

Chapter 5

Infinite connection

Universal access?: looks at patterns in access to computers in schools and at work.

Exponential use of the Internet: the rapidly-expanding worldwide network and exponential rise in Internet use.

The world in your pocket: focuses on the expansion of mobile phones and their increasing use as broadband devices.

A digital society: examines the outbreak of social networks with the example of Facebook and its number of active users, as well as the online advertising opportunity it has created.

Local diversity: the use of English language is progressively losing its prevalence on the Internet as online interactions among communities emphasise the diversity of cultures.

Transforming our Internet: looks at the rise in the numbers of Apps available for download to portable devices and Internet traffic for cloud computing.

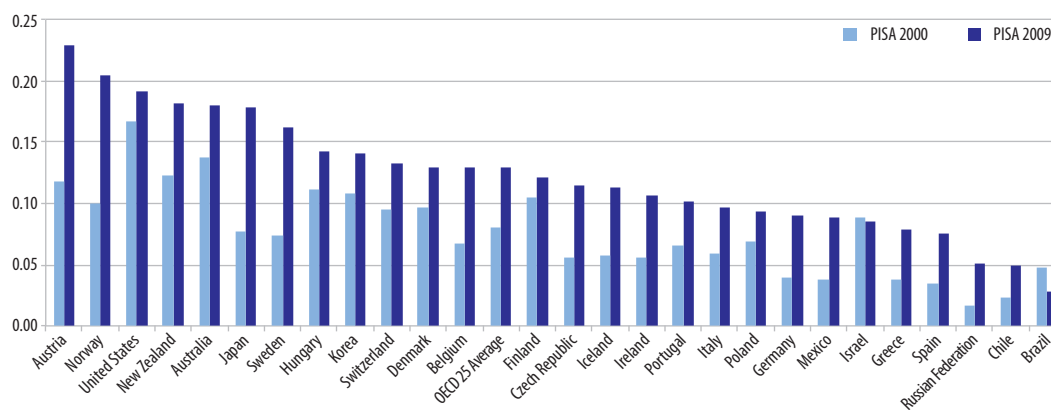
New connections, emerging risks: takes a walk on the wild side of cyber bullying and internet fraud.

UNIVERSAL ACCESS?

Information technology has developed very rapidly over the past 40 years, with computers becoming smaller, faster, cheaper, and more powerful. Information technology is now an integral part of our daily lives and embedded in many products. Many of us are now living in technological environments and need to adjust to the rapid pace of change. The ease and speed at which very large quantities of information can be rapidly accessed in a variety of settings is a key matter for education, as is the development of the skills necessary to use this resource effectively. While access to a computer at home and work has become almost universal in OECD countries, many questions may be raised about the use made of that technology for education, despite significant investments made by countries in order to provide access to computers and the Internet in schools.

Figure 5.1. More computers in schools

Average ratio of the number of computers to the number of students in schools, in PISA 2000 and 2009



StatLink  <http://dx.doi.org/10.1787/888932758644>

Note: PISA is the OECD's Programme for International Student Assessment, for more information, see www.oecd.org/pisa.

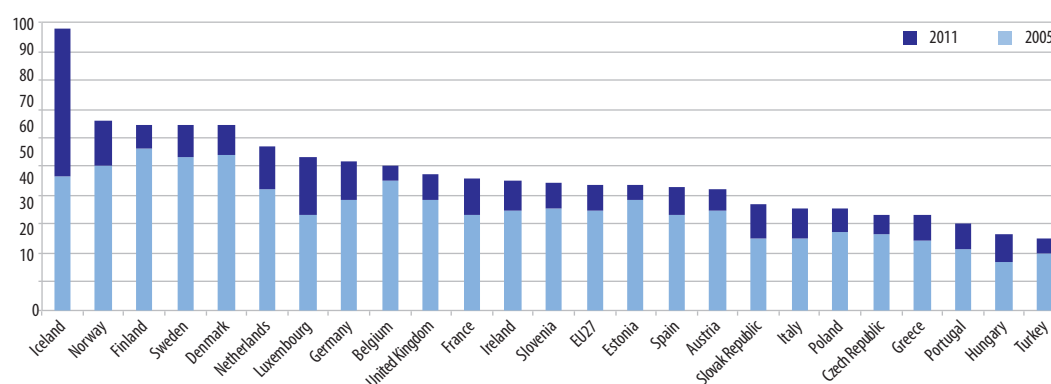
Source: OECD (2011), *PISA 2009 Results: Students OnLine: Digital Technologies and Performance (Volume VI)*.

Despite the ubiquity of computers in homes, student access to computers at school is still limited. Data from the OECD's Programme for International Student Assessment (PISA) indicate that on average across OECD countries the ratio of computers to students increased from 0.08 (so, less than one in ten) to 0.13 (just under one in eight) between 2000 and 2009. However there is wide variation: in Austria and Norway there was over one computer available for at least every five students in 2009, while in Brazil, Chile, and the Russian Federation there was one computer available for 20 children or more. Between 2000 and 2009, some countries experienced large increases in the ratio of computers to students at school: Chile, the Czech Republic, Germany, Greece, Japan, Mexico, Norway, the Russian Federation, Spain, and Sweden all doubled their ratios. But just as with home access, the presence of computers in schools by itself says little about how computers are actually used: access to computers, time spent (and for what purpose), and types of instructional methods all combine to give a better indicator of how technologies are being used at school.

Access and use of computers at work is also increasing, becoming for many an indispensable part of their working day, in particular through use as a communication channel. Between 2005 and 2011 there was a clear increase in the share of workers using an Internet-connected computer. Iceland and other Nordic countries (Finland, Denmark, Norway, and Sweden) had the highest levels in 2011, while Hungary and Turkey had the lowest levels. The size of the increase is also country specific: Iceland more than doubled its share in that time period (from 46% to 98%), a far greater increase than any other country. For education, these trends indicate that computer literacy is a fundamental skill for the majority of jobs, and not just restricted to those positions commonly labelled “information intensive”. Future forms of the “digital divide” might thus centre on the skills and capabilities to use information technologies effectively, and schools can play a role in equipping graduates with equal capacities in this domain.

Figure 5.2. Computing becoming a more common part of the work environment

Share of employed people at work using an Internet-connected computer, in 2005 and 2011



StatLink  <http://dx.doi.org/10.1787/888932758663>

Note: In place of data for 2011, figures from 2010 are used for Austria, Denmark, the EU27, Iceland, Turkey and the United Kingdom.

Source: OECD (2012), *OECD Internet Economy Outlook 2012*.

And education?

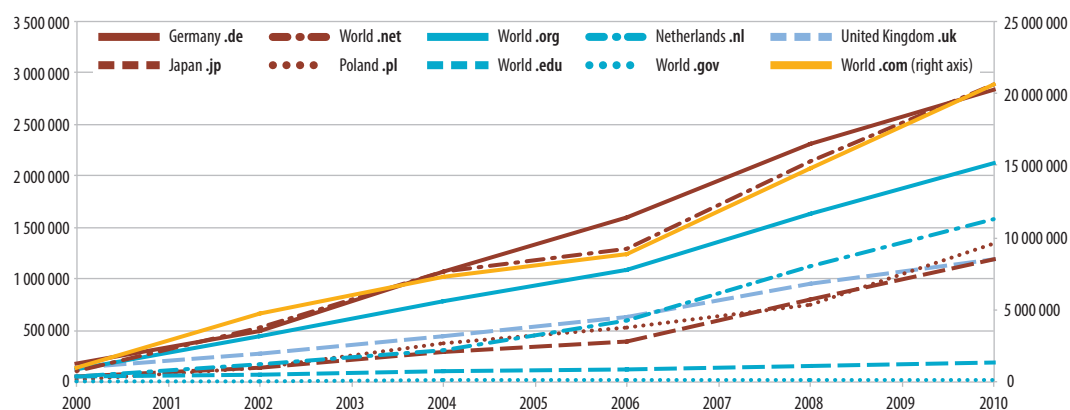
- Increasing numbers of computers are present at schools and routinely used at work. Are we adequately preparing students with the techniques and skills needed to take advantages of the opportunities that ICT offer?
- Teacher use of ICTs often lags behind the technical skills required by students by the time they enter the workplace. How can education ensure that students develop these skills? And how might teachers be better prepared for this?
- With technological development continuing at a rapid pace, how well has education kept pace and, indeed, should it? What are the benefits and costs of students learning through technology?

EXPONENTIAL USE OF THE INTERNET

Computers and information technology have become an integral part of daily life for everything from business to entertainment, as well as for social interaction. Once a primarily Anglophone medium, the Internet is now a completely global space that is transforming almost all aspects of our lives. Our language reflects this change: words like “google” or “tweet” or “skype” have become verbs that are incorporated seamlessly into conversation. For education, complex pedagogical and technical questions remain in determining the best way to support and guide teachers in their use of technology in the learning process. Students can also benefit from basic guidance in their use of technology. For example, they often need help in determining the quality and objectivity of information found in search results that may appear to be rigorous research, but is often from biased or dubious sources.

Figure 5.3. Internet expanding world wide

Web servers by domain, 2000-2010



StatLink  <http://dx.doi.org/10.1787/888932758682>

Note: Domains are the suffix letter strings attached to the end of web addresses that identify the site's origin or type. Every country has a unique domain suffix and there are also worldwide topic-related suffixes (.org or .edu). Data presented here include the top five OECD country domains, as well as the top five world domains, ranked according to 2010 figures.

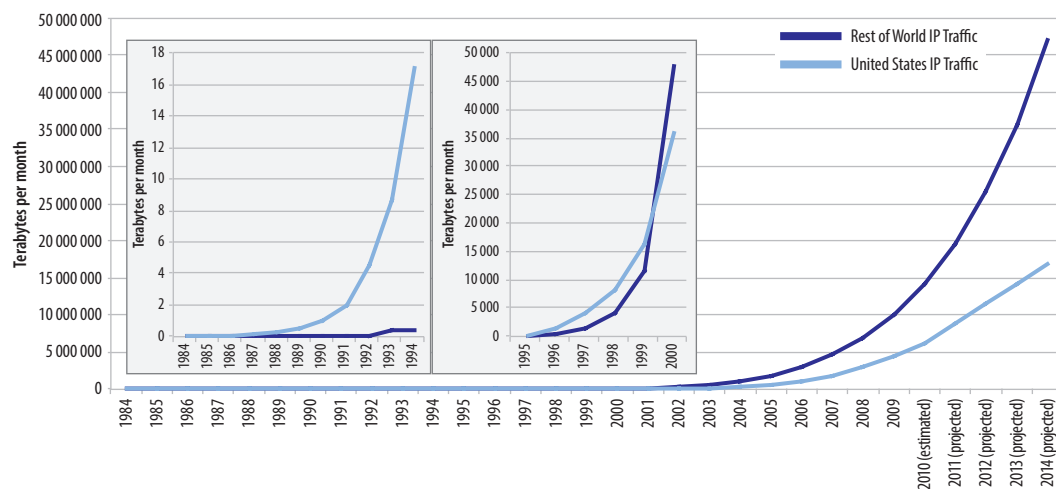
Source: OECD (2011), *OECD Communications Outlook 2011*.

In the last decade, the number and diversity of web sites world wide has exploded. From just over 2.2 million in 2000, the number of websites registered world wide grew to nearly 46 million by 2010. Almost 34 million of these websites were registered to the domain names in the figure above (the most common of all suffixes used), and over 20 million of these used the “.com” suffix. But, the numbers are only part of the story. The diversity of domain names has also increased, from the year 2000 when .com accounted for more than half of all websites to 2010, when the German suffix .de, the Polish .pl, the Japanese .jp and the British .uk all joined the worldwide domain suffixes of .net and .org as major registries of websites and Internet activity. This diversity clearly illustrates the expanding reach and impact of the Internet on our day-to-day use and transmission of information.

The increase in the amount of global Internet activity (the flow of traffic, not just the number of websites) has been so rapid that it is difficult to grasp conceptually. The figure below illustrates that during the 30 years between 1984 and 2014, the volume of Internet activity increased exponentially. During the late 1980s and 1990s total IP traffic in the United States more than doubled each year until 1995, when it increased tenfold. It was not until 1995 that global IP traffic similarly began to climb, increasing so rapidly that by 2000, IP traffic from the rest of the world had surpassed the volume from the United States. These dramatic increases can be attributed to numerous phenomena, including the proliferation of mobile devices (particularly Internet-enabled devices like smart phones and tablets), an increasing number of Internet users, faster broadband speeds, more affordable connectivity, and greater use of video and voice over protocol (VOIP, for example, Skype) online.

Figure 5.4. Global Internet activity rising exponentially

Global IP traffic, 1984-2014 (projected)



StatLink  <http://dx.doi.org/10.1787/8888932758701>

Note: Internet Protocol (IP) traffic, is the amount of data exchanged between different IP addresses (unique numbers assigned to every device using the Internet). This is essentially a measure of the volume of Internet activity. Terabytes are a unit of digital data equal to 10^{12} bytes. The maximum figure on the y axis of 50 million terabytes is equal to 50 exabytes.

Source: OECD (2011), *OECD Communications Outlook 2011*.

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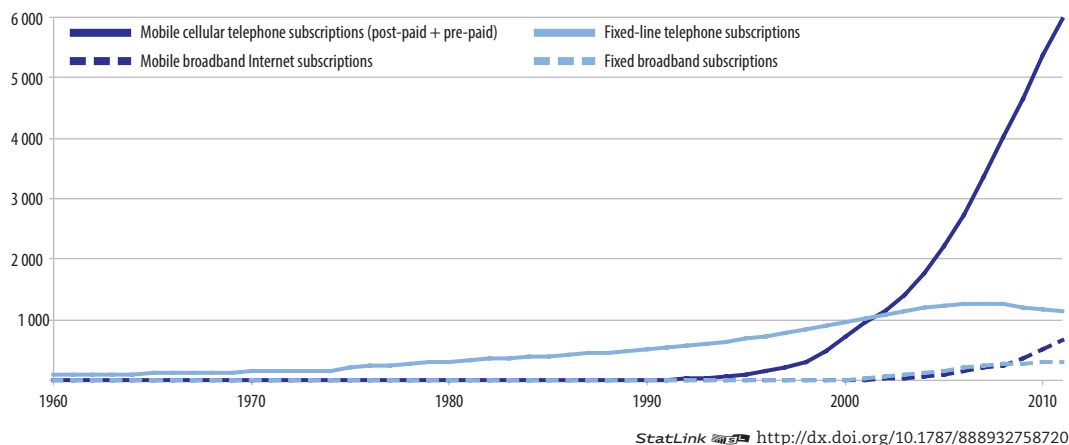
- There has been dramatic growth in the amount of information available and the ease with which anyone can upload materials. How can educators develop their students' critical capacity to use and contribute to this wealth of information?
- With new modern technology we can type any question about any subject and get an immediate answer. Does this search and find mentality alter cognition, including the way we store and retrieve information? Should this influence the way we teach in the classrooms?
- With the rise of online courses, what kind of quality control should be imposed on e-learning? Who oversees quality assurance?

THE WORLD IN YOUR POCKET

Mobile technology continues to transform the way we work, access information, and communicate with each other. Although mobile phones have been around since the late 1980s, it is only in the last ten years that they have become almost universal. Mobile phones now not only far outnumber fixed-line telephones, they are starting to completely replace them. As smartphones and other portable devices continue to develop and expand their range of services, their share of the world market expands. The ubiquity and ease of use of mobile devices has profound implications for education in terms of access, use of information, and privacy. It also has the potential to change the way we communicate and collaborate with each other, both in real time and across national boundaries.

Figure 5.5. Mobile devices expanding, while use of fixed lines dwindles

Number of fixed-line and mobile telephone subscriptions (in millions), and number of mobile and fixed broadband Internet subscriptions (in millions), 1960-2011



Note: Broadband and Internet data for 2011 include estimates for some countries.

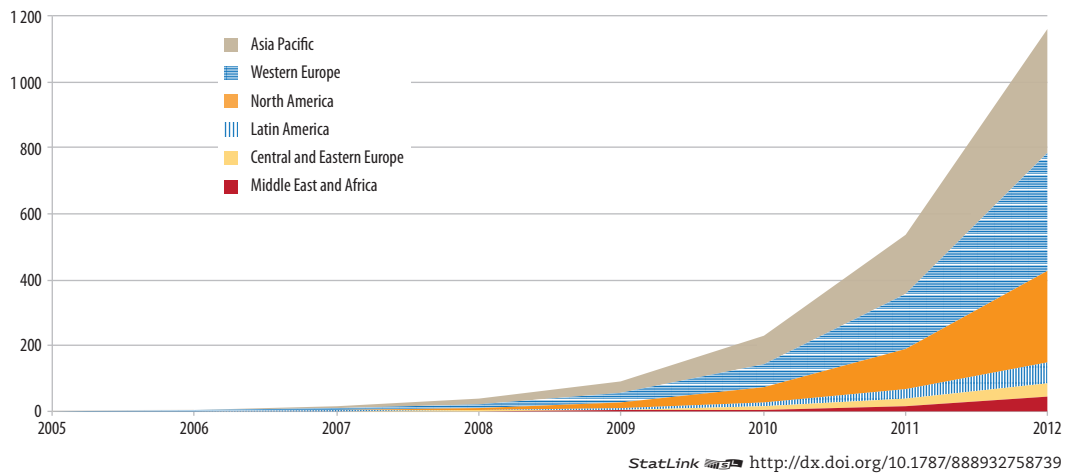
Source: OECD (2012), *OECD Internet Economy Outlook 2012*.

The fixed-line telephone was the king of communication devices throughout the twentieth century up until the mid 1990s, when people started to use mobile phones. By 2002, the number of mobile phone subscriptions had outnumbered fixed-line subscriptions for the first time. In 2011, there were nearly 6 billion mobile phones, or one phone each for 87% of the world's population. Given that not everyone has a mobile phone, this means that in many countries people are now actively using more than one. In OECD countries, the highest number of mobile phones per population can be found in Estonia and Italy, which average nearly 1.5 phones per person. In contrast, countries like Cuba, for example, only 11% of the population has a mobile phone. This is truly a worldwide trend: mobile subscriptions rose from 35% of people in UN-classified developing countries in the year 2000 to 75% in 2011. This is partly a result of improved coverage, with 90% of the world's population within range of at least 2G reception in 2010, up from 61% in 2003.¹

Subscriptions to services through which people can use mobile broadband on phones and other portable devices have also increased in recent years. The figure below shows

a very marked increase in subscribers to mobile broadband between 2005 and 2012, especially in North America, Western Europe and the Asia Pacific. The projections foresee this growth continuing over the medium term. Easier and more frequent access to the Internet and mobile devices is changing the way we communicate with each other, and also the way we work and collaborate. For education, these trends put issues of privacy, data protection, and control of the sources and quality of knowledge, squarely on the agenda for policy makers, teachers, and school leaders.

Figure 5.6. Expanding use of mobile broadband
Mobile IP traffic world wide by region, 2005-2012



Note: Internet Protocol (IP) traffic is a measure of the amount of data exchanged between different IP addresses (unique numbers assigned to every device using the Internet). This is essentially a measure of the volume of Internet activity. Here it refers to only the traffic initiated from mobile sources, such as smartphones or other similar portable devices using a mobile (non-fixed-line) Internet connection. The data from 2010 are estimated figures, those from 2011 and 2012 projected.

Source: OECD (2011), *OECD Communications Outlook 2011*.

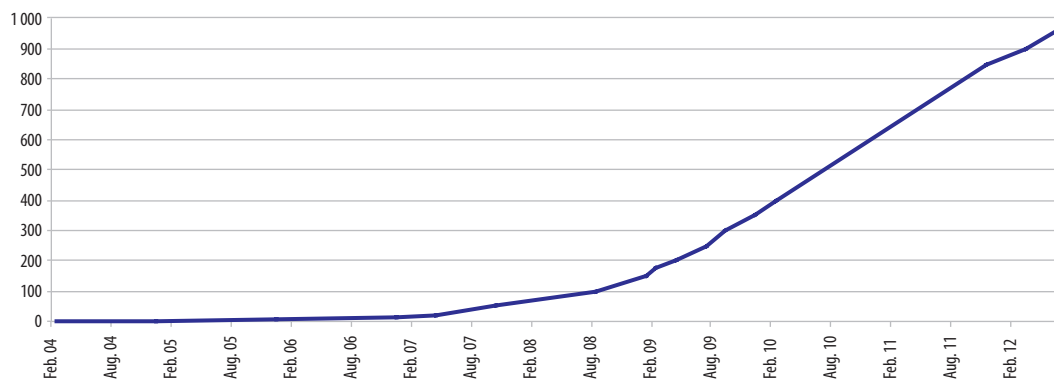
And education?

- Many students have access to pocket-sized portable devices connected to the World Wide Web, permitting endless possibilities for information access and communication. How does this affect conventional notions of curriculum, assessment and examinations? Should it?
- Many students have their own mobile phone. What place, if any, do mobile phones have in the classroom and in learning?
- More students have access to unlimited information on portable devices. To what extent does this transform our understanding of the classroom as the *place* of learning?

A DIGITAL SOCIETY

Continuing rapid technological development has changed the way we interact with each other and our communities. Online services include banking, shopping, research and development, multi-media entertainment, and audio and video communication. The introduction of user-generated content has made the Internet a participatory experience and has redefined knowledge as well as community, with social networking playing an increasingly important role. The rise of Facebook and other online communities and the escalating use of online advertising are key trends that illustrate how fundamental a role the Internet plays in most people's lives. As adolescents and children are the most frequent users of online services and social networks, schools and teachers are increasingly faced with the challenges of educating and guiding students through the positive and negative aspects of the virtual world.

Figure 5.7. Increasing engagement with online communities
Number of active Facebook users (in millions), 2004-2012



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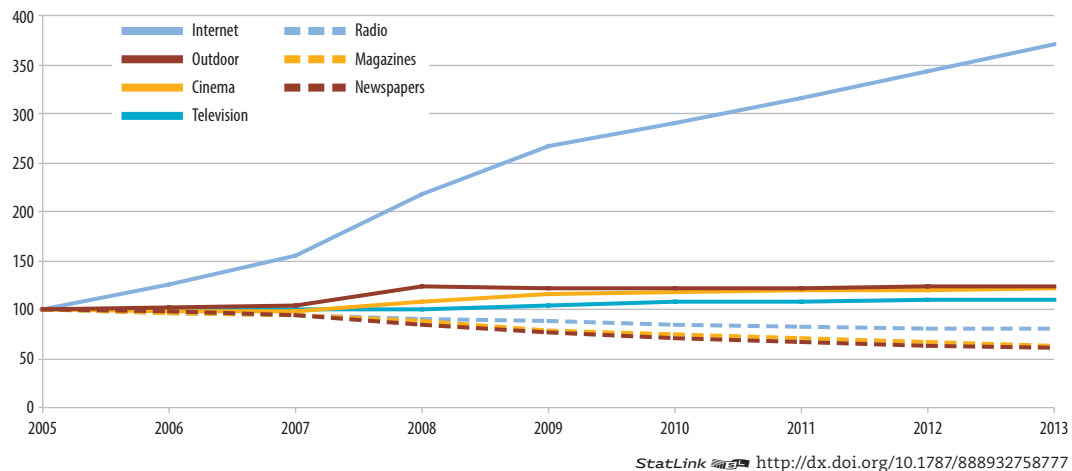
Source: Facebook (2012), News Room: Key Facts and Timeline.

Interactive social networking has become the new norm. Online communities, such as Facebook, LinkedIn, Instagram and others, have exploded into existence in a very short period of time. Founded in 2004, Facebook had 955 million monthly active users by the end of June 2012. Of these, over half (543 million) are using Facebook via their mobile or handheld device, and 81% of these are outside of Canada and the United States. For many, Facebook has become an essential part of their daily routine, like having a morning coffee or eating lunch with a colleague. Indeed 552 million people world wide use Facebook every day. The ubiquity of Facebook has transformed the way friends and acquaintances communicate with each other, as the site is often used as the sole means of communication for arranging upcoming events. It has also led to challenges for some as it has the potential to blur the boundaries between the personal and professional parts of life.

Another example of how the Internet is woven into the fabric of our daily lives is the rapid rise of Internet advertising relative to other, more traditional forms of advertisement. Prior to 2005, television, radio, newspapers and magazines, and even

billboards, were the most commonly used media for advertising. Since then however, the Internet has outstripped all the other categories combined in terms of the amount expended on advertising. This simple measure reveals a great deal about what we do with our time, what we pay attention to, and where we are considered to be most receptive to advertising messages. It also reveals the habits and patterns of consumers under 25 years, the segment of the population with the highest level of discretionary income and thus a highly targeted market for advertisers.

Figure 5.8. Internet now a key medium for advertising
Advertising expenditures by medium, 2005-2013



Source: OECD (2012), OECD Internet Economy Outlook 2012.

And education?

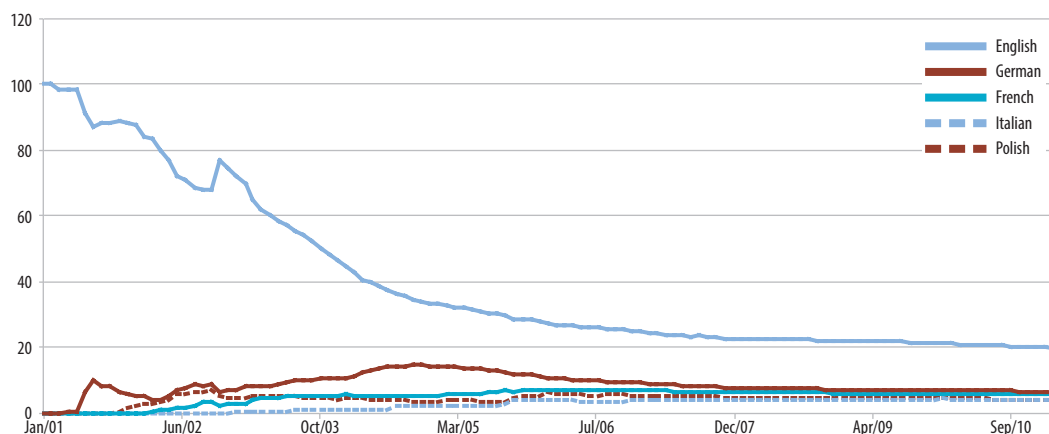
- With the increase of user-generated content on the Internet, what can its participatory and collaborative models bring to formal learning systems?
- Students are one of the most targeted demographic groups for advertising. Should our school systems be teaching our children about advertising and the impact its messages can have on them? If so, starting at what age?
- Social networking and user-generated-content Internet sites are often perceived as taking time away from the core business of learning. Should schools see social network sites as an opportunity to extend the learning process/experience beyond the classroom?

LOCAL DIVERSITY

English was long the dominant language of the Internet, but that is changing. Since the mid-2000s, the number and diversity of languages on the Internet – on websites, social networking, wiki sites, and on blogs – has increased dramatically. There are now over 250 languages represented on the Internet, with English, Chinese, Japanese, Portuguese, and Spanish making up the top five. This diversity makes the Internet that much more accessible to users of different nationalities. For education, the diversity in online content means that non-English materials, resources, opinions, blogs and networks, are more readily available to teachers and students. It also opens new opportunities for language learning, for example through Skype language lessons and conversational exchange, or through other web pages or materials that are produced and made available for free by native speakers in their countries.

Figure 5.9. English becoming less dominant online as major sites increase multi-lingual content

Proportion of Wikipedia articles by language as a percentage of total articles on this site, January 2001-February 2011



StatLink  <http://dx.doi.org/10.1787/888932758796>

Source: OECD (2012), OECD Internet Economy Outlook 2012.

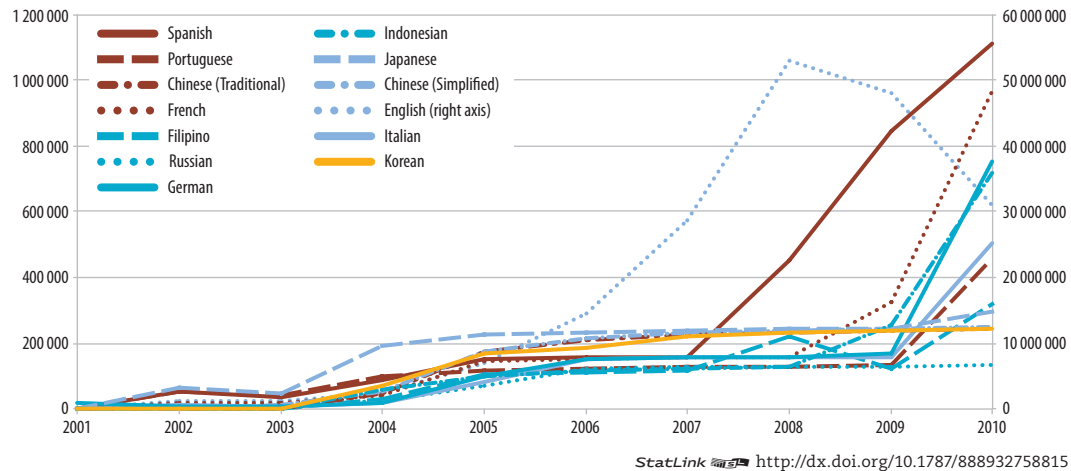
Online content is more multi-lingual, with a rise in non-English language content over the last several years. One example of this is Wikipedia, an online encyclopaedia created and maintained collectively by thousands of authors. The rationale behind this process is that the sheer number of users reading the articles should ensure that content is edited and mistakes corrected. When it began in January 2001, 100% of the articles were written and maintained in English. Just two and a half years later, in October 2003, only 50% of the entries were written in English, with French, German, and Polish following in descending order of volume. By February 2011, less than 20% of the content was written in English, and more than 250 other languages were represented in entries on the site.

Another measure of user diversity in online content is the number and origins of blogs. From 2001 to 2010, the number of blogs skyrocketed. While English is still the language

of the majority of them, the diversity of languages represented has broadened widely. As tracked by Google, the languages most frequently used in blogs between 2009 and 2010 were (in order of frequency) Spanish, French, German, Indonesian, Italian, and Portuguese. These were followed by Filipino, Japanese, simplified Chinese, Korean, and a number of other languages, including artificial languages like Esperanto. A fun fact: in the year 2010, there were over 15 000 blogs written in Esperanto on the Internet.

Figure 5.10. **Individuals engaging online in many different languages**

Number of blogs indexed by Google, presented by language (left axis) and English (right axis), 2001-10



Source: OECD (2012), *OECD Internet Economy Outlook 2012*.

And education?

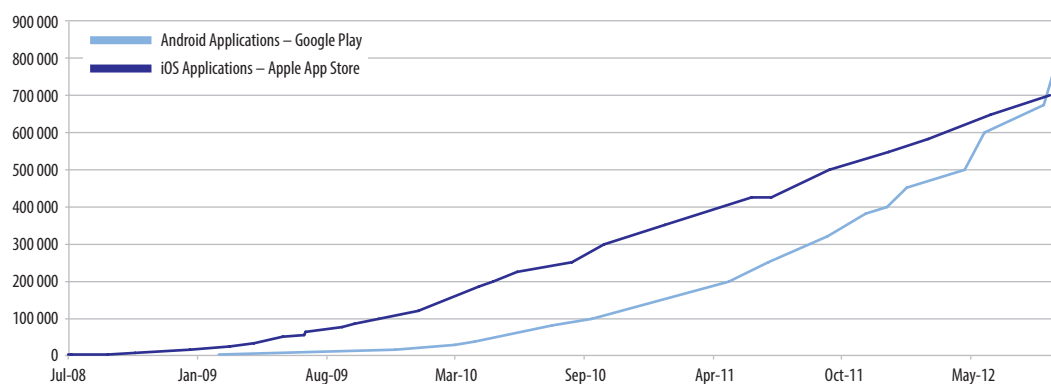
- ICT has the potential to allow more self-paced, interactive and personalised learning. How much more should this potential be exploited, whether in schools, vocational or higher education, or non-formal learning for adults? Can it be over-done?
- The increasingly multi-lingual nature of the Internet creates opportunities for teachers as well as learners. How might teacher professional development take advantage of this potential for peer learning?
- The explosion of the number and quantity of multi-lingual information on the Internet can be an opportunity but also a challenge to the user. How does the local diversity of Internet content lead to better or worse quality of information available for students? Does this vary according to the language used?

TRANSFORMING OUR INTERNET

The Internet has transformed many of our daily tasks, how we socialise and, increasingly, the ways we define ourselves through our online identity and presence. But the Internet itself is also changing and transforming. Two of the most recent and interesting trends are the rise of downloadable applications, or “apps”, and the emergence of cloud computing. Applications are essentially software programs, and cloud computing refers to storage or other services provided to users via Internet connection to servers in remote locations. Being able to store large files virtually and allow access to colleagues all over the world is a significant step in global connection. Similarly, the increase in the number of handheld digital devices has spawned an enormous market for mobile interactive information that can be accessed immediately. Want to know what song you’re listening to while you’re driving or shopping? Want to find the closest Chinese restaurant? There’s an App for that!

Figure 5.11. **There’s an App for that!**

Approximate number of applications available for download on the Google Play and Apple App Store, 2008-2012



StatLink  <http://dx.doi.org/10.1787/888932758834>

Note: “Apps” or applications are software programs delivered over the Internet on mobile or portable devices.

Source: Wikipedia (2012), Google Play, and Apple Store (iOS).

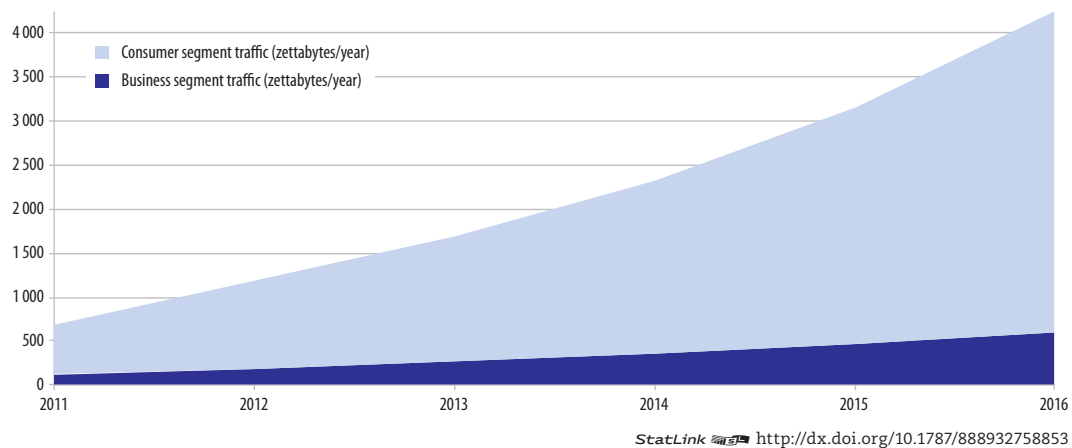
Applications, or *apps* for short, have in recent years become a significant market for providing third party functions to products and services. Perhaps the most prominent use of apps has been for the addition of functionality to portable devices, such as smartphones and tablets. The app retail market for such devices has been explosive. In January 2009, there were 15 000 separate apps available for download from Apple’s App Store for use on their iPhones and iPads. Just three short years later in January 2012, this number had grown to over half a million, and by September 2012, the Apple App Store sold more than 700 000 different apps. Competitors to Apple have released their own tablets and smartphones, experiencing a similar pattern of growth in app development and download from their stores. Although slower at the start of 2010, by September 2012 the numbers of apps available for download through Google Play for Android phones had nearly reached those available through Apple. By October 2012, this number had surpassed Apple’s figures to reach 850 000. As the market for smartphones and tablets is still growing, these numbers will continue


to rise. Of course, smartphones and tablets are not the only part of the emergence of apps. Apple and other companies provide access to a variety of applications for computers, and online service companies, such as Facebook, have begun to make use of apps to allow third parties to add functionality and provide services to their account holders.

Cloud computing is another emerging face of our interactive world. Although still new, cloud computing already accounts for 39% of data-centre traffic world wide, a figure that is projected to grow to 64% by 2016. It is a truly global trend, led in 2011 by North America (with a traffic volume of 261 exabytes per year), followed by the Asia Pacific (216 exabytes per year), and Western Europe (156 exabytes per year). Projections for future use suggest that the Asia Pacific region will emerge as the biggest user of cloud computing services and solutions by volume, followed by North America. The volumes are staggering: annual global-cloud IP traffic is projected to reach 4.3 zettabytes by the end of 2016. Students need to be increasingly tech-savvy and confident for life in a future where flexible access to enormous data and files will be the norm.

Figure 5.12. Virtual world increasingly up in the clouds

Global cloud data-centre traffic volume, 2011-2016



StatLink  <http://dx.doi.org/10.1787/888932758853>

Note: Cloud computing is a general term for hardware and software services delivered over the Internet. Major cloud providers include Amazon, Google and Microsoft. Users make use of cloud storage facilities to manage large files or synchronise between their own devices or with colleagues and friends. Exabytes are a unit equal to 10^{18} bytes. Zettabytes are equal to 10^{21} bytes. One zettabyte is equal to approximately 1000 exabytes. Data beyond 2012 are projections.

Source: Cisco Systems, Inc. (2012), *Global Cloud Index: Forecast and Methodology, 2011–2016*.

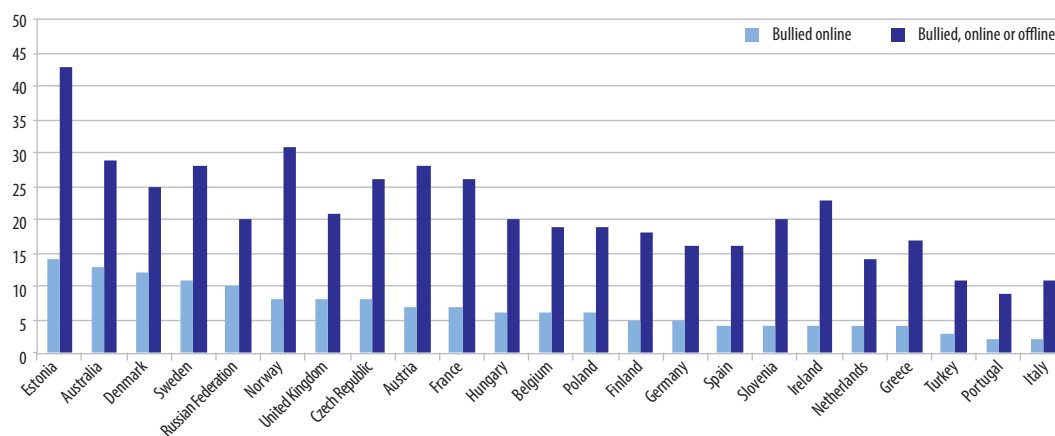
And education?

- Applications are increasingly becoming the way to add functionality to computers, online services and portable devices. Does this make it important for students to learn the programming skills to develop their own apps?
- Cloud computing is already used to virtually store and access large datasets and aid in organising conferences and reviewing draft publications in the international academic community. How can concerns regarding accidental or deliberate disclosure of protected information be best addressed (for example, disclosing the identity of anonymous reviewers, or deliberate data mining)?
- How can education utilise advances in technology to enrich student learning environments? Is there a market for educational apps to improve learning in the classroom and extend it beyond?

NEW CONNECTIONS, EMERGING RISKS

Despite the enormous potential of the Internet to reshape our world, there is a downside to infinite connectivity. Rising challenges, for example the rise of Internet fraud, online privacy concerns and identity theft, are all part of a new global online world. For parents and children, there are also specific issues related to cyber bullying, worries about keeping children protected from explicit content and online predators. Today's students, willingly or unwillingly, are exposed to new dangers, which parents and educators do their best to shield them from. Guides to monitoring and protecting Internet users – of all ages – make it clear that the best preventive strategies involve awareness, constant vigilance, and for protecting children, keeping an open dialogue about their concerns and online lives.

Figure 5.13. **Cyber bullying: An emerging and troubling challenge**
Percentage of children surveyed reporting being bullied online and offline, in 2010



StatLink  <http://dx.doi.org/10.1787/888932758872>

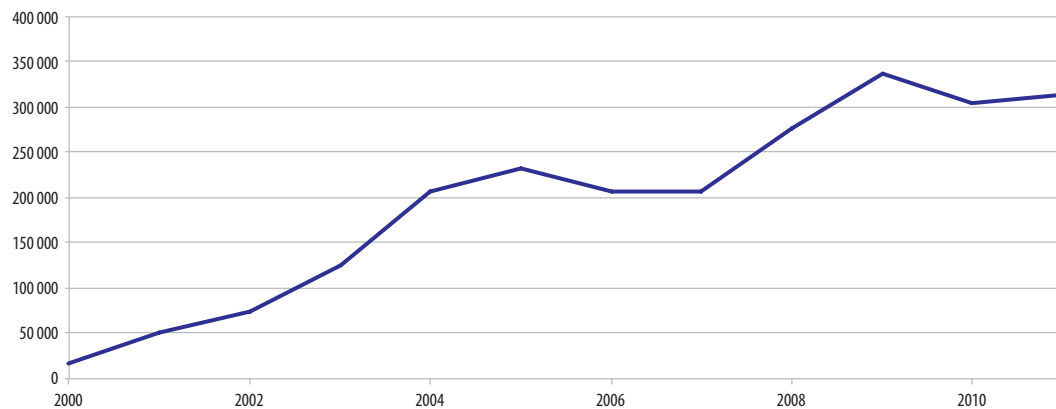
Source: Livingstone, S., L. Haddon, A. Görzig, and K. Ólafsson (2011), *EU Kids Online September 2011*.

Cyber or online bullying occurs when a young person (child, preteen or teen) is threatened, harassed, or embarrassed by another young person using the Internet. A number of high-profile tragedies, for example teens who committed suicide as a result of cyber bullying, have brought this topic to the top of policy, education, and parental agendas. Figure 5.13 illustrates the rates of cyber bullying reported by young people in 2010. More than 10% of the surveyed internet users aged 9-16 years reported having been the victim of bullying online in Australia, Estonia, Denmark, Sweden and the Russian Federation. The lowest rates, between 2% and 3%, were reported by youth in Italy, Portugal and Turkey. While cyber bullying is increasingly worrisome, bullying offline is still reported to be more common. The survey additionally notes that the bully and victim roles are often interchangeable and related. Of the young internet users surveyed, only 4% of those who reported not bullying others had been the victim of cyber bullying. For those who conceded to having bullied others online, 18% reported being bullied themselves. This figure rose to 47% for the self-confessed offline bullies. It is important to note that some of the differences between countries may be accounted for by the fact that the figures are self-reported and so comparisons should be conducted with caution.

Online security is something that concerns all users of the Internet. The numbers and types of reported online fraud, for instance, have multiplied enormously since the start of the century. In the United States alone, the numbers of complaints of Internet fraud have grown from almost 17 000 in the year 2000 to over 300 000 in 2011. These numbers include a variety of scams, including everything from identity theft, romantic fraud, loan collection hoaxes, spam, and the well-known African prince who just needs your bank account details to access his fortune. As awareness of the most common scams grow, so too does the ingenuity and creativity of the fraudsters. The best prevention is constant vigilance, caution, and taking the time to educate yourself and others. It is also important to report experiences of fraud to the appropriate authorities so that the types, volume, and strategies of Internet fraud can be monitored and dealt with appropriately.

Figure 5.14. Internet fraud on the rise

Number of complaints received annually from victims of Internet crime by the United States Internet Crime Complaint Center (IC3), 2000-2011



StatLink  <http://dx.doi.org/10.1787/888932758891>

Note: Complaint data are derived from United States figures but the Internet crime may originate anywhere in the world.

Source: United States Internet Crime Complaint Center (2011), *2011 Internet Crime Report*. Used with permission. ©2011. NW3C, Inc. d/b/a the National White Collar Crime Center. All rights reserved.

And education?

- Young people are increasingly engaged online. How can concerned adults, such as teachers and parents, best educate them to be aware of Internet risks and how to deal with them as they arise? Is better filtering and protection the answer?
- The anonymous nature of online posting and commenting has been the subject of intense debate, with those in favour citing freedom of speech issues – and those against arguing that it can encourage hate speech and a lack of accountability. Should education take a pro-active stance in encouraging respectful online behaviour?
- What responsibilities do educators have in monitoring student's time online during school hours, and how can different parental standards of safety be accommodated? Is there a need for system-wide policies to establish consistent standards in online security for all schools?

NOTE

1. International Telecommunications Union (2012), *ITU Statistics*, online, www.itu.int/ict/statistics, accessed November 2012.

FIND OUT MORE

Relevant sources

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The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Definitions and measurement

- **2G:** 2G is short for second generation wireless or mobile telephone technology. The systems through which mobile phones operate have changed and evolved over time, changing their format and adding new services. The 2G networks were not only more efficient than their predecessors, but contained additional data services, such as text messaging. Following 2G systems, 3G or third generation mobile systems were rolled out in many countries since 2001 and added further functionality including greater reliability, faster data transfer speeds and mobile broadband. Phone carriers in many countries are now beginning to install fourth generation or 4G mobile systems, the key benefit of which is again a marked increase in speed of data transfer. While 2G systems have been superseded, they are still used in many parts of the world.
- **Android:** Android is a mobile operating system developed by Google which currently runs on a number of Smartphone brands such as the Motorola Droid, the Samsung Galaxy, and Google's Nexus One.
- **Applications ("Apps"):** Apps are software programs developed for a specific task to run on mobile phones, tablets, Personal Digital Assistants (PDAs) or other portable devices.
- **Cloud computing:** Cloud computing is a general term for hardware and software services delivered over the Internet. In essence, the software and data are stored on servers at a remote location from the user and managed by a third party. Major cloud providers include Amazon, Google and Microsoft. End users can access cloud-based applications through a web browser or via a desktop or mobile application, and primarily make use of cloud storage facilities to manage large files or synchronise between their own devices or with colleagues and friends.
- **Data mining:** The process of analysing data (normally very large quantities) from different perspectives and summarising it into useful information. Data mining software is one of a number of tools for analyzing data, and allows users to reveal trends, patterns and relationships. The use of data mining techniques could have implications for privacy, if information from different sources (each independently privacy protected) is combined in such a way that it allows for the identification of individuals or sensitive data.
- **Domains:** Domains are the suffix letter strings attached to the end of web addresses that identify the site's origin or type. Every country has a unique domain suffix, there are also worldwide topic-related suffixes, such as ".org" which are used for non-profit or international organisations, ".edu" for education-related institutions or information, and ".gov" for government-related websites.
- **Exabytes:** A unit of digital data equal to 10^{18} bytes (or around one billion gigabytes). One exabyte of storage could contain 50 000 years worth of DVD-quality video. This unit of measurement precedes Zettabytes (see below for definition).
- **Internet Protocol (IP) traffic:** The Internet is distributive, that is, there is no one entity "the Internet" administered through any central location. Internet use is therefore measured through flow. In this case, flow is measured through (IP) traffic, a measure of the amount of data exchanged between different IP addresses (unique numbers assigned to every device using the Internet). This is essentially a measure of the volume of Internet activity.
- **iOS:** iOS is a mobile operating system developed by Apple, and is currently running on Apple iPhone, iPod touch, and iPad.

- **Mobile broadband:** Mobile broadband is a general term used to describe high-speed Internet access from mobile providers for portable devices, such as a mobile phones, tablets, or laptops.
- **Terabyte:** A unit of digital data equal to 10^{12} bytes.
- **Webserver:** Essentially a host for a number of unique websites, rather than web pages. For example, the OECD has a website that includes many webpages, but is counted as one webserver.
- **Wireless Internet:** A wireless Internet connection allows access to the Internet without a hard-wired connection, such as an Ethernet cable. Several computers and other Internet-enabled devices can share a single Internet connection if they use it wirelessly, and users can access the Internet from any point within range of the signal.
- **Zettabyte:** A unit of digital data equal to 10^{21} bytes, or 1 000 exabytes (see above for definition).



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