chapter one
going digital

1.1 The importance of being digital

We are in the middle of a digital revolution. Around one in every three people on the planet now carries a digital mobile phone around with them wherever they go. Globally, more hours are spent consuming digital media, such as the internet, than any analogue media, including television and radio. Digital technologies are transforming businesses and governments, and changing the ways we live and interact. The 2006 ITU TELECOM WORLD event, in Hong Kong, China (4-8 December 2006) for which this report has been prepared has the tagline "Living the Digital World". But what does it mean to be "digital"?[1]

In a sense, humans have always been digital, but this magical word "digital" needs some demystification. The word "digital" arises from the Latin "*digitus*", meaning "finger". This, then, is its first meaning. Fingers have always been used to signal, among other things, numerical data such as number and quantity. Later, the notion of a number, as expressed by the finger, was transferred to the written or oral symbol, i.e. number or digit. This is the second meaning. The decimal system, or the system based on ten digits, is the one most of us use and are familiar with.

From days immemorial, the digits of the hand have been used to create, to innovate, and to communicate. And just as they were used to represent discrete numbers, in recent times, a system of discrete binary digits (limited to the two digits: zero and one) has been developed to which all transmissible data can be reduced. This binary digit system is the modern and third meaning of this widely used word. Otherwise stated, in ordinary technological parlance today, when speaking of "digital", we mean machines capable of recording, transmitting, or receiving data in binary digit form.

The various advantages of the use of this method for data storage and transmission are discussed further in this publication. In this context, it is striking that smoke signals and even the Morse and Murray codes relied upon the binary idea (off and on, dot or dash). And one may say that, in this sense, technology has come around full circle.

Digital technologies have been crucial in the distribution of knowledge and information, which many argue are at the core of power in society. Through the use of communication technologies like the internet and the mobile phone, the reach of our relatively short digits has been extended to a much larger sphere—that of the global digital world.

1.1.1 The rule of the thumb

As a digit, the human thumb (also known as pollex) merits special attention. It is unique in that it has much more freedom of movement and is opposable to the tips of all of the other fingers. This has distinguished human beings from other members of the animal kingdom, including primates. Charles Darwin pointed to the pivotal role of the opposable thumb in the evolution of the human species[2].

In English, the alternative word for "thumb" is "*pollex*", from the Latin. In Latin, the derivation of the

latter from "*polleo*" meaning "powerful" is significant, revealing the singular importance assigned to this digit. In Roman times, the thumb was used in many aspects of culture–it played a prominent role for the preparation of medicines[3] and in voting for death in the gladiatorial arena.

The Greeks were no less attached to their thumbs, calling them "$αντιχειραζ$" or "*anticheir*" meaning "another hand"[4]. If one is adept at making plants grow, one is said to have a "green thumb". As Isaac Newton once remarked–"in the absence of any other proof, the thumb alone would convince me of God's existence". Indeed, in many cultures, the thumb has become a vital tool for social relationships. In Europe and the Americas, it is used for hitchhiking or as a signal for victory, agreement, or going ahead ("thumbs up"). In India, the thumb has long been used by priests, and other authorized persons, to place the sacred mark on the forehead.

Today, the thumb can be seen as a cementing force in human society. From the narrow streets of Varanasi (India) to the wide avenues of Barcelona (Spain), people are regularly seen walking, eating, talking and even driving while their thumbs busily tap on the keypads of handheld digital devices. As an industry sector, messaging on mobile phones has in the space of just a few years become a global industry generating around USD 80 billion annually in revenue[5]. Interestingly, it has also taken off faster in some developing countries, like China or the Philippines, than in many developed countries (figure 1.1 and box 3.2). Expressions like "thumb culture" and "thumb tribes"[6] are widespread, as the mobile phone gets closer to the human body[7], providing a digital extension of the physical self.

Due to the thumb's important role in digital messaging (and also gaming), it has been observed that it is replacing other digits in different categories of tasks, from pointing to ringing doorbells, e.g. in countries like Japan[8]. So it is no wonder that people have been known to complain of the occasional repetitive strain injury due to overuse[9]. In his book "The Singularity is Near"[10], Ray Kurzweil talks about the role of this important digit in enabling humans to evolve far ahead of animals, allowing them to experiment and build things. The thumb has long been a catalyst for innovation and invention, and it seems it will continue to be so for some time to come.

1.1.2 From digits to digital

Digital technologies, as they are known today, have radically transformed businesses and individual

Figure 1.1: Thumb culture
Growth in SMS/MMS usage in selected economies, 2001-2005

SMS/MMS per user per month, selected economies
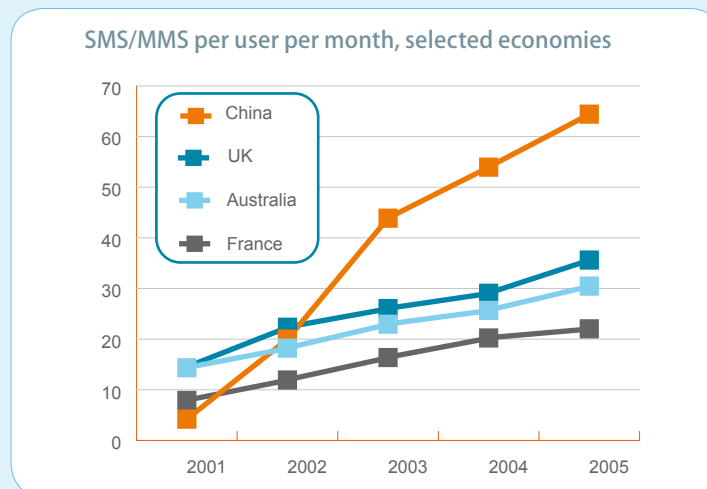
Source: ITU, adapted from Eurostat, OECD, OFCOM, China Mobile, China Unicom

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lifestyles alike. Storage and communications have been made much more efficient. The digitization of information also makes it more easily transferable between media, reduces information loss, and is more suitable for remote or distributed access. Underlying these developments was the microprocessor—a catalyst for technological development and at the heart of Moore's law, which stipulates that processing power will double every 18 months. The internet, especially since the creation of the World Wide Web (WWW), has allowed humans to create and share information and knowledge instantly on a global scale. The advent of digital mobile technologies was an equally revolutionary development, as technologies like GSM and CDMA heralded the dawn of an entirely new world of digital individuals who, even on the move, remain constantly networked and connected.

The use of digital techniques offers a number of advantages over the analogue equivalent:

- Digital techniques can enable large numbers of copies to be produced at low cost;

- Digital copies are more faithful to the original;

- Digital media makes it easier for virtually anyone to create, save, edit, and distribute any document or part thereof;

- Digital storage allows a greater volume of information to be stored and made available with the same resources;

- Digital signals are more robust and less vulnerable to static and noise or degradation over time;

- Digital technologies enable greater speeds of communication, a higher number of channels and frequencies, and a higher resolution of images and sounds.

Not surprisingly, the global consumption of media today is primarily in digital form, with those under the age of 55 spending more time consuming digital media than any other type of media, including traditional television and radio (figure 1.2). Broadband is leading to more diverse and

Figure 1.2: Going digital
Global consumption of media during leisure time by age group (hours per week)
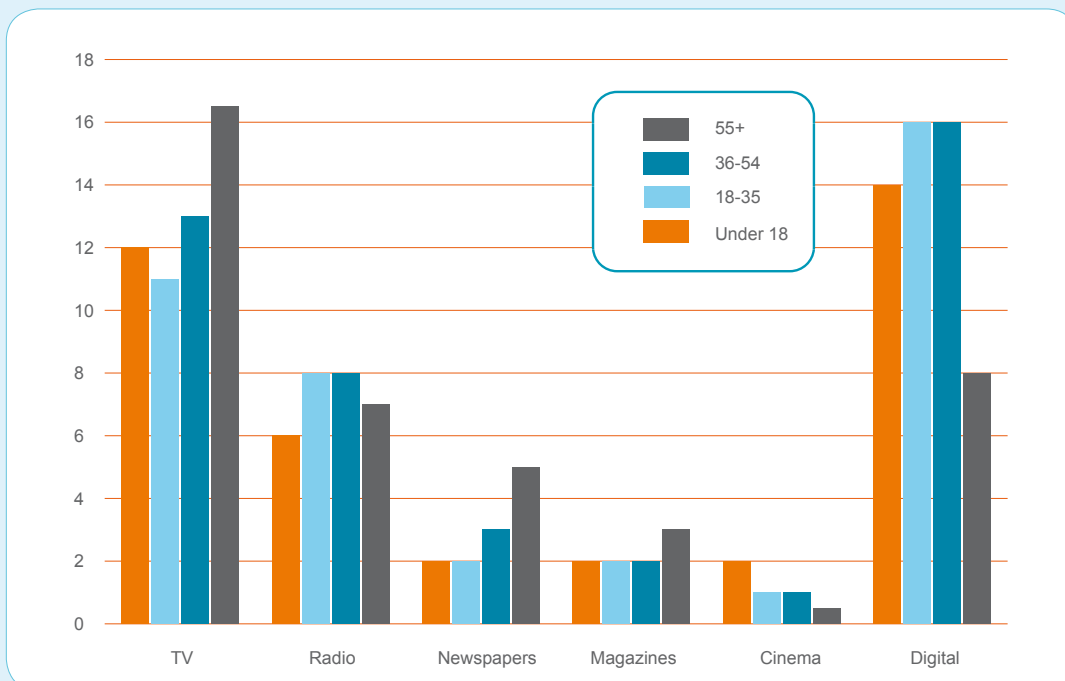
| | 55+ | 36-54 | 18-35 | Under 18 |

on-demand content services. Moreover, digital platforms are being used for banking and other transactions: from e-commerce to new mobile payment systems. We are witnessing what has been termed a "digital revolution", which had its beginnings in the early 1980s and refers to the replacement of analogue devices and services with their digital successors. This technological shift has brought about considerable change in the human condition itself, especially in its socio-economic and cultural aspects.

The transition from narrowband to broadband[11] digital networks (figure 1.3) is now well-advanced in the fixed-line world where there were some 216 million broadband subscribers across the world at the end of 2005 (see data table 6), amounting to just over half the total number of internet subscribers and around one-fifth of total fixed lines. In the mobile network, the transition to broadband has been slower, but as of the end of 2005 there were just over 60 million mobile broadband users in around 60 different economies, representing almost three per cent of total mobile users (see data table 4).

1.2   Digital, invisible and ubiquitous

The next step in the digital revolution is digital ubiquity. Technical innovation based on advances in, *inter alia*, radio-frequency identification (RFID) and sensor technologies, are giving rise to a new paradigm for the digital age, in which information and communications capabilities would be invisibly embedded in the environment around us. In this future "internet of things"[12], mundane daily tasks would be fully automated and no longer require manual input. Technology would seem to slowly fade and disappear from the consciousness of the user. This notion of "ubiquitous computing", which was first expounded by Mark Weiser, points to the "invisibility" of technology through the transformation of everyday items into tiny computers[13]. We should thus expect to see the computer, which has already transformed itself from the mainframe (one computer for many people) to the personal computer (one computer per person), to proceed to the phase of the ever-present (ubiquitous) computer (many computers per person) (figure 1.4).

Figure 1.3: Broadening the scope
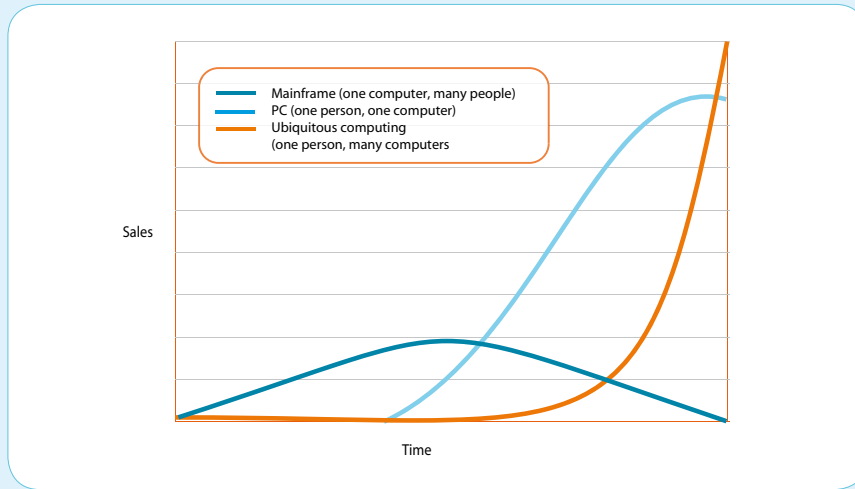*Development of broadband networks, worldwide, 1999-2005 and by region, 2006*
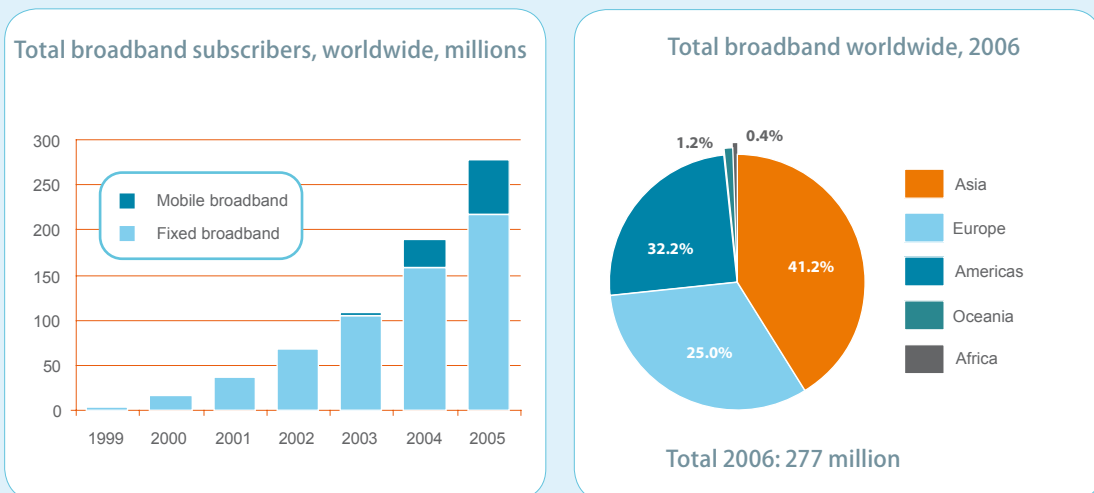
Note: "Broadband" in this context means networks offering capacity equal to or greater than 256 kbit/s in one or both directions. For mobile services, this includes W-CDMA, CDMA 1x EV-DO and CDMA 1x EV-DV. For fixed-line broadband it includes DSL, cable modems, metro ethernet, fixed wireless access, fibre to the home, etc. (see Technical notes).

Source: ITU Information Society Statistics Database (see data tables 4 and 6)

Figure 1.4: The ubiquity of digital
From one computer for many people to many computers for one person

Legend:
- Mainframe (one computer, many people)
- PC (one person, one computer)
- Ubiquitous computing (one person, many computers)

Sales / Time

Source: Adapted from Ignas G. Niemegeers, "The Invisible Network", TU Delft, 2005

People today have a large number of personal devices that they carry around with them daily, what with laptops and mobile phones, digital cameras and portable music players, to name the popular items. One out of every three human beings on the planet is a mobile user[14], and more and more mobile phones are coming equipped with digital cameras and music-playing capabilities. As such, the mobile phone has begun to resemble a pocket computer more than a telephone. Household appliances have also begun taking a similar route, with audio/video devices embracing digital and processing capabilities, together with other white goods such as fridges and ovens. Not only is the workplace being increasingly equipped with digital information and communication technologies, but so too are our cars and homes. Passengers in moving vehicles might enjoy internet access and digital television, before heading home to a fridge stocked with fruit juices pre-ordered via the internet, and an oven that has been pre-set to cook a casserole.

1.3　Digital dilemmas, digital dexterity

As the world becomes increasingly digital, new challenges and important dilemmas arise for businesses and policy-makers. Private individuals, too, are faced with a bewildering number of choices for their information and communications needs.

For businesses, one of the main areas of concern is deploying services that are of interest to the end-user, while providing an adequate return on investment. In this context, customer retention is more to the point than customer acquisition, at least in the long-run and particularly in markets nearing saturation.

A level-playing field is considered to be vital to stimulating investment, affordability and innovation. This holds no less true for the information and communication sector. As such, policy-makers have been increasingly relying on general principles of competition policy to ensure that incumbents do not possess undue advantages over their competitors and that new entrants are not squeezed out of the market. In an era of digital convergence, these tasks are rendered all the more complex, due to services having to be delivered through a complex array of channels and media. Moreover, deriving value from these services is no longer as straightforward as it has been in the past, when there was typically one network per service provided. In today's multi-service and multi-network environment, operators and service providers are faced with important choices: collaboration, competition, innovation or a combination?

Nowhere is this more evident than in the content market. The role of content provider, network operator and service provider are not yet distinctly clear and this is so not only among businesses themselves, but also among regulators and industry watchdogs. For instance, the allocation and degree of responsibility for content transmitted over a network remains a grey area. Both regulators and businesses need added flexibility and dexterity in dealing with these new and important issues. Change, which lies at the very foundation of the new digital world, will be a constant driving force and will require continuous adaptation and rapid response.

As always-on digital access becomes the norm, users must learn to manage a new digital lifestyle—both in terms of the benefits it yields but also the threats it poses. One of the most important areas in this regard is the protection of privacy and identity. In the digital world, there are times when people need to represent themselves accurately and securely, for instance, for the purposes of e-commerce. However, there are other circumstances in which people may want to have the freedom to project a persona in cyberspace which is quite different to that in the real world. Being able to distinguish between the two in a manner which is predictable, proportional, manageable, and socially acceptable is important for maintaining human dignity in an ever deepening sea of digits.

1.4   About this report

This report, entitled digital.life, is the eighth in the series of ITU Internet Reports. The reports series, which was launched in 1997, has been tracking the development of the internet worldwide. This edition focuses on consumers and looks at how human lives are being shaped and re-shaped by advances in digital technologies:

- Chapter two, lifestyles.digital, begins by examining the underlying technological enablers of new network infrastructures and content diversification;

- Chapter three, business.digital, considers how businesses are adapting to fast-paced digital innovation, how digital access can be extended to underserved areas, and how policy-making might need to adapt in light of rapid media convergence;

- Chapter four, identity.digital, explores the changing nature and role of the digital individual and of digital identity (both abstract and practical) as human lives become increasingly mediated by technology;

- Chapter five, living the digital world, concludes by putting forth a number of important challenges to be addressed, and imagining how our lifestyles might evolve in the digital age.

The Information Society Statistics in the annex to the report present the latest available data for more than 200 economies worldwide in terms of their use of digital information and communication services.

Endnotes for Chapter one

1   "Being digital" was the title of a seminal book by Nicholas Negroponte published in 1995.

2   Charles Darwin, The Descent of Man, 1871.

3   Anthony Corbeill, Nature Embodied: Gesture in Ancient Rome, Princeton University Press, 2004.

4   Michel de Montaigne, "Of Thumbs", Essays, 1533-1592.

5   There are many different and wildly varying estimates of the size of the global market for SMS and MMS traffic. For instance, Portia Research estimate the global market for mobile messaging to have been worth USD 55bn in 2005 (see www.portioresearch.com/Mob_Mess_Fut_brochure.pdf). IMImobile estimates that 92 billion SMS/MMS were generated each month in 2005 (see www.imimobile.com/whitepapers/MMSC%20Whitepaper.pdf#search=%22sms%20market%20size%22). The GSM Association estimates a total of one trillion SMS were sent during 2005 (see www.gsmworld.com/services/messaging.shtml). At a conservative estimate of USD 0.08 per message, this generates a total market size of USD 80 billion. The global average price for an SMS was around USD 0.12 in 2006 (see data table 3).

6   Howard Rheingold, Smart Mobs: The Next Social Revolution, Perseus Books, 2002.

7   Lara Srivastava, "Mobile manners, mobile mania", in P. Glotz, S. Bertschi, C. Locke (eds), Thumb Culture: The meaning of Mobile Phones for Society, Transcript, 2005.

8   Sadie Plant, On the Mobile, Motorola, 2002.

9   New York Times, "All thumbs, without the stigma", 12 August 2004.

10 Ray Kurzweil, "The Singularity is Near: When Humans Transcend Biology", Penguin Group, 2005.

11 In this content, "broadband" is defined as a network offering a combined speed of equal to, or greater than, 256 kbit/s in one or both directions.

12 ITU Internet Report 2005: The Internet of Things, November 2005 (available at www.itu.int/internetofthings).

13 Mark Weiser, The Computer for the 21st Century, Scientific American, September 1991.

14 ITU Information Society Statistics Database. There were 2.17 billion mobile phone subscribers in January 2006.