Chapter 1

An overview of the digital economy

The expansion of the digital economy has acted as a driver of economic growth in recent years and is transforming society as a whole. This chapter provides an overview of the current situation and likely evolution of the digital economy, and a synthesis of the publication. It highlights progress made and challenges ahead, drawing on national strategies, and concludes with an examination of the broader context of Internet governance issues.

1.1 Introduction

The digital economy is growing quickly (OECD, 2013a). It permeates the world economy from retail (e-commerce) to transportation (automated vehicles), education (Massive Open Online Courses), health (electronic records and personalised medicine), social interactions and personal relationships (social networks). Information and Communication Technologies (ICTs) are integral to professional and personal life; individuals, businesses and governments are increasingly inter-connected via a host of devices at home and at work, in public spaces and on the move. These exchanges are routed through millions of individual networks ranging from residential consumer networks to networks that span the globe. The convergence of fixed, mobile and broadcast networks, along with the combined use of machine-to-machine (M2M) communication, the cloud, data analytics, sensors, actuators and people, is paving the way for machine learning, remote control, and autonomous machines and systems. Devices and objects are becoming increasingly connected to the Internet of Things, leading to convergence between ICTs and the economy on a grand scale (Chapter 6).

This publication documents evolutions and emerging challenges in the digital economy and highlights ways in which OECD countries and partner economies are taking advantage of ICTs and the Internet to meet public policy objectives. It provides evidence and case studies to help inform policy makers of regulatory practices and policy options to help maximise the potential of the digital economy as a driver for innovation and inclusive growth.

National digital agendas are critical for boosting economic and social growth

Going digital can bring countries closer to sustained prosperity. Governments in OECD countries are increasingly cognisant of the need to develop the digital economy in a strategic manner to expand its benefits and respond to key challenges such as reducing unemployment and inequalities, and lifting people out of poverty. The growing number of national digital agendas highlights the increasing recognition that effective "Internet policy making" depends on a set of coherent policies, developed in close co-operation with all stakeholders, that build on the country's strengths and take advantage of the open, decentralised and scalable nature of the Internet (OECD, 2011).

The conditions that underpin the digital economy are closely interdependent. Infrastructures used to enable communication within and across borders need to be of high quality, accessible to all and available at competitive prices (Chapter 2). They provide a foundation for applications and services based on new business models, the development of e-commerce, enhanced production methods, and new collaborative scientific and social networks (Chapter 3). All these positive outcomes are dependent on building trust in the reliability and security of online networks, services and applications. Users must also be assured that their online privacy and consumer rights are protected (Chapter 5). Finally, people must be equipped with the appropriate skills to make use of ICTs and digital

processes and to manage risks to their online economic and social activities (Chapters 3 and 5). Ensuring that all these conditions are met requires a whole-of-government approach.

The analysis of national digital strategies confirms the relevance of such an approach for OECD countries and emerging economies, such as Brazil, Colombia and Egypt. On the supply side, all countries aim to further develop telecommunications infrastructures and to promote the ICT sector. On the demand side, they strive for higher uptake of ICTs by government and by businesses and SMEs in particular. Fostering the development of digital local content creation remains an important goal alongside improvements in public administration, healthcare, transportation and education. Strengthening digital security and privacy also ranks high, although the resources allocated to improving digital privacy protection are persistently lower than for security. Countries are also increasingly considering the need to promote ICT-related education, training and re-skilling in conjunction with measures to foster entrepreneurship and employment. In so doing, several countries also aim to further e-inclusion, especially for older people and disadvantaged social groups (Section 1.2).

However, leveraging the innovation and growth potential of the digital economy also calls for governments to facilitate the transition towards going digital and to recognise the potential disruptive effects. Accordingly, policy makers in charge of the digital economy in OECD countries and partner economies are starting to work with their counterparts in labour and education to leverage the potential of new digital markets for employment growth, and to facilitate the transition of workers to new types of digital jobs.

Despite passing several milestones, the digital economy has not yet reached full potential

Overall, the outlook for the ICT sector in 2015 is positive although the sector has not yet fully recovered in all countries from the double-dip crisis that struck the world economy in 2007 and 2009. ICT venture capital investment is on the rise and back to its highest level since the dot-com bubble. The share of ICT goods and services in OECD total value added has remained stable, while ICT global trade has continued to grow for ICT manufacturing and especially ICT services. ICTs play a key role in innovation activities, as demonstrated by Business Enterprise Expenditures on Research and Development (BERD) in the ICT sector and the recent increase in ICT-related patents (Chapter 2).

Broadband markets continue to grow with an increase in wireless broadband subscriptions offsetting a decrease in fixed telephony, confirming a trend towards mobile-fixed substitution. Fixed and mobile broadband subscriptions reached 344.6 million and 983.4 million subscriptions, respectively in June 2014, with corresponding annual growth of 3.7% and 14.2% over the past two years in the OECD area. Telecommunication revenue and investment levels remain relatively stable. However, the performance of communication networks is improving with the deployment of fibre and the mobile telephony norm Long Term Evolution (4G), while prices are declining, in particular for mobile services (Chapter 2). Overall, global Internet traffic grew by 20% annually and the number of people using the Internet reached 2.9 billion worldwide.

Although ICTs and the Internet already contribute significantly to digital economies worldwide, efforts to improve broadband speed, ensure access to Internet addresses for 1 billion users in developing economies (Chapter 2), and increase the use of broadband to generate wealth (Chapter 3), hold considerable potential to boost growth in the years ahead.

Available evidence for OECD countries reveals significant potential to expand coverage and improve the quality of fixed and mobile broadband infrastructures. The new OECD methodology for measuring advertised fixed broadband speeds (up to and over 1 Gbit/s) allows governments to identify key areas that require attention with a view to transforming the digital economy and maintaining progress towards the "Internet of Things" (Chapter 6). With regard to mobile broadband, governments are increasingly aware of the growing demands placed on networks and are conscious of the need to allocate more spectrum resources to mobile communications. Accordingly, policy makers are testing innovative licensing schemes to increase efficiency in the use of spectrum. They also now recognise the role of fixed infrastructures as a critical building block for offloading and backhauling wireless traffic and to enable better use of available spectrum (Chapter 4). The complementarity of fixed and mobile networks is one reason why emerging economies with less developed fixed networks face greater challenges in leveraging the rapid growth of wireless services. In OECD countries, around three quarters of smartphone use occurs on private Wi-Fi access via fixed networks.

Uptake by business, individuals and governments of digital opportunities enabled by broadband is central to achieving economic and social benefits (Chapter 3). Many developing countries are concentrating on the demand side with a particular focus on promoting entrepreneurship and use of ICTs by SMEs. In OECD countries, the opportunities created by the digital economy have begun to transform established industries, including banking, transportation, retail, energy, health, and publishing and media. In the case of the content industry the amount of digital content is growing with considerable room for dematerialisation, especially for books and videos. New business models based on collaborative production methods, such as crowdfunding platforms, now provide entrepreneurs with capital through peer-to-peer (P2P) lending or offer P2P currency exchange models. Similarly, in the sphere of domestic activities, new "sharing economy" platforms allow people to rent, exchange or share their apartment or car. All these initiatives challenge existing regulation of established markets and call for balanced policy responses that enable innovation while protecting the public interest.

The most recent data confirm the huge potential for increased adoption and use of ICTs and the Internet to boost growth through innovation in goods, services and business organisation, across all sectors (Chapter 3). While most firms in OECD countries have a broadband connection – 95% of all enterprises with more than 10 employees in 2014 – few use enterprise resource planning software (31%), cloud computing services (22%) or receive electronic orders (21%). E-commerce sales account on average for just 16% of total turnover, and up to 90% of e-commerce comes from business-to-business transactions (i.e. consumers account for a small portion of e-commerce). Differences among countries and between small and large firms remain considerable.

The scope for further uptake is significant for individuals as well. Despite wide diffusion – in 2014, about 81% of the adult population in the OECD used the Internet of which over 75% used it every day –intensity of Internet usage continues to vary across OECD countries and among social groups. Activities such as sending emails, searching for product information or social networking show little variation across countries, but differences are large for activities associated with a higher level of education such as e-government, e-commerce and online banking. The breadth of Internet activities carried out by users with tertiary education is on average 58% higher than for those with lower secondary education and below. About 70% of OECD students use the Internet at school but

only a few – between 12% and 2% depending on the country – use computers every day for practise and drilling sessions (OECD, 2014a).

Governments increasingly use ICTs to achieve public sector transformation and to shift from a citizen-centred to a citizen-driven approach. This trend is reflected notably by their use of social media to communicate and engage with citizens. At present, 28 out of 34 OECD countries have a Twitter account for the head of government or government as a whole and 21 have a Facebook account (Chapter 3).

Vigilance is essential to ensure competition and trust

To maximise the potential of the digital economy for productivity, innovation, growth and jobs, governments need to do more than encourage broadband expansion and uptake of ICTs and the Internet. They must also engage in further and renewed efforts to protect competition, lower artificial barriers to entry, strengthen regulatory coherence, improve user skills, and build trust in essential infrastructures and applications.

For example, competition in the digital economy is being challenged by several major shifts including: (i) technical convergence towards Internet Protocol (IP) fixed, mobile and broadcasting networks; (ii) increasing integration of business models among telecommunication providers and new Internet players providing over-the-top applications; and (iii) offers of bundled voice, video and data services. These changes necessitate regulatory reform in most countries, in order to apply the same rules to offers of similar services, and to ensure technological neutrality. A good example of this is the provision of privileged (unmetered) access to specific Internet applications in bundled offers ("zero-rating"), which can potentially enhance competition or inclusiveness in some circumstances and damage them in others. Likewise, policy makers and regulators need to remain vigilant to ensure that consolidation of mobile markets does not harm users or reduce the level of innovation resulting from competitive markets. They also need to ensure that mergers between fixed and mobile players, which have the potential to enhance competition, do not instead reduce the capacity of other actors to compete (Chapter 4).

Trust is also critical to economic and social interactions, and especially to virtual relationships conducted in a globally interconnected environment. ICTs and the Internet provide many benefits to users, but existing survey data show that concerns about security and privacy risks still affect user trust in digital products and services (EC, 2015). Businesses are increasingly taking steps to address these risks, with one estimate putting overall expenditure on privacy programmes among Fortune 1000 companies at USD 2.4 billion per year (IAPP, 2014).

Data security breaches continue to be a significant problem, however, leading to increasing interest by policy makers in mandatory breach-reporting obligations. Other indications of elevated attention in security and privacy risk include an uptick in cybersecurity insurance as a means to transfer risk, the continued development of national cybersecurity strategies, improved cross-border co-operation particularly in privacy enforcement, the growing engagement of courts, the emergence of transparency reports by companies as a means to address the "trust gap", and growing opportunities for skilled security and privacy professionals.

Tensions between the need to address security and privacy challenges and the need to avoid a drop in innovation and productivity remain acute. The OECD has called on leaders and decision makers to integrate digital security and privacy risk management in their

broader economic and social risk management frameworks, rather than addressing these issues as separate technical and legal challenges. Nevertheless, additional steps must be taken, in particular to supplement cybersecurity strategies with national privacy strategies, so as to address privacy issues in a co-ordinated, holistic manner (as called for in the OECD Privacy Guidelines) and enable stakeholders to clarify the depth of protection to be afforded to individuals and the limitations society is willing to accept to serve collective public interests (Chapter 5).

Internet governance and policy are high on the political agenda

With the growing pervasiveness of ICTs and the Internet across economies, the importance of Internet policy making and Internet governance has increased among stakeholders of the international community and are high on the agenda of many governments (Section 1.8). [1]

The next two years (2015-16) are set to shape the future Internet governance landscape. In particular, the outcomes of the following distinct but inter-related processes will be critical. The international community is developing a proposal to transition United States Government oversight of the Internet Assigned Numbers Authority (IANA) to the international Internet community. In December 2015, the mandate of the multi-stakeholder-led Internet Governance Forum (IGF) will need to be renewed and the high-level intergovernmental World Summit on the Information Society Conference (WSIS+10) will review the 2005 Tunis Agenda and propose a way forward. In September 2015, the United Nations will launch the post-2015 development agenda, setting sustainable development goals, which are likely to include increased access to ICTs and the Internet to create an inclusive and global digital economy. In this context, fostering innovation on the demand side and the development of content and applications in emerging countries will become a goal in upcoming years.

Underlying these initiatives is the fundamental need to preserve the openness of the Internet. The conception of the Internet as an open platform, where businesses, citizens and governments can serendipitously innovate and develop applications and services, has enabled numerous innovations in the digital economy. In recent years, however, concerns have emerged that the economic and social benefits brought by the open and decentralised architecture of the Internet and by the free flow of trans-border data may be affected, directly or indirectly, by issues such as territorial routing, local content or data storage requirements, network neutrality, the stalled transition to IPv6, universal acceptance of multilingual domain names and the creation of alternative networks.

The benefits of, and risks to, an open Internet will be discussed by ministers and other high-level stakeholders at the forthcoming OECD Ministerial Meeting in 2016, along with other key issues pertaining to global connectivity, the Internet of Things, demand-side initiatives to foster innovation and trust in the digital economy, and ways to foster job creation and develop the skills needed to maximise the benefits of the digital economy.

1.2 National digital strategies and ICT policy priorities

ICTs and the Internet are essential for the economy and for society as a whole. Their impact is so profound that no sector remains unaffected. The implications for policy making are thus far-reaching. While traditional ICT-related policies tended to focus on the ICT sector, recent policies have become more horizontal, covering issues ranging from business creation and productivity growth to public administration, employment and education,

health and aging, environment and development. ICT-related policies focus on enabling the positive economic and social conditions necessary for development and growth.

Most OECD countries and partner economies have established or are close to adopting national strategies addressing policy priorities related to the digital economy. Out of the 34 countries[2] that responded to the *OECD Digital Economy Outlook 2015* questionnaire, 27[3] have an overarching national digital strategy, many of which were established or revised between 2013 and 2014. A few countries do not have an overall strategy, either because it is under development or review (e.g. Austria and Switzerland) or because their digital economy policy comprises several strategies and policies associated with specific issues and/or sectors, which collectively form a national digital economy framework (e.g. the Russian Federation and the United States).

National digital strategies are cross-sectoral by nature and in many instances are designed explicitly to boost countries' competitiveness, economic growth and social well being. Denmark's *ICT Growth Plan*, for example, is designed to support "growth in the ICT sector as well as ICT-based growth in the private sector more generally".[4] Germany's Digital Agenda 2014-2017 highlights "the increased exploitation of the potential of innovation in order to achieve further growth and employment"[5] as its primary objective (in addition to enhancing high speed networks and trust). Italy's Strategy for the Digital Agenda 2014-2020 aims to "ensure economic and social growth, through the development of skills in business and the dissemination of digital culture among citizens".[6] Mexico's National Digital Strategy (2013) aims to make Mexico to "the leading country in digitization in Latin America … with a similar level of digitization to the OECD average by 2018".[7] Specifically, the strategy will focus on fostering innovation and entrepreneurship in the digital economy, improving the quality of education through ICTs, contributing to government transformation, guaranteeing universal access to health services and increasing civil participation. Turkey's Information Society Strategy and Action Plan 2014-2018 aims to promote "growth and employment in accordance with the 10th National Development Plan (2014-2018) and the 2023 Goals of the Turkish government".[8]

Some national strategies, such as that of Australia, plan to make the country "a leading digital economy by 2020".[9] The Plan France Numérique also aims to build a more competitive digital economy in addition to targeting youth and preserving and reinforcing social values. [10] Japan's ambitious Declaration to be the World's Most Advanced IT Nation aims to achieve its goal by 2020, [11] while the Information Economy Strategy of the United Kingdom intends to "help the UK accelerate in the global race, focusing on [its] strengths".[12] The tendency to focus on a country's strength emerges as a characteristic of national digital strategies across some OECD countries.

The various national digital economy strategies of EU member countries reflect the objectives set out in the Digital Agenda for Europe (EC, 2010), the first of seven flagships initiatives established under the "Europe 2020" strategy for smart, sustainable and inclusive growth. The aim of the Digital Agenda is "to maximise the social and economic potential of ICT, most notably the Internet, a vital medium of economic and societal activity". To help EU member states achieve this objective, the Digital Agenda contains 132 "actions",[13] grouped around seven challenging priority areas including: (i) achieving the digital single market; (ii) enhancing interoperability and standards; (iii) strengthening online trust and security; (iv) promoting fast and ultra-fast Internet access for all; (v) investing in research and innovation; (vi) promoting digital literacy, skills and inclusion; and (vii) promoting ICT-enabled benefits for EU society.

Typically, national digital economy strategies build on and sometime integrate pre-existing national strategies related to ICTs, for example, national broadband strategies, e-government strategies and cybersecurity strategies. They often co-exist with other complementary national strategies such as national innovation strategies or development strategies. The forthcoming Digital Agenda for Austria, for example, is building on existing national strategies such as Broadband Austria, e-Health in Austria,[14] eFit 21 – Digital Agenda for Education[15] and e-Accessibility in Austria[16] among others. Sweden's ICT for Everyone – A Digital Agenda for Sweden[17] builds on a number of ICT-specific strategies including the national Broadband Strategy, [18] the E-Government strategy,[19] ICT for a greener administration[20] and the e-Health Strategy.[21] In addition, Sweden's national digital strategy is complemented by the National Strategy for Regional Growth and Attractiveness[22] and the Swedish Innovation Strategy.[23]

Key pillars of national digital economy strategies

The following list reflects the key pillars of many present national digital strategies, with the majority emphasising demand-side objectives (3-8).

1. Further develop telecommunications infrastructure (e.g. access to broadband and telecommunication services) and preserve the open Internet.
2. Promote the ICT sector including its internationalisation.
3. Strengthen e-government services including enhanced access to public sector information (PSI) and data (i.e. open government data).
4. Strengthen trust (digital identities, privacy and security).

Additional demand side objectives, prominent in many national digital strategies include the following:

5. Encourage the adoption of ICTs by businesses and SMEs in particular, with a focus on key sectors such as (i) healthcare, (ii) transportation and (iii) education.
6. Advance e-inclusion with a focus on the aging population and disadvantaged social groups.
7. Promote ICT-related skills and competences including basic ICT skills and ICT specialist skills.
8. Tackle global challenges such as Internet governance, climate change and development co-operation.

Broadband capacity, coverage and resilience

All national digital strategies promote the development of national telecommunication infrastructure and services. Typical objectives include: increase broadband capacity and speed; increase broadband coverage to better connect remote areas; and improve the resilience of existing broadband infrastructure. Many strategies add a further objective: expand mobile broadband and allocate spectrum efficiently.

Digital Canada 150, for example, includes the pillar "Connecting Canadians" which states that "all Canadians, especially those living in rural areas, should have access to high-speed broadband and affordable wireless services so that they can participate and benefit from the digital economy".[24] To achieve this objective, Canada plans to invest CAD 305 million over five years to extend and enhance access to high-speed broadband networks with the aim of reaching a target speed of 5 megabits per second (Mbps) for up to 280 000 additional Canadian households.[25]

The United Kingdom's Information Economy Strategy foresees the provision of high-speed broadband to enterprise zones that are presently not served. To this end, Broadband Delivery UK (BDUK), which forms part of the United Kingdom Department for Culture, Media and Sport, is implementing projects such as the Super Connected Cities Programme (SCCP) to support broadband growth in cities. SCCP will fund cities to provide access to high-speed wireless broadband in publicly owned buildings and remove barriers to rapid private sector deployment.

The overall objective of Sweden's national digital strategy, ICT for Everyone – A Digital Agenda for Sweden, is to achieve world-class broadband by 2020, with access guaranteed for 90% of all households and businesses at a minimum speed of 100 Mbps. To reach this target, the Swedish government plans to establish good market conditions and eliminate obstacles to development. This includes ensuring that relevant regulation is in place.

A primary objective of Digital Czech v 2.0 – The Way to the Digital Economy,[26] is to support the development of high-speed Internet networks at speeds of 30 Mbit/s for all inhabitants of the Czech Republic and 100 Mbit/s for at least half of all households by 2020.

Australia's national digital strategy intends to narrow the gap in online access between capital cities and regional areas in households and businesses by 2020. Portugal's Agenda Portugal Digital (APD),[27] adopted in 2012, aims to promote the development of broadband infrastructure to facilitate access for all citizens to broadband speeds equal or over 30 Mbps by 2020. Accordingly, the Portuguese government launched five public tenders for the deployment of high-speed networks in rural areas, involving 139 municipalities covering more than 1 million people and investments worth EUR 156 million. Luxembourg's Digital Lëtzebuerg[28] envisions an ambitious roll out of countrywide ultra-high broadband connections and plans to offer 100% of the population the possibility to opt for a 1 Gbit/s downstream / 500 Mbit/s upstream or faster domestic connection by 2020.

Likewise, the US national broadband plan, Connecting America: The National Broadband Plan,[29] released by the FCC on March 2010, seeks to ensure that all people living in the United States have access to broadband capability. The plan set an ambitious goal of providing at least 100 million homes with affordable access to actual download speeds of minimum 100 Mbps and actual upload speeds of minimum 50 Mbps by 2020. It also recommended that the FCC make 500 MHz of spectrum newly available for broadband use by 2020 and set forth a number of recommendations aimed at improving the utilisation of existing infrastructure and fostering further infrastructure deployment. The vast majority of recommendations in the plan do not require new government funding; rather, they seek to drive improvements in government efficiency, streamline processes and encourage private activity to promote consumer welfare and national priorities. The principal funding requests relate to: (i) improving public safety networks, (ii) speeding deployment of Internet services to unserved geographical areas, and (iii) increasing broadband adoption efforts. For example, the plan recommends that Congress consider public funding of approximately USD 6 billion for the creation of a federal grant programme to support the establishment of a nationwide, wireless, inter-operable broadband public safety network.

Resilience is a major topic in the national digital strategies of a number of countries. Japan's strategy, for example, aims to secure IT infrastructure environments at the world's highest levels. This not only includes policy measures to secure fair competition among businesses with a view to enabling the use of low-cost, high-speed broadband environments; it also incorporates measures to ensure the use of ICTs during large-scale

natural disasters through higher resilience and redundancy of ICT infrastructures. The measures presented include: (i) redundancy in international IT infrastructure including undersea cables; (ii) regional distribution of data centres (which are currently concentrated in the Tokyo region); and (iii) regional collaboration to encourage distribution of Internet exchanges and backup systems.

Luxembourg's Digital Lëtzebuerg, foresees the roll out of broadband with a particular focus on ultra-high bandwidth in dedicated business areas, which will feature guaranteed redundant fibre access.

The Digital Agenda for Norway, ICT for Growth and Value Creation,[30] aims to increase the security and robustness of telecom networks. The Ministry of Transport and Communications will work with providers and the Norwegian Post and Telecommunications Authority to consider additional measures for increased network security, robustness and preparedness. These measures are directly related to policies on security risk management for the digital economy, discussed further below.

Development of the ICT sector: New technologies, goods and services

The other supply-side objective present in all national digital strategies is increased support for the ICT sector, typically in the following areas: (i) research and development programmes, (ii) promotion of standards, (iii) venture capital investments, (iv) foreign direct investment, and (v) export of ICT goods and services.

Many research and development (R&D) programmes focus on emerging technologies, in particular the Internet of Things, cloud computing and big data analytics. The Plan France Numérique, for example, plans to invest EUR 150 million (USD 162 million) to support R&D through five strategic digital technologies and services: (i) connected objects, (ii) supercomputing, (iii) cloud computing, (iv) big data analytics, and (v) security of information networks. Germany's Digital Agenda 2014-2017 intends to promote investment in: (i) industrial ICT applications, (ii) IT security research, (iii) microelectronics and (iv) digital services. Furthermore, two *Big Data Solution Centres* have been established in Berlin and Dresden to promote innovation related to big data (i.e. data-driven innovation) in industrial applications (Industry 4.0), science (e.g. life sciences) and healthcare.

Japan's national digital strategy aims to support the development of (i) internationally cutting-edge network technologies, in particular ultra-high-speed network transmission technologies; (ii) data processing and analysis technologies, including pattern recognition technologies; (iii) device, sensor and robotics technologies; (iv) software development and non-destructive testing; and (v) highly developed multilingual speech translation systems. Korea's National Informatization Master Plan[31] foresees investments in mobile platform technologies worth KRW 35 billion (USD 32 million). Poland's Strategy for Innovation and Economic Efficiency "Dynamic Poland 2020"[32] anticipates support for the development of the "Internet of Things" with particular emphasis on the energy sector (e.g. smart meters and power control systems). Finally, Digital Canada 150 plans to allocate CAD 1.5 billion to the Canada First Research Excellence Fund to help post-secondary institutions excel globally in research into (ICT) areas that create long-term economic advantages for the country. In addition, CAD 15 million will allocated to support research in quantum technologies and CAD 20 million will be assigned to support innovative R&D, with a view to linking small and medium-sized enterprises (SMEs) with universities, colleges and other research institutions.

The promotion of ICT-related standards is also a prominent feature of many national digital strategies. The second pillar of the Digital Agenda for Europe promotes "Interoperability & Standards" across EU member countries to ensure "that new IT devices, applications, data repositories and services interact seamlessly anywhere".[33] Achievements should be realised through improved standard-setting procedures and the promotion of better use of standards. The UK's Information Economy Strategy also places significant emphasis on interoperability and standards. According to the strategy, the Government has "to bring together a range of stakeholders [including bodies in the standards field] to align programmes, to build on existing knowledge and to put the United Kingdom in the best position to influence future standards at an international level". The strategy envisions a focus on "the use of standards for IPv6 and securing DNS". It also calls for better definitions for concepts such as cloud computing, 5G mobile and the Internet of Things "to enable ideas to be easily incorporated into standards and services". In a number of national digital strategies, promotion of standards is considered in relation to specific sectors. In Germany, for example, the strategy focuses on standards that optimise interoperability between ICT goods and service providers and "traditional" manufacturing, in line with Germany's promotion of "Industrie 4.0".

National digital economy strategies also promote investment in the ICT sector through venture capital. The Business Development Bank of Canada is due to make investments worth CAD 300 million in ICT companies according to Digital Canada 150. The strategy also anticipates funding of CAD 100 million to the Canada Accelerator and Incubator Program to support digital entrepreneurs and CAD 15 million annually to internships in SMEs. Germany also highlighted the importance of VC investments to globalisation of the ICT sector, with a particular focus on support for IT start-ups. Specific measures cited in the Digital Agenda 2014-2017 include: (i) information and advice for founders; (ii) improvements to financing through internationally competitive conditions for VC and crowd investments; (iii) "matching" start-ups to traditional businesses with related economic activities; (iv) targeted support of founders including their links to other German start-ups; and (v) the creation of international start-up "hubs" including incubators.

In France, the Plan France Numérique includes support for start-up incubator programmes. EUR 200 million has been allocated to Halle Freyssinet, an incubator site expected to accommodate more than 1 000 start-ups once operational in 2016. EUR 15 million of this amount has been dedicated to international promotion to attract potential investors and start-ups to the site. Several national digital strategies, including the Plan France Numérique, emphasise the importance of attracting foreign direct investment. Luxembourg's Digital Lëtzebuerg, for example, aims to maintain a positive environment for existing ICT companies while attracting new digital businesses. Egypt's national digital strategy[34] aims to attract investments to expand existing ICT companies and generate job opportunities (Box 1.1).

Some countries also emphasise the need to strengthen the export capacities of the ICT sector. Poland's Strategy for Innovation and Economic Efficiency "Dynamic Poland 2020" aims to promote the international expansion of the ICT sector, with a focus on outsourcing related activities. Hungary's National Infocommunications Strategy[35] also cites investments to promote the digital economy, including through the development of ICT services eligible for export. Mexico's development agenda Prosoft 3.0 seeks to establish the country as the second largest exporter of IT globally and quadruple the value of the sector. Prosoft 3.0 outlined eight strategic areas with key objectives for the next ten years (Figure 1.1).

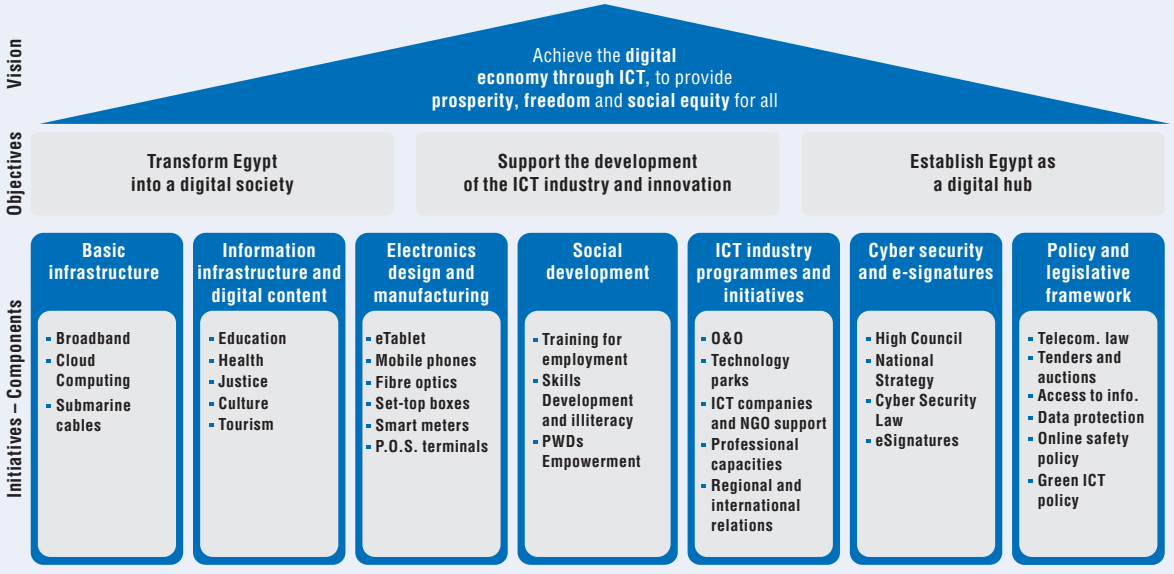
Box 1.1. **The Egyptian national ICT strategy**

The Egyptian ICT strategy has remained steadfast in its underlying objectives: (i) establish a strong ICT infrastructure as the backbone for development of the ICT sector, (ii) create spill-over effects to improve the general quality of life and increase job opportunities, and (iii) contribute to national economic development and GDP, estimated to reach 4% in 2014/15. In the aftermath of the 2011 revolution, the new government has persisted in supporting the ICT sector, which has remained resilient to national and global shocks and maintained the growth levels achieved in previous years.

The ICT strategy of the Ministry of Communications and Information Technology (MCIT) for 2014-2020 is entitled "Achieve the digital economy through ICT, to provide prosperity, freedom and social equity for all". The strategy involved multi-stakeholder input from NGOs, academia and multinational corporations, whose co-operation is central to implementing a series of strategic business plans with a focus on citizen participation and empowerment. The three main strategic objectives are: (i) transformation of Egypt into a Digital Society, (ii) development of the ICT Industry, and (iii) establishment of Egypt as a global digital hub.

The Digital Society is the primary strategic objective of the overall strategy and also the name of an ambitious business plan targeting the integration of government databases and supporting systems, in ways that enable the seamless delivery of services to help grow the economy, raise the standard of living and ensure better governance. The plan involves the utilization and deployment of ICTs to increase the efficiency of the government performance and facilitate services provision for citizens[1]. This will be achieved by building an ICT ecosystem that promotes the efficiency and transparency of internal government operations and the ubiquitous availability of quality e-services to all citizens and businesses. A national digital platform will be developed to ensure the seamless integration of different governmental systems and databases.

MCIT has identified seven pillars to achieving the objectives set out in the strategy: (i) basic infrastructure; (ii) information infrastructure and digital content; (iii) electronics design and manufacturing; (iv) community development; (v) ICT industry programmes and initiatives; (vi) cybersecurity and e-signatures; and (vii) policies and legislative frameworks. The seven pillars have been translated into strategic business plans for implementation.



Box 1.1. **The Egyptian national ICT strategy** *(cont.)*

The origins of the **Basic infrastructure** strategy date back to the "e-Misr" plan launched in 2011, which aimed to diffuse broadband services throughout Egypt, including underserved areas. Broadband supply will be ensured through regulatory interventions, legislative reforms and investment in infrastructure upgrade. The broadband strategy also responds to greater demand for bandwidth, coupled with consumer appetite for video content, news and multimedia services.

Cloud computing is another major component covering private as well as governmental practices, with a view to increasing the efficiency and cost effectiveness of IT systems. The main objectives are: (i) setting up the government cloud, (ii) providing cloud services to SMEs, and (iii) building cloud farms to serve the region and Africa. The model presents an affordable method of accessing needed infrastructure and applications, thus potentially serving the SME community as well as the governmental sector.

The Information infrastructure and digital content strategic business plan aims to support the government in achieving social justice targets, and to extend simple, affordable and ubiquitous access to knowledge and services, including to marginalized and remote segments of society. The plan supports programmes designed to promote and generate the development of digital content and services related to various sectors of the economy, particularly those of highest value to citizens and the overall economy (e.g. education, healthcare and justice, etc.). In addition, it encourages the use of open source material and the development of mobile applications and technologies in view of the available human skills, high mobile penetration (112%) and potential market demand both locally and regionally.

The plan also aims to preserve Egyptian identity through the conservation of natural and cultural heritage, drawing on knowledge generation among users. It fosters and enhances creativity with a view to moving towards sustainable development and a knowledge-based society. The plan rests on four pillars: promoting Arabic culture and Egyptian identity; responding to demands for new skills and qualifications; developing a competitive industry and new investment opportunities; and safeguarding Egypt's cultural heritage and reinforcing its international reputation. A key component of the plan is the use of open government data and user-generated content.

The Electronics design and manufacturing strategic business plan is geared towards maximising the potential of human resources available in the country, with both industries acting as important catalysts for quantum leaps in economic growth and development. The twin objectives of this plan are to increase industry revenues to EGP 70 billion by 2020 and EGP 560 billion by 2030, and to create 30 000 new jobs by 2020 and 300 000 by 2030. Achievement of these objectives relies on a foreign direct investment attraction programme geared towards ODMs/OEMs, and the creation of mega manufacturing sites in Egypt. In addition, the strategy aims to encourage the fabless design sector to develop technology and create innovative companies in Egypt. The plan aims to position Egypt among the top ranks of countries supplying software development skills and services to the rest of the world.

The Community development strategic business plan highlights social responsibility and targets women, inhabitants of remote and underprivileged areas, people with disabilities or reading difficulties, older people, orphans, street children and slum-dwellers, with the aim of using ICTs to improve quality of life. The plan supports and empowers the various segments of Egyptian society, enhances the role and presence of civil society associations, and aims to develop Egypt as a significant regional and global model in the use of ICT for social responsibility.

The ICT industry programmes and initiatives strategy capitalises on Egypt's unique geographical location and massive human talent pool, comprising highly qualified telecommunications engineers and IT professionals, which have enabled the creation of a strong outsourcing and offshoring industry. The strategy builds on these resources with a view to transforming Egypt into a digital hub for the delivery of Internet, telecommunications and digital services to the region and Africa. An important part of the strategy is the development of the new Suez Canal zone, which aims to generate approximately 120 000 job opportunities and USD 860 million over five years[2]. The plan is divided into two streams. The first lays

Box 1.1. **The Egyptian national ICT strategy** *(cont.)*

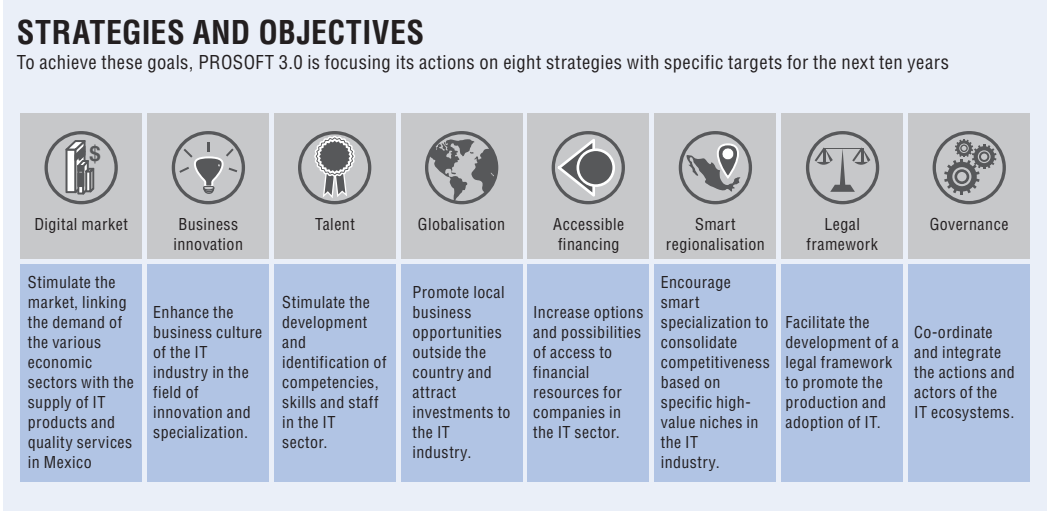
the foundation for the development of export capacity in the ICT sector. The sector's export capacities in the zone will be optimised through the creation of an international centre availing telecom services, and establishing the legal and infrastructural foundations of a technology park to attract local, regional and international companies. Key locations will also be identified to attract international investment for the establishment of a regional centre for electronic industries, especially mobiles and related components. The second stream concerns the enabling role played by the ICT sector in relation to other sectors, both locally and internationally, in particular the development of state of the art navigation, shipping and port logistical services. On the security front, the multi-stakeholder High-Level Cyber Security Council is mandated to protect data privacy and security in the digital society as part of the Cybersecurity and e-signatures strategy.

The policy and legislative framework strategic plan is an overarching tool that aims to ensure the legislative and procedural requirements for all other ICT projects and initiatives, and to create the appropriate environment needed for investment, as well as the protection of citizens' rights. This will be achieved by building a suitable environment for investment, including the development of existing legislation through multi-stakeholder participation, regulation and protection of citizens' rights to govern and regulate the business process. Over the past 15 years, the ICT sector has proven an indispensable engine for growth and development in Egypt, permeating all other sectors in the country. Investment and enhanced security are indispensable prerequisites for its continued work. The overall required investment for the National ICT Sector Strategy 2020 was estimated at nearly EGP 120 billion. Allocation of venture capital, investment banks and public-private partnerships, and local and international investors are forecast to cover around 88% of the total planned required investment.

For more details about Egypt's national digital ICT strategy, please consult *www.mcit.gov.eg*

1. The plan also foresees the development of a national identity smart card for citizens to access such service. In order to exploit potential synergies, MCIT is currently working on making the appropriate ecosystem available. The ecosystem includes as its main corner stone the establishment of a National Council for the Digital Society, which aims to institutionalize and coordinate: (i) strategic investments in, and the deployment of, digital government services across the various government entities and sectors, (ii) the change management and process re-engineering needed, as well as (iii) the regulation and synchronisation of services offered to Egyptian citizens by affiliated entities.
2. The establishment of technology parks represents a major business plan. They are a tool to promote local economic development. Building on the accumulative experiences of the Smart Village and the Technology Park in Maadi, the geographical map of the new technology parks will cover 9 of Egypt's governorates including within the new Suez Canal zone.

Figure 1.1. **Strategic areas of Mexico's Prosoft 3.0**



Source: Secretaría de Economía, Mexico.

Open data and e-government

Some national digital strategies highlight the use of open data citing improved interoperability as a main benefit. The Digital Agenda 2020 for Estonia,[36] for example, aims to open up public sector data for business innovation and promote the joint use of technologies and data (including cloud computing). It also aims to ensure cross-border interoperability of Estonian service infrastructure to facilitate the use and provision of cross-border services for both citizens and enterprises. In Japan, the Declaration to be the World's Most Advanced IT Nation highlights the key role of ICTs in enabling public service delivery at any time, by anyone, anywhere, via a one-stop e-government portal through which public sector data can be accessed. Promotion of open data usage ranks high in Japan's government.

Today's national digital strategies recognise that governments can act as catalyst for the digital economy. This is noticeable in the case of open data initiatives, where the public sector can stimulate data-driven innovation by opening up public sector information, including data. E-government initiatives are also used to stimulate the adoption of a wide range of applications needed for e-health and e-commerce. In this respect, a major trend in the current set of national digital economy strategies is the ongoing effort to promote trust in the digital economy through the establishment of (i) digital identities for all citizens, and (ii) electronic document verification systems (including e-billing systems).

Digital identities and e-authentication

A number of national digital strategies have prioritised the creation of national digital identities for citizens. The Digital Agenda 2020 for Estonia, for example, plans to develop existing national electronic identity cards (including mobile IDs) and promote their use in Estonia and across borders. Italy's Strategy for the Digital Agenda 2014-2020 also highlights the issue of digital identity with government spending of EUR 50 million foreseen to guarantee safe and secure access to digital services provided by the public administration and private entities, for all citizens and businesses, while ensuring a high degree of usability with mobile devices. Japan has also launched a large-scale initiative to establish a national digital identity for all citizens, with significant government investments linked to introduction of the "Number System", which will provide an infrastructure for IT utilization in the future. The individual numbers and corporate numbers are designed to enable accurate and rapid information confirmation and identity verification.

While not all national digital strategies aim to provide government digital identity management services, some support the deployment of secure authentication services. Digital Canada 150, for instance, foresees the creation of "new authentication services for consumers, including the Credential Broker Service and GCKey, to make it easier to manage and secure online usernames, identities and passwords". In the United Kingdom, the Information Economy Strategy anticipates the government "work[ing] closely with industry, privacy advocates and consumer groups to develop an Identity Assurance solution for HMG [Her Majesty's Government] services that leverages existing capabilities and sets informed industry standards". It is expected that "knowledge and skills applied during the development of this IDA [identity assurance] solution will create a centre of excellence within HMG across a range of digital, technology and service sector disciplines (e.g. identity and authentication technology, design, cyber security, research, business transformation, mobile communications, digital service and platform development)." A complementary measure consists of promoting international interoperability by aligning

the United Kingdom's IDA approach with that of other national governments, international standards bodies and major industry associations. Finally, some national digital strategies also promote document verification services, including digital signatures. Australia, for example, plans to expand the use of the Document Verification Service and investigate the use of trusted third-party credentials by the government. In Hungary, the National Infocommunications Strategy plans to boost the electronic commerce market not only by reinforcing electronic payments, but also by promoting electronic invoicing and e-signatures.

Trust: Digital privacy and security

These efforts are consistent with a key objective of many national digital strategies – to increase trust in the digital economy. The protection of privacy is seen as critical for trust, however effective implementation still raises challenges. The "Protecting Canadians" pillar of the *Digital Canada 150* strategy details existing forms of protection "in place for families and businesses through some of the most modern and effective privacy and anti-spam laws in the world". In the Czech Republic, the national digital strategy calls for the Office for Personal Data Protection to monitor the development and application of new forms of technology, and propose solutions in the event that self-regulatory mechanisms fail. The strategy also calls for the modification of existing legislation if necessary. Mexico's National Development Plan calls for measures to ensure personal data protection, while also encouraging accountability in the use of these data. Finally, the United Kingdom's Information Economy Strategy calls for the government to continue efforts "to drive and influence EU and international discussions in key areas such as privacy and data protection and the digital single market to ensure that growth opportunities are not inhibited by new or existing levels of regulation, while providing a proper balance of protection and security for citizens".

Although protection of privacy features prominently in many national digital strategies, this is not reflected in budget allocations – no country has yet allotted funding for privacy-related measures. This may be linked to the persistent perception that privacy is a legal matter under the purview of specialised enforcement authorities rather than a strategic horizontal objective. In some cases, however (e.g. Luxembourg's Digital Lëtzebuerg), dedicated R&D funding for ICT security and cryptology may provide spillover benefits for privacy-enhancing technologies.

Measures linked to cybersecurity appear frequently in national digital economy strategies, including references to R&D support measures and national cybersecurity strategies (e.g. Digital Canada 150 refers to Canada's Cyber Security Strategy). Cybersecurity measures may include public information on cyber risk and measures to combat cybercrime. Australia's national digital strategy, for instance, describes a number of actions to address digital security concerns including the development of a "National Plan to Combat Cybercrime" and the release of "Digital Citizenship Best Practice Principles" to address security risks. In Hungary, the National Infocommunications Strategy has allocated EUR 17 million to IT security with the aim of maximising protection of networks, IT infrastructure and public administration e-services, as well as disseminating information on digital risk management. Korea and Japan have also highlighted cyber security in their respective strategies, with the former earmarking government funds worth KRW 246 billion.

Some national digital strategies also aim to strengthen the national cybersecurity industry. The United Kingdom's Information Economy Strategy reiterates commitments made in the National Cyber Security Strategy to award 11 leading universities the status of Academic Centre of Excellence for Cyber Security Research, sponsor 78 PhDs and fund two Research Institutes. In addition, the strategy calls for the development of new routes to transfer cyber expertise between research institutions, industry and Government Communications Headquarters (GCHQ), otherwise known as the Cyber Growth Partnership. It also calls for collaboration with the Information Economy Council on areas of mutual interest, including R&D and skills, and for renewed commitment to develop and exploit innovations in cyber security. In Germany, the Digital Agenda 2014-2017 anticipates efforts to strengthen the security of online services via secured ICT infrastructures and to reinforce the IT security industry.

ICT adoption in education, healthcare and transport

Many national digital strategies aim to promote adoption of ICTs and the Internet in key areas such as education, healthcare and transport.

Promoting ICT adoption in education ranks high among national digital strategies with one frequently stated aim being to capitalise on the digital revolution to improve the effectiveness of the education system and ensure the development of basic and advanced ICT skills. Measures range from a focus on infrastructure (e.g. better connecting education institutions) to promotion of ICT-related curricula, teacher training and promotion of online learning environments (e.g. massive open online courses). In the United States, the Schools and Libraries Program is allocated USD 3.9 billion per year to provide schools and libraries with access to robust high-speed broadband connections. In 2014, the FCC freed up programme funds to address the broadband connectivity gap facing many schools and libraries capable of supporting individualised learning, especially in rural areas, and maximised the available options for purchasing affordable high-speed connectivity.

National digital strategies typically include a series of complementary measures. Australia's National Digital Economy Strategy aims to provide schools, registered training organisations (RTOs), universities and higher education institutions with the connectivity to develop and collaborate on innovative and flexible educational services, the resources to extend online learning resources to the home and workplace, and the facilities to offer students and learners the opportunity for online virtual learning. Its first action in this regard will be to complete the development of a new curriculum encompassing digital learning. Complementary efforts include partnering with industry to promote digital careers and encouraging access to virtual classes for vocational education and training (VET) students.

In the case of Canada, spending worth CAD 36 million over four years is foreseen to support the Computers for Schools Program, which provides students and interns with access to digital equipment and skills training. The United Kingdom's Information Economy Strategy describes a series of measures to promote ICTs in education with a view to ensuring a sufficient level of ICT skills in the economy. It further calls for a group combining the supply and demand sides of skills provision to develop a digital skills strategy. Specific actions for consideration include promoting the benefits offered by massive open online courses (MOOCs) to support ICT learning, workforce re-skilling and increased digital literacy. Other complementary measures include encouraging stakeholders from the private sector and

education institutions to agree on actions to improve employment outcomes for computer science courses, and to accelerate the uptake of e-skills apprenticeships.

E-Health care is another prominent area targeted by many national digital strategies. As with education, some measures focus on ensuring high-quality broadband connectivity across the healthcare system. But in most cases, measures aim to further the development of tele-medicine or the deployment and better use of electronic medical healthcare records. Italy's Strategy for the digital Agenda 2014–2020, for example, has allotted investments worth EUR 750 million to improve the cost-quality ratio of health-related services by reducing waste and inefficiency. Measures include electronic health records for all citizens, electronic pharmaceutical prescriptions, and online booking with a view to optimising health-related resources and reducing waiting times.

Some measures also target specific social groups, especially the elderly population. Australia's National Digital Economy Strategy, for example, aims to increase the share of high-priority consumers able to access individual electronic health records to 90% by 2020. These include older people, mothers and babies, and those with a chronic disease as well as their caretakers. The main steps include: (i) expanding the Medicare Benefits Schedule (MBS) for tele-health items; (ii) implementing video consultations for the after hours GP Helpline and Pregnancy, Birth and Baby Helpline; and (iii) evaluating outcomes from tele-health trials and developing action plans to address challenges.

In Austria, the initiative e-Health in Austria aims to address key challenges related to e-health financing, interoperability, and co-ordination among health institutions and stakeholders. Similarly, Germany's Digital Agenda 2014-2017 aims to improve co-ordination and interoperability between key stakeholders and their IT systems, and to address emerging IT security risks related to increasing digitisation of the healthcare system.

Lastly, some national digital strategies target transportation and logistics. Japan's national digital economy strategy plans to use ICTs to create a safe, economic and environmentally friendly road traffic system. It also aims to further internationalise and expand Japan's agriculture-related IT industry. Other national digital strategies emphasise the use of R&D or other policy measures to target sectors of strategic economic importance. Germany's Digital Agenda 2014-2017, for example, includes initiatives to increase digitisation and automation in manufacturing, and measures to promote information on best practices for industry and smart service applications.

E-inclusion: ICT adoption by households

The promotion of ICT adoption by households and individuals aims to advance social policy objectives such as e-inclusion. This objective still requires ICT supply-side policies, such as expanding broadband access to underserved areas, especially those home to disadvantaged social groups. However, supply-side measures are often supplemented by initiatives to increase the level of digital literacy and raise awareness about risks and opportunities online. One example of an initiative to further e-inclusion at multiple levels is the Low Income/Lifeline Program in the United States, which was approved for a comprehensive overhaul in 2012. A key objective in the modernisation process will be to ensure broadband availability for all low-income Americans. Lifeline builds on efforts by the FCC to close the broadband adoption gap and address digital literacy. The Commission aims to establish a Broadband Adoption Pilot Program using USD 13.8 million in savings from other reforms to test and determine how Lifeline can be used to increase broadband adoption among Lifeline-eligible consumers.

The Digital Agenda for Europe anticipates a multifaceted approach to e-inclusion. Under its activity "inclusive digital services", the Agenda calls for the European Commission to examine "how best to meet demand for basic telecom services in today's competitive markets, what role universal service could play in achieving the objective of broadband for all, and how universal service should be financed" (EC, 2010). It also calls for "concerted actions to make sure that new electronic content is also fully available to persons with disabilities". To promote accessibility, the Agenda calls, for instance, for the systematic evaluation of "accessibility in revisions of legislation undertaken under the Digital Agenda … following the UN Convention on the Rights of Persons with Disabilities".

Australia's National Digital Economy Strategy also includes supply and demand-side considerations, for example, under Action 24, to provide "free Wi-Fi access to remote Indigenous communities". At the same time, the strategy targets the aging population with measures to boost the Keeping Seniors Connected programme. Similar measures are found in a significant number of national digital strategies. For example, Germany's Digital Agenda 2014-2017 recognises the lack of confidence exhibited among elderly people in ICTs and has called for an examination into ways to increase their skills and trust.

Digital skills and jobs

All national digital strategies recognise improvement of skills and competences as a means to further e-inclusion. Key actions identified by the Digital Agenda for Europe to further e-inclusion relate to the development of skills and competences essential for the digital economy. Action 10 proposes "digital literacy and competences as a priority for the European Social Fund regulation (2014-2020)". Other measures include "promot[ing] a higher participation of young women and women returners in the ICT workforce through support for web-based training resources, game based eLearning and social networking". Digital Slovenia 2020[37] aims to ensure inclusiveness by raising awareness of the importance of ICT for the development of all segments of society. Ireland's National Digital Strategy[38] aims to reduce by half the number of "non-liners" (people who have not yet engaged with the Internet) by 2016. One measure envisioned in the Strategy is "awareness raising campaigns with industry stakeholders to convey to 'non-liners' what they could do online, and to highlight to existing users other ways they could use and benefit from further digital engagement". Ireland's strategy also foresees the introduction of a new training grants scheme (BenefIT) to fund digital skills training for citizens, and the development of an online mapping resource to identify digital skills learning opportunities.

A number of countries have identified ICT-related skills as the key to increasing job creation opportunities. The Czech Republic describes a number of measures in Digital Czech v 2.0 to increase ICT-related skills levels. These include collaboration between the Ministry of Labour and Social Affairs and the Ministry of Education, Youth and Sports on a strategy to increase digital literacy and develop e-skills among citizens. The goal is to ensure that new employees have adequate ICT skills and to support current employees during periods of transition due to ICT-related activities or the effects of globalisation. In Spain, the Digital Agenda[39] aims to promote digital inclusion and literacy, and to ensure the training of new ICT professionals. In Italy, the Strategy for the Digital Agenda 2014–2020 plans to invest EUR 12 million to promote digital skills and increase digital literacy levels, widen the curricula of topics related to digital skills, increase the number of ICT skills training courses, boost the number of graduates in fields related to ICT and raise the level of digital skills among civil servants. In Australia, e-inclusion is supported via measures

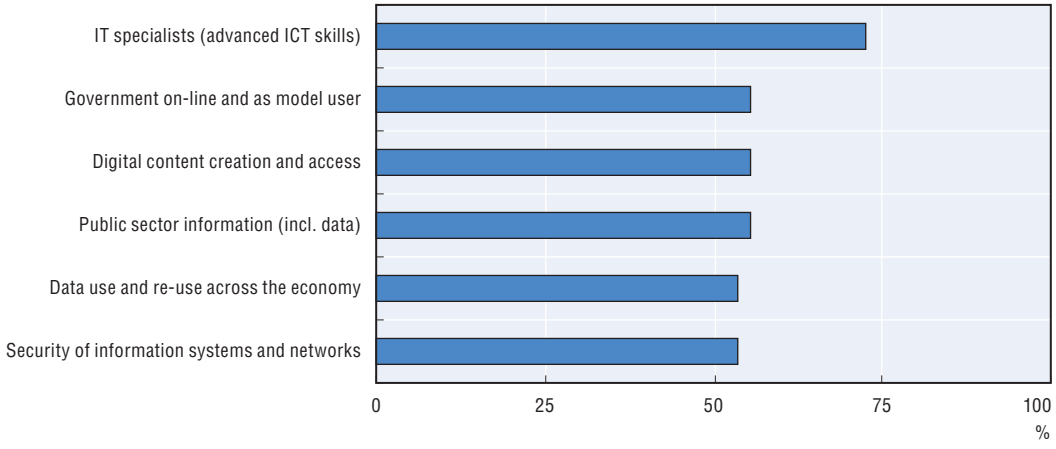
that directly target the labour market. The National Digital Economy Strategy aims to double the level of telework[40] to 12% of Australian employees and implement measures to raise awareness of telework in the labour market, such as organising an annual National Telework Week.

ICTs and global challenges

Very few national digital strategies have an international dimension. Among those that do, key issues are Internet governance, climate change and development co-operation. Germany has called for multi-stakeholder engagement around issues addressed in the Digital Agenda 2014-2017 and active involvement in international policy debates held at the International Telecommunication Union (ITU), the Internet Governance Forum (IGF) and the OECD. Germany's Agenda also addresses development co-operation issues such as the need for "cyber capacity building" and "cyber security capacity building" in developing countries. It also calls for the government to examine and consider the potential of digital technologies in Germany's Africa Strategy. Sweden also highlights international development co-operation in its strategy, ICT for Everyone – A Digital Agenda for Sweden. Strategic areas include the role of ICT in societal development with a focus on ICT for global development, and related issues such as research and innovation, ICT for the environment, gender equality, freedom on the net and copyright.

Overall, the analysis of national digital economy strategies show that ICT policies have changed considerably over the past decade and have been embraced by mainstream economic and social policy priorities looking to create positive framework conditions for growth and development. The above analysis is consistent with the results of the OECD Digital Economy Policy Questionnaire on countries' ICT policy priorities. In 2014, 26 out of 29 countries considered rolling out broadband Internet infrastructure to be their current top priority. For 19 out of 28 countries, digital privacy and security ranked second and third. But when asked to rate the likely evolution of their priorities in the near future, countries placed skills development as the top objective, followed by public service improvements and digital content creation (Figure 1.2).

Figure 1.2. **Top increasing ICT policy areas**



Note: ICT policy areas have been selected and ranked based on the majority rule for a particular prioritisation.

Source: Based on 31 detailed responses (including 25 OECD countries) to the OECD DEO Policy Questionnaire 2014 on current and future policy priorities, sent on June 2014.

StatLink http://dx.doi.org/10.1787/888933224095

The role of governments as active contributors in digital economy developments cannot be underestimated. Over one third of countries responding to the questionnaire placed government use of digital technologies and public sector information high on their future digital agenda. The need for governments to take an active role in the digital economy is reflected both in the OECD Recommendation of the Council on Public Sector Information, which was adopted in 2008 and reviewed in 2014, and the OECD Council Recommendation on Digital Government Strategies, adopted in 2014 (OECD, 2008, 2014f).

Box 1.2. **Brazil's national digital economy strategy**

In the past decade, the digital economy has grown exponentially in size and importance in Brazil, as can be attested by the ascending curves in subscriptions, value added, output and employment. Parallel to the growth in both salaries and demand of ICT goods and services, the Brazilian government has prioritised a sectoral approach of enhancing infrastructure, fostering the ICT industry, ensuring availability and affordability for underserved populations and connecting public institutions. A few recent and central national policies have been selected and are presented below.

Enhancing infrastructure

Having identified the need for greater investment in infrastructure, the Brazilian government established the National Broadband Plan (PNBL) by presidential decree (no. 7175/2010) in 2010. The PNBL consisted of expanding the fibre network to the interior regions of the country, installing submarine cables and a South American optical ring, and reducing tariffs on networks and access terminals. The PNBL was structured around six pillars of action with the central goal of achieving broadband coverage of 40 million households:

- *Price of telecommunication services*: offer fixed broadband (1 Mbps) to the value of USD 14.35 per month in all municipalities by the end of 2014, with tax cuts for broadband in rural areas (700 MHz and satellite ground small stations).
- *Transparency and competition*: implement a new regulatory framework for trade in wholesale broadband (30% reduction), auction orbital positions for satellites, and reduce barriers to entry for new retailers in copper and coaxial cable networks.
- *Speed and quality*: auction 2.5 GHz frequency bands; roll out 4G mobile service to all World Cup capitals; and set regulations for quality management applied to fixed and mobile broadband, and bidding terms for the frequency range of 700 MHz.
- *Price of access terminals*: remove taxes on personal computers, modems, tablets, smartphones and routers subjected to national production; exempt terminals aimed at rural service from all federal taxes and reduce taxes on M2M modules.
- *Expansion of terrestrial networks*: build new international traffic routes (submarine cables and South American optical ring); set new financing mechanisms for producers of optical fibre; develop a special taxation regime for machinery, instruments, equipment and building materials; and roll out telecom network infrastructure.
- *Telecommunications service coverage*: subsidise broadband connection to all urban public schools, issue bidding of 2.5 GHz frequency bands, accelerate the diffusion of 3G, and develop geostationary satellite for defence and strategic communications.

Four years after implementation of the PNBL, Brazil has experienced a substantial increase in fixed and mobile broadband subscriptions. However, fixed broadband infrastructure and full mobile broadband coverage, speed and quality continue to be a challenge. While 3G coverage reached 3 827 out of 5 570 municipalities in 2014, 4G connections served only 118 cities, yielding a total of 2.83 million subscriptions.

Box 1.2. **Brazil's national digital economy strategy** *(cont.)*

Fostering ICT and innovation

In 2012, the Ministry of Science, Technology and Innovation (MCTI) launched the Strategic Programme for Software and Information Technology Services (TI Maior), a broad programme designed to enhance Brazil's performance in the ICT sector. The programme focused on economic and social development through ICTs, innovation, entrepreneurship, scientific and technologic production, innovation and competitiveness.

As part of the TI Maior programme, Brazil integrated initiatives to promote start-ups, develop ICT skills, attract R&D centres, and enhance the creation of software and technology ecosystems around key areas.

- *Global R&D centres initiative*: a set of incentives was designed to attract R&D centres to Brazil. They included the provision of institutional advisory, tax reduction and research grants. This resulted in the announcement of several centres (Microsoft, EMC, Intel, SAP, Huawei and Baidu), yielding a total investment of USD 400 million and the creation of more then 300 highly skilled jobs over the next three years.
- *Digital Ecosystems initiative*: in order to foster technology ecosystems around key areas such as health, education, agriculture, sports, aerospace, telecommunications, finance, energy petroleum, mining and defence, this initiative disbursed more than USD 80 million in incentives for software creation.
- *Start-Up Brazil*: designed to accelerate the development of technology-based start-ups, this initiative has selected and funded 100 start-ups per year since 2013. Each start-up was supported with mentoring and received a grant of around USD 90 000.
- *Brasil Mais TI*: conceived to develop ICT skills, this initiative offers a comprehensive programme of online courses coupled with intermediation of job postings. Over three years it has trained 208 000 young people through courses of 16 to 380 hours.

Building a strategy for the future

Despite advances, many improvements are yet to be made regarding the deployment of infrastructure to connect households and businesses, and the adjustment of regulatory and institutional frameworks for the future digital economy. Brazil's ICT sector remains comparably small and dedicated largely to the domestic market, and increased levels of investment in R&D are needed to boost innovation and productivity. Competition can be strengthened to ensure "bottom up" innovation and may also play an important role in promoting greater equity.

In many OECD countries, the economic crisis has led politicians to refocus resources towards using the digital economy as a platform for promoting growth and productivity. Key challenges for the future include improving ICT adoption among businesses, increasing R&D investments, reviewing the General Telecommunication Law of 1996, ensuring competition in the face of market consolidation and adopting a strategic vision for sustainable growth.

1.3 Main trends in the ICT sector

The core of the digital economy is the ICT sector. After a couple of challenging years during the global financial crisis, the overall outlook for the ICT sector is positive and a number of indicators, especially those directed at the future development of the sector, indicate that the sector is getting back on its feet. This section provides an overview of the main developments and trends in the ICT sector in general, and then takes a closer look at communication markets and the Internet.

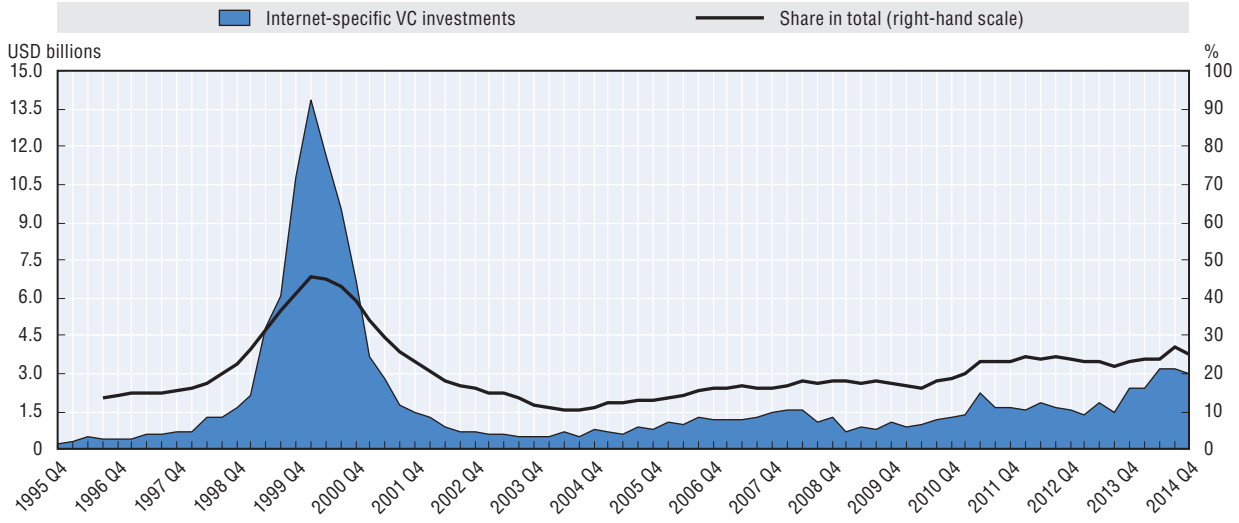
US venture capital investments are at their highest level and the semiconductor market is growing

Venture capital investments in ICTs and the development of the semiconductor market are two leading indicators for the future development of the ICT sector. The

increasing share of venture capital (VC) investments in ICTs reflects upcoming business opportunities in the sector. Venture capital investments in the United States reached almost USD 15 billion, their highest level since the dot-com bubble, and the share devoted to investments in the ICT industries reached 67% in the last quarter of 2014 (see Chapter 2, Figure 2.3). It is also worth noting that one quarter of all US venture capital investments are dedicated to companies whose business models are fundamentally dependent on the Internet (Figure 1.3).

Figure 1.3. **Amount of venture capital invested in Internet-specific companies in the United States**

USD billions and year-on-year growth, 4Q moving average



Source: Based on PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report based on Thomson Reuters data, February 2015.

StatLink http://dx.doi.org/10.1787/888933224107

The second indicator for future development of the sector is the growth rate of the semiconductor industry, where cyclical fluctuations appear ahead of other ICT industries. Since mid-2013, growth rates have increased steadily (Figure 1.4). According to the World Semiconductor Association, this trend is expected to continue over the next two years (see Chapter 2, Figure 2.2).

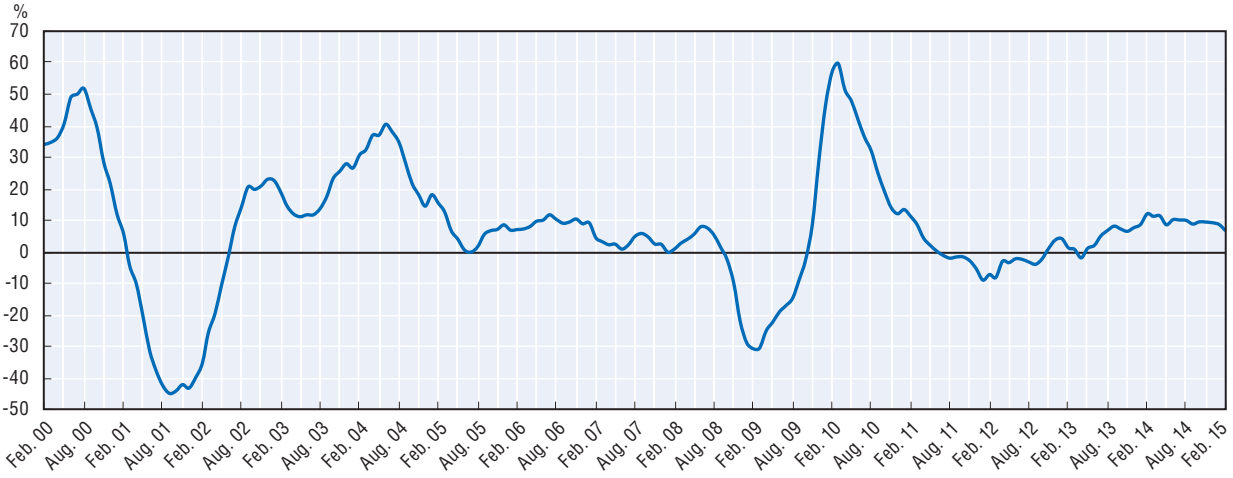
Trade in ICT services is growing faster than trade in ICT goods

International trade in ICT goods and services underscores the positive developments mentioned above. Trade data from 2001 to 2013 show continued growth in ICT trade with exports in ICT services growing faster than exports in ICT goods.

Between 2001 and 2013, world exports of manufactured ICT goods grew by 6% per year, reaching USD 1.6 trillion (see Chapter 2, Figures 2.10a and 2.10b). Production and exports of ICT goods are increasingly concentrated in a few economies (Figure 1.5). The shares of Japan and the United States in world exports of ICT goods halved from 2001 to 2013, due in part to offshoring of production. Korea is the only OECD country to increase its share of the world market for ICT goods over the same period.

Figure 1.4. **Growth in monthly semiconductors worldwide market billings**

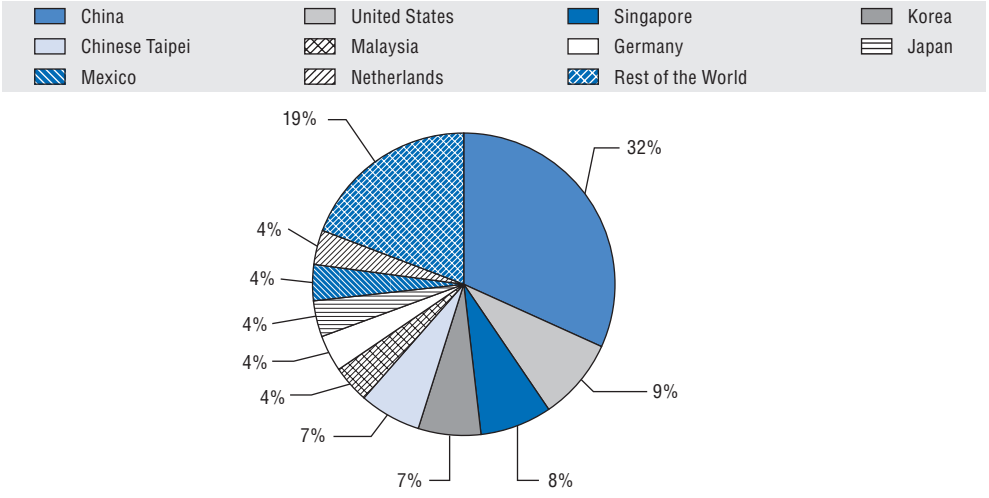
Year on year growth, three-month moving average



Source: Based on World Semiconductor Trade Statistics (WSTS), April 2015.

StatLink http://dx.doi.org/10.1787/888933224117

Figure 1.5. **Top ten exporters of ICT goods, 2013**



Notes: World is estimated based on the 103 BTDIxE declaring countries that reported ICT exports in all three years. World excludes re-imports for China and re-exports for Hong Kong China. China's ICT exports are adjusted for re-imports.

Source: OECD, Bilateral Trade Database by Industry and End-use category (BTDIxE), February 2015.

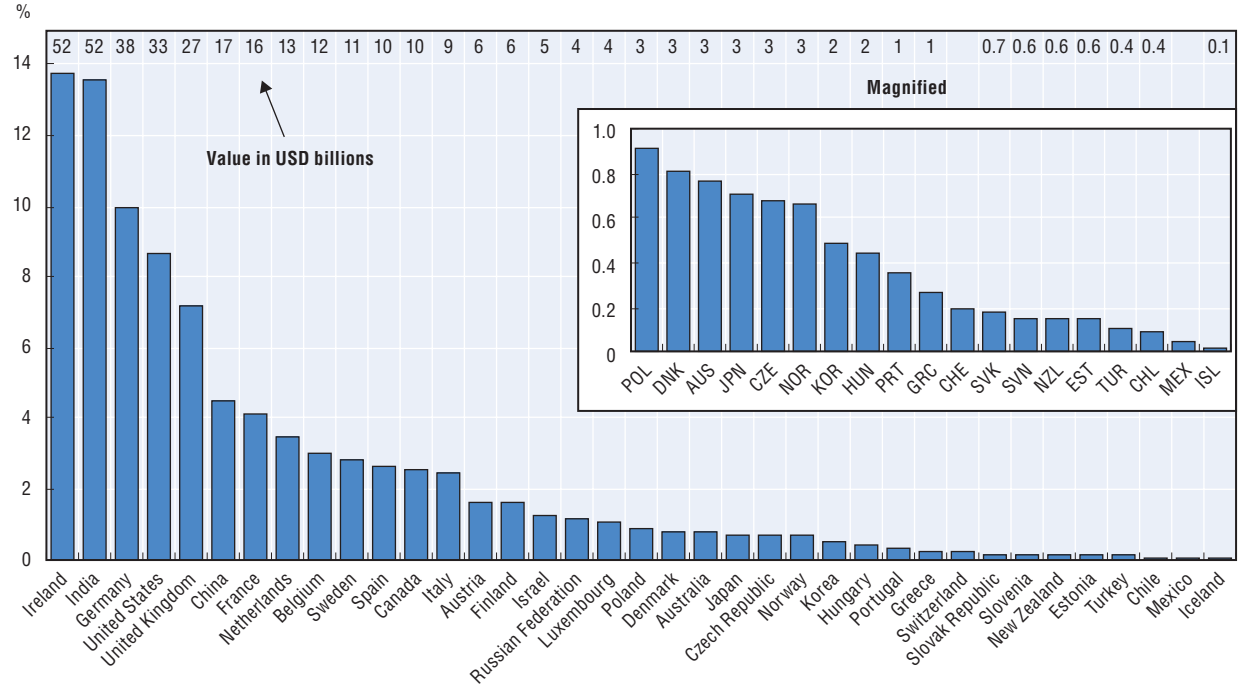
StatLink http://dx.doi.org/10.1787/888933224128

International trade in ICT services grew much faster than in ICT goods (30% per year). Between 2001 and 2013, it increased fourfold in current price dollar terms to almost USD 400 billion. In particular, the share of computer and information services almost doubled from 3.4% to 5.8% of world exports of services, while that of telecommunication services increased marginally. For the OECD area, the combined share of computer and information and communication services rose from 5.8% to 8.3% of total service exports (2001-13).

As with trade in ICT goods, a few economies account for a significant share in global exports of ICT services (Figure 1.6), with some major shifts in recent years. Ireland, which benefits from the presence of transnational companies, is the leading exporter of computer and information services, followed by India, which started from a very modest level. China is also becoming a major exporter of ICT services along with Germany, the United Kingdom and the United States. Together, these countries account for almost 60% of total exports of ICT services. The top exporters of telecommunications services include the United States, the largest European economies and the Netherlands.

Figure 1.6. **Exporters of ICT services, 2013**

Percentage shares of total world services exports and in USD billions



Notes: For Chile, Iceland and Israel, data refer to 2012. For Mexico and Switzerland, ICT services only include communications services.

Source: Based on UNCTAD, UNCTADstat, February 2015. http://unctadstat.unctad.org.

StatLink http://dx.doi.org/10.1787/888933224139

To a large extent, these trends are due to trade in intermediate inputs (i.e. goods and services used in production). The dramatic increase in ICT exports from China, for example, has been matched by a proportional increase in imports of ICT intermediate inputs – notably in its processing zones. Consequently, China's share of ICT goods and services valued added embodied in foreign final demand is significantly lower than its share of gross world exports. In 2011, US exports of ICT goods and services were higher than those of China in value added terms – driven partly by the high presence of US ICT services embodied in final demand products. Embodied ICT services also contributed to higher shares for India and the United Kingdom in value added terms (see Chapter 2, Figure 2.12).

Continued high R&D expenditures and a large number of ICT-related patents reflect the key role of the ICT sector in current innovation activities

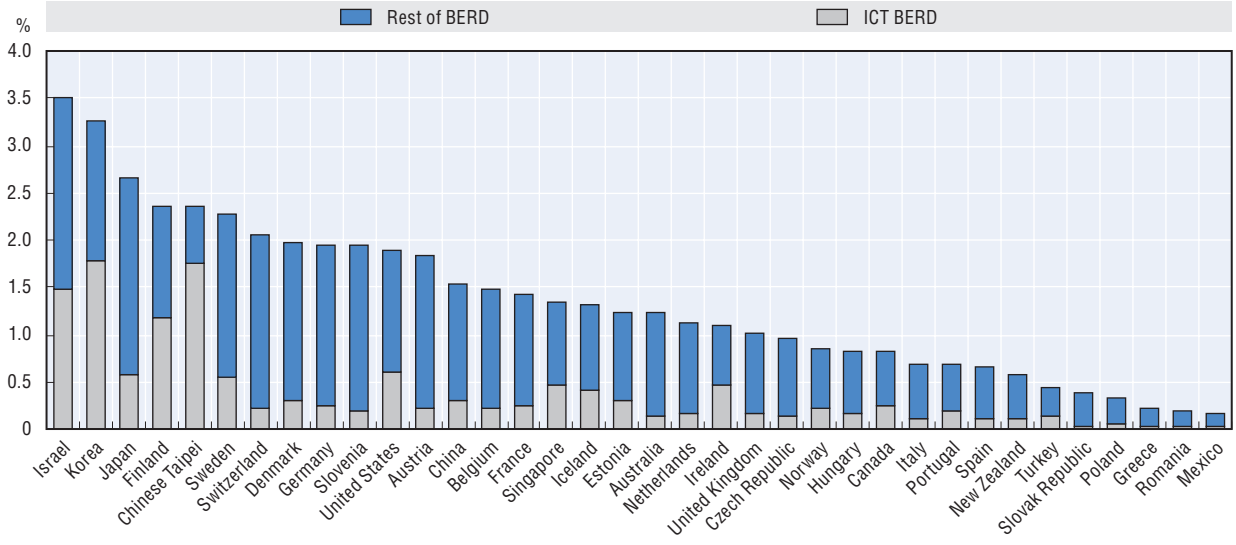
Another way to look at the future growth of the digital economy is to examine the role ICTs play in innovation activities. Two central indicators for measuring innovation are patents and research and development (R&D) expenditures.

Figure 1.7 provides an overview of ICT and total business enterprise expenditure on R&D (BERD). In 2013, total business enterprise expenditure amounted to 1.6 % of OECD GDP (OECD, 2015). Out of total BERD, business R&D performed by the ICT sector accounted for almost 33% or 0.5% of GDP. Large differences exist in R&D expenditures in the ICT sector across different countries. In Finland, Israel and Korea, ICT BERD accounts for over 40% of the total and represents between 1.2% and 1.8% of GDP.

ICT R&D expenditures in the OECD area tend to be more concentrated in ICT manufacturing (60% of ICT BERD) than in ICT services (see Chapter 2, Figure 2.13). In 2013, Chinese Taipei and Korea devoted over 70% and 50% of their total BERD to ICT manufacturing. Despite the drop in Nokia's activities, Finland continues to spend over 40% of its total BERD on ICT manufacturing, followed by Singapore, Japan, the United States and Sweden, all of which spent above 20% of total BERD.

Figure 1.7. **Business expenditure in R&D, 2013**

As a percentage of GDP



Notes: For the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Israel, Italy, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain Switzerland and the United Kingdom, data refer to 2012. For Australia, Austria, Belgium, Greece, Iceland, Ireland, Mexico, New Zealand, Singapore and the United States, data refer to 2011. The ICT sector is defined according to the OECD ICT sector definition based on ISIC Rev.4

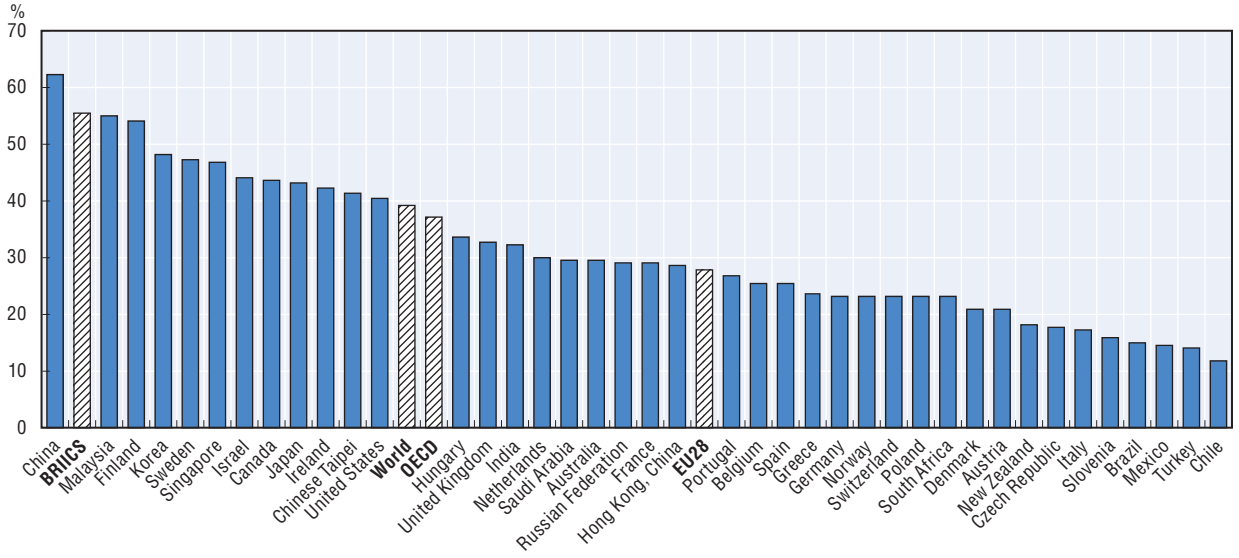
Source: OECD ANBERD and RDS Databases, February 2015.

StatLink http://dx.doi.org/10.1787/888933224145

While R&D provides a measure of innovation input, patents, registered designs and trademarks capture innovation output. In 2010-12, more than half a million patent applications were filed worldwide under the Patent Cooperation Treaty (PCT). Patent applications in ICT technologies accounted for almost 40% of total applications (Figure 1.8), representing a return to almost the 2000-02 level. However, a closer look at OECD and non-

OECD economies shows that ICT-related patent applications dropped by 2.8% compared to 2000-02 in the OECD area, while applications by Brazil, Russia, India, Indonesia, China and South Africa (BRIICS) more than doubled, reaching 55%, largely as a result of increased patenting by China (see Chapter 2, Figure 2.15).

Figure 1.8. **ICT-related patents, 2010-12**
As percentage of total PCT patent applications



Notes: Data relate to patent applications filed under the Patent Co-operation Treaty (PCT). Patent counts are based on the priority date, the inventor's residence and fractional counts. ICT-related patents are defined using a selection of International Patent Classification (IPC) classes. Only economies that applied for more than 250 patents in 2010-12 are included. BRIICS refers to Brazil, the Russian Federation, India, Indonesia, China and South Africa.

Source: OECD, Patent Database, *www.oecd.org/sti/ipr-statistics*, January 2015.

StatLink http://dx.doi.org/10.1787/888933224151

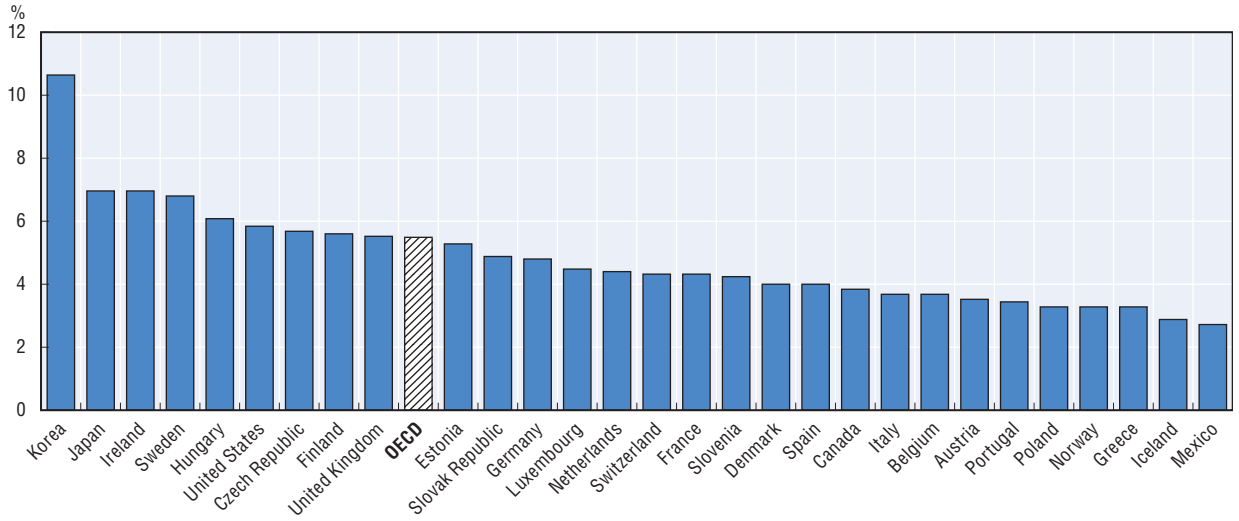
Although signs point to increased growth of the sector, the current share of ICTs in value added remains stable

While the above-mentioned developments suggest a positive future development for the ICT sector, the share of ICTs in OECD total value added has remained stable. In 2013, the ICT sector in the OECD area accounted for 5.5% of total value added (i.e. about USD 2.4 trillion). This share shows large variations across countries (Figure 1.9), ranging from 10.7% of value added in Korea to less than 3% in Iceland and Mexico (Figure 1.9). Ireland and Japan have the second largest share (7%), followed by Sweden and Hungary (over 6%).

Over two thirds of the ICT sector in the OECD is accounted for by IT and other information services (2% of total value added) and telecommunications (1.7%) (see Chapter 2, Figure 2.5). Computer, electronic and optical products and software publishing account for, respectively, 1.4% and 0.3% of total value added. The degree of specialisation, however, varies significantly among countries. Korea shows the strongest specialisation in computer, electronic and optical products (over 7% of total value added), Luxembourg in telecommunications (3%) and Ireland, Sweden and the United Kingdom specialise in IT and other information services (3%).

Figure 1.9. **Share of ICT sector in total value added, 2013**

As a percentage of total value added at current prices



Notes: The ICT sector is defined here as the sum of industries ISIC rev.4 26, 582, 61 and 62-63. For Germany, Iceland, Ireland, Japan, Mexico, Poland, Spain, Sweden, Switzerland and the United Kingdom, data refer to 2012. For Canada and Portugal, data refer to 2011. For Ireland and the United Kingdom, data refer to SNA 93 and were extracted in October 2014. For the rest of countries, data refer to SNA 2008. For Canada, Iceland, Ireland, Japan and Mexico, data for Software publishing are not available, and are therefore not included in the definition. The figure for Switzerland shows the ICT sector share as defined by the OECD (2011a). In this particular case, the share is not totally comparable with the rest of the countries.

Source: Based on OECD, National Accounts Database, ISIC Rev.4; Eurostat, National Accounts Statistics and national sources, April 2015.

StatLink http://dx.doi.org/10.1787/888933224163

While employment in the ICT sector has remained stable in the OECD area, demand for ICT specialists across all sectors has risen steadily

Employment in the ICT sector accounted for more than 14 million people, almost 3% of total employment in the OECD (see Chapter 2, Figure 2.6). This share remained relatively stable throughout the financial crisis. Shares in ICT employment range between over 4% in Ireland and Korea to less than 2% in Greece, Portugal and Mexico. IT and other information services together with telecommunications industry account for 80% of ICT employment in the OECD area.

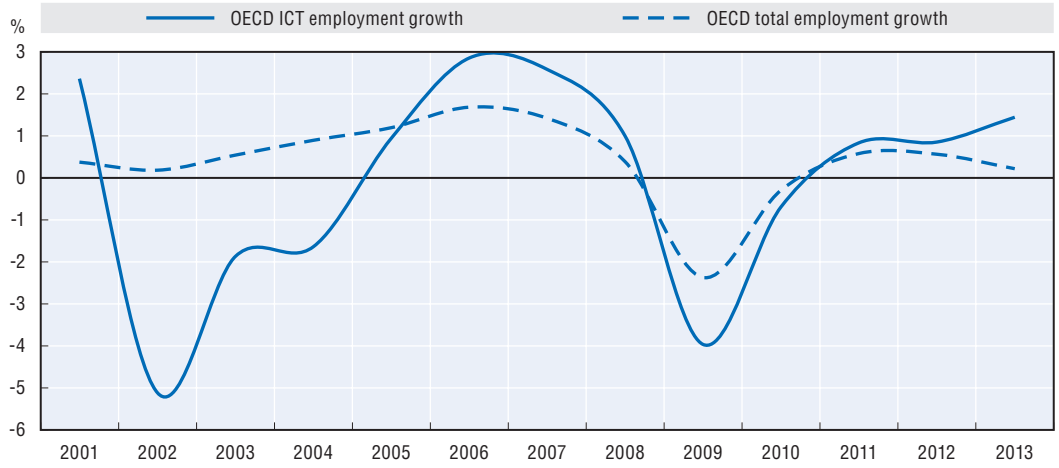
Overall, the contribution of the ICT sector to total employment growth has varied significantly over the past 15 years (Figure 1.10). In 2013, the ICT sector accounted for 22% of total employment growth, similar to its share just prior to the dot-com crisis.

Over 2001-13, the employment weight of ICTs decreased in countries with a large ICT sector and increased in countries with a smaller ICT sector. One likely explanation is that the crisis fostered rationalisation in large national ICT sectors and favoured ICT firms in countries with lower labour costs. Belgium and Hungary are the only exceptions to this general trend.

While employment within the ICT sector is stable, employment of ICT specialists across all sectors of the economy has risen, reaching at least 3% of total employment in most OECD countries (Figure 1.11). Finland, Sweden and Luxembourg employed the most ICT specialists in 2014 with shares of over 5%.

Figure 1.10. **ICT sector and total employment growth in the OECD area**

Year-on-year growth



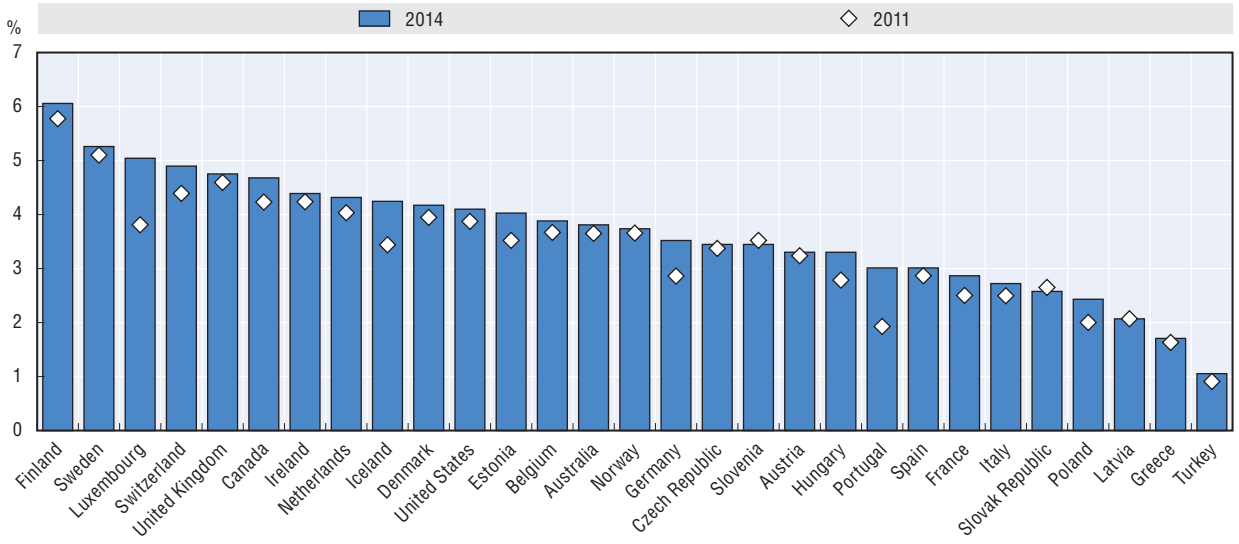
Notes: The aggregate for the OECD area includes 27 OECD countries for which data series were fully available. Data for 2013 are estimates.

Sources: Based on OECD, National Accounts Database, ISIC Rev.4 and national sources, March 2015.

StatLink http://dx.doi.org/10.1787/888933224177

Figure 1.11. **Employment of ICT specialists across the economy**

As share of total employment



Source: Based on Australian, Canadian and European labour force surveys as well as United States Current Population Survey, April 2015.

StatLink http://dx.doi.org/10.1787/888933224189

A significant part of ICT value added and employment in OECD countries is accounted for by foreign affiliates (i.e. local firms owned or controlled by a foreign company) (see Chapter 2, Figure 2.9). Foreign affiliates contribute to a host country's international competitiveness by providing access to new markets and new technologies for domestic suppliers and buyers, generating knowledge spillovers for domestic firms, and investing a higher share of revenues in R&D.

Moving from the main developments in the ICT sector as a whole, the following paragraphs take a closer look at recent developments in communications markets including macro-trends, broadband penetration, prices and developments of Internet traffic. Developments in communications markets play an important role as good connectivity and affordable prices are necessary conditions for uptake of ICTs among businesses, citizens and governments.

Communications markets in the OECD area remained relatively stable in terms of revenues, investments and average penetration levels

Between 2012 and 2014, communication markets in the OECD area remained relatively stable in terms of overall subscriptions, penetration levels, revenues and investment. Overall telecommunication turnover in the OECD area reached USD 1.352 trillion, just below the 2011 level of USD 1.372 trillion, while investment stabilised at about 14.7% of total turnover.

The decrease in fixed telephone subscriptions was offset by growth in wireless broadband subscriptions, which increased by 14% per annum, a lower rate than in previous years. Mobile voice markets reached maturity in terms of penetration rates with 114 mobile subscriptions per 100 inhabitants, and growth in mobile communications is now focused on broadband services. Mobile broadband penetration reached 78.23 subscriptions per 100 inhabitants in the OECD area. Seven OECD countries now have over one subscription per inhabitant, highlighting the critical and growing importance of mobile technologies.

Wireless broadband subscriptions showed healthy growth, while fixed broadband subscriptions experienced high variation depending on the technology

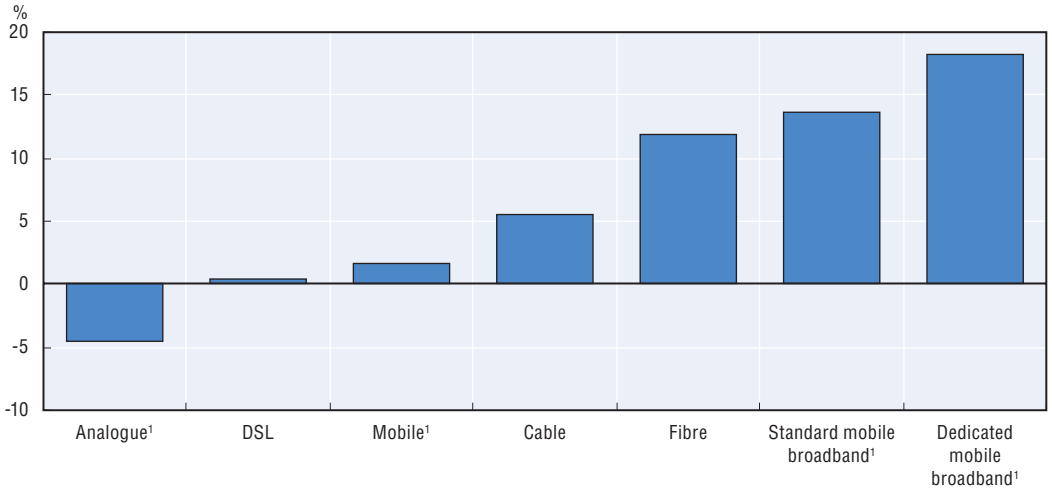
Growth rates in communication access paths between 2012 and 2014, broken down by technology, provide another perspective on the prevalence of mobile technologies (Figure 1.12). While wireless broadband subscriptions maintained a healthy growth of 18.14% (dedicated mobile broadband) and 13.61% (standard mobile broadband) per annum, fixed broadband subscriptions experienced very different growth rates. Fibre subscriptions showed a strong growth rate of 11.79% per annum, indicating that FTTH technology is gradually replacing DSL and cable broadband services. Not surprisingly, DSL subscriptions experienced a very low increase in relative terms (CAGR 0.4% in the same period). Cable grew at moderate rates (5.49% year on year), explained by the fact that DOCSIS 3.0 is more mature and provides higher speeds than deployed VDSL technologies.

Although some large OECD countries actively extend fibre connections, fibre subscriptions represent more than 10% of the total in only 14 OECD countries

On average, fixed broadband subscriptions amounted to 27 subscriptions per 100 inhabitants in the OECD area with Switzerland (47.3), the Netherlands (40.8) and Denmark (40.6) leading in terms of overall penetration (see Chapter 2, Figure 2.22). Some large OECD countries (Australia, Chile, Mexico, New Zealand and Spain) began to rapidly expand fibre penetration between 2012 and 2014 with the rate of deployment doubling each year. Overall, the transition from copper and cable to fibre is occurring at a gradual pace. At present, only 14 OECD countries have more than 10% of broadband subscriptions with fibre technology. Japan and Korea continue to lead the OECD by far with a fibre-to-the-home (FTTH) penetration rate of over 65%.

Figure 1.12. **Growth in communication access paths by technology**

As a percentage, June 2012 – June 2014



Notes: (*) For Analogue telephone lines and Mobile voice subscriptions, the growth rate is calculated from 2011 to 2013. Fibre includes FTTH/B/P and excludes FTTC. FTTC is included in DSL. Mobile accounts for all mobile subscriptions including voice only subscriptions and standard and dedicated mobile broadband subscriptions. Dedicated mobile broadband are data-only subscriptions. Standard mobile broadband are data and voice subscriptions.

StatLink http://dx.doi.org/10.1787/888933224199

A new OECD method allows measurement of broadband penetration by different speed tiers

The increased pervasiveness of the Internet in all sectors of the economy has underlined the importance of reporting broadband speeds. Accordingly, the OECD has adopted a set of harmonised speed tiers to report broadband speeds in a more detailed manner. The tiers break down subscriptions into those with advertised speeds higher than 1 Gbit/s, higher than 100 Mbit/s, higher than 25/30 Mbit/s, higher than 10 Mbit/s, higher than 1.5/2 Mbit/s and subscriptions not fulfilling these speed requirements but still qualifying as a broadband service (at least 256 Kbit/s of advertised download speed). For the first time, most OECD countries have used this breakdown to report broadband subscriptions (see Chapter 2, Figure 2.26).

The new method reveals a fixed broadband penetration rate of only 7.3 subscriptions per 100 inhabitants for speeds higher than 25/30 Mbit/s, indicating a need for further progress

The new measurement method enables analysis of broadband penetration by different speeds. While the average fixed broadband penetration for the OECD area amounts to 27 subscriptions per 100 inhabitants, the penetration for speeds higher than 10 Mbps amounts to 12.6 subscriptions per 100 inhabitants and 7.3 for speeds higher than 25/30 Mbit/s. These numbers indicate a need for further progress in the provision of high-speed connections, especially for applications where higher speeds are necessary such as medical imaging, office automation or effective use of cloud computing. In addition, actual broadband speeds are typically lower than advertised speeds (see OECD, 2014b).

In terms of mobile broadband speeds, network performance improved considerably due to LTE deployments between 2012 and 2014. According to Teligen/Strategy Analytics data from September 2014, 21 out of 34 OECD countries had at least one mobile operator

offering mobile broadband download speeds for laptops and tablets of 100 Mbit/s, in terms of theoretical advertised speeds.[41]

While prices for fixed-broadband connections showed little change, prices for mobile services have fallen markedly between 2012 and 2014

Affordability of broadband services is key to ICT adoption for all users, and for inclusive growth. Between 2012 and 2014, prices for fixed broadband showed little change. On average, countries with lower broadband speeds reported higher prices per Mbit/s. In contrast, Japan (USD 0.02), Sweden (USD 0.08) and France (USD 0.10) had the lowest prices per Mbit/s in 2014, in tandem with offers of high broadband speeds. Many countries have shown remarkable progress in bringing down entry prices per megabit per second. In 2012, three OECD countries had minimum prices of over USD 1, whereas in September 2014 the most expensive country was Greece with USD 0.74. Certain counties have considerably reduced their entry prices, such as Mexico (from USD 1.69 to USD 0.52) and Israel (from USD 0.77 to USD 0.32). Operators in those countries have also started offering higher speeds, usually through fibre networks, although these deployments may be restricted to the largest cities.

Prices for mobile services have fallen markedly between 2012 and 2014 for all OECD baskets. Prices for the 30 calls + 100 MB basket, for example, dropped by 10% from USD 19.74 to USD 17.72 per month and prices for the 100 calls plus 2 GB basket by 17% (see Chapter 2). Countries that experienced the largest price declines were Italy (52% on average across all baskets), New Zealand (46%) and Turkey (44%), while prices in Canada, France, Ireland, Slovak Republic, Switzerland and the United States remained relatively stable. Prices increased in Austria (36%) following a merger from four to three operators, and Greece (13%) over the two-year period.

Global Internet traffic continues to grow by 20% per year, albeit at a slower pace compared to previous years

Global Internet traffic continued to grow. According to Cisco's Visual Networking Index, Internet traffic grew by 20% CAGR in 2013. While this still represents double-digit growth, the growth rate has slowed down compared to 2012 (39%). This indicates that Internet adoption may be approaching saturation in areas where people have affordable access to networks, as over two thirds of the population in many OECD countries now use the Internet. For the first time, IPv6 usage is growing significantly, although from a very low base. Adoption has reached 30% in Belgium and over 10% in Germany, Norway, Luxembourg, Switzerland and the United States. However, the OECD average still only equalled 3.5% as of April 2014.

1.4 Uptake and use of ICTs across the digital economy

As the previous sections have shown, the public and private sectors have undertaken significant effort to expand existing broadband infrastructure. However, increased uptake on the demand side among businesses, households and the public sector is essential to benefit from these deployments. The uptake and adoption of ICTs depend on a multitude of factors, including the perceived value of using ICTs, the offer of digital applications and services, availability of the requisite skills and trust in the digital economy. The following paragraphs discuss usage across the economy and society, and present new business models and key issues in the area of trust.

While almost all businesses rely on ICTs, differences exist between countries and among large and small companies

Current adoption and usage rates show that almost all businesses in the OECD area rely on ICTs. In 2014, 95% of all enterprises with more than ten employees had a broadband connection. While close to 100% of large companies are connected to broadband, the experience for small firms is more varied. In Canada, Denmark, Finland, Korea, the Netherlands, Slovenia, Spain and Switzerland, almost all small firms had a broadband connection (98% and over). However, in Mexico, uptake was below 80% for small firms.

Statistics on the percentage of firms that have a website paint a similar picture. By 2014, more than three quarters of businesses (76%) had a web presence. In most OECD countries, 90% or more large enterprises had a website, while this was the case for only 69% of small businesses. Within the OECD area, web presence in SMEs ranges from 90% and above in Denmark, Finland and Switzerland to less than 50% in Latvia, Portugal and Mexico, indicating a significant divide in uptake between different OECD countries.

Participation in e-commerce is low and points to a significant divide between large companies and SMEs in the use of more sophisticated ICT services and applications

Analysis of Internet and ICT use beyond simple connectivity and web presence highlights significant potential to leverage ICTs for overall businesses processes. Participation in e-commerce, for example, is still relatively low in the OECD area (Figure 1.13). In 2013, only 21% of companies sold their products and services online, representing a small increase of 2 percentage points over 2009. There are considerable differences between OECD countries. In New Zealand, over 45% of companies engage in online sales, while the share is 10% or lower in Greece, Italy, Mexico and Turkey. There is also a significant gap between large and small companies. Participation in e-commerce for enterprises with 250 or more persons employed was 40% in 2013, but only 18.9% for small companies. The same picture is reflected in e-commerce sales as a percentage of turnover. On average, e-sales amounted to 17.1% of total turnover, however the share for large companies was 22.1% of turnover compared to 9% for small firms.

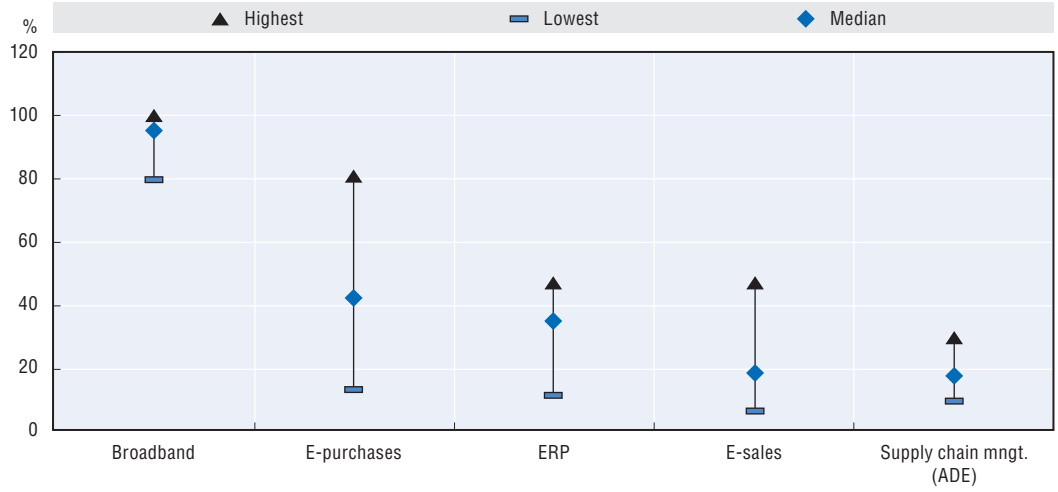
The modest uptake in e-commerce is paralleled by a relatively low adoption rate for supply chain management or enterprise resource planning (ERP) software applications to manage business information flows. One factor might be the changes in business organisation these processes necessitate. In 2014, on average, only 31% of companies used ERP applications, against less than 22% in 2010.

Further analysis shows that use of ERP applications is popular among large firms, with an adoption rate of more than 75% (Figure 1.14). These firms often need to manage more complex processes and can afford to invest in IT software. Conversely, ERP software was used by less than 25% of small firms, for which it has only recently become more affordable.

Differences in adoption rates of ERP software are also notable across countries. Adoption rates range between 44% and 92% for larger enterprises and between 7% and 41% for smaller ones, with Belgium, Austria, Sweden and Denmark leading, and Latvia, Iceland and the United Kingdom lagging for enterprises of all sizes (see Chapter 3, Figure 3.4).

Figure 1.13. **How enterprises make use of selected ICT applications, 2014**

Percentage of enterprises with ten or more persons employed



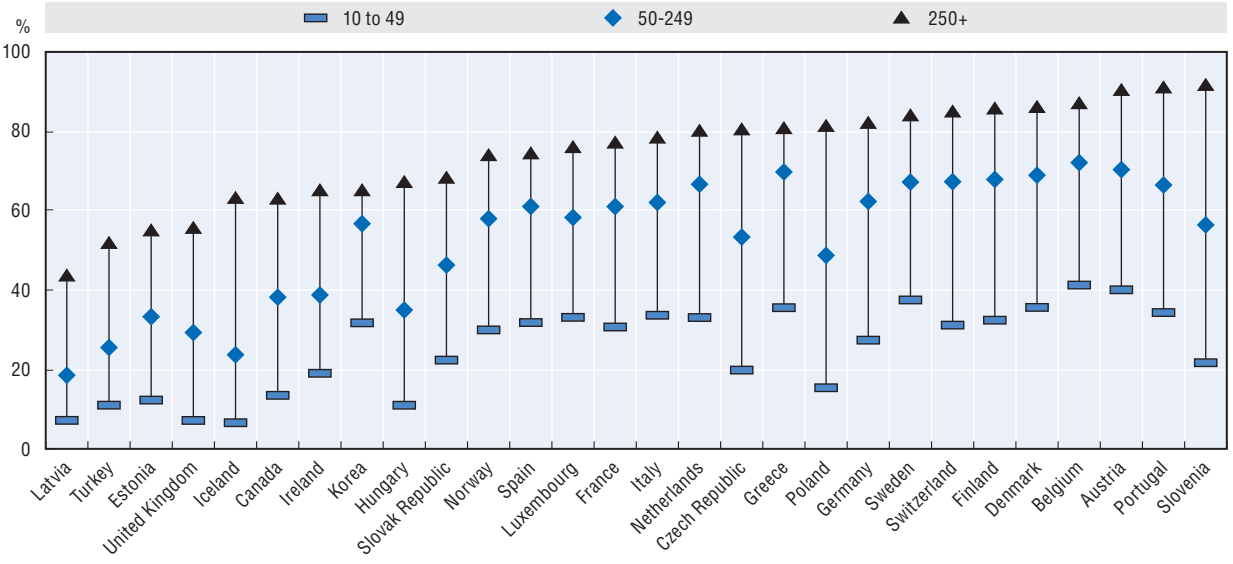
Notes: Supply chain management refers to the use of automated data exchange (ADE) applications. For countries in the European Statistical System, e-commerce variables (online purchases and online sales) refer to 2013. For Australia, Canada, Japan and Korea, data refer to 2013. For Mexico and New Zealand, data refer to 2012. For Switzerland, data refer to 2011.

Sources: OECD, ICT Database; Eurostat, Information Society Statistics and national sources, March 2015.

StatLink http://dx.doi.org/10.1787/888933224209

Figure 1.14. **Gaps in the use of enterprise resource planning software, 2014**

Percentage of enterprises in each employment size class



Notes: Unless otherwise stated, sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more persons employed are considered. Size classes are defined as: small (from 10 to 49 persons employed), medium (50 to 249) and large (250 and above). For Canada, medium-sized enterprises have 50 to 299 employees. Large enterprises have 300 or more employees. For Korea, data refer to 2013. For Switzerland, data refer to 2011.

Sources: OECD, ICT Database; Eurostat, Information Society Statistics and national sources, March 2015.

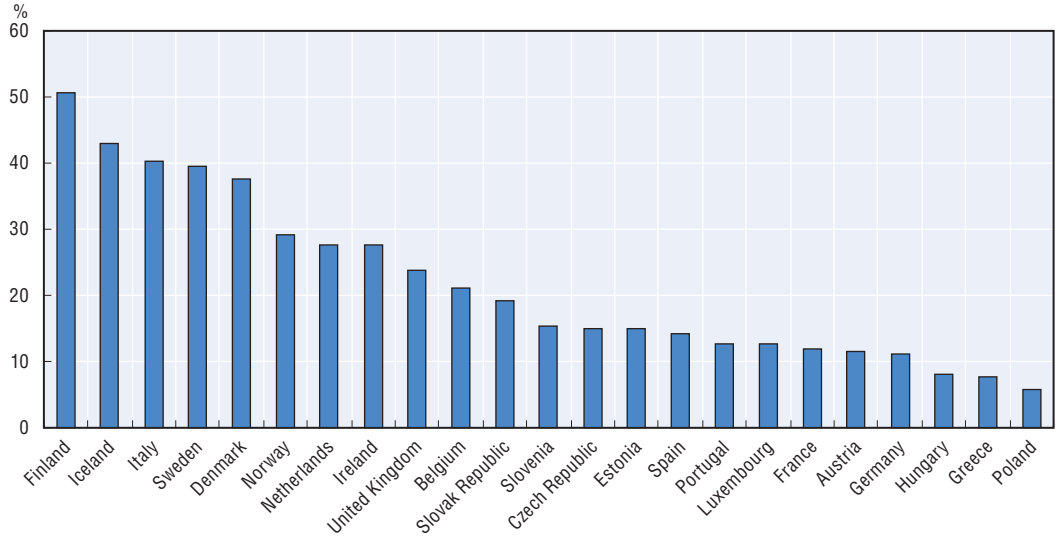
StatLink http://dx.doi.org/10.1787/888933224213

Diffusion of cloud computing among enterprises has accelerated over recent years, with higher uptake among large businesses compared to small businesses

Among the new uses of ICTs by firms, cloud computing deserves special attention. The cloud transforms computing into a service model that enables access to services, applications and computing power in a flexible, scalable and on-demand way (OECD, 2014c). Since cloud computing transforms computing into a service, firms can turn their capital expenditures into operating expenses.

Diffusion of different cloud computing applications and services among firms has accelerated in recent years. In 2014, 22% of companies relied on cloud computing services, with shares ranging from 50% in Finland down to 6% in Poland (Figure 1.15). In most countries, uptake is higher among large businesses (close to 40%) compared to small or medium-sized enterprises (around 21% and 27%, respectively). Only in Switzerland and the Slovak Republic are adoption rates higher for smaller companies than large ones. Businesses more frequently invest in cloud computing services with a high level of sophistication, such as finance/accounting software, CRM software and computing power, than less sophisticated services such as emails, office software or file storage (see Chapter 3, Figure 3.6).

Figure 1.15. **Use of cloud computing by enterprises, 2014**



Source: Eurostat, Information Society Statistics, January 2015.

StatLink http://dx.doi.org/10.1787/888933224224

Overall, businesses are increasingly adopting ICTs in their operations. However, there is room for progress, especially with regard to the use of more sophisticated ICT services and applications. In particular, small companies show low-uptake rates and are lagging behind. SMEs represent a large share of the economy in OECD countries; policy makers therefore have an important role to play in fostering their uptake of ICTs. To this end they need to carefully assess the barriers SMEs currently face with regard to adoption of ICTs, and promote uptake through measures such as raising awareness, promoting skills and tackling legal barriers that prevent small firms from purchasing and selling

online. In addition, the data indicate important differences in uptake rates across OECD countries. Since uptake of ICTs affects firm productivity, policy actions (or lack of) can have long-lasting implications for overall economic productivity. This implies a need for urgent policy actions, especially in countries with low uptake rates. The next section takes a closer look at uptake and use of ICTs among individuals.

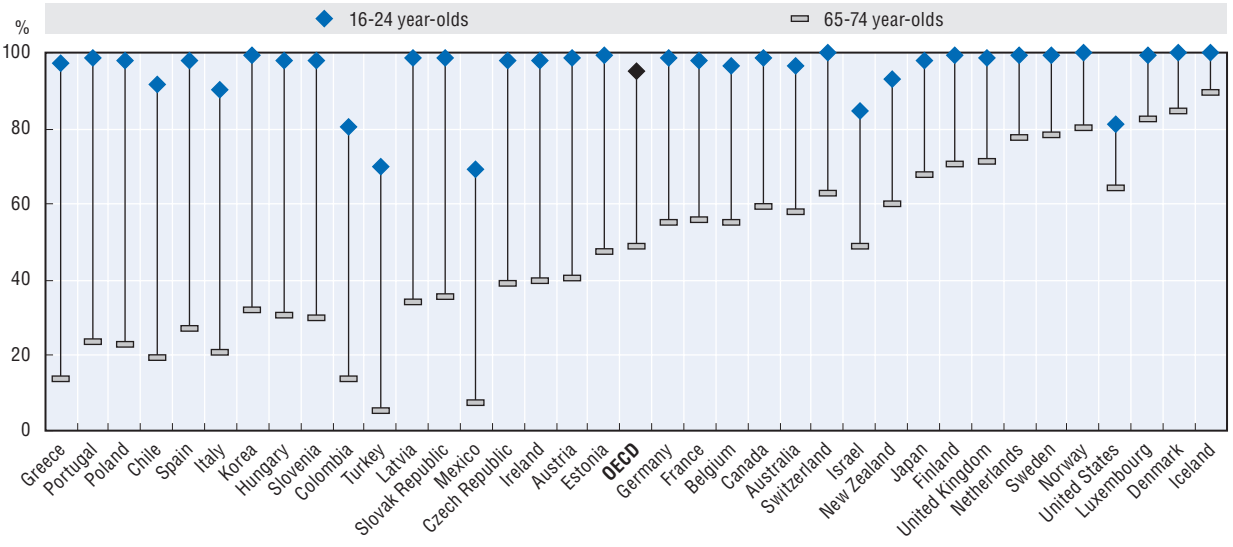
While almost all adults in the OECD area use the Internet, differences exist based on age and education

In 2014, diffusion of the Internet among adults in the OECD area was widespread (Figure 1.16) with 81% of the adult population accessing the Internet of which over 75% use it on a daily basis. More than 40% of adults used a mobile or smartphone to connect to the Internet in 2013.

However, gaps exist across different age groups and education levels. In most countries, uptake by young people is nearly universal, but there are wide differences for older generations. Over 95% of 16-24 year-olds in the OECD area used the Internet in 2014 against less than 49% among 65-74 year-olds. Usage rates for 65-74 year-olds with tertiary education are generally in line with those of the overall population, and in leading countries approach usage rates among 16-24 year-olds. However, differences between high and low educational attainments among 65-74 year-olds are particular large in Hungary, Poland and Spain (OECD, 2014a).

Figure 1.16. **Gaps in Internet usage by age, 2014**

As a percentage of population in each age group



Notes: Except otherwise stated, Internet users are defined for a recall period of 12 months. For Switzerland, the recall period is 6 months. For the United States, no time period is specified. For the United States, data refer to individuals aged 18 and above living in a house with Internet access, and to age intervals 18-34 instead of 16-24 and 65 and above instead of 65-74. Data are sourced from the US Census Bureau. For Australia, data refer to 2012/13 (fiscal year ending in June 2013) instead of 2013, and to individuals aged 65+ instead of 65-74. For Canada, Japan and New Zealand, data refer to 2012 instead of 2014. For Chile, Israel, the United States and Colombia, data refer to 2013 instead of 2014. For Israel, data refer to individuals aged 20-24 instead of 16-24. For Colombia, data refer to 12-24 year-olds instead of 16-24, and 55 year-olds and above instead of 65-74. For Japan, data refer to 15-28 year-olds instead of 16-24 and 60-69 year-olds instead of 65-74.

Sources: OECD, ICT Database; Eurostat, Information Society Statistics and national sources, March 2015.

StatLink http://dx.doi.org/10.1787/888933224237

Nearly all Internet users rely on the Web to send emails and read news

Basic use of the Internet is nearly ubiquitous in the OECD area. Over 2013-14, on average 87% of Internet users sent emails, 82% relied on the web to obtain information on goods and products, and 72% read news online (see Chapter 3, Figure 3.9). While 58% of Internet users ordered products online, only 21% sold products over the Internet. These activities showed little variation across all countries. However, use of the Internet for more sophisticated activities, such as e-government, e-commerce and online banking, showed larger cross-country variability. For example, more than four out of five Internet users in Finland engage in online banking, compared to less than one out of five in Greece.

More sophisticated Internet use, associated with higher levels of education, differs across OECD countries

More sophisticated Internet activities are associated with higher levels of education and more complex services infrastructures. The breadth of Internet activities carried out by users with tertiary education is, on average, 58% larger than for those with lower secondary education and below. Differences by level of education are particularly high for Belgium, Hungary, Ireland, Korea and Turkey.

In terms of e-commerce, about 50% of individuals in OECD countries bought products online in 2014, up from 31% in 2007. This trend is very likely to continue in the near future and has already disrupted traditional distribution channels for some categories of products, such as travel and holiday services. The rapid diffusion of smart mobile devices has resulted in a growing number of individuals buying products via their mobile device.

The share of online purchases varies widely across countries as well as across different product categories, with age, education, income and experience all playing a role in determining the uptake of e-commerce by individuals. For example, more than three quarters of adults buy online in Denmark, Norway and the United Kingdom, while only between 10% and 20% of adults do so in Chile and Turkey, and below 5% in Mexico and Colombia.

An increasing number of individuals use the Internet for education and continuous learning

Over the last few years, ICTs have contributed to a wider array of learning opportunities, with massive open online courses (MOOCs) becoming increasingly popular. In 2013, 7.8% of Internet users in the European Union followed an online course compared with 4.7% in 2007. This percentage varied from 16% in Finland to less than 3% in the Czech Republic (see Chapter 3, Figure 3.13).

The next section discusses the use of digital government services by businesses and households, as well as the use of ICTs by the public sector itself.

While use of e-government services is widespread across companies, only 35% of individuals use e-government services on average in the OECD area, with large differences across countries

e-Government services and applications are used by both companies and individuals. While use of e-government is frequent in OECD countries, the level of e-government engagement with people varies significantly depending on the country.

In 2013, the large majority of OECD enterprises (90%) interacted online with public authorities. Compared to 2010, the share of enterprises completing and submitting forms electronically increased by almost 20 percentage points in the Czech Republic and Italy, and by over 10 percentage points in Ireland, New Zealand and Norway.

Individuals use e-government services to a lesser extent. In 2013, 64% of individuals in the OECD area relied on e-government services for activities such as retrieving government information and downloading or filling and transmitting forms online. This share, however, remains quite dispersed across countries. In Iceland, 88% of individuals use e-government services, while less than 40% do so in Chile, Italy and Poland. Poor connectivity and provision of e-government services, as well as insufficient skills or other cultural factors, are often the root causes of low uptake rates. In addition, users in the EU area experienced problems with e-government services such as technical failures of websites (24% of all users in 2013) and outdated information (23% of users), factors that can also slow down the use of e-government services.

Governments are relying on digital technologies to move from a citizen-centred to a citizen-driven approach

Governments, on their side, aim to achieve public sector transformation through the use of ICTs to shift from a citizen-centred to a citizen-driven approach, implying that citizens and businesses determine their own needs and address them in partnership with public authorities (see Chapter 3, Box 3.1).

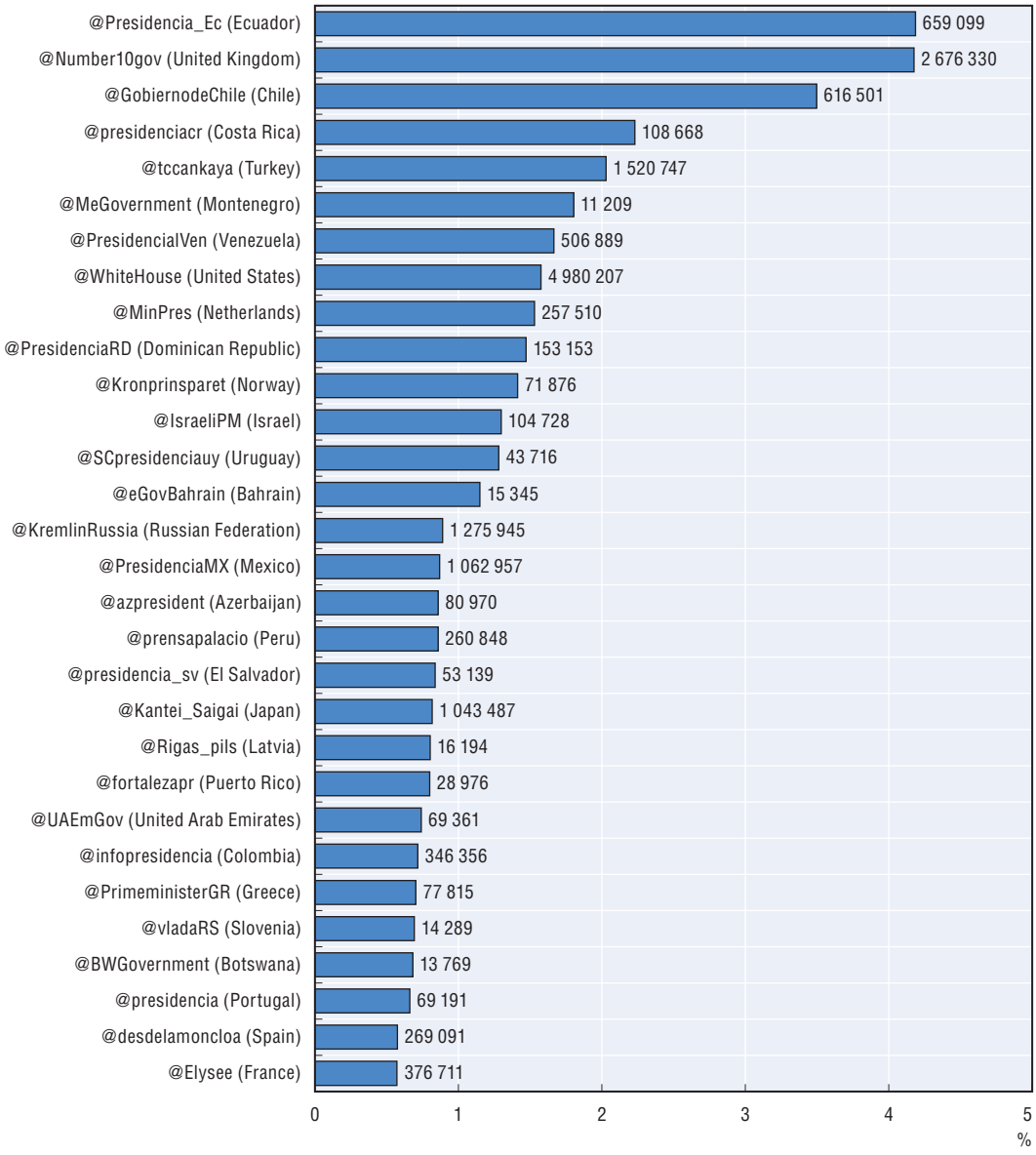
This shift is also reflected in government use of social media. The majority of governments around the world now draw on social media to communicate and engage with their citizens. As of November 2014, the office representing the top executive institution (head of state, head of government, or government as a whole) in 28 out of 34 OECD countries had a Twitter account and 21 had a Facebook account. This has enabled some governments to achieve significant popularity rates (Figure 1.17).

However, there is considerable uncertainty among institutions regarding how best to use social media outside of "corporate" communications (e.g. to improve public services or create trusted relationships with citizens). As a result, measurement is scarce and rarely targeted to relevant goals. Moreover, social media do not automatically "level the playing field" in the sense of empowering all societal groups equally, as level of education still determines the likeliness of using social media in many OECD countries (OECD, 2014d).

Governments are promoting open government data to increase public sector transparency and deliver societal and economic benefits

Another key area for governments is open government data (OGD), which has demonstrated significant potential to transform public services and is driving sectors to adopt a data-driven and inclusive approach. Many governments use OGD as an essential strategic enabler to increase public sector transparency and deliver societal and economic benefits. Reuse of government data enables entrepreneurs to create new types of commercial content and services, individuals to make more informed choices, and governments to work with citizens to create more liveable public spaces. However, many legal, institutional and policy-related issues still need to be addressed before governments and citizens can fully capture the value of data usage to transform operations, services and policy making.

Figure 1.17. **Top 30 central government Twitter accounts**
As a percentage of the domestic population and by number of followers



Notes: OECD calculations based on Twiplomacy data, June 2014 (Followers); World Bank (2013 population data). Accounts for head of state, head of government or government are given as a whole. Personal or political accounts are excluded. Only the account with the most followers per country is displayed. States with less than 500 000 inhabitants are not included.

Source: Androsoff and Mickoleit, 2015.

StatLink http://dx.doi.org/10.1787/888933224246

1.5 New and evolving business models

Increasing ICT uptake has been observed during recent years among businesses, governments and different groups of society. However, there is still huge potential for increased adoption and use of ICTs, especially in terms of more sophisticated ICT use across the economy and society. Tapping this potential will be crucial for further economic growth and social benefits. Several trends such as increased penetration of smartphones,

the surge in mobile social networking and heightened production of new data are touted to further spur uptake and drive the emergence of new businesses. These trends and emerging business models are discussed below.

Increasing penetration of smartphones, growing mobile social networking and the development of new data are driving the emergence of new business models

Increased smartphone penetration and intensity of use across society, the surge in mobile social networking and the development of new data are driving the emergence of new business models in the digital economy, and continue to radically transform established industries such as transportation, energy media delivery or banking.

Between 2012 and 2013, smartphone adoption in OECD countries grew by 30%, reaching a high of 73% in Korea and an average of almost 50% in 2013. Individuals use their smartphones for an increasing variety of activities with increasing intensity, including activities traditionally carried out on a computer, such as browsing the Internet, emailing or accessing a social network. More sophisticated activities, including online banking, mobile purchases and job search, are also experiencing fast growth. Many of these activities are carried out on dedicated mobile apps. Popular travel, mobility and retail apps have all made a recent appearance (TechCrunch, 2014), pointing to the growing effect of digital services delivered via mobile apps on traditional sectors.

Online social networking has largely gone mobile. In 2013, over 40% of individuals in OECD countries used their smartphones several times per day to access social networks. Several central elements of social networking, such as an online identity, sharing of content and frequent status updates, play an important role in preparing the grounds for new business models to flourish, notably those building on collective consumption in the sharing economy and exploring the possibilities of collaborative production.

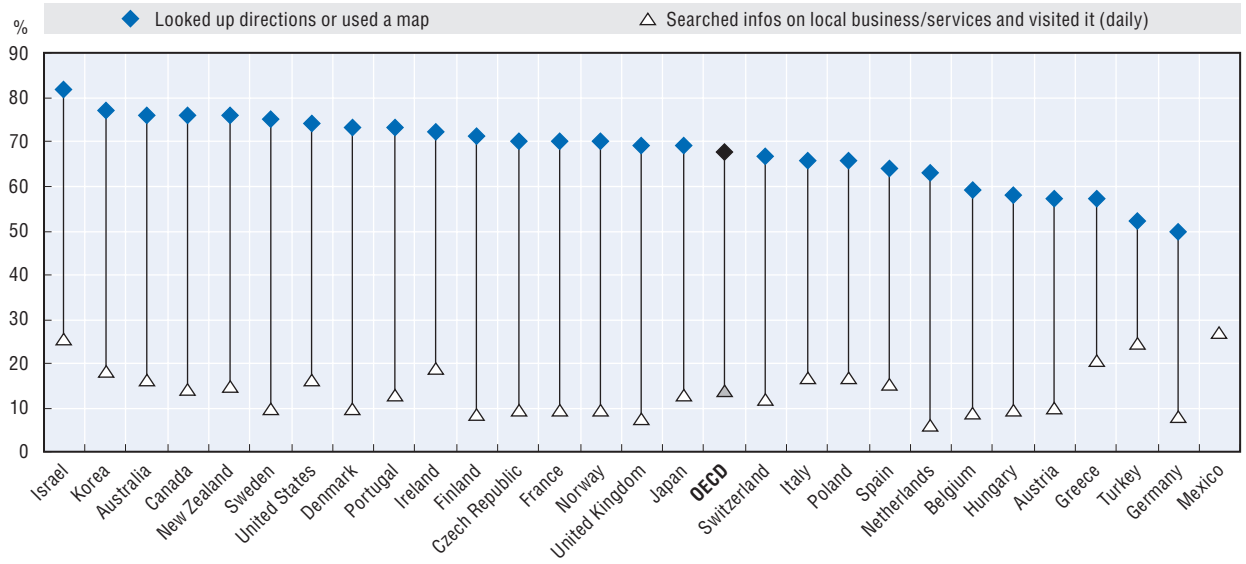
Many mobile apps not only function with but also produce data, which can be used by entrepreneurs and businesses to offer innovative services. An important form of data produced on smartphones is geo-locational data. These are collected by and used in numerous mobile applications and services (mostly in real time) such as online maps. In 2013, 68% of smartphone users in the OECD looked up directions or used a map on their smartphone, up 18% from 2012 (Figure 1.18; Chapter 3, Figure 3.16). Beyond its use for online mobile maps, geo-locational real-time data enable new services in areas such as shared mobility and multichannel retailing.

These trends are influencing incumbent businesses in established markets and are enabling the emergence of new business models. The following sections shed some light on new business models in retail, banking, health and collective consumption.

Many firms are adopting multi-channel selling strategies and engaging in m-commerce

A growing number of individuals across the OECD purchase goods and services via their smartphones. The share of smartphone users who ordered a good or a service on their mobile device has grown from 24% in 2001 to 38% in 2013, and is likely to increase in coming years. Product information gathered on smartphones also influences purchasing decisions both online and offline. From the consumer perspective, m-commerce and mobile product information gathering translate largely into greater choice, convenience and reduced transaction costs, notably in product search.

Figure 1.18. **Smartphone use of selected geo-location services, 2013**



Notes: No data available for Chile, Estonia, Iceland, Luxembourg, Slovak Republic, Slovenia. The sample covers private smartphone users who use the Internet in general.

Source: Our Mobile Planet, 2013.

StatLink http://dx.doi.org/10.1787/888933224251

Firms are responding to these trends by combining bricks-and-mortar retailing and online presences. The effects of this multichannel selling are mixed, especially for SMEs, which rely increasingly on e-commerce intermediaries. On the one hand, these intermediaries allow for wider reach and facilitate online selling through the offer of various services along the selling chain. On the other hand, large intermediaries might also create new entry barriers for SMEs.

Uptake of e-commerce by SMEs has been moderate due to trade and regulatory barriers, as well as consumer mistrust, especially across borders

Overall uptake of e-commerce by SMEs has been moderate so far, especially across borders. Among other factors, consumer resistance to cross-border purchases, trade and regulatory barriers (e.g. high custom administration costs, high tariffs, inadequate property right protection) and lack of working capital to finance exports may explain this situation. Policy measures to reduce these barriers will benefit SMEs in particular, as they typically have only limited resources to address these barriers.

Retail banks are seeing demand shift to online and mobile banking and are starting to face competition from online banks and peer-to-peer platforms

Retail banks are facing continuing shifts in demand through online and mobile banking, as well as new competition from online peer-to-peer (P2P) lending platforms or, more recently, P2P currency exchange models. P2P platforms are still too small to significantly affect retail banks, but current trends suggest that they may have a disruptive potential on the banking sector.

More than half of Internet users in OECD countries use online banking, and mobile banking is catching up. In 2013, 60% of Internet users in OECD countries used online banking, up from 42% in 2011 and 31% in 2007 (OECD, 2012, 2014a). Uptake of mobile online

banking has also increased at a similar rate, from 35% of smartphone users in 2012 to 47% in 2013 (see Chapter 3, Figure 3.18).

The rise of online and mobile banking is changing market boundaries and the parameters for competition in traditional retail banking. In reaction to higher competition from online banks, offline banks can either specialise in specific place-based business (e.g. farmers), or step up their response to online competition, an option that involves significant costs. The expected trend points towards a reduction in local bank branches, with 20% of local branches estimated to disappear by 2020 in the United States, mostly to the detriment of smaller regional and community banks (PWC, 2014a).

P2P lending platforms tend to offer better returns than traditional banks and are mostly unregulated

New competition for retail banks also comes from P2P lending, which has blossomed thanks to low interest rates (*Economist*, 2014). P2P lending platforms match borrowers and lenders, mostly via online auctions, and offer often better returns than most banks. So far, P2P lending platforms are primarily targeting the consumer credit market. However, more recently, platforms like Funding Circle have started to focus on small business lending. P2P lending platforms have not yet come under serious economic stress. If their strong growth continues, and if they prove able to deal with economic uncertainties, they may become a potentially disruptive competitive force in consumer credit markets.

P2P lending has attracted little attention from regulators to date. The United Kingdom is among the few countries to have taken a pro-active stance on regulating P2P lending platforms. Important issues covered in the UK regulatory framework on crowdfunding over the Internet include minimum capital requirements, dispute resolution rules, client money protection rules, disclosure and reporting rules, as well as successor loan servicing arrangements.

The amount of digital content is growing, but there remains room for dematerialisation

Thanks to the growing availability of digital online content, consumption continues to rise. For example, Spotify, an online music streaming service, offers over 20 million tracks licensed globally, and adds on average over 20 000 songs per day.[42] The iTunes Store, available in 119 countries, offers a selection of over 26 million songs (Apple, 2013). However, despite the transformations experienced by major content markets, there remains room for dematerialisation, especially in the area of videos and books (Figure 1.19).

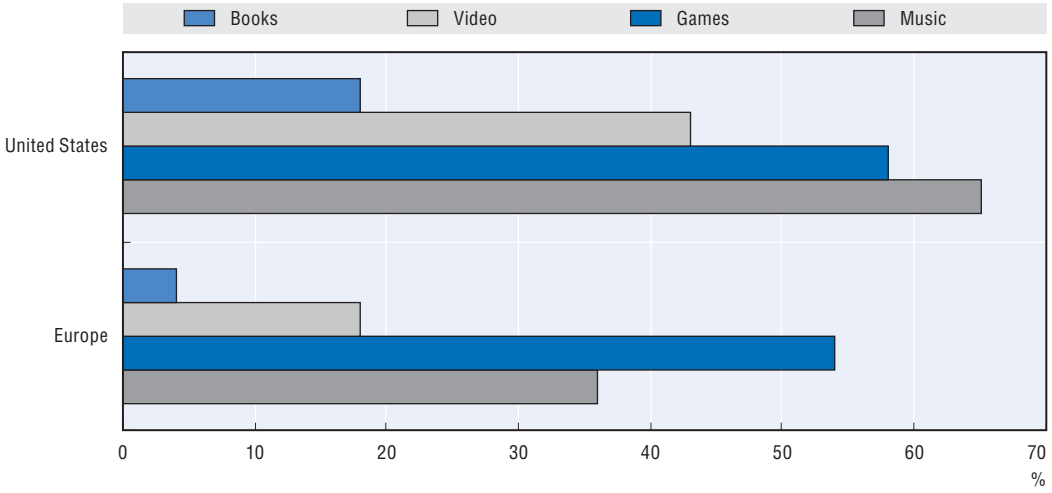
User-created content, notably images and video, continues to grow strongly. YouTube, for instance, reported in mid-2014 that users are uploading 100 hours of video to YouTube every minute.[43] Increasingly, digital content is being consumed and shared on mobile devices.

Television is undergoing significant transformation with delivery of audio-visual content over the Internet, and advertising revenues in digital content markets growing fast

Television services are also undergoing transformation with delivery over the Internet targeted to individuals and increased flexibility. Audio-visual content delivered over the Internet allows users to view films and programmes of their choice on any device, at any time. Netflix, for example, claims to offer over 10 000 movies and TV titles via its streaming-on-demand platform in the United States.[44] These offers are increasingly

being picked up on mobile devices. In November 2014, for the first time, Americans spent more time on mobile devices (177 minutes per day on average) than in front of a TV (168 minutes) (Flurry, 2014).

Figure 1.19. **Digital shares in content markets, US and EU, 2013**



Source: IDATE, 2014.

StatLink http://dx.doi.org/10.1787/888933224264

Advertising, a main revenue source in several digital content markets, is following suit. In 2013, revenues from online advertisement amounted to USD 117 billion and are expected to increase to over USD 190 billion by 2018, closing the gap with total TV advertisement revenues. Search accounts for the largest proportion of online advertising (USD 48 billion in 2013), followed by video and mobile advertisement with compound annual growth rates of 23.8% and 21.5% respectively (PwC, 2014b). Google currently dominates the market for online advertising, while Facebook and Google increasingly command the mobile segment (see Chapter 3, Figure 20), which may raise competition issues in the future.

Smartphone apps have enabled rapid development of the mobile health market and allowed for a higher degree of self-monitoring and wider collection of health data

The convergence between wireless communication technologies and healthcare devices, as well as increased use of smartphones for health monitoring, has started to reshape the health sector and open new markets with large growth potential.

Smartphones, in particular, offer the potential to broadly and cheaply diffuse more intensive self-monitoring, feedback, self-management and clinical support than has been possible previously. The data gathered can be leveraged to trigger highly personalised interventions and can be stored in large databases with the potential to boost healthcare research and innovation.

The market for mobile health and wellness apps (*mHealth*) has developed rapidly in recent years. The number of mHealth apps published on the two leading platforms, iOS and Android, has more than doubled in only 2.5 years to reach more than 100 000 apps (Q1 2014) (research2guidance, 2014). In 2012, 69% of US smartphone owners reported tracking at least one health indicator such as weight, diet or exercise (Fox and Duggan, 2013).

According to some estimates, the global mHealth market may reach USD 23 billion in 2017, with Europe accounting for USD 6.9 billion and Asia-Pacific for USD 6.8 billion, ahead of the North American market of USD 6.5 billion (GSMA and PwC, 2012). By 2017, mHealth could potentially save a total of EUR 99 billion in healthcare costs in the European Union. The largest savings would be in the areas of wellness/prevention (EUR 69 billion) and treatment/monitoring (EUR 32 billion), while increasing the wage bill for workers in mHealth by EUR 6.2 billion (GSMA, 2013).

Governments have a rising interest in electronic health records with many OECD countries having a national plan for their implementation

Increasing use of ICTs in healthcare has led to rapid growth in the amount of digitised data available. Over the past decade, in particular, there has been a rising interest in electronic health records (EHRs) in OECD countries. In 2011-12, most countries had a national plan or policy to implement EHRs (22 of 25 countries) and the majority had already begun to implement that plan (20 countries) (OECD, 2013b). EHR systems in some countries include data on key patient characteristics and health problems, as well as patient histories of encounters with the healthcare system and treatments received from a variety of healthcare providers (see Chapter 3, Figure 3.21). The greatest contribution of these systems as they develop is the potential for secondary analysis of data to monitor and conduct research, with a view to improving the health of the population and the quality, safety and efficiency of healthcare. The most commonly included secondary uses reported were public health and health system performance monitoring. Fourteen countries also indicated that they intended for physicians to be able to query data to support treatment decisions.

New businesses in the area of urban mobility and home sharing enable the shared consumption of private goods, which has raised new regulatory concerns

Another bundle of innovative business models has emerged over the past years under the heading of the "sharing economy". These models enable collective consumption of private durable goods by providing access to excess capacity of these goods.

Prominent sharing economy businesses are platforms that offer, for example, short-term rental of space, mostly homes. Although home exchanges are not new, the speed and scale at which platforms such as Airbnb have made commercial home sharing a common practice is unprecedented. The second market in which sharing economy business models have emerged at great speed is urban mobility. Shared mobility options range from the rental of private cars (Zipcar), rides (Uber, Lyft, blablacar) and parking spaces (justpark) to the rental of free floating (Car2go, DriveNow) and station-based cars (Autolib') and bikes (Velib'). These services are enjoying strong success among users, although their impact on urban mobility remains to be assessed (see also Chapter 3).

Factors that facilitated the emergence of these goods are, among others, increasingly ubiquitous mobile Internet penetration, the availability of real-time geo-locational data, social networks and the availability of online ratings, as well as constrained economic conditions which may have encouraged citizens to welcome additional opportunities to monetise assets, and consumers to welcome cheaper offers.

Many sharing economy businesses models currently rely on self-regulation, notably via ratings and reviews. While these reviews provide incentives for both sides to deliver on their promises, they suffer from several shortcomings, such as low response rates, incomplete information and misleading ratings.

While the sharing economy brings benefits to consumers such as a high variety of services and lower prices, its business model is not always consistent with existing regulations and laws, established at a time when the underlying technologies were unavailable. This situation has raised strong reactions from incumbent business associations, who regard it as unfair competition; from trade unions, who are concerned by the undefined status of the people working in these new businesses; and from policy makers, who want to ensure the protection of consumers and workers, to the point that these activities have been forbidden in some countries or cities.

The challenge for regulations and laws is to ensure effective protection of consumers and workers in this new economic environment, while fostering the potential benefits from the sharing economy. In addition, the changing business environment creates opportunities for strong co-operation across different ministries (e.g. ministries of transport, the economy and those concerned with ICT).

Crowdsourcing is used for multiple firm activities such as the creation of ideas, product development and marketing

While the sharing economy concerns "collective consumption", crowdsourcing and crowdfunding provide two interesting examples of "collaborative production". Both large companies and entrepreneurs make increasing use of these practices, for example, for capital peer-to-peer lending which could also be beneficial for SMEs.

Crowdsourcing can be applied to a large range of activities, the most common of which include idea creation, product design, problem solving, product development, marketing and advertising (Simula and Ahola, 2014). Large firms and organisations such as IBM, General Electric, NASA, DARPA or USAID tend to organise crowdsourcing within their internal networks. Smaller firms that have neither the scale nor the resources to undertake internal crowdsourcing address external communities, mostly via a crowdsourcing platform. Crowdsourcing is typically organised as a contest of competing people in which a prize rewards the winning solution. Platforms that enable online collaboration, such as Wikipedia, or co-creation, such as Quirky, are still rare.

Crowdsourcing for product development is not a widely spread practice, but some firms are using it intensively and with success (Figure 1.20). The most common approach elicits customer involvement and feedback through social media (see Chapter 3, Figure 3.22). In the EU28 countries, almost 10% of enterprises are currently involving customers in the development or innovation of goods and services. Another good example is the Chinese smartphone producer Xiaomi, which releases a new version of its MIUI software once per week, based on customer feedback. Customers make suggestions and vote on modifications via Weibo, the Chinese equivalent of Twitter (*The Economist*, 2013).

To date, crowdsourcing in OECD countries is not regulated. However, issues such employment regulation (e.g. rules for employing and remunerating people online), as well as issues related to intellectual property will need to be addressed in the future.

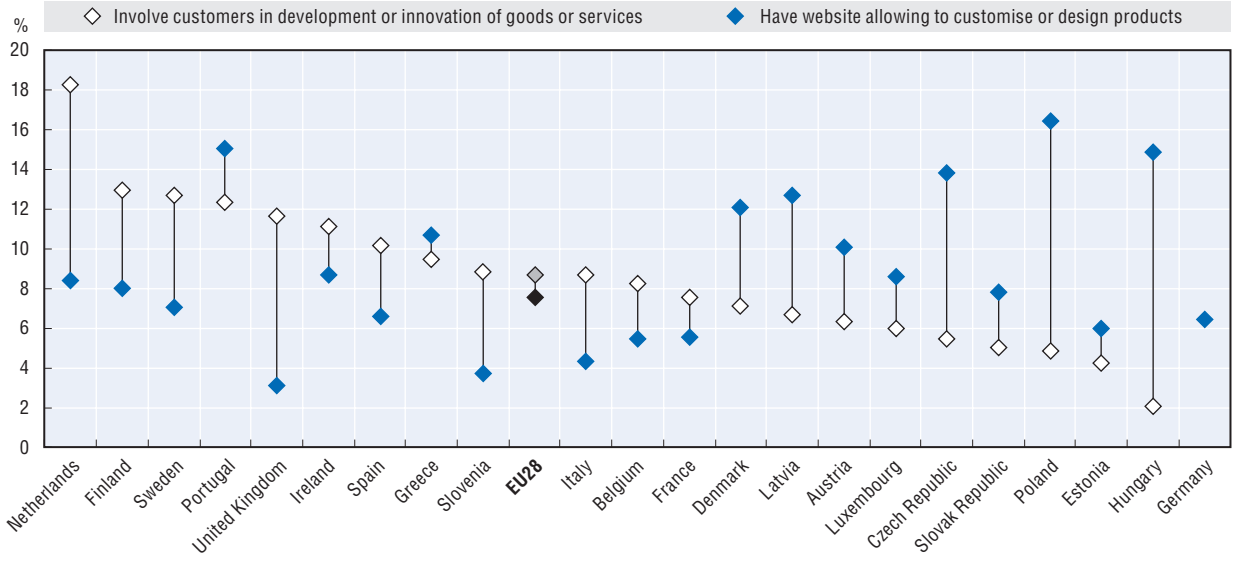
Crowd-funding provides additional sources for early stage funding of start-ups, but a clearer regulatory framework is needed to foster its potential and minimise risks

The term *crowdfunding* is used for different types of platforms, enabling lending (P2P), donations or reward-based funding, and equity crowdfunding (investment). The crowdfunding market has grown strongly over the past years, driven mainly by non-equity

crowdfunding. Crowdfunding is most developed in the United States and Europe, which accounted for 60% and 35%, respectively, of the market in 2012 (Massolution, 2013).

Non-equity crowdfunding (donation and reward-based) platforms create opportunities for innovators while creating little risks for backers, which have no financial interests attached to their contribution, but rather care for the (future) product (Belleflamme and Lambert, 2014).

Figure 1.20. **Customer involvement in product development, 2013**



Note: Unless otherwise stated, sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more persons employed are considered.

Source: Eurostat, Information Society Statistics, January 2015.

StatLink http://dx.doi.org/10.1787/888933224270

Opportunities created by equity crowdfunding platforms for both entrepreneurs and investors should be examined together with risks. Given the potential to provide additional resources for early stage funding of start-ups, a clear regulatory framework is necessary to minimise risks and foster the potential of crowdfunding (Wilson and Testoni, 2014). Few countries have addressed these challenges so far. In particular, in Europe, the second largest crowdfunding market, a variety of national regulations remain to be addressed. The United States has adopted a comprehensive legal framework for crowdfunding, through the Jumpstart Our Business Startups (JOBS) Act, which is currently being implemented.

1.6 The Internet of Things

While use of the Internet as a digital platform has enabled the creation of the sharing economy, the ability to connect any smart device or object is enabling the "Internet of Things". It will have a profound impact on multiple sectors of the economy, including industry automation, energy provision and transportation (see Chapter 6).

In the coming years, billions of devices will be connected to the Internet. While the vision of smart, communicating objects has been around for decades, the smartphone revolution has made it possible. Smartphones and tablets provide an easy, ever-present interface through which people can interact with connected devices and objects. In

addition, the scale of demand for smartphones has led to a dramatic decline in costs for the various components of connected devices, such as screens, sensors, processors and network interfaces.

The present report uses a broad definition of the Internet of Things (IoT), encompassing all devices and objects whose state can be read or altered via the Internet, with or without the active involvement of individuals. This includes laptops, routers, servers, tablets and smartphones, all of which are often considered to form part of the "traditional Internet". However, as these devices are integral to operating, reading and analysing the state of IoT devices, they are included here.

The Internet of Things consists of a series of components of equal importance – machine-to-machine communication, cloud computing, big data analysis, and sensors and actuators. Their combination, however, engenders machine learning, remote control, and eventually autonomous machines and systems, which will learn to adapt and optimise themselves.

There have been numerous predictions about the size of the Internet of Things. The most widely cited is that of Ericsson, which stated in 2010 that there would be 50 billion connected devices by 2020. Prior to this, Intel estimated in 2009 that 5 billion devices were already connected to the Internet and predicted that this number would rise to 15 billion by 2015. In 2012, the OECD produced its own estimates of IoT usage in people's residences, to verify some of the claims. Today, in OECD countries, an average family of four with two teenagers has ten Internet connected devices in and around their home. Estimates indicate that this figure could rise to 50 by 2022. As a result, the number of connected devices in OECD countries would increase from over 1 billion today to 14 billion by 2022. Actual measurements of the number of devices connected to the Internet have proven harder to obtain, with countries only now starting to collect some data.

Governments have recognised the potential benefits of the Internet of Things and introduced regulations in areas such as numbering policies and spectrum policy

A number of governments have introduced regulations that depend on the Internet of Things to achieve policy goals. For example, the Internet of Things enables governments to manage public spaces in more efficient, more effective or different ways. Remotely monitoring traffic lights or dykes allows governments to optimise traffic flow or to better understand flooding risks. It also allows governments to achieve policy goals in new ways. For example, reducing congestion using road pricing, calculated on time of day and distance travelled, is possible via GPS and mobile communication, but more difficult to achieve through conventional means. Similarly, smart energy meters lead to more decentralised energy markets and higher consumer awareness of energy use. Analysts and governments have high expectations of eHealth devices which will allow remote monitoring of patients at home or work. However, only a few such devices are available on the market – a situation that appears to be due not to a lack of research or government commitment, but rather to difficulties in implementation.

The potential benefits of the Internet of Things feature in a growing number of public policies, either as a means to achieve goals or an area targeted for research. There is no consistent approach among governments, but some examples can be provided. In particular, some countries have begun to assess whether current policies are aligned

with the perceived future. Ofcom in the United Kingdom, for example, has initiated a consultation on the implications of the Internet of Things for spectrum and numbering policy (Ofcom, 2014). The Netherlands, the first country to liberalise access to IMSI numbers for SIM cards, is consulting on further policies regarding signalling point codes needed for routing traffic in mobile networks.

Governments still need to address multiple issues such as trust and naming and numbering or standardisation

The evolution of the Internet of Things will require substantial efforts on the part of governments to re-evaluate and review a significant number of policies. These could include the regulations surrounding naming and numbering, particularly with regard to numbers used in mobile networks, where further liberalisation and access for private networks could bring great economic benefits. Policies surrounding the use of "national" numbers on an international scale will also need discussion. Spectrum is another key area, as the extent needed for the Internet of Things is as yet unclear. Globally harmonised ranges would be best, but may be unattainable. Standards are also a challenge, as the Internet of Things encompasses technical levels through to business processes, as well as political decisions. As a result, existing applicable standards are fragmented. Lastly, privacy, security, liability, consumer rights and reliability are all affected by the pervasiveness and longevity of the Internet of Things.

As the Internet of Things becomes pervasive, it will touch much of government policy. Policy makers should therefore focus not just on the potential benefits, but also work to identify where data and functionality offered by the Internet of Things could be leveraged and combined with other data elsewhere.

In order to ensure that the Internet of Things works to the benefit of people, some have argued that it should be thought of as the "Internet of Trust", as trust will be fundamental to enhancing user experience and addressing key legal challenges such as user privacy. Another pertinent factor is legal frameworks. As Capgemini noted, the "IoT is global [but] the law is not" (2014). The OECD has typically considered security, privacy and consumer protection as key elements for building trust in new technologies such as the Internet of Things (OECD, 2005c).

1.7 Trust, competition and network neutrality

To maximise the potential of the digital economy for productivity, innovation, inclusive growth and jobs, governments need to work in multiple policy areas. They must, for example, engage in further and renewed efforts to protect competition, lower entry barriers in communications and content markets, strengthen regulatory coherence, improve skills, assign spectrum in an efficient manner and establish trust at the infrastructure and applications layers. Policy implications derived from new developments in the digital economy are discussed throughout all the chapters of this report. The following paragraphs focus on three policy issues: trust, competition and net neutrality.

Digital trust is elevated in profile and importance

The opportunities of the digital economy will not be realised in the absence of trust. Trust is a powerful tool in complex environments for reducing uncertainties and enabling reliance on others. It underpins business, institutional and personal relationships and is particularly important in a global online environment. In 2014, in an OECD survey on

31 possible priority areas for the digital economy, governments identified security as the second highest priority area and privacy as the third, with only broadband coming higher (OECD, 2014a).

Although the disclosures in 2013 by Edward Snowden have no doubt elevated the visibility of security and privacy, the increasing prominence of these issues is the result of a transformation in the way data are generated, shared and analysed, and the corresponding benefits that these developments have brought in terms of innovation, growth and well-being. It is also the result of the horizontal nature of security and privacy issues and the increasing recognition that they need to be considered within the broader economic and social landscape, encompassing trade, competition, education and health, to name but a few.

User privacy and security concerns are growing

Growing trust concerns were highlighted in 2014 by at least three surveys of Internet users in the United States and Europe. These suggest that 64% of respondents are more concerned about privacy than they were a year ago (CIGI, 2014), while 91% agree that they have lost control of their personal information and data (Pew, 2014). Top concerns include the misuse of personal data and the security of online payments (EC, 2015). In 2014 and 2015, security breaches in companies from North America to Asia affected tens of millions of individuals and had a significant economic impact, with one breach reportedly leaving the company with charges of USD 162 million (Lunden, 2015). However, the damage to the firm's reputation, relationships in the industry and impact on employees may be longer-lasting and hard to measure. Such data security breaches are not limited to the private sector; many involve personal data, and as such also represent a privacy problem. There is thus a growing need for better metrics and evidence to inform policy makers.

Businesses invest more to restore trust

The perception that user trust is at stake persists and has been reflected in recent business practices to protect privacy and secure services.

Demand for security expertise continues to grow steadily and is accelerating for privacy

Locating available professionals with the required skills to help organisations manage digital risks to security and privacy remains a challenge. For example, the International Information Systems Security Certification Consortium (ISC)[2] noted a fourfold increase over a decade of certified individuals worldwide as of the end of 2013, but evidence from Japan (National Information Security Center), the United Kingdom (National Audit Office) and the United States (Bureau of Labour statistics) suggests that the current skills shortage confronting organisations in both the public and private sectors is expected to become more severe over the next decade. As a result, the UK Cabinet Office, Department for Business Innovation and Skills, National Cyber Security Programme and GCHQ have partnered to lead and support activities to increase cybersecurity skills at all levels of education.

Privacy professionals are in steady demand, prompted in part by the existence of a statutory basis in a number of countries, such as Canada, New Zealand, the United States, Germany and other EU countries. This development has been encouraged and supported by professional associations. For example, the steep growth in membership of the International Association of Privacy Professionals (IAPP) suggests broad market recognition for sound data governance practices (see Chapter 5, Figure 5.2). In its *Fortune 1000 Privacy Program Benchmarking Study*, the IAPP noted that while budgets vary widely across

Fortune 1000 companies, the average privacy budget is USD 2.4 million, 80% of which is spent internally on areas ranging from developing policies, training and certification to audits and data inventories.

Under the 2013 revisions to the OECD Privacy Guidelines, accountable organisations need to put in place multifaceted privacy management programmes, and be ready to demonstrate them on request from a privacy enforcement authority (OECD, 2013c, para. 15). As a result, the increase in privacy budgets and the number of privacy professionals is accompanied by an increased focus on training, education and certification activities. Looking ahead, with the growth of data-driven innovation and data analytics, data ethics is becoming a key element in protecting privacy (OECD, 2015a, forthcoming). Companies will need to adjust their perception of privacy from that of a compliance matter to be addressed by legal departments or a technical issue to be handled by IT departments, and instead implement ethical review processes and ensure that privacy-literate employees are designated throughout the organisation to identify potential issues.

Transparency reporting is increasing

Improved transparency is a long-standing OECD objective dating back to the original 1980 Privacy Guidelines, and was reaffirmed in the 2011 OECD Recommendation on Principles for Internet Policy Making (IPPs). Concerns about government access requests – particularly to data entrusted to providers of cloud computing services – predate the revelations by Edward Snowden in 2013 and are not limited to intelligence gathering. But those revelations have brought into sharper focus the need for transparency. Today, Internet and communications businesses are under increasing pressure to be open about the manner in which they address government access requests. One response has been the publication of transparency reports; since Google issued the first transparency report in 2009 the number has grown with over 30 companies now issuing public reports.

While governments have begun to acknowledge the need to improve transparency and are taking steps in that direction, more work is needed to increase public awareness about how governments access and use commercial data. Transparency reports are an important step forward in this regard, but their quality and comparability needs to be improved.

Governments adopt comprehensive National Cybersecurity Strategies

Cybersecurity has become a national policy priority addressed in an increasingly integrated manner, encompassing economic, educational, legal, technical and sovereignty-related issues. Today, many OECD countries have a national cybersecurity strategy: Australia (2009), Austria (2013), Belgium (2013), Estonia (2014), Hungary (2013), Italy (2013), Japan (2013), Norway (2012), Switzerland (2012), the Netherlands (2013) and Turkey (2013). Many non-OECD members have also recently adopted or revised their national cybersecurity strategies: India (2013), Kenya (2013), Latvia (2014), Qatar (2014), Russia (2013), Singapore (2013), South Africa (2013), Trinidad and Tobago (2012) and Uganda (2013). In 2014, the Chinese government organised a high-level working group on cybersecurity and Internet management, chaired by the country's president, with no less than six agencies and ministries providing input into cybersecurity policies. The group aims to improve co-operation among different agencies and ministries, while raising the profile of cybersecurity among leaders (Segal, 2014).

One notable trend is the increased role played by international and regional organisations in the development, implementation and evaluation of national cybersecurity strategies in Africa, Europe and the United States. For OECD countries, the forthcoming revised 2002

Security Guidelines call for national strategies to pursue the following complementary objectives: (i) create the conditions for all stakeholders to manage digital security risk to economic and social activities and foster trust and confidence in the digital environment; (ii) safeguard national and international security, and (iii) preserve human rights. Looking ahead, an important objective is to support SMEs and individuals to better manage digital security risks to their own activities.

In contrast, government responses to privacy risks are largely legal in nature

Governments have not begun to develop national privacy strategies to address privacy issues in a coordinated, holistic manner, as recommended in the OECD Privacy Guidelines. Such an approach would enable stakeholders to clarify the depth of protection to be afforded to individuals and the limitations society would be willing to accept to serve collective public interests. Instead, despite increased attention devoted to privacy risks, including at the political level, legislation remains a key response.

Almost all OECD countries (aside from Chile and Turkey) have privacy legislation. In 2014, reforms took place in Australia to enhance the powers of the Office of the Australian Information Commissioner and in Japan to establish the first independent data protection authority for government-issued identification numbers. Japan is also reviewing its Personal Data Protection Law to ensure its suitability for a world of "personal data utilisation". Proposed privacy legislation in the United States, however, remains a work in progress. Outside the OECD, China amended its consumer rights law to add provisions on the protection of personal information. Brazil recognised fundamental rights regarding personal data in the "Marco Civil da Internet". South Africa adopted a Protection of Personal Information Act in November 2013 and established an information regulator. Singapore's new law governing the collection and use of personal data by private sector organisations came into force in July 2014.

In terms of international developments, negotiations are still underway to complete a major overhaul of Europe's data protection framework. The Council of Europe is updating its primary data protection instrument, Convention 108. The Organization of American States is also working on a model law on personal data protection. Meanwhile, Asia-Pacific Economic Co-operation (APEC) has begun a review of its 2004 APEC Privacy Framework, with a view to possibly drawing on elements from the 2013 update to the OECD Privacy Guidelines.

Co-operation for privacy enforcement and security responses is growing

Since the adoption of an OECD recommendation in 2007, co-operation among privacy enforcement authorities has improved. In particular, the International Conference of Data Protection and Privacy Commissioners took steps to operationalise good practices from the Recommendation. The Global Privacy Enforcement Network (GPEN), composed of 51 data protection authorities across 39 jurisdictions, has conducted a cross-border survey of disclosure practices regarding the use of personal data by mobile apps, with a view to increasing public and commercial awareness of data protection rights and responsibilities, as well as to identify specific issues for future enforcement actions and initiatives. With respect to cybersecurity risk management, statistics from the Forum of Incident Response and Security Teams (FIRST) reveal a steady increase in interaction, information sharing, collaboration and co-operation among Computer Security Incident Response Teams (CSIRT), which should lead to improved incident response and better cybersecurity risk management.

Technology responses: Encryption and DNSSEC

On the technology front, Apple, Google and other companies have increased the default use of encryption in response to cyber-security and privacy risks. The popular messaging tool, WhatsApp, also announced its own end-to-end encryption. Apple has begun to explicitly market its privacy practices at the CEO level, emphasising security and privacy as fundamental design elements in Apple products and services. Such developments offer encouragement to policy makers who have long hoped that businesses would treat privacy protection as a business differentiator.

Another effort to reduce the risk of breach of confidentiality (data snooping) and various forms of deceptive attacks launched against Internet users via the Domain Name System (DNS) is the promotion of a security technology called Domain Name System Security Extensions (DNSSEC). The risk is that hostile attacks could replace a genuine DNS response with a crafted response, thereby misdirecting a user's traffic to unintended locations. Internet users are placed in the position of being forced to trust the responses they receive from their queries, yet having no certain means to assure themselves they are not being misled by a malicious third party. The response to this vulnerability is to add digital signatures to the DNS resource records. This enables them to confirm that the received DNS information is genuine. The widespread adoption of DNSSEC can significantly improve the robustness and reliability of the Internet. Successful experiences in Sweden also suggest that co-ordinated efforts by key stakeholders can have a positive impact on the adoption rate of this promising technology, while the Internet Corporation for Assigned Names and Numbers (ICANN) has determined that all new generic top-level domains (gTLDs) must support DNSSEC from inception.

There is a need to develop a security and privacy evidence base

The growing profile of privacy and security issues has not been matched by an equivalent acceleration in the development of metrics and other evidence needed by policy makers to evaluate the size and nature of the problem, and address the challenges. Many CSIRTs generate statistics on the number of incidents handled, and also collect data or potentially have access to data that could be used to generate statistics on other relevant phenomena. The OECD is currently working with the incident response community to develop guidance to help improve the quality and international comparability of statistics produced by CSIRTs (see OECD, 2015a, forthcoming). A number of other developments related to privacy and security risks are covered in Chapter 4, including the possible growth of cybersecurity risk insurance markets and the increasing role of the courts.

Competition policy issues have grown in importance both on the supply and demand sides

Several trends in the digital economy such as industry consolidation in the telecommunications sector; convergence between broadcasting, fixed and mobile networks; and the emerging field of zero-rating have the potential to affect competition. In addition, some observers argue that the sharing economy might also create additional competition issues, since different rules may apply to individuals offering private services and industries offering professional services (Chapter 4). The following section discusses competition issues arising from convergence and industry consolidation. Zero-rating is

discussed in the section on net neutrality, while potential emergent competition policy issues linked to the sharing economy and collective consumption are highlighted in Chapter 3.

Recent years have seen a trend towards industry consolidation, especially in mobile communications

Consolidation in the communications and media industry is not a new phenomenon, but has increased in recent years, especially in mobile markets. Since 2010, 19 mobile mergers took place in OECD countries compared to fewer new entries for the same period (Chapter 4, Tables 4.5 and 4.6). Consolidation between fixed and mobile operators is another trend mirroring fixed-mobile convergence, discussed below.

In most countries, infrastructure competition has emerged between traditional public switched telephone networks (which later evolved to DSL) and cable networks (upgraded to provide Internet access services). There is, however, very limited geographical competition between the same networks in the same area. In some of these markets there may be additional players due to new private sector entry or municipal networks. Some observers also point to the potential for competition from mobile operators. While mobile networks certainly provide strong competition for traditional services, such as telephony, they are still regarded as being largely complementary to fixed networks. The degree of competition in many markets thus depends on the number of ISPs in an area.

Policy makers have addressed competition issues in fixed markets through measures such as unbundling and functional or structural separation.

Policy makers have addressed challenges to competition in fixed markets through the use of regulatory tools such as unbundling of local facilities, or measures such as functional or structural separation. In some cases, countries have opted for public investment in networks, usually linked with open access requirements.

For mobile markets, policy makers may need to influence the number of players

In mobile markets, all OECD countries have at least three mobile network operators (MNOs) and the majority have four. In addition, Mobile Virtual Network Operators (MVNOs) exert competitive pressure on established providers. However, a recent spate of mergers has raised concerns over the level of effective competition. For this reason, the OECD examined the implications of an increase or decrease in the number of players in mobile markets (OECD, 2014e). While it would be preferable for market forces to determine the number of players, the scarcity of spectrum resources and the need for significant network deployment investments suggest that policy makers may have to take a stance and determine, or at least influence, the number of players in mobile markets.

Recent years have witnessed the growing use of network sharing between MNOs in OECD countries. This can decrease costs to a single operator of network deployment and extend coverage to locations especially in rural areas which might otherwise be underserved. However, network sharing can affect competition through unilateral effects, potential co-ordination and information sharing. For example, in a market with four MNOs, two sharing agreements may facilitate co-ordination and effectively result in a wholesale duopoly. Telecom regulators and competition authorities need to be vigilant, monitor sharing agreements and assess whether MVNOs exert sufficient pressure on MNOs.

There is a need to monitor the effects of convergence and ensure technological neutral regulation

Competition in communication markets is also affected by increasing convergence. During recent years, trends in convergence have been observed mainly between fixed and mobile networks (i.e. joint provision of fixed and mobile communication services), and between telecommunications and television service offers, with market players tending to offer triple-play services (voice, video and broadband). More recently, convergence between telecommunications offers and over-the-top (OTT) services from application-based companies (e.g. Facebook, Netflix, Spotify) have begun to pose new challenges to current regulatory frameworks.

Convergence, whether between fixed and mobile, telecoms and broadcasting or telecoms and OTT, inevitably leads to service bundles. These enable consumers to benefit from integrated offers, but may lead to the exclusion of other operators unable to offer the full range of services. This situation calls for telecom regulators and competition authorities to advance regulatory reform, with a view to applying the same rules if similar services are being provided, thus guaranteeing technological neutrality. Since the principle of technological neutrality would suggest that similar services should operate under the same rules and conditions, its implementation poses significant challenges to most current regulatory frameworks, as the Internet and traditional television broadcasting services stem from radically different environments and OTT services are typically not included. In cases where bundling incorporates goods that have an important level of market power (e.g. premium television content) and bundles could become a serious source of competition concern, regulators have applied ex-ante regulation. For example, in the United Kingdom, the Office of Communications (Ofcom) imposed a wholesale obligation on the leading pay television provider, Sky, to offer its wholesale sports channels at regulated prices to third-party providers.

Network neutrality is gaining momentum

Network neutrality – or the issue around treating Internet traffic equally versus prioritising traffic – is complex and potentially involves two main aspects. One is the ability of users to access content and services, which could be affected by differentiation through pricing, quality of service or blocking of access (e.g. blocking VoIP services). The second concerns the commercial arrangements that enable traffic exchange between networks (i.e. peering and transit). Both issues relate to the relationship between users and their Internet service provider (ISP), whom they pay for access to the Internet, as well as to the terms and conditions by which networks agree to exchange traffic.

The network neutrality debate is becoming increasingly heated in Europe and elsewhere. In the United States, most policy discussions on network neutrality have so far focused on last-mile issues (e.g. the FCC's 2014 Open Internet Notice of Proposed Rule Making).

Network neutrality in Internet access service: Countries take different policy approaches

If ISPs change access terms to some content, services or networks, including quality, this might create different limitations for users of the network, and affect the capacity of users on other networks to communicate with them. Any unreasonable limitation of such

communication could lead to different quality levels for alternative network paths, not all of which treat traffic in the same manner. Apart from a potential "fragmentation" effect, limitations on access could affect the Internet as a platform for innovation.

There is no unified approach towards network neutrality, and policy frameworks vary from country to country. A number of OECD countries have introduced legislation to ensure network neutrality and have prohibited blocking and unreasonable discrimination of services. In 2010, Chile was the first OECD country to legislate in favour of network neutrality, followed by the Netherlands (2011) and Slovenia (2012). Brazil's Congress passed the bill "Marco Civil da Internet" (Internet's Civil Framework Act), which makes network neutrality the rule on the Internet, even though the implementing regulations still need to be developed by Presidential Decree. For its part, Italy is following a similar process with a public consultation launched in October 2014.

Other countries established provisions on network neutrality jointly with the industry, such as the Norwegian model of co-regulation, or Korea's "Guidelines on Net Neutrality and Internet Traffic Management", published in December 2011. The United Kingdom favours self-regulation, relying on transparency and competition to provide consumers with sufficient information to make informed decisions. In Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) released a network neutrality framework to guide the telecommunications industry in the use of acceptable traffic management practices.

While most European countries have not, at least officially, adopted a formal position on network neutrality, the European Commission has voiced on many occasions its support for this principle, linking it to the ability for users to "access and distribute information or run applications and services of their choice". Moreover, the European Parliament adopted its position on the proposal on 3 April 2014 and the Council gave a negotiation mandate to the Latvian Presidency on 4 March 2015. Dialogues between the institutions started in March 2015. In the United States, the FCC released on 12 March 2015, the Order "Protecting and Promoting the Open Internet", which established three "bright line" rules applicable to both fixed and mobile broadband Internet access service, prohibiting blocking, throttling and paid prioritisation (FCC, 2015).

Network neutrality and traffic exchange between networks: Efficient traffic exchange markets have developed in competitive markets without the need for regulation

The Internet's model for traffic exchange works extremely well and has been a major ingredient in enabling it to scale so rapidly and pervasively. At its heart, every user of the Internet pays for his or her own access. In turn, their ISP undertakes to provide connectivity to the rest of the Internet either through peering (direct interconnection) or transit. The purchase of transit enables an ISP to reach all networks around the world. Peering enables two ISPs to directly exchange traffic, bypassing the transit providers. The use of peering allows ISPs to reduce their costs, as they do not need to purchase transit for that traffic. To save costs, ISPs establish or make use of Internet Exchange Points (IXPs), where they can peer with multiple networks at the same time. Meanwhile, the purchase of transit enables them to economically reach networks where they do not have facilities.

A recent survey found that 99.5% of peering agreements are realised on a handshake basis, with no written contract and no exchange of payment (Weller and Woodcock, 2013). Moreover, multilateral agreements exist on many IXPs, enabling hundreds of networks

to exchange traffic for free with any network that joins the agreement. Parties to these agreements include Internet backbone, access and content distribution networks, as well as universities, non-governmental organisations, branches of government, businesses and enterprises. Under the current voluntary system, operators invest in and expand their network to reach new peers, and co-operate with other networks to establish new IXPs in areas where there are none, because they save on transit costs.

The Internet model of traffic exchange operates in a highly competitive environment, largely without regulation or central organisation, and has enabled the development of an efficient market for connectivity based on voluntary contractual agreements. It has produced lower prices, promoted efficiency and innovation, and attracted the necessary investment to keep pace with demand. Nonetheless, where commercial negotiations do take place and in the absence of sufficient competition, one player may leverage their position to extract higher rents from others. In such instances, ISPs have the option to bypass each other. This is a key reason for the success of the Internet in competitive markets.

In the absence of sufficient retail competition a key issue is whether consumers are receiving the service they pay for. Resolving this question can be a challenge given that the Internet is a network of networks with each network responsible for delivering connectivity and traffic to its own customers. Nevertheless, computer scientists are developing tools to help inform stakeholders about issues such as the existence of online congestion. The preliminary report of a joint project undertaken in 2014 by the Massachusetts Institute of Technology's Computer Science and Artificial Intelligence Laboratory and the Centre for Applied Internet Data Analysis (CAIDA/UCSD) did not reveal widespread congestion among ISPs in the United States. Similar projects in other parts of the world would contribute greatly to informing policy makers and regulators.

Could zero-rating be considered a violation of net neutrality?

One emerging practice that features high in net neutrality discussions is zero-rating. The ICT industry applies the term zero-rating when some of the traffic sent and received by consumers over the Internet is unmetered.

Zero-rating can take a number of forms. For example, zero rating can be applied by ISPs to their own content or to that of pre-selected partners such as video or music services. When customers access this content, it does not count against the data cap of their broadband plans. Alternatively, if the customer of another ISP accesses that content over the Internet, they would pay a subscription charge to the service and their ISP would count these data against their allowance.

Another example of zero-rating involves a large difference in price between on-net and off-net traffic (i.e. either traffic supplied by the ISP itself or its unpaid peers, or content obtained via an IP transit network). These kinds of arrangements tend to be popular in countries that have broadband offers with low bit caps in monthly allocations. In Australia, lower bit caps due to high IP transit rates resulted in the use of zero-rating as a competitive tool. Smaller ISPs and content providers, such as radio stations, directly exchanged traffic and ISPs passed on the lower costs to their customers through zero-rating. This enabled consumers with low bit caps to stream audio from these stations – an option that would not have been attractive at metered pricing. Had regulation required these ISPs to treat this

traffic like that of any other content provider not directly interconnecting with them, it would have distorted the incentives for peering and transit.

An additional form of zero-rating occurs in developing countries where the practice is increasing. Popular Internet services, such as Facebook, WhatsApp, Twitter, Wikipedia and Google, have been partnering with telecommunication operators to offer zero-rated access to these services. However, it should be noted that these products do not provide access to the Internet, but only to a limited number of sites. The goal is to use these sites as a teaser to encourage wider Internet use among consumers. This approach can also help achieve social objectives by including unmetered access to websites such as Wikipedia or health and government information.

To date, regulators have taken different positions on zero rating. In Canada, Chile, Norway, the Netherlands and Slovenia, regulators have made explicit statements against zero-rating as anti-competitive or contravening national net neutrality regulation. In other countries the practice exists among various operators in different forms and regulators have not taken action.

While zero-rating can clearly be pro-competitive and may have beneficial aspects for economic and social development, regulators need to be vigilant. Previous experiences in OECD countries have shown that zero-rating becomes less of an issue with increased competition and higher or unlimited data allowances. Indeed, it can be a tool to increase competition. Prohibiting zero-rating may have implications for a market where there is lower competition for transit and may reduce the effectiveness of peering. Nevertheless, in any market with limited competition for access, zero-rating can affect competition among content providers. For example, any situation where a dominant content provider is zero-rated and its competitors are not (and the provider's position enables them to opt for paid-peering rather than peering) may impede new or innovative firms from entering the market. Likewise, a situation where an ISP offers a high-volume service while setting a low data cap could also stifle competition.

1.8 Internet governance and policy outlook

The digital economy has far-reaching impacts across sectors. Accordingly, stakeholders are paying increasing attention to the issue of Internet governance at national and international levels, with many governments ranking the issue high on agendas (e.g. see OECD, 2011). In 2014, the international summit NETmundial in São Paulo produced a global multi-stakeholder statement of generally accepted principles and a further roadmap for Internet governance (NETmundial, 2014).

A number of distinct but interrelated processes could further shape the Internet governance landscape over the next two years. Firstly, the Internet community is developing a proposal to transition oversight of the Internet's technical resources from the United States government to the global multi-stakeholder community. The private, non-profit Internet Corporation for Assigned Names and Numbers (ICANN) has convened this process at the request of the United States. Secondly, developments in the network neutrality discussion are expected with a number of states, such as Brazil, the European Union and the United States, to review or develop net neutrality regulation and discuss ways to deal with zero-rating in this context. Lastly, the United Nations is due to publish the Sustainable Developments Goals as part of the post-2015 development agenda. These are likely to make

reference to ICTs and their role in promoting development, which has focused interest on the potential economic and social benefits of an open Internet.

The IANA stewardship transition

Internet governance is – as the Internet itself – spread out, with a number of different organisations handling different aspects. Coordination of the domain name system and Internet addressing has been handled largely by the private, non-profit Internet Corporation for Assigned Names and Numbers (ICANN), since its creation in 1998.

ICANN coordinates bottom-up policy development processes by stakeholders of the domain name system. ICANN also performs the narrower set of technical functions known as the Internet Assigned Numbers Authority (IANA) functions under contract with the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA) since 2000.

Under its role as the "IANA functions operator", ICANN allocates blocks of IP addresses and network numbers to Regional Internet Number Registries (RIRs) that serve different geographical regions. ICANN also administers protocol parameter registries that involves maintaining many of the codes and numbers used in Internet protocols. And importantly, ICANN performs certain administrative duties associated with the root zone file and root zone WHOIS, which includes reviewing change requests from top-level domain name operators. ICANN also provides "other services" related to the administration of the .int and .arpa top level domains.

In March 2014, NTIA asked ICANN to convene a multi-stakeholder process to develop a proposal to transition the US stewardship role over the IANA functions to the global multistakeholder community. Prior to this transition, NTIA specified that the proposal must adhere to specific conditions. Namely, the proposal must:

- Support and enhance the bottom-up, multistakeholder model;
- Maintain the security, stability, and resiliency of the domain name system;
- Meet the needs and expectations of the global customers and partners of the IANA services;
- Maintain the openness of the Internet.

NTIA also stated that it would not accept a proposal that replaces its role with a government-led or an inter-governmental organization solution.

In response to this task, stakeholders organized two parallel processes. The first focuses on the specifics of the IANA functions and developing a transition proposal and the second focuses on enhancing ICANN accountability to the global community of Internet stakeholders. For the first track, an IANA Stewardship Transition Coordination Group (ICG) was established in July 2014. The ICG called for the three communities of interest aligned to the three primary IANA functions – domain names, numbering resources, and protocol parameters – to each develop a proposal related to that function.

The Internet Engineering Task Force (IETF) for the protocol parameters function and the Regional Internet Registries (RIRs) for the Internet numbers related function submitted their proposals to the ICG in January 2015. An ICANN Cross Community Working Group (CWG-Stewardship) on naming related functions was at the time of writing continuing to develop their proposal. Once the naming proposal is finalized, the ICG will review

and compile them into one consolidated transition proposal. Once fully vetted by the broader community, the ICG will submit a final proposal to ICANN who will then transmit it to NTIA.

The second process is addressing how to enhance ICANN's accountability to the global Internet community in the absence of the contractual relationship with the US National Telecommunications and Information Administration (NTIA). An ICANN Cross Community Working Group (CCWG-Accountability) was formed to look at ICANN accountability enhancements and established two work streams: 1) identify accountability measures that need to be in place before the transition, and 2) address accountability measures that should be adopted and implemented by ICANN in the longer term. Once the CCWG-Accountability has completed its work stream 1 output, ICANN will transmit it to NTIA.

NTIA has not set a deadline for this transition. While the base period of the IANA functions contract expires in September 2015, NTIA has the flexibility to extend the contract if the community needs more time.

Renewal of the IGF mandate and the Sustainable Development Goals

In December 2015, the mandate of the Internet Governance Forum (IGF) will come up for renewal. In the same month, the high-level meeting for the overall review by the General Assembly of the implementation of the outcomes of the World Summit on the Information Society (WSIS) will take place. The WSIS conferences in 2003 and 2005 and their outcomes played a key role in increasing the visibility of Internet governance on the international agenda. The forthcoming high-level meeting will review progress toward objectives established in the outcome documents, in line with UN General Assembly resolutions 60/252 and 68/302. September 2015 will also see the launch of the post-2015 UN development agenda with a new set of targets designed to replace and build on the Millennium Development Goals (MDGs). The Internet and ICTs appear in the MDGs only in the context of a "global partnership for development", as a sub-target of Goal 8.[45] The new targets, the Sustainable Development Goals (SDGs), place a stronger emphasis on increased access to ICTs as a means to create an inclusive and global digital economy (UN, 2014). According to the draft document, Goal 9c underlines the need to "significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020".[46] Despite their inclusion in the SDGs, however, some experts in the Internet governance and development community believe that ICTs should be developed as a crosscutting, horizontal goal. The present formulation focuses primarily on access to ICTs, rather than on the economic and social benefits achievable through the adoption and use of ICTs. These issues are likely to be discussed during the upcoming Internet Governance Forum (IGF) to be held in November in Brazil which, for the first time, aims at producing a declaration

The openness of the Internet

Another issue gaining attention in the area of governance and policy is preservation of the open Internet. Internet openness can be viewed as a spectrum, ranging from completely open to completely closed. From a policy perspective, neither extreme is optimal. On the one hand, boundaries and limitations may be required for economic or social purposes;

on the other, closed systems are economically and socially costly because they reduce opportunities for trade gains, and social and civic inclusiveness, exchange and enrichment. The objective for governments is to ascertain the optimal position on the Internet openness spectrum. Assessing the full social implications of imposing limits may well be complex and requires careful examination of the dynamics at play – and the potential consequences. In addition, national choices have international ramifications, as restrictions on one national system may decrease the opportunities available to other countries to reap benefits from trade and knowledge flows.

The 2008 OECD Ministerial Meeting on the Future of the Internet Economy and the 2011 OECD Recommendation of the Council on Principles for Internet Policy Making (IPPs) highlighted the link between a distributed interconnected architecture designed to be open "by default" and the Internet's key role in catalysing economic growth and social well-being. Indeed, the digital economy has benefitted from numerous innovations resulting from businesses, citizens and governments serendipitously innovating and developing applications and service across this open platform. But in recent years, a number of policy and governance trends have arisen that may impact, directly or indirectly, the economic and social benefits delivered by the open and decentralised nature of the Internet and by the free flow of trans-border data. Such trends include data and content localisation requirements and new challenges in the area of net neutrality.

Ongoing OECD work aims to categorise different dimensions of the open Internet and to analyse the effects of an open Internet and the risks and consequences of fragmentation. The ultimate goal is to provide a framework accompanied by analysis and evidence that allows policy makers to make more informed decisions. The framework will have to acknowledge the balance between harnessing the Internet for economic growth and permitting sources of friction that address public policy goals. It must also recognise that this balance can differ between countries driven by different societal values.

The third OECD Digital Economy Ministerial Meeting

The benefits of and risks to an open Internet will be addressed at the forthcoming third OECD Ministerial Meeting on "The Digital Economy: Innovation, Growth and Social Prosperity" in 2016. Ministers and other high-level representatives of the global Internet community will take a holistic look at recent developments in the digital economy and discuss ways to maximise the economic and social benefits while mitigating risks. Discussions will be structured around four main themes:

- *The open Internet as a platform for growth* will analyse the benefits of openness and the concomitant risks and consequences of fragmentation, as well as innovations on the demand side enabled by ICTs and the conception of the Internet as an open platform.
- *Building global connectivity* will focus on issues related to the convergence of networks and services and the Internet of Things (Chapter 6).
- *Trust* will address the importance of consumer trust for market growth and explore digital risk management.
- *Jobs and skills* will focus on ways for policy to promote labour market transformation and for digital skills to maximise the benefits of the digital economy.

Box 1.3. **Brazil: Internet governance and policy outlook**

Promoting multistakeholderism in policy making

The Internet's complexity, global reach and constant evolution require timely, scalable and innovation-enabling policies. As the Internet becomes more critical to economies and societies and affects an increasing number of interests, the decision making process around legal and political frameworks becomes more complex, and sometimes, contentious. Experience has shown that multi-stakeholder processes can provide the flexibility and global scalability required to address Internet policy challenges.

The Brazilian experience in promoting a multi-stakeholder approach to Internet policy making has received international acclaim and inspired the organisation of the 2014 NETMundial conference in São Paulo to discuss principles and a roadmap for Internet governance. Brazil's success in implementing a participative and cross-sectoral framework for Internet policy making is the result of an innovative framework embodied by the Internet Steering Committee (CGI.br).

The CGI.br is responsible for establishing strategic directives related to the use and development of the Internet in Brazil, as well as guidelines for the implementation of Domain Name registration, allocation of IP (Internet Protocol) and administration of the Top Level Domain (TLD) ".br". The CGI.br follows a multi-stakeholder model and consists of 21 members, including nine representatives from federal government, four from the business sector, four from civil society, three from the scientific and technical community, and a renowned Internet expert.

Typically, this steering committee meets once per month and publishes its agendas and minutes online. A group of multi-sectoral consulting chambers support the steering committee by discussing specific topics in depth, such as changes to the technical structure of port 25 which resulted in a drop in online spam.

The Internet Steering Committee's decisions are supported and executed by the Centre for Information and Coordination (NIC.br), established in 2005 as a non-profit organization. NIC.br has a mandate to register and maintain .br domain names, respond to and treat security incidents, promote studies, measure indicators, and recommend procedures and standards, among other operational assignments. CGI.br and ANATEL also counsel the President of the Republic on implementing exceptions to the network neutrality principle.

Marco Civil

The Brazilian Internet Bill of Rights (Bill of Law no. 12.965/2014), or "Marco Civil" in Portuguese, consolidates rights, duties and principles for the use and development of the Internet in Brazil. Its importance lies not only in its principles, but also in the manner in which its was drafted. The law was a joint initiative of the Ministry of Justice in partnership with the Centre for Technology and Society at the Getulio Vargas Foundation (FGV). It was based on an open and collaborative consultation process, implemented at an unprecedented scale across the country.

The first phase of the consultation registered more than 800 proposals, comments and messages of support from various sectors of Brazilian society concerning key topics for debate about Internet use. The second phase saw the formulation and submission of a draft bill for comments and public debate.

The initiative gained national and international attention for its multi-stakeholder approach and for the development of a regulatory framework defining key principles for a user-centric open Internet. Public consultation is currently underway on further regulations for certain provisions of the law. The main issues under discussion relate to network neutrality, protection of personal data and data retention requirements for providers.

Notes

1. See, for example, the OECD Principles of Internet Policy Making (OECD, 2011) and the NetMundial Multistakeholder Statement (NETmundial, 2014).
2. These include: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States (OECD countries), and Egypt, Latvia, Lithuania and Russian Federation (non-OECD countries).
3. These include: Australia, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Turkey and the United Kingdom (OECD countries), and Egypt, Latvia and Lithuania (non-OECD countries).
4. See *www.evm.dk/~/media/files/2014/web-185953-indhold-v-kstrapport-for-digitaliering.ashx*.
5. See *www.digitale-agenda.de/DA/Navigation/DE/Home/home.html*.
6. See *www.agid.gov.it/sites/default/files/documenti_indirizzo/strategia_italiana_agenda_digitale_0.pdf*.
7. See *http://embamex.sre.gob.mx/italia/images/pdf/national%20digital%20strategy.pdf*.
8. See *www.bilgitoplumu.gov.tr/en/2014-2018-information-society-strategy/*.
9. See *http://apo.org.au/research/advancing-australia-digital-economy-update-national-digital-economy-strategy*.
10. See *www.france-universite-numerique.fr/IMG/pdf/feuille_de_route_du_gouvernement_sur_le_numerique.pdf*.
11. See *http://japan.kantei.go.jp/policy/it/index_e.html*.
12. See *www.gov.uk/government/publications/information-economy-strategy*.
13. In 2012, the Digital Agenda for Europe underwent a review that identified areas where more focused action is needed to create growth and jobs in Europe. As a result of the review it added 31 actions.
14. See *www.bmg.gv.at/home/Schwerpunkte/E_Health_Elga/E_Health_in_Oesterreich/*.
15. See *www.efit21.at/en/about-efit21*.
16. See *www.sozialministerium.at/cms/site/attachments/7/7/8/CH2477/CMS1332494355998/nap_behinderung-web_2013-01-30_eng.pdf*.
17. See *www.regeringen.se/sb/d/108/a/181801*.
18. See *www.government.se/sb/d/574/a/134980*.
19. See *www.regeringen.se/sb/d/15700/a/206004*.
20. See *www.government.se/sb/d/574/a/152926*.
21. See *www.government.se/download/70f489cb.pdf?major=1&minor=181914&cn=attachmentPublDuplicator_0_attachment*.
22. See *www.regeringen.se/sb/d/2498*.
23. See *www.government.se/sb/d/2025/a/202558*.
24. See *www.ic.gc.ca/eic/site/028.nsf/eng/home*.
25. This investment comes on top of CAD 14 billion already allocated over the next ten years for a new Building Canada Fund, to which broadband and connectivity projects are eligible. The Building Canada Fund consists of a National Infrastructure Component (CAD 4 billion), which will support projects of national significance, and Provincial-Territorial Infrastructure Component (PTIC) (CAD 10 billion) for projects of national, local or regional significance.
26. See *www.mpo.cz/zprava149132.html*.
27. See *www.portugaldigital.pt*.
28. See *www.gouvernement.lu/4103941/dossier-de-presse-digital-letzebuerg-20141017.pdf*.
29. See *www.fcc.gov/national-broadband-plan*.
30. See *www.regjeringen.no/nb/dep/kmd/dok/regpubl/stmeld/2012-2013/meld-st-23-20122013-2.html?id=728993*.

31. See *www.msip.go.kr/cms/www/open/go30/info/info_1/info_11/__icsFiles/afieldfile/2014/11/24/%EC%A0%9C5%EC%B0%A8%EA%B5%AD%EA%B0%80%EC%A0%95%EB%B3%B4%ED%99%94%EA%B8%B0%EB%B3%B8%EA%B3%84%ED%9A%8D%282013~2017%29.pdf*.
32. See *www.mg.gov.pl/node/20481*.
33. See *http://ec.europa.eu/digital-agenda/en/our-goals/pillar-ii-interoperability-standards*.
34. See *www.mcit.gov.eg/Upcont/Documents/MCITstrategy2013_en.pdf*.
35. See *www.nih.gov.hu/download.php?docID=25413*.
36. See *http://e-estonia.com/nordicday/digitalagendas/*.
37. See *www.mizs.gov.si/si/medijsko_sredisce/novica/article//8881/a6a53e02d821d14c3dbcc42bea5b9b35*.
38. *www.dcenr.gov.ie/NR/rdonlyres/54AF1E6E-1A0D-413F-8CEB-2442C03E09BD/0/NationalDigitalStrategyforIreland.pdf*.
39. See *www.agendadigital.gob.es/Paginas/Index.aspx*.
40. The definition of Telework in this Goal includes Telework of a formal, scheduled, contracted nature.
41. These speeds are reached under very specific conditions, in particular with regards to the number of users in a cell, distance to a tower and so forth.
42. For more information, see *http://press.spotify.com/fr/information/*.
43. For more information, see *www.youtube.com/yt/press/statistics.html*.
44. See OECD based on Instantwatcher (*http://instantwatcher.com/titles/all*).
45. Target 8F states: "in cooperation with the private sector, make available the benefits of new technologies, especially information and communication technologies".
46. In addition, ICTs are mentioned briefly in Target 5b, on enhancing the use of enabling technologies, in particular ICT, to promote women's empowerment (goal 5 "Achieve gender equality and empower all women and girls").

References

Androsoff, R. and A. Mickoleit (2015), "Measuring government impact in a social media world", *OECD Insights* blog, 18 February 2015, *http://oecdinsights.org/2015/02/18/measuring-government-impact-in-a-social-media-world* (accessed 15 April 2015).

Apple (2013), "iTunes store sets new record with 25 billion songs sold", *Apple Press Info*, 6 February 2013, Cupertino, *www.apple.com/pr/library/2013/02/06iTunes-Store-Sets-New-Record-with-25-Billion-Songs-Sold.html* (accessed 15 April 2015).

Belleflamme, P. and T. Lambert (2014), "Crowdfunding: some empirical findings and microeconomic underpinnings", prepared for a special issue of the *Revue Bancaire et Financière*, July 2014.

Brazil (2010), Decreto N° 7.175 de 12 de Maio de 2010, *Presidência da República*, *www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7175.htm* (accessed 29 April 2015).

Capgemini (2014), "Internet of Things = Internet of trust", *Capping IT Off* blog, 19 September 2014, *www.capgemini.com/blog/capping-it-off/2014/09/internet-of-things-internet-of-trust*.

CIGI (2014), *CIGI-Ipsos Global Survey on Internet Security and Trust*, Centre for International Governance Innovation, Waterloo, ON, *www.cigionline.org/internet-survey* (accessed 15 April 2015).

EC (2015), *Special Eurobarometer 423: Cyber Security Report*, European Commission, Brussels, *http://ec.europa.eu/public_opinion/archives/ebs/ebs_423_en.pdf*.

EC (2010), *A Digital Agenda for Europe*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2010)245 final, European Commission, Brussels, *http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0245R(01)&from=EN* (accessed 21 November 2014).

Economist (2014), "Banking without banks", *The Economist*, 1 March 2014, *www.economist.com/news/finance-and-economics/21597932-offering-both-borrowers-and-lenders-better-deal-websites-put-two*, (accessed 22 October 2014).

Economist (2013), "Taking a bite out of Apple", *The Economist*, 12 September 2013, *www.economist.com/news/business/21586344-xiaomi-often-described-chinas-answer-apple-actually-quite-different-taking-bite-out*, (accessed 14 October 2014).

FCC (2015), *Report and Order on Remand, Declaratory Ruling, and Order, in the Matter of Protecting and Promoting the Open Internet*, 12 March 2015, Federal Communications Commission, Washington DC, *http://transition.fcc.gov/Daily_Releases/Daily_Business/2015/db0403/FCC-15-24A1.pdf*.

Flurry (2014), "Mobile to television", *Flurry Insights*, *www.flurry.com/blog/flurry-insights/mobile-television-we-interrupt-broadcast-again#.VG-PgPnF9HX* (accessed 21 November 2014).

Fox, S. and M. Duggan (2013), "Tracking for health", *Pew Research Center*, 28 January 2013, Pew Research Center, Washington DC, *www.pewinternet.org/2013/01/28/tracking-for-health/*.

GSMA (2013), *Socio-economic Impact of mHealth: An Assessment Report for the European Union*, London, Groupe Speciale Mobile Association and PricewaterhouseCoopers, *www.gsma.com/connectedliving/wp-content/uploads/2013/06/Socio-economic_impact-of-mHealth_EU_14062013V2.pdf*.

GSMA and PwC (2012), *Touching Lives through Mobile Health: Assessment of the Global Market Opportunity*, London, Groupe Speciale Mobile Association and PricewaterhouseCoopers, *www.gsma.com/connectedliving/gsma-pwc-report-touching-lives-through-mobile-health-assessment-of-the-global-market-opportunity/* (accessed 21 November 2014).

IAPP (2014), "Benchmarking privacy management and investments of the Fortune 1000", *International Association of Privacy Professionals* (IAPP) website, *https://privacyassociation.org/resources/article/benchmarking-privacy-management-and-investments-of-the-fortune-1000-2/* (accessed 15 April 2015).

IDATE (2014), *Digiworld Yearbook 2014*, IDATE, Montpellier, France.

Lunden, I. (2015), "Target Says credit card data breach cost it $162M in 2013-14", *TechCrunch*, 25 February 2015, *http://techcrunch.com/2015/02/25/target-says-credit-card-data-breach-cost-it-162m-in-2013-14/* (accessed 15 April 2015).

Massolution (2013), *2013CF: The Crowdfunding Industry Report*, Massolution, Los Angeles, CA, *www.crowdsourcing.org/editorial/2013cf-the-crowdfunding-industry-report/25107* (accessed 13 April 2015).

NETmundial (2014), *NETmundial Multistakeholder Statement*, *http://netmundial.br/wp-content/uploads/2014/04/NETmundial-Multistakeholder-Document.pdf* (accessed 4 April 2015).

OECD (2015a), *Data Driven Innovation for Growth and Well-Being*, OECD Publishing, Paris, forthcoming.

OECD (2015b), *Improving the International Comparability of Statistics Produced by Computer Security Incident Response Team*, OECD Publishing, Paris, forthcoming.

OECD (2015c), *Trust in a Data-Driven Economy: Data and Analytics: Prospects for Growth and Well-being*, OECD, Paris.

OECD (2014a), *Measuring the Digital Economy: A New Perspective*, OECD Publishing, Paris.

OECD (2014b), "Access network speed tests", *OECD Digital Economy Papers*, No. 237, OECD Publishing, Paris, DOI: *http://dx.doi.org/10.1787/5jz2m5mr66f5-en*.

OECD (2014c), "Cloud computing: The concept, impacts and the role of government policy", *OECD Digital Economy Papers*, No. 240, OECD Publishing, Paris. DOI: *http://dx.doi.org/10.1787/5jxzf4lcc7f5-en*.

OECD (2014d), "Government use of social media. A Policy Primer to Discuss Trends, Identify Policy Opportunities and Guide Decision Maker", *OECD Public Governance Working Papers No. 26*, OECD, Paris, *http://dx.doi.org/10.1787/5jxrcmghmk0s-en*.

OECD (2014e), "Wireless market structures and network sharing", *OECD Digital Economy Papers*, No. 243, OECD Publishing, Paris, DOI: 10.1787/20716826.

OECD (2014f), *Recommendation of the Council on Digital Government Strategies*, OECD Publishing, Paris, *www.oecd.org/gov/public-innovation/recommendation-on-digital-government-strategies.htm*.

OECD (2013a), *The Internet Economy on the Rise: Progress Since the Seoul Declaration*, OECD Publishing, Paris, DOI: *http://dx.doi.org/10.1787/9789264201545-en* (accessed 13 April 2015).

OECD (2013b), *Strengthening Health Information Infrastructure for Health Care Quality Governance: Good Practices, New Opportunities and Data Privacy Protection Challenges*, OECD Health Policy Studies, OECD Publishing, Paris, DOI: *http://dx.doi.org/10.1787/9789264193505-en*.

OECD (2013c), *Recommendation of the Council Concerning Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data*, OECD, Paris, *http://oe.cd/privacy*.

OECD (2012), *OECD Internet Economy Outlook 2012*, OECD Publishing, Paris, *www.oecd.org/sti/ieconomy/oecd-internet-economy-outlook-2012-9789264086463-en.htm*.

OECD (2011), *Recommendation on Principles for Internet Policy Making*, OECD, Paris, *www.oecd.org/sti/ieconomy/49258588.pdf*.

OECD (2008), *Recommendation of the Council for Enhanced Access and More Effective Use of Public Sector Information*, OECD Publishing, Paris, *www.oecd.org/sti/oecdrecommendationonpublicsectorinformationpsi.htm*.

Ofcom (2014), *Promoting Investment and Innovation in the Internet of Things*, Ofcom, London, *http://stakeholders.ofcom.org.uk/consultations/iot/* (accessed 15 April 2015).

Our Mobile Planet (2013), *Our Mobile Planet – Full Data Sets and Country Reports*, Google, Mountain View, CA, *http://think.withgoogle.com/mobileplanet/en-gb/downloads/* (accessed 13 April 2015).

Pew Research Center (2014), *Few Feel that the Government or Advertisers can be Trusted*, Pew Research Center, Washington DC, *www.pewinternet.org/2014/11/12/few-feel-that-the-government-or-advertisers-can-be-trusted/* (accessed 13 April 2015).

PricewaterhouseCoopers (2015), MoneyTree Survey Report, February, London Pwc.

PwC (2014a), *Retail Banking 2020: Evolution or Revolution?* PricewaterhouseCoopers, London, *www.pwc.com/et_EE/EE/publications/assets/pub/pwc-retail-banking-2020-evolution-or-revolution.pdf*.

PwC (2014b), *Internet Advertising – Key Insights at a Glance*, PricewaterhouseCoopers, London, *www.pwc.com/gx/en/global-entertainment-media-outlook/segment-insights/internet-advertising.jhtml* (accessed 20 November 2014).

research2guidance (2014), *mHealth App Developer Economics 2014: The State of the Art of mHealth App Publishing*, research2guidance, Berlin, *http://research2guidance.com/r2g/research2guidance-mHealth-App-Developer-Economics-2014.pdf*.

Segal, A. (2014), "China's new small leading group on cybersecurity and Internet management", *Forbes*, 27 February 2014, *www.forbes.com/sites/adamsegal/2014/02/27/chinas-new-small-leading-group-on-cybersecurity-and-internet-management/* (accessed 15 April 2015).

Simula, H. and T. Ahola (2014), "A network perspective on idea and innovation crowdsourcing in industrial firms, *Industrial Marketing Management*, No. 43, pp. 400-408, *http://dx.doi.org/10.1016/j.indmarman.2013.12.008*.

TechCrunch (2014), "Travel, retail and media are 3 industries taking over the App Store", *TechCrunch*, 18 October 2014, *http://techcrunch.com/2014/10/18/travel-retail-and-media-are-3-industries-taking-over-the-app-store/* (accessed 22 October 2014).

UN (2014), *Open Working Proposal for Sustainable Development Goals*, Full report of the Open Working Group of the General Assembly on Sustainable Development Goals, document A/68/970, United Nations, New York, *https://sustainabledevelopment.un.org/content/documents/1579SDGs%20Proposal.pdf*.

Weller, D. and B. Woodcock (2013), "Internet traffic exchange: Market developments and policy challenges", *OECD Digital Economy Papers*, No. 207, OECD Publishing, Paris, DOI: *http://dx.doi.org/10.1787/5k918gpt130q-en*

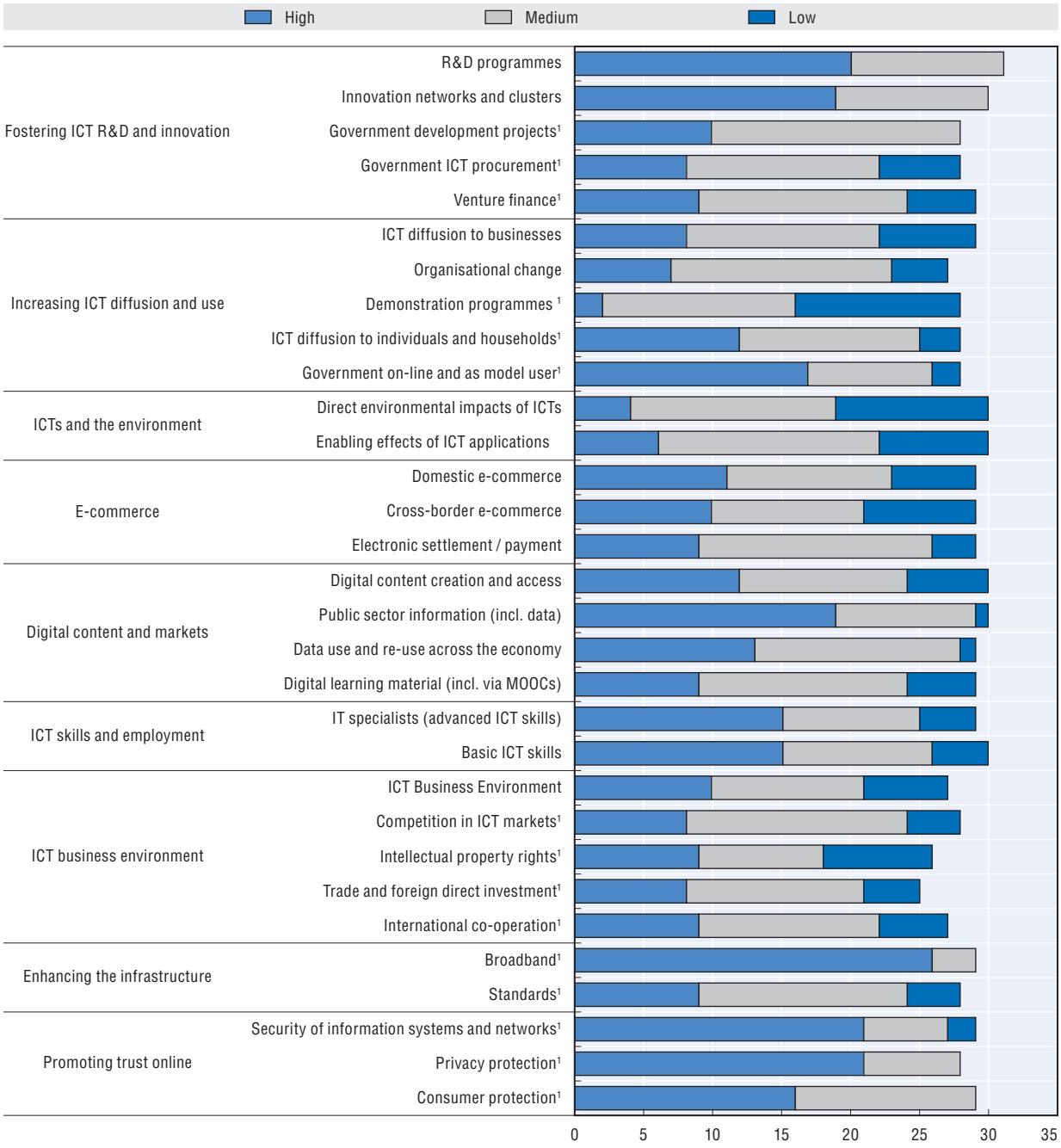
Wilson, K. and M. Testoni (2014), "Improving the role of equity crowdfunding in Europe's capital markets", *Bruegel Policy Contribution Issue*, 2014/09.

WSTS (World Semiconductor Trade Statistics) (2015), *WSTS Historical Billings Report*, *www.wsts.org/Teaser-Left/Historical-Billings-Report*.

ANNEX

Figure A.1. **Current ICT policy priorities, 2014**

Number of responses



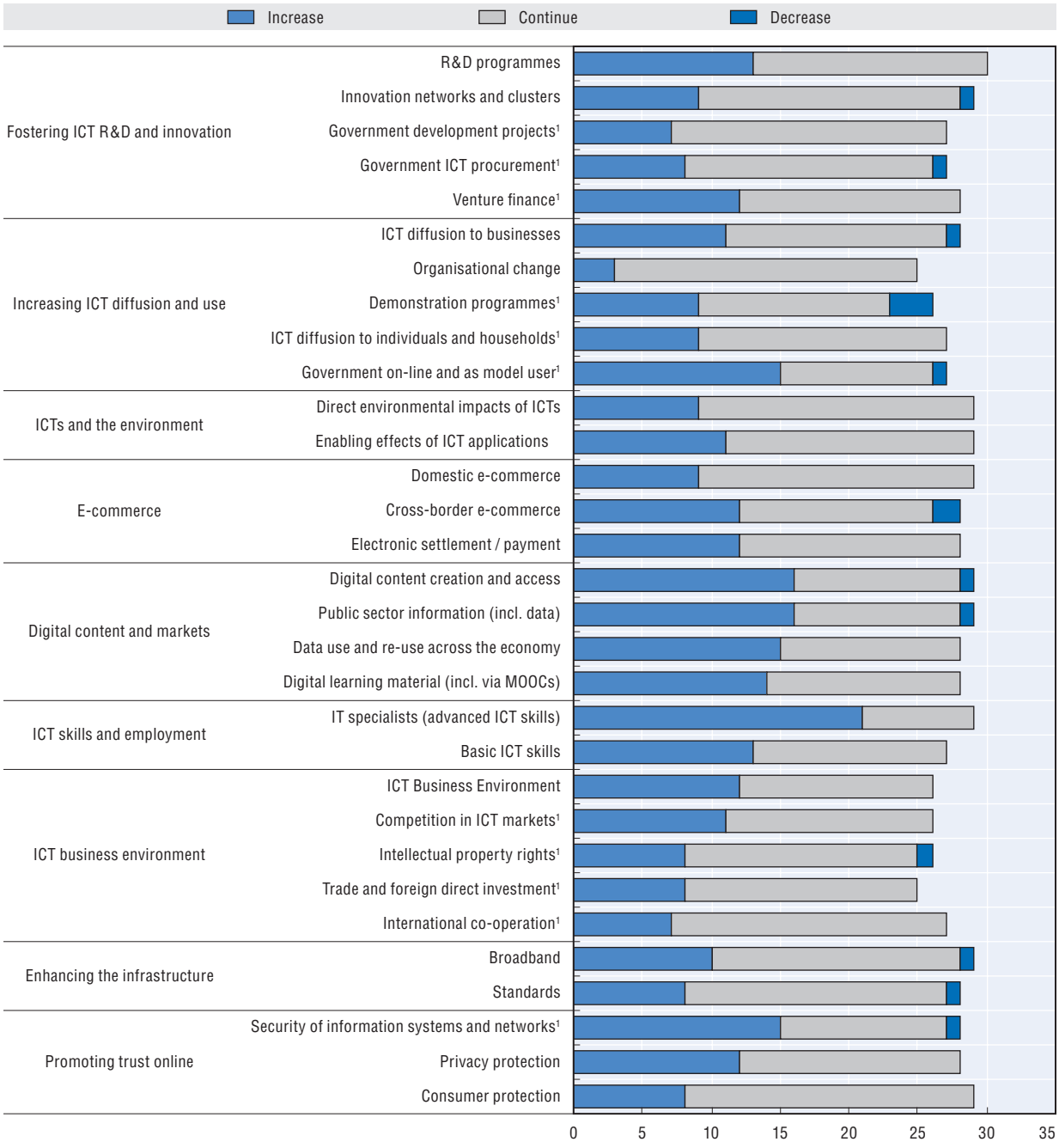
Note: *These policy areas are not covered in the 2014 policy questionnaire. They are retained here because (i) they are included in national strategies for the digital economy, and (ii) some of the policy areas are being addressed by other committees conducting related surveys (e.g. the Public Governance Committee on e-government and government ICT procurement).

Source: Based on 31 detailed responses (including 25 OECD countries) to the OECD DEO Policy Questionnaire 2014 on current and future policy priorities, sent on June 2014.

StatLink http://dx.doi.org/10.1787/888933224286

Figure A.2. **Evolution of ICT policy priorities**

Number of responses



Note: *These policy areas are not covered in the 2014 policy questionnaire. They are retained here because (i) they are included in national strategies for the digital economy, and (ii) some of the policy areas are being addressed by other committees conducting related surveys (e.g. the Public Governance Committee on e-government and government ICT procurement).

Source: Based on 31 detailed responses (including 25 OECD countries) to the OECD DEO Policy Questionnaire 2014 on current and future policy priorities, sent on June 2014.

StatLink http://dx.doi.org/10.1787/888933224297