



The Future of the Internet Economy

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Introduction

The Internet has, in a short space of time, become fundamental to the global economy. More than a billion people worldwide use it, both at work and in their social lives. Over the past three decades it has grown from an experimental research network and now underpins a range of new economic activities as well as activities and infrastructures that support our economies, from financial markets and health services to energy and transport.

But are we making the most of what the Internet has to offer our economies and societies? What are likely future developments, and can we make sure they are positive ones?

Major changes are taking place in how we access the Internet and how we make use of it. As a result, the Internet's reach, capabilities and potential achievements are high on the policy agenda in OECD and non-OECD countries.

The Internet offers access to a host of activities through both wired and wireless technologies. It provides a platform for innovation, for new communication technologies, the provision of new products and services and access to an unparalleled wealth of information. But this also raises concerns, notably in the area of reliability, scalability, security and openness of access. If global supply-chain management depends on the Internet, then a breakdown or security breach could cause major economic damage. If people's personal data are compromised online, it may breach their privacy or affect many other aspects of their lives.

Looking forward, the Internet is poised to connect an ever-greater number of users, objects and information infrastructures. This means that the policy framework governing its use and development also needs to be adaptable, carefully crafted and co-ordinated across policy domains, borders and multiple stakeholder communities.

This *Policy Brief* looks at likely future developments in the Internet economy, and how all stakeholders can help the Internet to meet the increasing demands made upon it, continue to drive innovation, provide new communications services and platforms, while being secure and respecting privacy. ■



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Observer oecd

Has the economy become an Internet economy?

The Internet is making economic activity more efficient, faster, and cheaper, and extending social interaction in unparalleled ways. Increasingly, the largest productivity gains for businesses come from using online networks in some form. The multinational food giant Nestlé, for example, now receives all of its orders directly from supermarkets over the Internet. The shipping company UPS used online networks to optimise its delivery routes, saving 12 million litres of fuel in 2006 from nearly 100 000 trucks.

The Internet has also brought unprecedented user and consumer empowerment as well as opportunities for new innovative and social activities. Individuals have greater access to information, which facilitates comparisons and creates downward pressure on prices. Internet users are extremely active, creating new content themselves and interacting in new ways.

The Internet is quickly permeating *all* economic and social domains, and most public policy areas. For instance, e-government has become the prime tool for supporting government functions and interaction with citizens and businesses. Healthcare systems are increasingly making use of the Internet and online networks to increase affordability, quality and efficiency, through electronic patient record systems, remote patient monitoring and healthcare delivery, along with improved diagnostics and imaging technologies. Educational performance is found to be correlated with home access to, and use of, computers – all other things being equal. Moreover, environmentally-friendly technologies based on the Internet in buildings and transport systems and alternative power generating systems can help address climate change and improve energy efficiency.

The influence of the “network of networks” is inherently global; helping to forge closer integration of our economies and societies. Moreover, as the Internet expands even further it can help the economic and social development of people of all countries. While there have been remarkable developments in recent years, much remains to be done: about 20% of the world’s population use the Internet, but over 5 billion people still lack access to it. ■

How is the Internet evolving?

Before the rapid development of the Internet, separate systems – telephone, television and video, individual computer systems – stored and transmitted voice, video and data. Today, these systems are converging onto the Internet. In addition to convergence of network platforms, convergence is also taking place at several other levels: at the content level with Video on Demand (VoD) and television over Internet Protocol networks (IPTV); at the business level, with companies offering combined television, Internet and telephone services to subscribers; and at the device level, with multi-purpose devices that can combine email, telephone and Internet, for example.

Indeed, this has become the era of converged media. Users upload some 10 hours of video *per minute* alone to the video sharing site YouTube. By 2008, nearly 300 million people are registered to use free VoIP (voice over Internet Protocol) software Skype, enabling them to make phone calls worldwide at little or no extra cost via their existing Internet access. Converged media are also increasingly becoming mobile with the expansion of wireless broadband networks.

As convergence takes place and investment in next generation networks (NGN) begins, the role of very fast optical fibre networks “to the home” becomes increasingly important given that emerging applications, such as high-definition television and video-on-demand, require increasing amounts of bandwidth.

The regulatory challenges associated with convergence are significant. With migration to Internet Protocol-based networks, one network can handle many types of converged services. This means that governments face a fundamental shift in the way they regulate broadcasting and telecommunication services. The issue for the future of the Internet Economy is how best to stimulate a competitive environment as technologies and markets evolve, to ensure that the Internet can meet growing expectations, especially as high speed networks, both fibre and wireless, develop. For this, insight is needed into the impact of convergence on competition, the regulatory and policy issues of network infrastructure and services, the promise of multi-platform competition, and the implications for greater connectivity, pricing, sustainable competition, investment and innovation.

As communication platforms converge towards using the Internet Protocol (IP), IP addresses are crucial to the scalability of the Internet and thus to the continued growth of the Internet economy, as all devices connected to the Internet need IP addresses to communicate. Over 85% of the total four

Box 1.
**TACKLING THE INTERNET
ADDRESS SHORTAGE**

Connecting to the Internet depends on having an Internet (protocol, IP) address, which is currently IP version 4. The unallocated pool of IPv4 address space is depleting, with 85% of the total four billion IPv4 addresses already allocated by 2008. A precise date for the exhaustion of IPv4 addresses cannot be given with certainty but it is estimated at around 2010 or 2011.

The solution is a new IP protocol that offers the possibility of more unique addresses. Available for some time, IPv6 allows for almost unlimited address space, but adoption has been relatively slow to date. For the Internet to connect billions of people and devices as well as creating smart environments, the extra addresses that IPv6 provides will be needed. Smart environments use new kinds of applications, like sensor networks. For example, the construction industry is using IPv6 to create smart buildings, which saves energy. IPv6 also enables features such as the Internet-based remote control of security cameras or turning on home appliances from a remote location.

billion IPv4 address blocks are already allocated and expectations are that the current pool of unallocated IP version 4 address blocks will be depleted within the next few years. Deploying the newer IP version 6 address blocks is necessary to enable growth in use of the Internet. But making the switch is difficult and it takes time and resources as well as a commitment by all stakeholders, including governments. ■

How is the Internet driving Innovation?

The Internet and information and communications technologies (ICTs) are profoundly changing how research and creative activity are undertaken, for example by enabling distributed research, grid and cloud computing, simulation, or virtual worlds. They are also changing the organisation of science, research and innovation, by linking the creativity of individuals and allowing organisations to collaborate, pool distributed computing power and exploit new ways of disseminating information. This is fostering competition, stimulating the restructuring of industries and institutions, with potentially major impacts on innovation and growth. ICTs and the Internet account for a significant share of total research and development, patent applications, firm start-ups and venture capital. The global nature of the Internet is further spurring the pace and scope of research and innovation, and encouraging new kinds of entrepreneurial activity.

Digital technology and the Internet are also transforming platforms for delivering news, entertainment and other information. Participative networks enable users to contribute to developing, rating, collaborating and distributing Internet content and customising Internet applications, driving a range of new social and economic opportunities alongside new models of production. In Korea, for example, more than 40% of Internet users have their own blog. The policy challenge is to encourage innovation, growth and change, and develop appropriate governance that does not stifle creativity or affect the openness of the Internet as a dynamic platform for innovation.

Because the marginal costs of exchanging and reproducing information and digital content are very low, another policy challenge is to facilitate access to and use of digital content and develop new business models while preventing unauthorised use. Many new business models are emerging around the provision of content, and this area is evolving rapidly. The music and video industries, for example, are still grappling with these issues as they seek to develop new, more effective and popular ways of commercialising their products on line.

Public organisations play a significant role in creating large amounts of publicly funded Internet content, research and information and holding digital content created by others. Facilitating access and commercial re-use of public sector content and information can bring significant economic and social benefits when re-used. An example is in developing innovative value-added services that utilise map and weather information. ■

How can we increase confidence in the Internet?

The question of security was not at the top of the agenda when the Internet was originally designed for a small and trusted community. Today, as a global platform for commerce and social interaction, confidence in the Internet is vital if full use is to be made of its potential, whether in buying and selling goods online, interacting with public administrations such as filing tax returns, or in managing of sensitive personal information such as health records. Absolute trust may never be achievable but users need to be confident that their online activities are as secure as offline equivalents.

Increasing trust online requires policies and measures to strengthen the security of information systems and networks, and more effectively ensure respect of privacy and personal data, to create trustworthy digital identities, and to protect consumers, minors and other vulnerable groups.

The Internet is widely viewed as both a critical infrastructure in itself and a key enabler of other critical infrastructures. The monitoring and control of power grids and water plants, for example, often depend on the functioning of underlying IP-based networks. In addition, most industrial control systems that monitor and control critical processes are increasingly connected, directly or indirectly (through corporate networks), to the Internet and therefore face new threats. Protecting the Internet is a public policy priority.

Cybercriminality has become a multi-million dollar industry that takes advantage of the borderless nature of the Internet. Cybercriminals develop malicious software or “Malware” to infiltrate or damage computer systems and to steal identities and confidential data such as credit card details. They use networks of several hundred thousands of malware-“infected” computer systems to extort money from public and private organisations by threatening to overload their services and make them unavailable. Law enforcement is essentially based on the idea that the criminal is physically present at the scene of the crime. However, “Internet criminals” can be on another continent, and frequently route through several third-party countries, making their precise location difficult to determine and creating challenges for law enforcement.

Protecting privacy is also becoming much more difficult in the Internet age. The Internet makes it possible to store or transfer huge amounts of data at little cost. At the same time, vast amounts of personal information are searchable, linkable and traceable. As a result, privacy-related risks are increasing. The more personal data are transferred from one entity to another, or are used to extract information for other purposes, the more likely a breach of privacy becomes. When thousands of personal records can be stored on a laptop or USB key, the loss or theft of that device can pose a major problem. The information could be used for fraud or identity theft purposes, it could be made public and severely damage a large number of individuals’ privacy or it could simply be lost or damaged if no backup copy had been made. ■

Where do we go from here?

Beyond the current Internet, a set of new technologies, such as radio frequency identification (RFID) and location-based technologies, are predicted to enable new innovative applications and cause the network to evolve into an “Internet of Things”. In the longer term, small wireless sensor devices embedded in objects, equipment and facilities are likely to be integrated with the Internet through wireless networks that will enable interconnectivity anywhere and at anytime. The future uses and capacities of technologies that bridge the physical and virtual worlds are expected both to bring economic benefits and raise new societal challenges.

An “Internet of things” is predicted to be able to help individuals in their daily tasks and enhance business processes, supply chain management and quality assurance. It will enable distance monitoring of ambient conditions (e.g. temperature, pressure) and be used in a myriad of new applications, in areas such as healthcare and environmental monitoring. However, concerns relating to the invisibility of data collection and to the ability to trace and profile individuals could be exacerbated if tags and readers become pervasive and are combined with sensors and networks.

Another pressing need for policy makers is to better understand the role and contribution of the Internet and other information and communications technology in driving productivity and economic growth, and as a platform for innovation, increased collaboration and shared creation. There is also a need to analyse the economic, social and cultural impacts of emerging Internet technologies, applications and services, including virtual worlds, sensor-based networks and social networking platforms.

In addition, more should be done to promote more open and competitive markets for goods and services, and to meet the challenges of transforming government and the public sector so that they are more efficient, transparent and accountable. Further research is also needed into the impact of Internet and related ICTs in addressing climate change and improving energy efficiency and into translating these findings into policy action.

As the global reach of the Internet increases, it is necessary to ensure that co-operation on regulatory enforcement expands as well. OECD governments have already developed policy frameworks to assist in cross-border co-operation on law enforcement in the areas of consumer protection, spam (unwanted e-mail) and privacy. More work is needed to improve cross-border co-operation, broaden access to information, and combat threats to the security and stability of the Internet, as well as assessing the impact of changing technologies, markets and user behaviour on our concept of privacy, security and consumer empowerment.

Finally, to craft appropriate policies, a broad range of information is required. Being able to better measure and assess the growth and

performance of the Internet is one vital piece of information. The Internet still represents a “black box” of unknowns for many stakeholders, despite its status as an increasingly critical infrastructure in many countries. There is also a need to improve statistical systems to measure the changing use of the Internet and related ICT networks by individuals and businesses in order to provide reliable information on evolving uses and the impact of the Internet on economic performance and social well-being.

Internet-related policies should be crafted with the input of business, government, civil society and technical experts. The participation of all stakeholders is needed to develop and implement policies and principles. Evolving towards an inclusive multi-stakeholder approach is the starting point for good governance in the information society. An effective and innovative multi-stakeholder approach is needed for government, the private sector, the Internet technical community, civil society and individual users to jointly shape the policy environment for the future of the Internet economy. ■

For further information

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