conclusion: through the combined interaction of law, technology and Internet literacy, by 2025 people should be in a position to control how their own personal information is made available and used for commercial (or other) purposes. Whether we chose to make use of this ability is another question. Already today we can delete the "cookies" on our PCs as frequently as we wish or filter the information they gather, thereby controlling their ability to track our web history. How many of us know? How many of us do?

> *By 2025 people should be in a position to control how their own personal information is made available and used for commercial (or other) purposes*

Harnessing the "meta-data"

"Web 2.0" has taught us that we all can be creators of on-line content, and that, beyond any value we create individually there is enormous potential for new understanding of markets and society from capturing and analyzing the "meta-data" we are collectively generating. Add to that the ability to capture and analyze data generated by an infinity of "things" connected to the Internet, and we can imagine a powerful new source of competitive advantage and governmental performance.

The conceptual economy

New ways of thinking about and describing the digital world and its economy in 2025 continue to percolate. One is the "conceptual economy", in which value will be in the meaning of products, not just their function, with meaning created by creative, educated people everywhere, empowered and sharing their creativity through web-based platforms supporting "open innovation". In this understanding, creative talent itself becomes a new currency and asset in working life, influencing the choice of jobs and employers.

SOCIAL & POLITICAL FEATURES OF THE DIGITAL WORLD IN 2025

Overview

As we have seen, by 2025 we may expect to inhabit a world where mass collaboration may have become the pervasive economic paradigm, powered by limitless networked computing power. But what about society itself? What will be the effects of these technological capabilities on our social interactions and governance in a hyper-networked world?

It is useful at the outset to observe just how much has already changed in the last 10 years. Who would have thought ten years ago that today the biggest and most trusted tv station in the world would be a website, that you can win the American elections by building on-line communities, or that legislators would be twittering to engaged constituents from inside the halls of parliaments? Equally, there is a surge in online social behaviour, as we increasingly create, maintain and facilitate relationships via greatly expanded social networks, and use them to organize not just our own social activity, but social and political movements, organizations and events.

New digital tools will have been developed by 2025 to further broaden and deepen these trends (high resolution two-way video capability looks to be one). This prospect poses fundamental questions:
> In the digital society of 2025, what will be the role of government and public service?
> How will we deal with issues like security, privacy and identity?
> How will we inform ourselves and make judgments?
> How equalitarian and how virtual will society become?

Digital democracy 2025

The digital tools of mass collaboration have already begun to blur the line between established forms of representative democracy and more direct democracy in which mobilized citizens are able to permanently engage in and often decisively influence policy priorities and legislative outcomes. Most legislative bodies have yet to welcome this phenomenon, let alone re-engineer themselves in order to facilitate and manage it on the basis of a clearly defined set of principles able to ensure that fundamental democratic values are preserved. By 2025, all will have had to.

Digital government 2025: all for one, one for all

By 2025 the governed will typically be at least as well-informed as governments, producing a transition from government as an institution to government as a platform where stakeholders – people – can actively participate, collaborate and add value. Rather than simply a decision-making body at the top of a pyramid, (democratic) government will also function as a coordinating and mediating platform at the centre of connected expert and stakeholder communities. In this scenario government will itself need to innovate and empower within its own structures to play its role, and thus will also need to attract and develop the talent necessary to deliver value in the new collaborative paradigm.

> *Government will itself need to innovate and empower within its own structures to play its role*

Net Patrol

By 2025 not just the model but the responsibilities of government will likewise have morphed to reflect the reality that the Internet has become the central nervous system of our economies and societies. Most notably, governments will have become at least as concerned with the cyber-security and safety of citizens and nations as they are with safety from physical harm or attack.

Meeting this responsibility will require new concepts, new tools, new talent, and new frameworks for cooperation across society, because cyberspace is fundamentally different from physical space in two crucial ways: there are no frontiers, which means that threats can originate from any geographic location; identity is difficult to track – online you can be anonymous or use a fake identity. This means quite simply that security has to be addressed globally. It will not be sufficient to pursue these efforts in Europe alone.

At the individual level, we already know that we should try to protect our PCs and other devices with software to protect them from criminal agents who want to capture credit card data, or turn our devices into distance-controlled robots for sending out spam without our knowledge. But personal security is only the beginning of what cyber-security will be all about by 2025.

By 2025 our societies will be far more dependent on smart digital systems in our core infrastructures than we are today. These systems will inevitably become targets of sustained cyber-attack, as well as possible physical attack, ranging from data theft or tampering, to hostile takeover of systems control, to the physical destruction of satellites or network infrastructure – all for the purpose of disrupting society.

Democratic societies will need to balance the responsibility of the state to protect its citizens with individual privacy rights and freedom of Internet access

Indeed, the very nature of warfare – and the enemy – will shift, as states race to develop a fighting capacity in this space and to define rules of engagement. Nor will such cyber warfare strategies and capabilities be restricted to nations and their governments. Criminal and ideological movements are already active. Governments could find themselves at a disadvantage for retaining the technical talent and skills necessary to prevail, and will need to find unconventional ways to make use of them. Governments are already calling for a move from passive defense on the edge of vulnerable systems to active defense, including active surveillance.

This said, cyber-security in 2025 will not be found only in technical solutions administered by public authorities. Government will need to create the platforms and tools for collaborative efforts with individuals, businesses and other non-governmental organizations to reduce vulnerabilities throughout society. And because cyber-attacks are both unforeseeable and unpredictable, crisis management systems need to be put in place, again involving a broad range of societal actors.

National security vs. individual freedoms

In a 2025 national security environment of greatly expanded cyber-risk, democratic societies will need to balance the responsibility of the state to protect its citizens with individual privacy rights and freedom of Internet access. Indeed, this balance looks like becoming a primary differentiating feature between open, democratic societies and those states which attempt to control the Internet not to protect their citizens but to protect themselves from their citizens. The world's democracies will find it increasingly difficult to ignore the need for policies to shape future political and economic relations with such states.

Knock knock, who is it?

Security and privacy in the digital world share one important feature: they both benefit from a climate of trust in the safety and reliability of the Internet. Key to the creation of this climate is trust in the identity of individuals, businesses, government and other organizations we encounter on-line.

Today it is all too easy to set up a fake website for some malicious purpose that looks reliable, or is even a convincing copy of a trusted site, and fool a significant number of people into believing that it actually is what it appears to be. In the social networking sphere, it is likewise simple to disguise or misrepresent one's true identity. These risks are difficult to counter, and continue to inhibit the growth of Internet use for legitimate purposes.

But progress is at hand. By 2010, all European citizens, businesses and administrations will be able to benefit from a secure means of electronic identification (eID) that allows people online to enter secure zones where they can be sure that their privacy is respected and where they can make use of services without fear of attack by malicious software or fraudsters. Well before 2025 we should all be in possession of an electronic "European Citizen Card".[17]

> *By 2010, all European citizens, businesses and administrations will be able to benefit from a secure means of electronic identification (eID)*

---
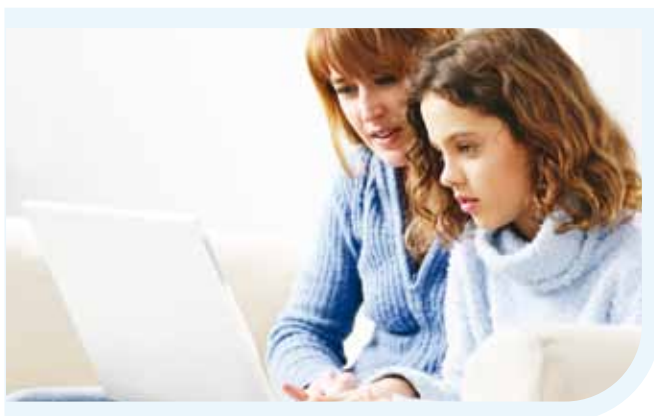
17 *eID will offer a secure zone where providers guarantee that only services based in cooperating jurisdictions are available. It will allow for the restriction of e-mail or downloads from non-trusted servers to non-active content if the user decides this, or even fall back to text only e-mail. In such secure zones, which users may choose to enter or not, they will benefit from the rich possibilities of Web 2.0 without risking exposure. (This electronic ID is not the same as a travel document like a passport, which is used only for physical control of identify.) Currently the EU is funding projects to test eID such as "SaferChat", "eID electronic delivery" and "eID change of address" mechanisms that will allow for easier authentication and verification of transactions.*

Who do you trust?

The spread of digitally-enabled mass collaboration in the creation and dissemination of "news" looks like another powerful lever for political and societal change by 2025. The new way of finding news and processing it is to look at sources not under intermediate editorial control. Major unedited "news" / video sites often provide many different unedited perspectives without anybody editing what we see, leaving it up to us individually to apply our own thinking and judgment about the sources we trust. Multiple bloggers addressing the same subject create the same new potential to harvest information from a range of sources in the marketplace of ideas, and to distill meta meaning from that.

In this scenario, professional journalism could be more alive than ever in 2025, although the output may be published in different ways. More bloggers will be the journalists of 2025 and vice versa, often not working exclusively under the umbrella of a single newspaper, TV station or magazine. By 2025 we may expect to have to think more and to make choices. This has particular relevance for politicians, who will need to be active participants in this developing, no-holds-barred marketplace of ideas.

This said, the "old" electronic media, notably television and radio, reach mass audiences with the same information and content, arguably creating an "informational commons" and thus arguably fostering informed, participative citizenship. Individually customized access to and use of information and communications could undermine this societal function and effect. Serious political debate has yet to begin on the future relevance of communication that serves basic public interest objectives – and more specifically on the future place and character of public service media in the Internet-based digital world of 2025.

Global governance for a global Internet?

Meanwhile, global inter-governmental and multi-stakeholder debate on future Internet governance and management looks certain to intensify through the UN-based Internet Governance Forum[18]. One clear pressure point is the growing demand to accommodate languages other than English, seen by many as a necessary condition for the continued existence by 2025 of a single worldwide Internet. A second is the push for more multi-lateral governmental oversight of ICANN, the private, not-for-profit corporation responsible under mandate from the U.S. government for managing the assignment of Internet domain names and numbering and other technical aspects of the Internet[19].

> *One clear pressure point is the growing demand to accommodate languages other than English*

18 http://www.intgovforum.org/cms
19 http://en.wikipedia.org/wiki/ICANN; http://www.icann.org

What world(s) do we want?

The prospect that by 2025 ubiquitous high-speed broadband access will become common-place has led some to predict that we will be living in a much more unified and socially egalitarian world. Others suspect that the online world will be largely a reflection and inten-sification of real world networks and communities, including social and cultural distinctions.

Another open question is the degree of virtualization that people will want in their lives. Humanity will presumably not escape our Maslovian pyramid of physical and metaphysical needs[20]. Services like Second Life may have inspired the imagination of what is possible in creating virtual worlds, but very soon after its launch it became apparent that what people create in Second Life, and the actions that they take, closely mimic real life.

Arguably the most important question we have confronted in this exercise is also the most difficult to answer: over the next 15 years, will the digital technologies and tools of mass collabo-ration draw human society closer together, or will they rather fragment our societies into myriad self-conscious, self-communicating, self-collaborating, self-absorbed communities of special interest or specific identity, with unpredictable political, economic and social consequences?

---

20 http://en.wikipedia.org/wiki/Maslow's_hierarchy_of_needs

CONCLUSION: WHAT DIGITAL WORLD DO WE WANT?

The fundamental political question Europe's democratic societies and political leaders must confront today is, quite simply, what place do we want Europe to occupy in the digital world of 2025, and what public policies do we need – starting today – to make it happen?

The foreseeable spread of digitally-enabled mass collaboration into most human activity takes this question way beyond digital technology and "ICT" sector policies themselves. Every policy area will have to address it – the sooner the better.

On the next page we offer an indicative list – particularly for the attention of the incoming European Parliament and European Commission – of policy areas in which the trends identified in this report need to be further examined and acted on, and where action – or inaction – over the next five years will prove decisive for Europe's economic and social well-being in the digital world of 2025, and beyond.

INDICATIVE EU POLICY PRIORITIES 2009-2014

Technology policy

> *Science, research & development*
  – European Research Area
  – ICT priorities & strategies
  – Public & private roles

> *Science education*

> *European software strategy*

> *Innovation through ICT*
  – Systems integration
  – Embedded systems
  – Life-time optimization

> *Standards / interoperability*

Economic policy

> *Education, training and skills
  for the digital world*
  – Employment policy

> *Smart growth – application of ICT in:*
  – Health care
  – Education
  – Public services
  – Major infrastructure

> *Intellectual property*
  – Copyright, patents, trademarks
  – European frameworks

> *Regulation*
  – Electronic communications
    ("telecom") framework
  – Privacy
  – Spectrum
  – Competition

> *Environment*
  – Emissions
  – Waste

Social and political dimension

> *Privacy & security*
  – Personal security
  – E-identity
  – Civil & national defence
  – Critical infrastructure

> *Social networks*
  – Media
  – Culture

> *Digital divide*
  – Universal service
  – Regional policy
  – Development policy

> *Politics & public sector*
  – Legislators/ participative democracy
  – Government
  – Public services

> *Internet governance*
  – Technical management of the
    Internet (Future of ICANN)
  – Languages/ single Internet?

European Internet Foundation
Political Leadership for Network Society

The Digital World in 2025: EIF Events & Guests

TOWARDS THE DIGITAL WORLD IN 2025: (13.11.2008)

Ajit Jaokar - Founder and CEO of Futuretext, Author of "Mobile Web 2.0"

Andrea Pirotti - ENISA, European Network and Information Security Agency

Andrew Herbert - Managing Director, Microsoft Research

Christina Kaul - International Policy Director, Vodafone

Eric Besson - French State Secretary, Prospectives & Evaluation of Public Policies & Internet

Erich Ruetsche - Manager Business Development & Relations, IBM Zurich Research

Gee Rittenhouse - VP, Head of Research, Bell Labs, Alcatel-Lucent

Howard Williams - Internet Institute, University of Oxford

Ilkka Lakaniemi - Head of Global Political Dialogue and Initiative, Nokia Siemens Networks

Lutz Heuser - Chair of ISTAG and SAP Corporate Research

Lynn St. Amour - President and CEO of the Internet Society

Marc Fossier - France Telecom Orange Group, Senior VP, Technologies & Innovation

Michel Vergotte - Director Business Development, eBay

Patrick Dixon - Founder and Chairman, Global Change

Viviane Reding - European Commissioner for Information Society & Media

INTERNET GOVERNANCE FORUM - FOLLOW-UP ON MEETING IN HYDERABAD (20.1.2009)

Antti Peltömaki - Deputy Director General, DG Information Society DDG2, European Commission

Martin Boyle - Senior Policy Adviser, Nominet UK

Peter Hellmonds - Head of Corporate Social Responsibility, Corporate Affairs Division of Nokia Siemens Networks

MEETING WITH INTEL CHIEF TECHNOLOGY OFFICER "THE POWER OF THE MICROCHIP" (28.1.2009)

Justin Rattner - Chief Technology Officer, Intel

CLOUD COMPUTING AND THE CONVERGENCE OF NETWORKS AND SERVICES (17.2.2009)

Mats Nilsson - Vice President, Head of Portfolio Management and Terminals for Multimedia Solutions, ERICSSON

Paolo Campoli - Senior Director Technology and Products, CISCO

Rian Liebenberg - Engineering Director, GOOGLE

A EUROPEAN RESPONSE TO NEXT GENERATION ICT (18.2.2009)

David Kennedy - Director at Eurescom (European Institute for Research & Strategic Studies in Telecomm.)

Joachim Schaper - VP of EMEA, SAP Research and member of ISTAG (Info Society Technology Advisory Group)

MEETING WITH LORD CARTER, UK Minister for Communications, Technology and Broadcasting (2.3.2009)

THE DIGITAL ECONOMY IN 2025: EUROPE'S ROLE AND WEIGHT IN THE GLOBAL DIGITAL ECONOMY IN 2025 (17.3.2009)

Gérard Pogorel - Professor of Economics and Management, TELECOM ParisTech (ENST)

Larry Hirst - Chair, IBM Europe, Middle East and Africa

Paul Hofheinz - President of the Lisbon Council

THE DIGITAL ECONOMY IN 2025: A EUROPEAN INDUSTRIAL PROPERTY STRATEGY FOR THE 21st CENTURY (18.3.2009)

David Benjamin - Co-chair of the Steering Committee of BASCAP (Business Action to Stop Counterfeiting & Piracy)

Margot Froehlinger - Director, DG Internal Market D (Knowledge-Based Economy), European Commission

THE DIGITAL WORLD IN 2025: PERSPECTIVES FOR THE EUROPEAN SOFTWARE INDUSTRY (2.4.2009)

Craig Mundie - Chief Research and Strategy Officer - Microsoft

THE DIGITAL WORLD IN 2025: SOCIO-POLITICAL ASPECTS (14.4.2009)

Ajit Jaokar - Founder and CEO of Futuretext, Author of "Mobile Web 2.0"

Henri Serres - Managing Director of Information Systems and Communication at the French Ministry of Defense

Ziga Turk - Secretary General of the European Council "Reflection Group on the Future of Europe"

SOCIO-POLITICAL ASPECTS OF THE DIGITAL WORLD IN 2025: TOWARDS A EUROPEAN IDENTITY PLATFORM (15.4.2009)

Reinhard Posch - CIO Federal Government Austria and Chair of the ENISA Management Board