Chapter 3

Information and communication technology and its impact on the economy

This chapter examines the evolution over time of information and communication technology (ICT), including emerging and possible future developments. It then provides a conceptual overview, highlighting interactions between various layers of information and communication technology.

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.

3.1 The evolution of information and communication technology

The development of ICT has been characterised by rapid technological progress that has brought prices of ICT products down rapidly, ensuring that technology can be applied throughout the economy at low cost. In many cases, the drop in prices caused by advances in technology and the pressure for constant innovation have been bolstered by a constant cycle of commoditisation that has affected many of the key technologies that have led to the growth of the digital economy. As products become successful and reach a greater market, their features have a tendency to solidify, making it more difficult for original producers to change those features easily. When features become more stable, it becomes easier for products to be copied by competitors. This is stimulated further by the process of standardisation that is characteristic of the ICT sector, which makes components interoperable, making it more difficult for individual producers to distinguish their products from others. Unless the original producer can differentiate its product from the copies (for example, by bundling its product with services or other features that are not easily duplicated), or otherwise find a way to maintain a dominant position in the market, it will be forced to compete solely on price or move to other market segments.

This process tends to cause prices of the commoditised goods or services to fall, and innovation to move elsewhere in the value chain. This does not necessarily mean that every single component of the commoditised product becomes a commodity. A producer of a component of the overall product can maintain or create a proprietary advantage by enhancing some elements or subsystems of that component. This can "decommoditise" those elements or subsystems of the commoditised product, creating new opportunities at a different stage of the value chain.

3.1.1 Personal computing devices

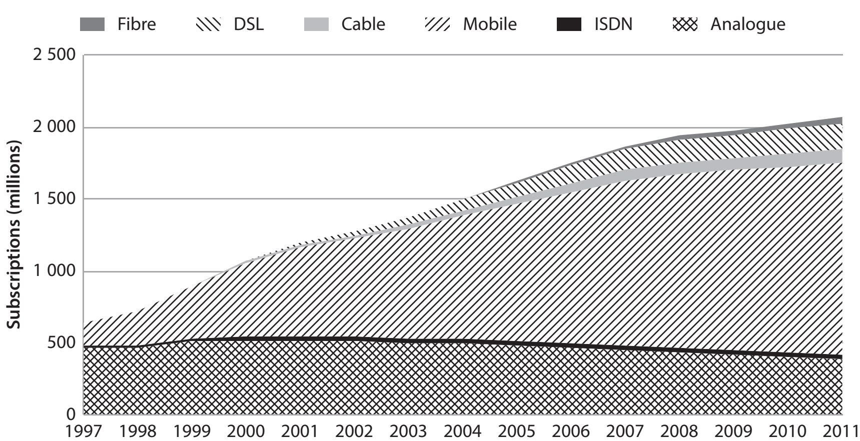
Early in the life of the digital economy, many manufacturers of computing hardware used proprietary hardware components, which meant that the computers of different manufacturers operated on entirely different standards. When the architecture of personal computers was largely standardised thirty years ago, however, many market participants started competing on price. That, combined with rapid technological progress, resulted in substantial drops in the price of personal computing hardware. In the period that followed, the most successful manufacturers succeeded in large part because their products integrated best with other products or because they developed the strongest marketing and distribution strategies, rather than primarily because the hardware they produced was distinguishable from those of their competitors. As mentioned above, this cycle has been paralleled at various points throughout the evolution of the digital economy, resulting in substantial changes in the digital value chain over time.

A relatively recent development is the advent of innovative integrated packages of hardware and software, such as smartphones and tablets (and increasingly, connected wearable devices). Designing, manufacturing and selling these devices has allowed companies to improve their position in the value chain and on the market. There appear to be two major trends that confirm the growing importance of devices. The first trend is the diversification of devices. Consumers initially accessed the Internet almost exclusively through personal computers. Now the industry has designed a wide variety of devices providing access to the web, such as smartphones, tablets, and connected TVs. The second trend is the growing specialisation in devices of businesses formerly specialised in software or other parts of the value chain. Several businesses have launched their own tablets or other devices. These devices allow them to establish a closer relationship with their customers, allowing them to collect more detailed information so that they may provide customised service with even more relevance and added value.

Over time, hardware devices have both multiplied and diversified in terms of features and technical characteristics. As shown in Figure 3.1, the number of mobile devices connected to the Internet keeps rising, forming an interconnected infrastructure colloquially referred to as the Internet of Things (see section 3.2 on discussion of emerging and potential future developments below). After a long period of personal computer commoditisation, hardware has regained

Figure 3.1. **Total fixed, mobile and broadband access paths**

subscriptions (millions)



Source: OECD (2013a), *OECD Communications Outlook 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/comms_outlook-2013-en.

importance in the value chain. At the same time, the price of devices continues to fall over time. Devices connected through the Internet operate within certain standards that accelerate their commoditisation, if only because individuals own more and more devices that must be synchronised around the same set of content and data. In addition, connected objects and devices facilitate sales of intangible goods and services (for example, a connected car becomes a point of sale for services based on geo-location, including driving assistance). For this reason, a number of businesses now use hardware devices as loss leaders in their business model, aimed at expanding the market of customers for goods and services available through those devices, or at otherwise leveraging their growing network of end users. Assuming these trends continue, it appears that for many businesses, revenue from connected devices may ultimately flow primarily from the operation rather than the continued sales of these devices.

3.1.2 Telecommunications networks

As the Internet turned into a major business phenomenon and adoption rates accelerated, the network component providers, infrastructure intermediaries, and Internet service providers (ISPs) that powered and operated the infrastructure of the telecommunications networks that form the Internet became central to the digital economy. The interconnection of networks initially gave birth to a specific economy organised around the status of such infrastructure providers as the primary points of contact with the ultimate end users, through peering points, data centres, and the data routes that form the Internet backbone.

The strength of ISPs, however, has traditionally been primarily in providing network access rather than in providing services across these networks. As a result, unless the ISPs could leverage their control of access to telecommunications networks, they had difficulty maintaining their status as the sole access point to the end user against competition from third-party businesses that provided content and services directly to users over the Internet. The providers of this content (sometimes called over-the-top (OTT) content), were able to deliver services more responsive to demand. Thus, while ISPs remain privileged points of contact with end users and have in general been able to maintain high profit margins, leveraging control of network access was not possible in most cases because ISPs were generally operating in increasingly competitive markets due to sector regulation and were essentially local in their reach (although some ISPs operated across borders, and many, such as mobile network providers, still do).

In contrast, OTT content providers could offer an unified experience to users at scale, since their reach was global, unlike network providers whose reach was limited to the length of their network. As a result, providers of OTT content increasingly took on a direct relationship with the end users.

The development of open source software accelerated the pace of innovation on top of the networks. As a consequence, while the success of OTT content providers has increased aggregate demand for networks, in markets where there is sufficient competition, prices have declined. While a compelling hardware device or new network service can still give a particular firm a short term lead and introduce new business models (such as "app stores", for example), experience has shown that no single player in the value chain can entirely control access to customers as long as there is sufficient competition.

3.1.3 Software

The World Wide Web, initially made of websites and webpages, marked the emergence of Internet-powered software applications. Software has therefore been regarded from the beginning as an important component of the value chain. Even some software, however, is becoming commoditised. This commoditisation has, once again, been driven by standards, starting with those of the Internet: the Hypertext Transfer Protocol (HTTP), the Hypertext Markup Language (HTML) and later Extensible Markup Language (XML) data formats, email exchange protocols such as Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP), and Internet Message Access Protocol (IMAP). On top of these standards, communities of open source developers needed to accelerate the speed to market and constantly iterate newer versions of their software. In order to innovate at this pace, they chose to share their source code rather than redevelop it. Although some major software vendors have countered the process of commoditisation with innovation and differentiation, large-scale differentiation and advanced positions have become increasingly difficult to sustain.

As growing competition in the development of operating systems, databases, web servers, and browsers reduced profits in many companies' core business, it also created new opportunities. Just as commoditisation in the hardware market cut profit margins for traditional manufacturers while creating new opportunities for low-cost low-margin manufacturers, growing competition in the software market has forced software companies to become more creative and more responsive to consumers' needs, all of which benefited the consumer.

3.1.4 Content

Content gained attention at the end of the 1990s, when content production, consumption and, above all, indexation appeared to drive the digital economy's growth. It saw the rise of first content portals and then search engines as the main gatekeepers to accessible content on the Internet. Today, many major players in the digital economy are content providers.

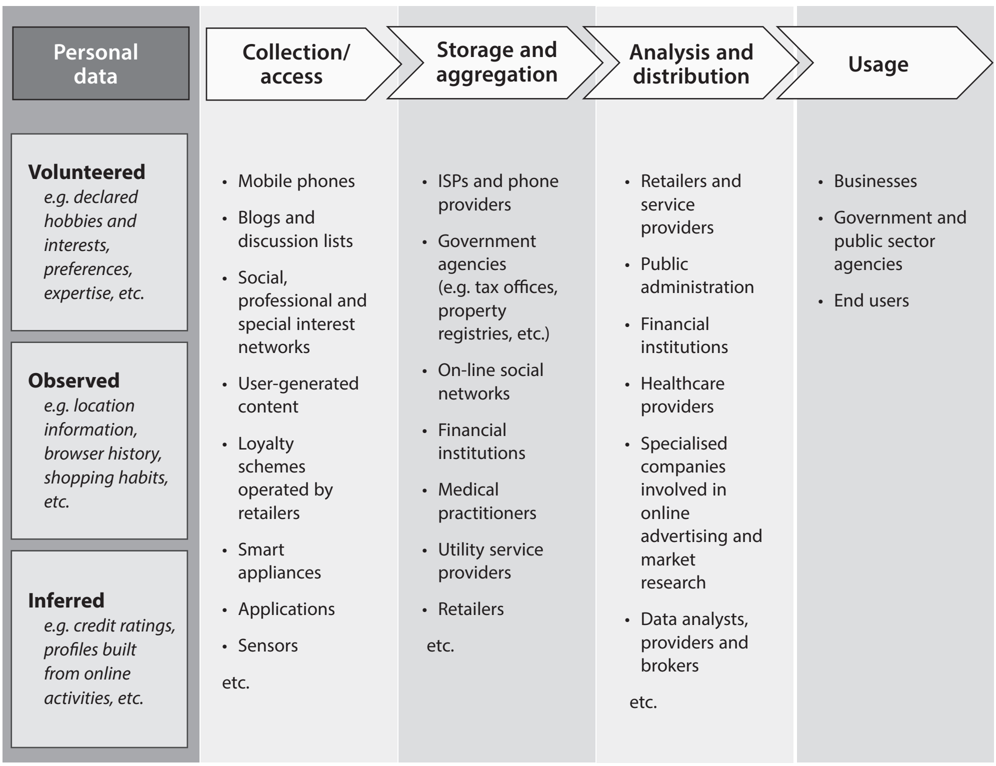
The definition of content in that regard is quite large: it includes both copyrighted content produced by professionals, enterprise-generated content, and non-copyrighted user-generated content (such as consumer reviews or comments in online forums). The importance of content flows from the fact that it is important to attract an audience and provoke interactions between users. In addition, more content updated more frequently increases a website's visibility in search results. Content has hence been a driving force behind the advertising industry: it has become a key asset to attract an audience and monetise it with advertisers. Content has also become a way to advertise in and of itself, with classification into three categories: owned content (content distributed by the brand on its own channels), paid content (content distributed by other media in exchange of a payment by the brand), and earned content (content willingly created and shared by customers without direct payment by the brand, such as customer product reviews, videos, and social media sharing).

Content is more and more often produced by users, resulting in greater volumes of content. The success of sites predicated on massive online collaboration by users, such as Wikipedia and YouTube, has proven that an entire experience can be built around content primarily generated by individual users. Further, the emergence of the social networking phenomenon, and the success of major applications in which links and interactions between users matter more than any primary content put forward to attract an audience show the same path. Even advertising relies increasingly on user-generated content, through the concept of earned content, one of the pillars of content marketing. The sophistication of techniques designed to customise services, including cookies (technical tools used by businesses to collect user data, notably for commercial purposes such as behavioural advertising), targeting and retargeting, and collaborative filtering, is also relevant. The amount of content available online has become so vast that relatively few businesses have succeeded online by offering premium content, unless they can leverage that content through a service that prevents competition on volume.

3.1.5 Use of data

Users of applications provide businesses with access to substantial amounts of data, which are often personal and are used in a variety of ways that continue to be developed.[1] Collected data can be used not only to customise the experience, but also to generate productivity and quality gain at scale, through controlled experimentation. Personal data is acquired in multiple ways; it can be: provided voluntarily by users (for example, when registering for an online service); observed (for example, by recording Internet browsing activities, location data, etc.), or inferred (for example, based on analysis of online activities). The chart below, which is non-exhaustive, provides illustrations of the ways in which data is collected, stored, analysed, and used. Capacity to collect useful data is increasing as the number of Internet-connected devices increases. Businesses of all sorts make use of user data, as it allows them to tailor their offerings to customers. As increasing amounts of potentially useful data are collected, more and more sophisticated techniques must be developed in order to collect, usefully process and analyse that data.

Figure 3.2. **Personal data**



Source: OECD, based on World Economic Forum (2011), *Personal Data: The Emergence of a New Asset Class*. www3.weforum.org/docs/WEF_ITTC_PersonalDataNewAsset_Report_2011.pdf.

3.1.6 Cloud-based processes

As a result of the standardisation and commoditisation of different individual resources, such as hardware, network infrastructure, and software, some businesses have been able to combine those resources and make them available through the Internet as services.

Centralised hosting of software resources dates back to the 1960s, when mainframe providers conducted a service bureau business, also referred to as time-sharing or utility computing. Such services included offering computing power and database storage to banks and other large organisations from their worldwide data centres. Cloud computing at scale is the result of several trends related to both technology and business models: growing availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualisation, service-oriented architecture, and utility computing. As a result, value has migrated to new proprietary applications that are not stand-alone software products, but Internet-based applications that combine executable code, dynamically updated databases, and user participation. Although the term "cloud computing" has become commonplace, these applications have also at various points been referred to as "infoware", "computing on demand" or "pervasive computing".

The X-as-a Service (XaaS) acronym has been introduced to refer to the trending transformation of software products from goods to services. The Internet essentially accelerated a transition from traditional software business to XaaS models. A website is essentially a software application providing a service delivered over the Internet rather than provided locally or on-site. The service can be about providing access to content (as a portal), or about providing access to executable code performing certain features. Thus the expansion of the Internet brought a new class of centralised computing providers, called application service providers (ASP). ASPs provided businesses with the service of hosting and managing specialised business applications, with the goal of reducing costs through central administration and through the ASP's specialisation in a particular business application.

As of today, many business-to-consumer (B2C) applications are also delivered as software as a service: search engines, social networking applications are mainly used through a web browser, without any need to download any executable code beforehand. Although applications continue to be downloaded and installed locally, this is done primarily when there is a frequent need to use them offline. Even some locally-installed applications, however, require an Internet connection to provide full functionality. The growing popularity of smart phones and other devices that use frequently interrupted mobile Internet connections, however, has made downloading applications prominent again.

Focusing on value created through cloud-based processes is particularly useful to analyse the ultimate development of the Internet of Things (discussed below), which refers to the Internet as a network connecting individuals, content, and things in everyday lives. At the centre of this complex network of interconnections are powerful software-powered processes whose resources can only be stored and executed in the cloud.

3.2 Emerging and potential future developments

The rapid technological progress that has characterised the development of ICT has led to a number of emerging trends and potential developments that may prove influential in the near future. Although this rapid change makes it difficult to predict future developments with any degree of reliability, these potential developments are discussed below.

3.2.1 Internet of Things

The number of devices connected to the Internet is expanding rapidly, but substantial room for expansion remains. While Cisco has estimated that between 10 and 15 billion devices are currently connected to the Internet, that figure represents less than 1% of the total devices and things that could ultimately be connected (Evans, 2012). Within the area of the Organisation for Economic Co-operation and Development (OECD), households alone currently have approximately 1.8 billion connected devices. This figure could reach as many as 5.8 billion by 2017, and as many as 14 billion by 2022 (OECD, 2013a). As increasing numbers of connected devices are developed and sold, the expansion of machine-to-machine communication appears likely to dramatically expand and improve the ability of businesses to collect and analyse relevant data.

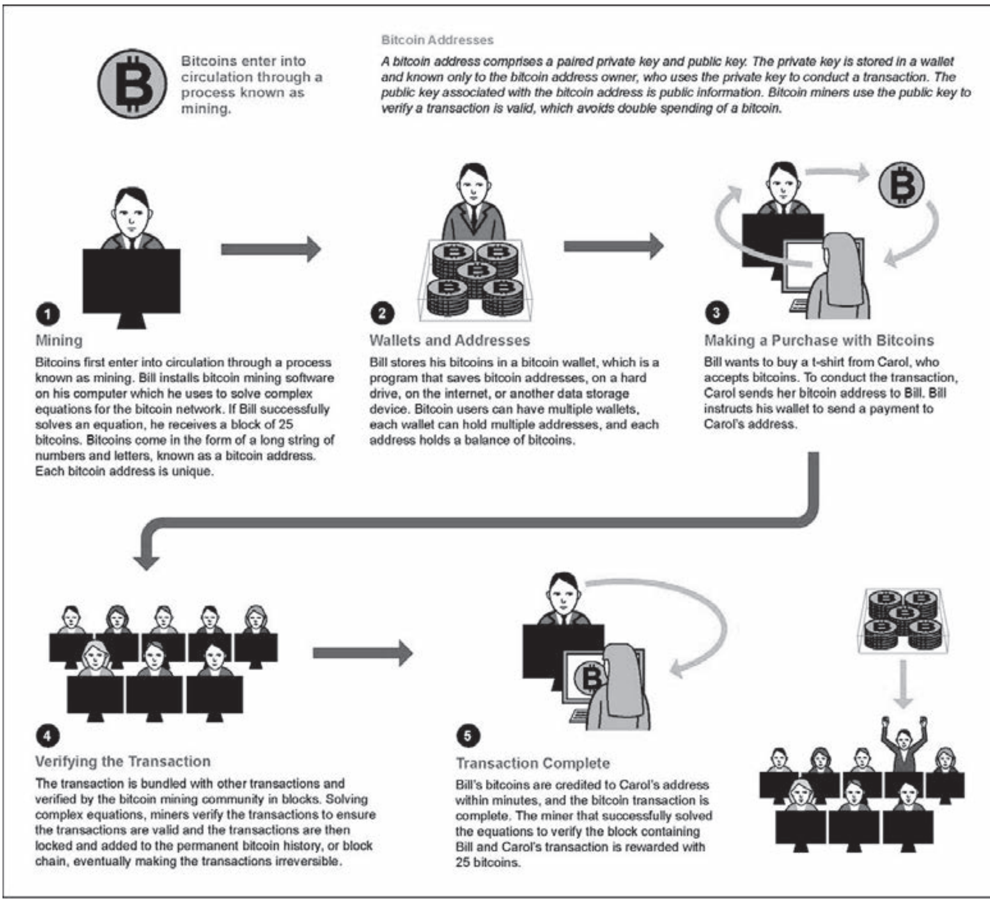
A major feature of the Internet of Things is the widened ability to collect and share data through powerful information systems connected to a multitude of devices, censors, and cloud computing components. The analysis and use of the data collected and transmitted by connected devices can help individuals and organisations use their resources more accurately, make informed purchasing decisions, ramp up productivity, and respond faster to changing environments. As devices increasingly transmit more detailed data, the processing of this data can be used automatically to change the behaviour of those devices in real time. It can also make training workers for skilled positions an easier and more cost-effective process. This trend, so far primarily contained in data-intensive industries such as finance, advertising, or entertainment, is likely to penetrate more traditional industries in the future.

3.2.2 Virtual currencies

Recent years have been marked by the appearance and development of "virtual currencies", meaning digital units of exchange that are not backed by government-issued legal tender. These currencies have taken various forms. Some virtual currencies are specific to a single virtual economy, such as an online game, where they are used to purchase in-game assets and services. In some cases, these economy-specific virtual currencies can be exchanged for real currencies or used to purchase real goods and services, through exchanges which may be operated by the creators of the game or by third parties.

Other virtual currencies were developed primarily to allow the purchase of real goods and services. The most prominent example of this type are the various "cryptocurrencies", including in particular bitcoins, which rely on cryptography and peer-to-peer verification to secure and verify transactions. Many private operators have chosen to accept payment in bitcoins.

Figure 3.3. **How bitcoins enter circulation and are used in transactions**



Source: U.S. Government Accountability Office (2013), *Virtual Economies and Currencies*, Report to the Committee on Finance, U.S Senate.

As virtual currencies increasingly acquire real economic value, they raise substantial policy issues. Some of these stem from the anonymous nature of transactions. In the case of bitcoins, for example, transactions can be made on an entirely anonymous basis, since no personally identifying information is required to be provided to acquire or transact in bitcoins.

3.2.3 Advanced robotics

The development of new connected and smart robots is changing manufacturing profoundly. The increased productivity of new automated factories is already making it possible for some multinational enterprises that had previously moved manufacturing offshore to take advantage of lower labour costs to consider moving their manufacturing activities back to where most of their customers are.

Manufacturing will be further changed by the progress in robotics, as robots have the potential to make factories less labour intensive and force multinational enterprises to think about production and distribution at the same time. This trend has the potential to be felt particularly strongly in already machine-intensive industries, as automation increasingly centres on artificial cognition, sensors, machine learning, and distributed smart networks. It will also have a potential impact where automation has been scarce so far, especially in small factories and workshops, because software can help improve security and allow humans to work alongside automated systems. Also, as robots embed more software and are connected to cloud-based resources, it will become both easier and cheaper to programme them, which could lead to lowered prices, making them more accessible to small and middle-size operations. These lower costs have the potential to bring manufacturing activities increasingly closer to the customers.

In the future, progress in artificial intelligence and the emergence of cognitive computing may expand the influence of robots beyond the manufacturing sector and into broader segments of the economy, as well as into household applications such as assisting the elderly or disabled with manual tasks. As robots learn to do jobs that previously were solely done by humans, they can potentially generate productivity, help lower prices for customers, contribute to scaling up operations at a global level, and create innovation opportunities which will lead to the emergence of new activities that will require new skills and potentially create new jobs.

3.2.4 3D Printing

Advances in 3D printing have the potential to enable manufacturing closer to the customer, with direct interaction with consumers impacting the design of product features. As a result, manufacturing could gradually move away from mass production of standardised products, and instead focus on shorter product lifecycle by adopting a strategy of constant experimentation at scale. In the healthcare industry, 3D printing of custom health products such as hearing aid earpieces is already heavily used. In addition, 3D printing has the potential to reduce environmental impact relative to traditional manufacturing, by reducing the number of steps involved in production, transportation, assembly, and distribution, and can reduce the amount of material wasted as well (Manika, 2013). Beyond that, it is conceivable that some manufacturers could eventually transition away from assembling products themselves, and could instead license plans and specifications to third party manufacturers or even retailers who will "print" the products on demand, closer to the customers, but at their own risks and with a very low margin. Alternatively, consumers may be able to assemble products themselves by using 3D printers, further increasing the possibility of locating business activities at a location that is physically remote from the ultimate customer.

3.2.5 The sharing economy

The sharing economy, or collaborative consumption, is another potentially significant trend within the digital economy. The "sharing economy" refers to peer-to-peer sharing of goods and services. The sharing economy is not new, but advances in technology have reduced transaction costs, increased availability of information, and provided greater reliability and security. Recent years have seen the emergence of numerous innovative sharing applications using different business models and focusing on one particular service or product, such as cars, spare rooms, food, or clothes. Most individuals who participate in the sharing economy do not do so mainly to make a living, but to entertain relationships with others, to serve a cause that inspires them, or simply to make ends meet. Because the supplementary income is a net benefit and often does not involve much quantitative cost-benefit analysis, amateur providers have a tendency to share their available resources at a lower price than what a professional might have billed, thus bringing down overall prices, including those of the professionals. Through time, as certain platforms attract substantial number of individuals, these platforms become the prime access point for customers on the online market and have the potential to provide substantial competition for traditional e-commerce applications operated by professionals, which may cut their profit margins further.

3.2.6 Access to government data

Governments are making progress at making machine-readable resources, notably data, publicly available in what has been alternatively labelled as open data policy, open government or government as a platform. There are three main goals assigned to open government policies:

- **Accountability:** Making government resources available allows the public to have direct access to these resources in order to track, document, and evaluate public policy cost, efficiency, and effectiveness. When it comes to accountability, open government strategies are meant to providing tools for transparency and to improving democracy as a whole.
- **Better performance:** Opening government resources also is intended to provide the means for government agencies to better co-operate with one using cross-agency software applications.
- **Participation of third parties in government business:** When government resources are made available to others outside government, third parties can combine these resources with their own to create hybrid applications that allow better and more personalised service.

3.2.7 Reinforced protection of personal data

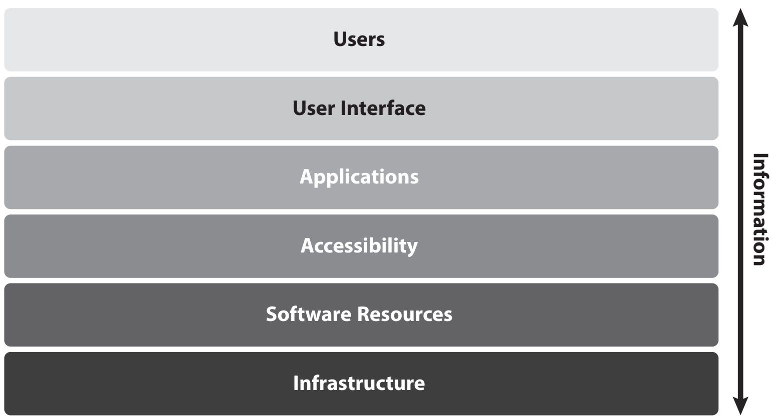
Under most legal systems, personal data supplied by users is protected by privacy rules and remains the property of those users. Personal data is regarded as an asset owned by the individual to whom it relates, such that it is considered their choice, rather than that of the organisation that holds it, to use, exchange, or make this information available. Data protection rules usually specify what constitutes personal data, how it is gathered, the standards companies must follow with respect to secure storage and the requirement to notify individuals of the personal data held and their rights of access to it. In many countries, rules require adequate data security provisions in regard to transfer of personal data to third countries. Compliance costs are usually borne by the public authorities, companies and other organisations that collect data from individuals.

As individuals become more sensitive to the use of their personal data and expect their privacy to be protected, discussions are ongoing in a number of countries to strengthen applicable laws and regulate data collection and exploitation by organisations (OECD, 2012, 2013b). Increasingly, these rules are imposing requirements as to how and where data is stored and processed. As exemplified by the bills currently discussed in the European Union, and in several countries, this trend could lead to a significant change in business models that rely on the use of personal data. For example, the obligation to make sure an individual has expressed consent for the collection of anonymous data, notably in cookies, could affect the user experience while surfing on web pages and make it more difficult to target or retarget advertising banners or clicks.

3.3 The interactions between various layers of information and communication technology (ICT): a conceptual overview

One way to picture the ICT sector is to focus on interactions between different layers, each characterised by a mix of both hardware and software. This approach is illustrated in Figure 3.4.

Figure 3.4. **A layered view of ICT**



At the base lies the *infrastructure* of the Internet, which consists of the cables, tubes, routers, switches, and data centres that are designed and manufactured by firms specialised in network interconnection, and operated by ISPs, carriers, and network operators. Content delivery network operators, whose goal is to serve content to end users with high availability and high performance, pay ISPs, carriers, and network operators for hosting servers in their data centres. Internet protocol (IP) addresses and domain names are managed at this level.

Immediately above, stored in servers that are located in data centres and organisations all around the world, are the core *software resources* that enable organisations to create applications, which can consist of raw data, digital content, or executable code. These can include both resources produced by organisations and resources derived from individual users and collected and stored by organisations for later use.

On top of these core resources is a layer of tools providing the fundamental *accessibility* necessary to allow software resources to be combined on top of the infrastructure to create applications usable by individual or business end users. This layer effectively provides the structure necessary for software applications to take advantage of the underlying infrastructure and core software resources of the Internet. This accessibility can be provided in many forms. An operating system that makes it possible to run applications on digital devices, for example, is one of the most familiar ways in which accessibility is provided: it allows a developer to design an application to be run on a certain device. The core higher-level protocols that allow communication of data between applications, such as the Hypertext Transfer Protocol (HTTP) that forms the foundation of data communication on the World Wide Web, or the SMTP that provides a standard for email transmission, are another form of accessibility. Other ways to provide accessibility include web services, application programming interfaces (API), and software development kits (SDKs), all of which provide ways for applications usable by end users to connect with the resources necessary to connect to underlying resources.

The accessibility layer effectively provides platforms for the creation of *applications* that are usable by end users, and that are able to access the core software resources on top of the infrastructure. Those applications form the fourth layer of the digital economy. An application is a combination of software resources creating value for the end user through the provision of goods or services. Applications can fit together or link to one another: for instance, a web browser is an application, and it gives access to websites that are themselves web-based applications; an app store is also an application with a value proposal that is to allow users to discover and purchase other applications. Within the application layer are applications performing a gatekeeping function, retaining user information and allowing it to be combined with other resources only when necessary and with the express consent of the end user. These gatekeeping activities include authentication of users, payment, and geolocation, all of which involve collection and use of data so sensitive that a certain level of trust is required between the organisation and the user.

The next conceptual layer is the machine-to-human *interface* layer. An interface represents the user experience. The interface is displayed through a physical point of contact that can be either a device or a whole place (such as a store). Devices are of two kinds: they are generic when they support many applications; they are non-generic when only one application can run on them. For instance, a computer, a smartphone or a tablet are generic devices. A connected thermostat is a non-generic device. Certain devices, like connected cars, were generally non-generic in the early stages of their development, but become progressively more generic as they are equipped with more accessibility features (such as an operating system).

At the top of the chart, above the layers of functions, sit the *users*, who can be either individuals acting in their personal capacity or on behalf of a business. These individuals interact directly with the interface layer to access applications, either directly or through the services of another application acting as a gatekeeper.

Each layer is provided with hardware resources, software resources, and network connectivity. Resources can be stored at multiple levels: in data centres at the infrastructure level; in virtual servers located in the cloud; and on user devices (a computer or a tablet for instance). The business relationships between the layers are generally relationships between clients and providers: a company that operates a business in only one layer is generally paid by a company operating a business in the layer above. For instance, cloud computing operators that provide accessibility make payments to infrastructure operators and are paid by application developers. A company operating at the top layer derives payments directly from its interactions with end users, either by charging them money or through generation of value that can then be monetised by the company to derive income from another customer or business. The organisations that are paid at the top level are those operating connected devices, gate-keeping activities or an application that is tethered neither to a device nor to a gate-keeping capacity.

In general terms, several business models in the digital economy can be described in terms of vertical integration between layers. For example, traditional web businesses use software resources (layer 2) and rely on open protocols (like HTTP) (layer 3) to combine those resources into a web application (layer 4). They pay operators of the bottom layer to put their application on line, and their interactions with users generate revenue either directly from the user in the form of payment (which can be received directly or through a gatekeeping operator), or indirectly through the generation of value that can then be monetised elsewhere in the business model.

These interactions explain why some companies consider it critical to operate at the top, especially by providing applications performing gatekeeping functions. In fact gatekeepers are able to collect data from their users, analyse them and eventually make them available for developers to power even more applications (and collect even more data), or market them to other companies (advertising). This also explains the creation of large ecosystems based on a dominant position in the market of gatekeeping, accessibility and sometimes the operation of devices.

Note

1. User sensitivity has triggered waves of protest against certain features, practices or terms of service carried out by some companies with respect to personal data. In reaction, companies have often rolled back the features and even set up new ones to help their users control and protect their private information. It is worth noting as well that the collection and use of personal data is a closely regulated area across the OECD, with most legislation tracking the main elements of the OECD Privacy Guidelines.

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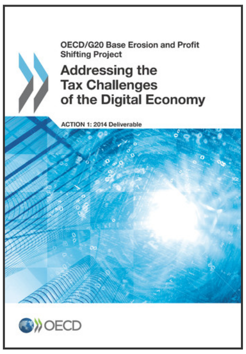

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