

chapter three

business.digital

3.1. Deriving value

3.1.1 A huge market (however you slice it)

How big is the market for digital lifestyles addressed by this report?

- At one level, it is a huge market representing digital industries such as telecommunications, computing and broadcasting with a combined sales turnover equivalent to around 7 per cent of global GDP (Box 3.1).
- At another level, it is a market of one person (“me”), who is just as likely to value services delivered free-of-charge as those for which a price is demanded.

Therefore, building a business model to derive value from digital lifestyles involves seeking common elements among the six billion plus “me” markets and combining free-of-charge and paid-for content into a ‘must-have’ package. It is a market in which conventional distinctions—for instance, between business and residential services, or between urban and rural areas—bear less relevance than in the past, but in which new, more meaningful types of segmentation are needed but remain elusive.

Traditionally, markets have been viewed in terms of supply and demand, in which vendors and service providers create value for which consumers are

willing to pay. But, in the emerging digital world, it is just as likely to be the consumers themselves that create the value. The classic examples of this are the massively multi-player online role-playing games (MMORPGs), or the social networking websites explored in chapter two, where the majority of content is created by users, but within a broad set of parameters and rules established by the service provider. More conventional businesses, such as telecommunication operators, have also begun heading in this direction. In the 19th Century, telegraph messages were typed and decoded directly by employees of the telegraph company. By the 20th Century, users could send and receive messages themselves, but most of the equipment comprising the network was owned and operated by the telephone company. In the 21st Century, equipment owned directly by the user is increasingly being used to transmit messages (for instance, via P2P networks such as those used by Skype, or via inter-locking Wi-Fi networks).

This trend towards making the users of a service participate in its provision is sometimes called “McDonaldization”, after the famous fast-food chain that invites its customers to serve themselves and clear their table after they have eaten.¹ Similar trends can be noted in computing (for instance through the free and open source software (FOSS) movement and in broadcasting (where reality TV and phone-in programmes use ordinary people and viewers to create content). Perhaps the biggest success that telephone and broadcasting companies have made in persuading users to create their own value is in the growing market for SMS (box 3.2).

Box 3.1: Digital business is big business

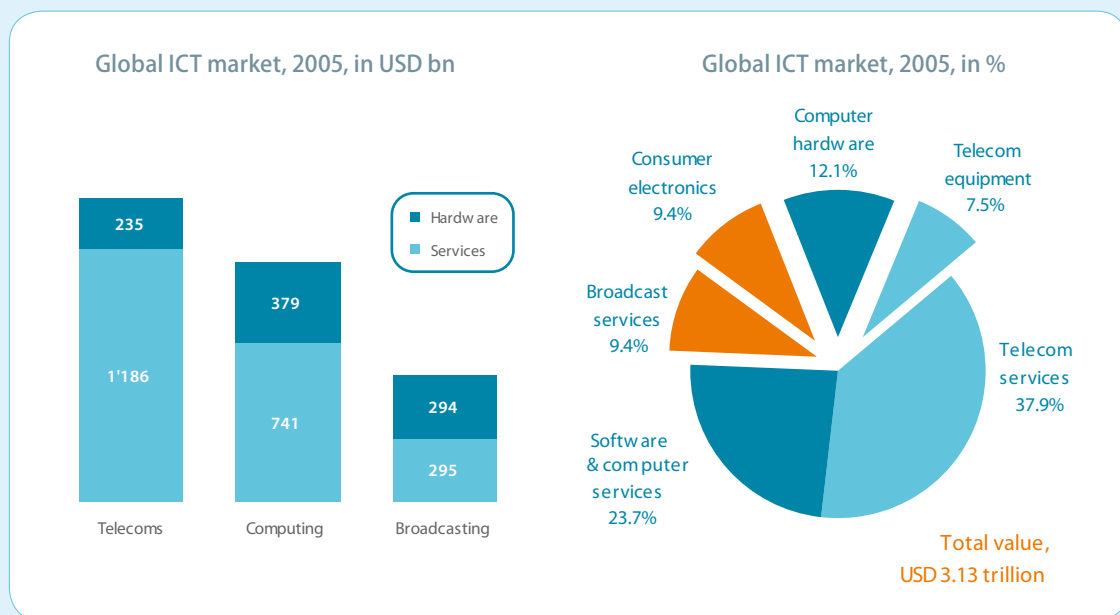
Estimating the ICT market size

The market addressed in this report may be interpreted as the combined sectors of telecommunications, computing and broadcasting which together constitute the sector for information and communication technologies (ICTs). This is a global market worth some USD 3.13 trillion in 2005, equivalent to around 7.6 per cent of Gross Domestic Product (GDP). It is a market that continues to grow at a slightly faster rate than global GDP, at around 6 per cent during 2005.

Just over two-thirds of the market comes from sale of services, with telecom services being the main component. Of the remaining 29 per cent, which derives from equipment sales, computer hardware is the major component, despite the continuing fall in the price of semiconductor chips for a given level of performance following "Moore's Law"². Telecoms is the largest sector overall, but has the lowest ratio of equipment to services sales (at 1:5). By contrast, in the broadcasting market, the ratio between sales of broadcast services to sales of equipment is approximately 1:1, with the majority of service sales income coming from advertising rather than directly from end-users.

Of course, there can be endless debates as to how the market is defined: should semiconductors or music be included, for instance? Should consumer electronics be left out? Does "internet" constitute a whole market segment in its own right? Such queries are normal in a sector where technological change is a driving force.

The global market for ICT hardware and services, broken down by percentages and USD values



Note: These figures are expressed in USD values at 2005 levels. They cannot be compared directly with comparisons published in earlier years because of currency fluctuations.

Source: ITU Information Society Statistics Database, IDATE

The trends towards personalisation of services and user-created value in digital lifestyles are shaping the market in a number of significant ways:

- Customers are now generating a higher share of network investment than in the past. More and more equipment is owned directly by customers (e.g. PCs, mobile phones, broadband routers and Wi-Fi networks, etc.),

while for service providers, the costs of market entry have fallen. This is especially true in those countries that have adopted unbundling of the local loop, or infrastructure-sharing on wireless masts, meaning that it is no longer necessary for new entrants to construct a network from scratch. Thus, vendors looking to create new market openings are increasingly having to

Box 3.2: Short messages, big profits

SMS—a great success for operators in both developed and developing markets

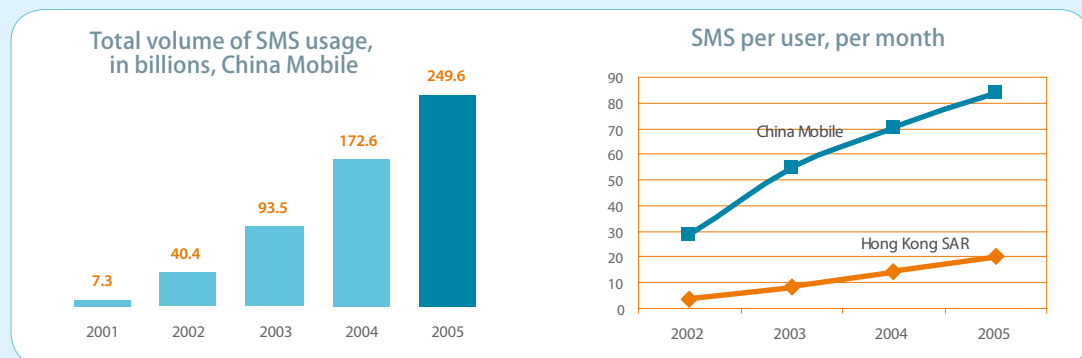
Short Message Service, or SMS as it is better known, is a curious market in which users, rather than operators, take the initiative. The capacity to send messages of short duration (around 160 characters) was built into the technical specification of the second-generation (2G) mobile system called GSM (Global System for Mobile communications) which was launched commercially in July 1991. But mobile operators did not perceive that such a cumbersome system for composing and sending messages between users would ever become popular. It took a few years for users to discover the hidden capacity to send text messages, and when they did, it was users in the Philippines who first popularized the service. A large number of free SMS messages were included in pre-paid packages, and when the credit to make outgoing voice calls ran out, SMS messages started to be used for soliciting incoming calls. During a brief period at the start of the Millennium, the Philippines' volume of SMS exceeded that of Europe, the USA and China combined.³ Europe and China have caught up rapidly, but the USA still lags behind.

Globally, the volume of text messages sent from mobile phones is worth around USD 80 bn per year and continues to grow, especially in developing countries and for premium-rate services. An example of the latter is the enormous success of reality TV programmes, like American Idol or Big Brother, that combine live action with interactive texting from viewers to determine the outcome. The final of the 2005 UK edition of Big Brother generated some 6.4m texts in a single night, at a premium-rate of 50p each, generating revenues of £ 3.2m (USD 5.9m), to be split between the production company (Endemol), the broadcaster (Channel 4), the different mobile network operators and a charity.⁴ Perhaps it is no surprise that Endemol, which pioneered this model, is owned by a telephone company (Telefónica de España).

However, the biggest potential revenues for SMS come from the developing world where, ironically, it is often seen as a cheaper alternative to mobile voice calls. An illustration of this comes from a comparison between Hong Kong SAR and mainland China. In Hong Kong, with a wealthy, sophisticated and young user base, and an intensively competitive market, one would imagine that conditions were ideal for the spread of SMS. But take-up has been slow, with a monthly volume in December 2005 of around 20 per user per month. In China, by contrast, this usage level was already attained five years earlier, and in 2005, SMS usage totaled around 250 billion SMS, or 84 per user per month. Nevertheless, this still pales into insignificance compared with Singaporean usage, which is over 110 per user per month.

Why the difference in popularity of SMS? Price is one factor, but not so much the absolute level as the relative price. An SMS in Hong Kong SAR, at around 2.6 US cents, is less than a third of the global average. But, more significantly, a mobile voice call is only marginally more expensive than an SMS in Hong Kong, and usage packages typically contain around 1'000 minutes of use, whereas in China, a user can send up to eight SMS for the price of a single minute of voice (with costs shared between user and receiver) Internet usage and answerphone ownership are also relatively low in China, so some SMS usage substitutes for e-mail and voice-mail, with the latter being, in any case, culturally unpopular in China. Whatever the reasons, SMS is financially significant for China Mobile, contributing some RMB 24.7 bn (USD 3.1bn) or around 10 per cent of 2005 revenues.

SMS in China and Hong Kong SAR



Note: For China, figures represent the results of only China Mobile (i.e. excluding results for China Unicom), while for Hong Kong SAR, the figures include SMS sent for all mobile operators.⁵

Source: China Mobile Annual Report, available at: www.chinamobiletd.com/. OFTA statistics, at www.ofta.gov.hk/en/datatstat/main.html⁶

address the consumer market directly, rather than only their traditional market of networks and service providers, as explored in section 3.1.2.

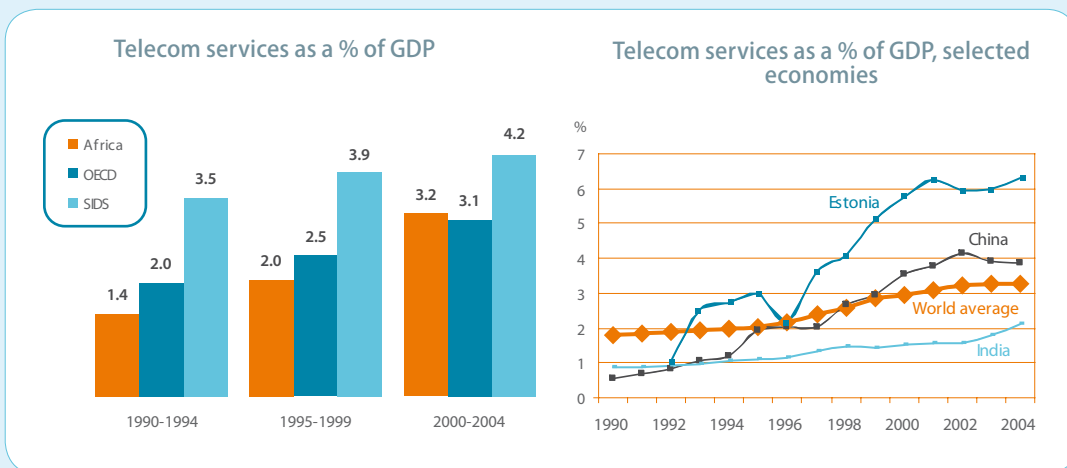
- A higher percentage of revenue now derives from subscription charges and advertising, and less from usage charges. As a general rule, telephone service providers used to make around one-third of their revenue from fixed charges (subscription and connection) and two-thirds from usage charges, but this ratio has progressively reversed, especially as internet use has shifted from dial-up to broadband. For mobile phone companies, too, the introduction of pre-paid subscriptions, which account for the lion's share of the market in most countries, has shifted the balance towards flat-rate payments. This phenomenon is explored further in section 3.1.3.
- Inter-modal competition (between different technologies) is now just as significant as competition between companies in the same market. The battle for voice traffic that was fought between fixed-line telephone providers, cable TV companies and mobile service providers is now being re-fought, but this time it's all about data traffic. Mobile networks

are progressively undergoing a broadband makeover to enable them to compete with DSL and cable modem networks in the delivery of high-speed internet services. Inter-modal competition, resulting from technological convergence, is examined in section 3.2.1.

- Markets are increasingly global, with an increasing share of both revenue and innovation coming from outside the home market of the service provider. The internationalisation of ICT products and services is proceeding apace, with much of the new growth occurring outside OECD member countries. In some cases, new services are being pioneered in developing countries before they take-off in developed markets. Nevertheless, the pace of growth is uneven, and not all developing countries are benefiting. This theme is explored further in section 3.2.2.
- As a result of these trends, policy formulation requires an increasingly integrated approach, rather than one based on traditional sector-specific regulation. The three sectors that constitute the ICT market (telecommunications, computing and broadcasting) have very different regulatory regimes, ranging from regulation of carriers to regulation of content

Figure 3.1: The growing contribution of telecommunication services to the global economy

Telecommunication services as a percentage of Gross Domestic Product (GDP), in selected regions and selected economies, 1990-2004.



Note: Based on an analysis of telecom services as a proportion of GDP, for those economies where data for both series are available for the period 1990-2004.

OECD = "Organisation for Economic Cooperation and Development"; SIDS = "Small Island Developing States"

Source: ITU analysis, based on the ITU Information Society Statistics Database

and competition policy. As the three sectors converge, a new approach is required. Policy-making is therefore becoming more consumer-oriented and less carrier-oriented. It is also less driven by scarcity, as discussed below in section 3.3.

3.1.2 Value creation

The two big waves of changes over the last decade—the expansion of mobile communications and the internet, led by the World Wide Web—have both created a number of potentially massive new market openings. In the early days, it was predicted that the main impact of these two technologies on the ICT sector would be to replace existing revenues for fixed-line voice services and for data leased lines, and this has to some extent happened. But while some revenues have undoubtedly been lost, new market openings, particularly in the area of content provision, have greatly exceeded the revenues lost.

The clearest evidence for this is at the macro-economic level, where the contribution of ICTs to the general economy has grown rapidly, despite falling prices. As figure 3.1 shows, in 2004 telecommunication services contributed some 3.3 per cent of Gross Domestic Product (GDP) worldwide, compared with just 1.8 per cent in 1990, with virtually every single economy enjoying growth. This implies that the telecommunication sector has grown, on average, at twice the rate of the global economy during this period. But there are some interesting variations. For instance:

- **Small island developing states (SIDS)**, particularly those where tourism makes a major contribution to the national economy, are generally much more dependent on telecommunications (especially international telecommunications) as a source of revenue, with an average of 4.2 per cent of their GDP coming from this source in 2000-2004. SIDS are particularly vulnerable, therefore, to changes in the international telecommunications regime, and the terms of trade have turned against them as a result of the progressive dismantling of the international accounting rate system over the past decade. This is one reason why they have not grown their ICT sectors as rapidly as other regions.
- The leading industrialised economies of the **Organisation for Economic Cooperation and Development (OECD)**, which provide a combined total of more than 80 per cent of global telecommunications revenue, have seen this contribution to GDP increase by more than half, as a proportion of their GDP. Among OECD economies, the economies of the former Eastern bloc have seen the most spectacular growth: for instance, in Hungary, the share of telecommunications revenue has risen from 1.1 per cent of GDP in 1990 to a peak of 7.3 per cent in 2001, while the Czech Republic and Poland have similarly witnessed peaks of 4.9 per cent and 4.5 per cent of GDP, respectively.
- The economies of **Africa** started from a position well below that of the OECD, but have recently overtaken it, with 3.2 per cent of their GDP coming from telecommunications in 2000-2004. This turnaround is almost entirely due to the rise of mobile communications on the continent, which is integrating African economies more closely into the global information society. The fact that Africa's citizens pay as high a percentage of their national wealth on telecommunication services as the global average suggests that lack of affordability is not as great an issue as it was in the past, although excessively high tariffs may still be a problem.
- However, the most dramatic changes have occurred in **individual economies** (figure 3.1, right chart). In China, telecommunications revenues as a percentage of GDP have grown from less than half the global average in 1990 to overtake it since 1999. In Estonia, since its re-creation as an independent state, the ICT sector has been prioritized by the government and this is exemplified by a telecom sector which contributes more than 6 per cent of national wealth. India is an equally interesting case, because its telecom boom had a major impact only relatively recently, with a sudden upturn in spending since 2002, following moves to liberalise the sector. India is now in a similar position to China seven years earlier, and can be expected to enjoy rapid growth of its ICT sector in the near future.

Although macro-economic data provide comprehensive proof of the new market openings that are being created, trends at the micro-economic level, i.e. relating to individual companies, and how their prospects are rated by the financial markets, are perhaps even more compelling. As of mid-2006, the financial markets rated the top five companies in the ICT equipment, ICT services and digital content sectors at similar levels, with a market capitalisation of around half a trillion dollars each. But when one compares these market valuations with the annual revenues of the companies in the different sectors, it can be seen that the three sectors are quite different (figure 3.2). The financial markets assign a market capitalisation to the equipment sector equivalent to 21 months of annual revenue. For the services market, the market capitalisation is worth 27 months, but for the content sector, it is worth more than seven years of revenue. In other words, the big five companies in the internet/media content sector (Microsoft, Google, Yahoo!, eBay and Amazon) are expected to grow at a substantially faster rate than the top five companies in either the equipment manufacturing or service provision sectors.

This valuation of digital content companies is all the more remarkable, when one considers that market capitalisation is at least partly based on assets. Whereas the service providers have assets comprising networks, switching centres and billing systems, and the equipment manufacturers have factories and R&D laboratories, the assets of the digital content companies comprise mainly their staff, software and brand names. Google stands out, with a market capitalisation of USD 118 billion equivalent to 19 years worth of revenue. This puts it on a par with the annual GDP of an economy such as Malaysia. Google's main assets are its search engine technology and its brand name. It makes 99 per cent of its revenue from advertising. Although it has a solid track record of revenue growth and profitability, this only stretches back as far as its creation in September 1998.

One major advantage of the high valuation afforded by the markets to the digital content sector is that it means these companies can grow by acquisition, as well as through organic growth. During 2005, for instance, Google acquired some 15 companies for a purchase price of USD 130.5 million, mainly to acquire technology, but also patents, business

models and creative staff. In 2006, Google paid USD 1.6 billion for the video-sharing website YouTube, founded as recently as February 2005.

Similarly, eBay, another highly-valued content company, used its high market capitalisation to acquire Skype, a market-leader in the field of peer-to-peer VoIP in October 2005 for USD 2.6 billion; PayPal, a global payments platform, for USD 0.4 billion; and six other companies during 2005.

Of course, it is tempting to speculate that we have "seen it all before", in that market valuations reached unsustainable levels in the early 2000s, before the bursting of the *dot.com* bubble (box 3.4). Certainly, the potential for wildly inflated expectations, over-investment and "creative" accounting remains today, but some of the basic conditions that prevailed in the late 1990s are different from those that prevail today. Crucially, the internet of the late 1990s was a slow-speed, dial-up version—little removed from the basic telephone network. Digital subscriber line (DSL) technology, developed at ITU, has now added more than a quarter of a billion broadband subscribers across the world, and the internet is finally capable of delivering the visions that were proudly presented as the business models of the *dot.com* generation.

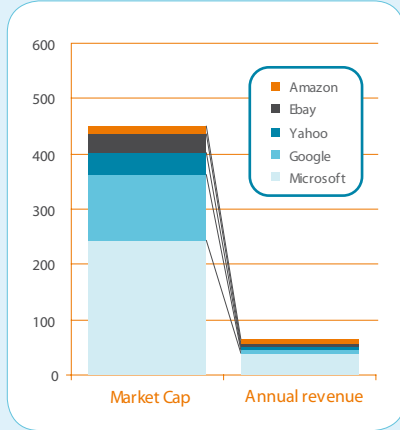
A further difference, on the mobile side, is that the exorbitant prices paid for 3G licences do not seem quite as extortionate as they did in the context of the collapse of the IT bubble, given the ongoing expansion of the mobile sector to reach 2.17 billion subscribers worldwide at the end of 2005, of which just over one tenth have already shifted to 3G. The reality is that, despite the severity of the crash that affected the technology sector between 2000 and 2003, the underlying networks have simply kept growing with barely a hiccup.

As well as leading companies and national economies, small companies and entrepreneurs are also exploiting the benefits of digital markets. One of the reasons for this is that the internet has greatly reduced barriers to entry in numerous sectors. With a website, an eCommerce server and some astute marketing, even the smallest company in the remotest part of the world can potentially build a global business. Rates of new firm formation in the technology sector are as high as they have ever been and, as the example of Google shown

Figure 3.2: Tracking the “Big Fives”

Market capitalisation and annual revenues for the top five companies in the digital content, telecom services and ICT equipment manufacturing sectors

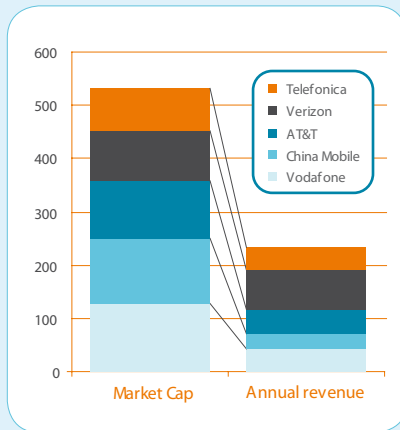
Top 5 digital content companies



Company	Market cap (USD bn)	Annual revenue (USD bn)	Year-to-date
Microsoft	244.8	39.8	31/06/ 05
Google	118.5	6.1	31/12/ 05
Yahoo!	38.0	5.3	31/12/ 05
Ebay	35.4	4.6	31/12/ 05
Amazon	14.3	8.5	31/12/ 05
Totals	451.0	64.2	

Ratio of market capitalisation to revenue=7.02

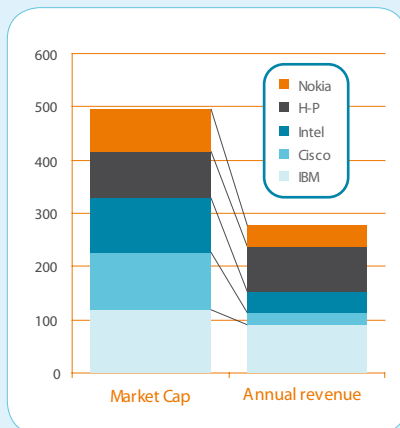
Top 5 telecom service companies



Company	Market cap (USD bn)	Annual revenue (USD bn)	Year-to-date
Vodafone	128.4	41.3	31/03/ 06
China Mobile	120.6	30.9	31/12/ 05
AT&T	108.0	43.9	31/12/ 05
Verizon	95.1	75.1	31/12/ 05
Telefonica	78.3	42.6	31/12/ 04
Totals	530.3	233.8	

Ratio of market capitalisation to revenue=2.27

Top 5 ICT equipment manufacturers



Company	Market cap (USD bn)	Annual revenue (USD bn)	Year-to-date
IBM	117.8	91.1	31/12/ 05
Cisco	109.6	22.0	31/07/ 04
Intel	101.7	38.3	31/12/ 05
HP	86.7	86.7	31/10/ 05
Nokia	80.8	40.5	31/12/ 05
Totals	496.5	278.7	

Ratio of market capitalisation to revenue=1.78

Note: Market capitalization data is for 21 July 2006. Annual revenue is for latest available year. Companies are ranked (top five) according to market capitalization rather than annual revenue.

Source: ITU, adapted from Company reports, Finance.Yahoo!.Com and Edgar Online

above illustrates, it is possible to build a billion-dollar company in just a few years. In the case of YouTube it took less than 18 months. But the critical element remains getting the business model right, including the pricing of services.

3.1.3 Is the price right?

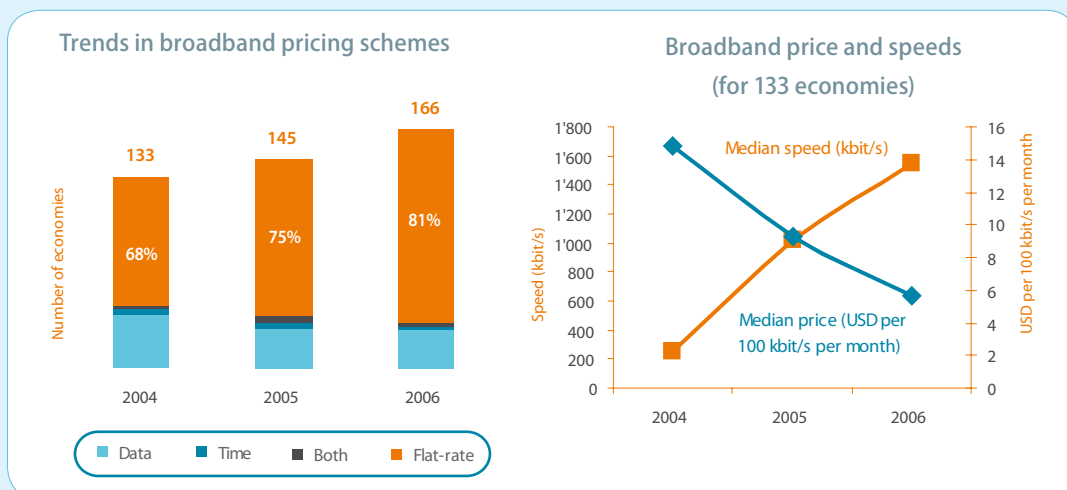
Although there are only a relatively limited number of pricing formats for ICT services, there seems to be an apparently infinite number of variations on them, which often makes it difficult to compare one company's offerings with another. Of course, this is partly deliberate, as most service providers would prefer to avoid "beauty contests" where price schedules can be compared directly. But the complexity also reflects the increased scope for bundling that emerges through convergence, as previously distinct services are bundled together under "multiple play" type offerings that combine voice (fixed and/or mobile), video and internet services.⁷

There are four basic pricing models in the ICT sector:

- **Time-based, metered pricing** has traditionally been the mainstay in the telecommunication sector, with calls being billed according to the duration of the call, geographic distance and/or the time of day or week, when the call was placed. Although geography is now less important, metered pricing is still used for local calls on fixed-line networks in most of the world (North America, Hong Kong, Australia and a few other markets are the exceptions), for long-distance and international calls on fixed-line networks, and for mobile networks virtually everywhere.
- A variation on time-based pricing is **volume-based pricing**, with time metering being replaced by a measure of content throughput. Volume-based pricing is a way of rationing capacity, particularly on data-based networks (e.g. leased lines, broadband, 3G cellular), but it becomes less relevant, once bandwidth is not so scarce. Both time-based and volume-based

Figure 3.3: Broadband pricing trends

Trends in pricing and price models for fixed-line broadband services, worldwide, 2004-06



Note: "Data" refers to price packages that impose an upper limit ("bit cap") on the volume of data that can be downloaded per month for a fixed price. "Time" refers to price packages that use time-metering (e.g. 20 hours use per month). "Both" refers to price packages that have thresholds for both a bit cap and time usage. "Flat-rate" implies unlimited monthly use.

Source: See Biggs, Phillippa (2006) "Broadband Update", in ITU News, 2006 vol. 5, p21, available at www.itu.int/itu-news/manager/display_pdf.asp?lang=en&year=2006&issue=05. Data is based on the annual broadband price survey carried out by ITU (see data table 7)

Table 3.1: Broadband prices: halving each year

Lowest prices for broadband, per 100 kbit/s per month, April 2006, and change 2005-06

	Economy	Company	Speed Mbit/s	Price per month USD	Price per 100 kbit/s	Change 2005-06
1	Japan	Yahoo! BB	51.2	31.19	0.07	-12.5%
2	Rep. of Korea	Hanaro	51.2	40.59	0.08	...
3	Netherlands	internet Access	20.4	27.97	0.14	-81.3%
4	Taiwan, China	Chunghwa	12.3	22.67	0.18	...
5	Sweden		24.6	56.08	0.23	-6.5%
6	Singapore	Starhub	30.7	73.17	0.24	-85.0%
7	Italy	Libero	12.3	37.23	0.30	-73.8%
8	Finland	Elisa	24.6	85.64	0.36	-51.4%
9	France	Free	10.2	37.29	0.36	-90.1%
10	United States	Comcast	4.1	20.00	0.49	...
11	Germany	Freenet.de	6.0	30.95	0.52	...
12	United Kingdom	Pipex	8.1	50.89	0.63	-53.6%
13	Hong Kong, China	Netvigator	6.1	51.17	0.83	...
14	Portugal	Sapo	8.1	75.82	0.93	...
15	Canada	Bell	4.0	41.26	1.01	-3.9%
	Unweighted Average		18.3	44.33	0.42	-50.8%

Note: The broadband prices were sampled in July 2005 and April 2006. Price change is shown only for those companies for which equivalent services were available in both periods.

Source: ITU research (see also data table 7)

pricing lend themselves to pricing packages that set specific thresholds. For instance, for mobile networks, packages offering a specific number of minutes of use per month are popular, while for broadband networks, a bit-cap may be set on the monthly volume of usage.

- The third main pricing model is **flat-rate, unmetered pricing**, which offers a certain bundle of services for a fixed monthly rate. This pricing model has typically been used for cable TV where a certain number of channels are offered for a basic fee, with premium services offered in higher-price tiered payments. Flat-rate is also increasingly popular for broadband. Indeed, pre-payment, now the dominant pricing model used for mobile communications, can be considered a form of flat-rate pricing.

- The final type of payment model is **advertising-funded**, which is the most common model used by free-to-air television. It is also commonly used for internet content. The end-user may not make any direct payments at the point of use, but indirectly pays for ICT services through increased usage of those products and services that are advertised.

The first two of these pricing models are driven by scarcity and the need to ration the use of available capacity. As higher-capacity fixed networks are deployed, including higher-speed broadband (e.g. VDSL, fibre) and mobile broadband (e.g. W-CDMA, HSDPA, CDMA 1x EV-DO), scarcity is less of an issue and flat-rate pricing is being adopted more widely (figure 3.3, left chart). In July 2004, only two-thirds of the 133 economies that offered broadband services worldwide had flat-rate tariffs available. By April 2006, the number of economies

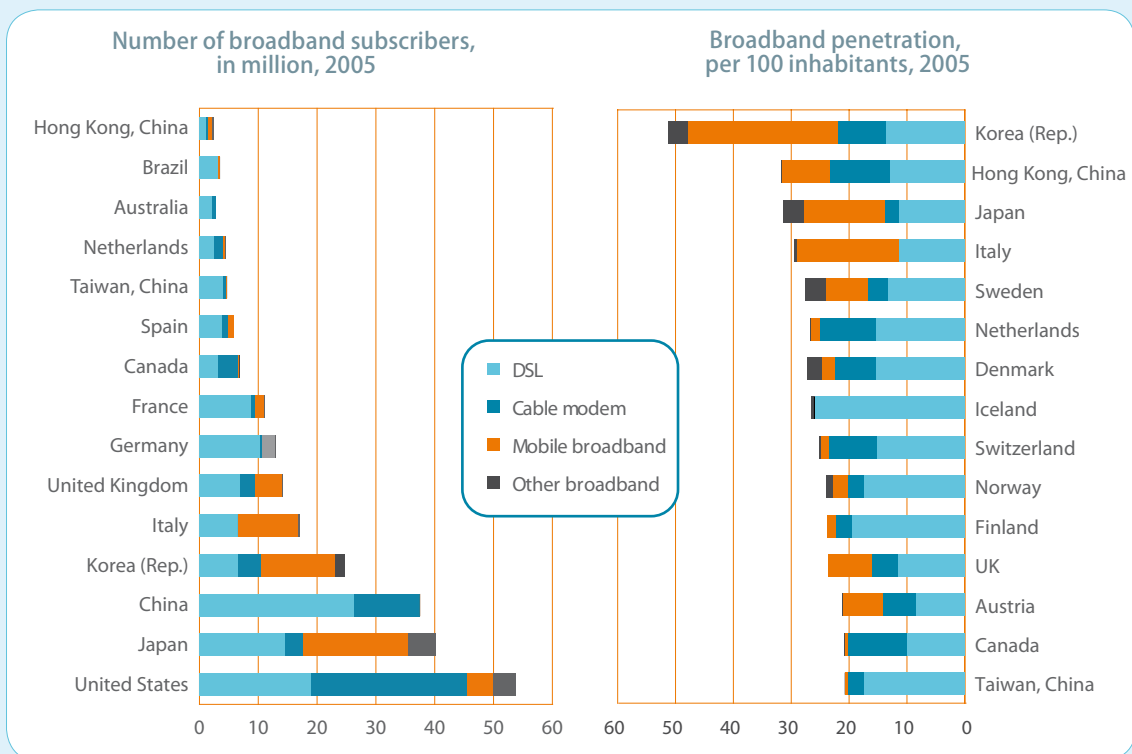
where operators offered commercial broadband service had increased to 166, with flat-rate pricing available as an option in 81 per cent of them. Time-based pricing had almost completely disappeared and the number of economies where operators still imposed bit-caps had shrunk to just 28, though this includes some major economies such as Australia, South Africa and Italy (figure 3.3, left chart). However, alternative pricing schemes, without bit-caps, are now available in most of these economies.

Furthermore, broadband offers are improving at a truly remarkable rate, in terms of both the price and speeds available. In July 2004, the median speed available worldwide was around 256 kbit/s (the bare minimum to be defined as broadband, according to the definition used by ITU), but within 22 months, this had improved to over 1.4 Mbit/s

(figure 3.3, right-hand chart). By 2006, some 29 economies had service offerings with speeds of greater than 3 Mbit/s available. Similarly, the median price per 100 kbit/s of data per month had fallen over the same period from USD 15 to just USD 5. In the ICT sector, the familiar vector of change is the so-called Moore's Law (box 3.1), which specifies that semiconductor capacity is expected to double, for a similar price, every 18-24 months. However, in broadband economics, the price/performance ratio appears to double every 12 months or so while the price halves every 15 months—at least that has been the experience to date. As an illustration of this, Table 3.1 tracks prices for leading companies in the major broadband economies. It illustrates that broadband prices per 100 kbit/s per month have fallen by 50 per cent, on average, over just 10 months.

Figure 3.4: Top 15 broadband economies

Top 15 economies for broadband (both fixed-line and mobile), ranked by total number of subscribers (left chart) and penetration rate (right chart), at 31 December 2005



Note: "DSL" = Digital Subscriber Line technologies. "Cable modem" = broadband services delivered over a cable TV network. "Mobile broadband" = 3G cellular services offering services in excess of 56 kbit/s. It includes Wideband CDMA, HSDPA, CDMA 1x EV-DO and EV-DV. "Other broadband" includes other technologies delivering broadband access in excess of 200 kbit/s, including fibre to the home/office, metro ethernet, satellite broadband, fixed wireless access, public Wi-Fi etc.

Source: ITU Information Society Statistics Database

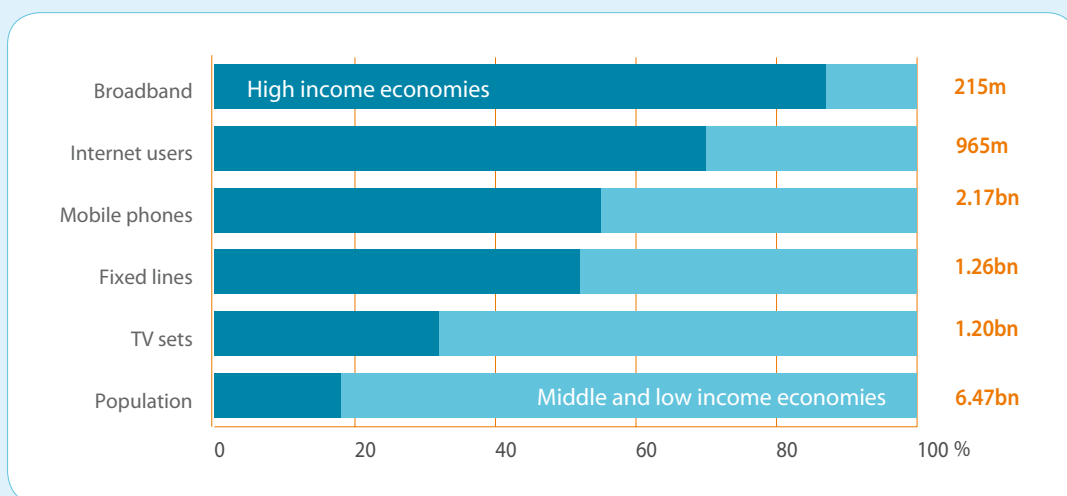
Although mobile broadband has been slower to take off than fixed-line growth, it is now beginning to show comparable growth, with just over 60 million subscribers at the start of 2006 (see data table 4).⁸ Although this represents only one third of the level of subscribers for fixed-line broadband, and the speeds on offer commercially are generally much slower, the gap between fixed and mobile broadband has been narrowing over recent years. Indeed, in some economies, such as Italy, Japan and the Republic of Korea, mobile broadband now constitutes more than half of the total broadband subscribers (figure 3.4).

Key factors driving growth in mobile broadband include the introduction of higher-capacity, easier-to-use services and a shift towards flat-rate tariff models. For instance, in Japan, NTT DoCoMo offers subscribers to its FOMA 3G mobile service a billing package (*pake-hodai*, or packet flat-rate service) that offers unlimited use of i-mode and e-mail for ¥4'095 (USD 35.80) per month, including tax.⁹ But the more common practice is for mobile broadband vendors to offer a series of packages with bit-cap data thresholds for certain levels of usage. For instance, 3 in the UK offers a 3G data card with packages ranging from 100 MB to 512 MB per month at prices ranging from £20 to £45 per month (USD 37–84).

The mobile broadband services currently on offer have many of the same limitations and deficiencies as fixed-line broadband, when it was first introduced at the turn of the millennium. They are complex to use and the quality of services offered (e.g. video clips, live TV streams) can sometimes be poor, due to capacity constraints. They also remain relatively expensive compared to equivalent fixed-line broadband services. The rationale behind bit caps and pricing packages is partly to maximise revenue, but also to ration the available bandwidth until higher-bandwidth offerings become available. For these reasons, mobile broadband is priced much more highly than fixed-line services at present and can only be considered as substitutable over a narrow range of applications, for instance, for downloads of music, where the ability to download directly to mobile handset might be considered more convenient than access over a PC and a fixed-line broadband service. Problems relating to price, speed and quality should be resolved as CDMA networks shift W-CDMA to HSDPA and as CDMA 2000 1x networks are upgraded to EV-DV and EV-DO (see discussion in section 2.1). Furthermore, the development of fixed-wireless services (e.g. WiMAX), dual-mode handsets and data cards that can use both mobile and fixed internet access will progressively blur the differences between different

Figure 3.5: The digital divide reduces with age of technology

The distribution of usage between high income and other economies, among different technological platforms, 2005



Source: ITU Information Society Statistics Database

platforms. Ultimately, the goal is to deliver access to consumers more cheaply and conveniently. Improving the technical capabilities of mobile networks will help increase the overall range of delivery platforms available, as explored in the next section.

3.2. Delivering access

3.2.1 Platforms for delivering services

What can be considered as a basic ICT service today? Twenty years ago, it might have been defined as a “telephone in every home”. Ten years ago, with the rise of mobile phones and the internet, that might have been modified to “each individual having access to a phone” or “a PC in every home”. Now, it is not just the availability of devices or services that matters, but the quality of the connectivity that they offer. “Broadband” is now the essential service offering, whether over fixed or mobile networks, and in some countries it is even being regarded as part of the incumbent carrier’s universal service obligation¹⁰. And yet, wide differences are emerging between broadband offerings in different countries, for instance between those services that are “symmetrical” (i.e. having the same capacity in both directions) or “asymmetric” (i.e. with typically a faster speed for downloading than uploading). One of the driving forces underlying the spread of broadband is the major upgrade of existing fixed-line and mobile networks to an IP-based platform. “Best practice” at present comprises the so-called 100/100 networks that offer symmetrical download and upload capacities of 100 Mbit/s.¹¹

Each country has a different mix of players and networks which, in turn, reflect different regulatory environments, corporate strategies and user habits. Figure 3.4 illustrates the broadband networks of the top 15 broadband economies, ranked by number of subscribers and network penetration. Although no two countries are identical, it is possible to identify a number of patterns:

- Economies with at least **three** different broadband network platforms (e.g. DSL, cable and mobile) competing for the market, with each having a significant market share (of at

least 10 per cent). This category includes the market leaders by penetration of the Republic of Korea, Japan and Hong Kong SAR, as well as the UK and Sweden, at more modest levels of penetration.

- Economies with **two** main broadband technologies competing for the market. Typically, this means DSL competing against cable modems, which is the case in the United States and Canada (where cable is dominant) as well as in China, Netherlands and Switzerland (where DSL is dominant). However, in the case of Italy, the two technologies competing for the market are DSL and 3G mobile. The same is true also for Portugal and South Africa, although they do not feature in the top 15 economies.
- Economies with only **one** dominant broadband technology, usually DSL. As a general principle, these economies have not, to date, grown their broadband markets fast enough to enter the top 15, although Iceland is one exception. At lower levels of penetration, Brazil, Poland and Ireland also have more than 90 per cent of their broadband subscribers on DSL networks.

As a rule of thumb, the greater the level of competition (or the perceived threat of competition, according to the theory of contestable markets), including inter-modal competition between different platforms, the faster the rate of growth. In those economies that have historically done best in terms of broadband, potential users generally have the most choice. The Republic of Korea, which has the highest level of broadband penetration in the world (including mobile broadband) benefits from having market competition not only from DSL, cable and mobile, but also from fibre-to-the-home, public Wi-Fi services, metro ethernet and satellite.¹²

3.2.2 From digital.life to digital.world

The World Summit on the Information Society (WSIS), which was held in two phases in Geneva (10-12 December 2003) and Tunis (16-18 November 2005), concluded with a bold commitment “to build

Box 3.3: Measuring the digital divide

Using the Digital Opportunity Index (DOI) to measure the digital divide

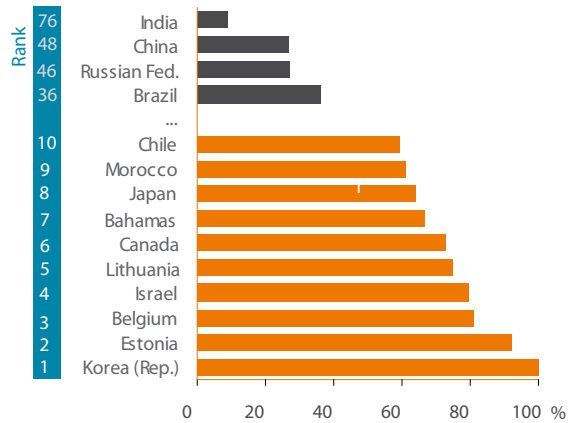
One way of measuring the digital divide is by using the Digital Opportunity Index (DOI)¹³, a new statistical tool, approved by the WSIS, as a part of an approved methodology for tracking progress in implementing the WSIS outcomes¹⁴. Specifically, the “Gini coefficient”, which is a statistical tool that ranges between 0 (equal distribution) and 1 (inequality), can be used to measure the level of inequality in nine of the eleven indicators that comprise the DOI and for 180 economies. In the 2005 release of the DOI, the distribution was most unequal for mobile broadband (for which the Gini coefficient was 0.96) and for fixed broadband (0.68). For cellular mobile phones it was a more reasonable (0.51) and lower still for fixed lines (0.43). The lowest Gini scores were for measures of “opportunity” such as mobile coverage (0.18).¹⁵ This suggests that mobile communications, in particular, represents the best hope for reducing the digital divide. The next release of the DOI, in May 2007, will show whether the divide is increasing or decreasing for these indicators.

As well as using the index as a whole to track the digital divide, it is also possible to use the individual indicators. The composition of the basket has been designed in such a way as to avoid disadvantaging developing countries in these measures. For instance, for broadband use, rather than measuring the absolute number of subscribers, or the level of penetration, instead the indicator selected is “fixed broadband subscribers as a percentage of total fixed internet subscribers”. Interestingly, the “top ten” economies in this indicator include a number of developing countries, such as Morocco or Chile, as well as transition economies, such as Estonia or Lithuania. Similarly, among the so-called BRIC economies (Brazil, Russian Federation, India and China) their rankings on this indicator are generally higher than would be predicted by, say, their GDP per capita¹⁶. These economies can be interpreted as carrying out a technological leapfrogging strategy, in which users move directly to broadband (DSL, cable modem etc) and missing out the dial-up stage of internet evolution.

Note: In the table, the Gini index ranks between 0 (perfect equality) and 1 (full inequality). The two other indicators in the DOI (for which the Gini coefficient may not be the best measure of inequality) are internet and mobile affordability.

Source: ITU Information Society Statistics Database and Cho, Cheung-Moon (2006)

Broadband subscribers, as a % of total internet subscribers



Average DOI and Gini scores

DOI Indicator	Average	Gini Score
Mobile population coverage	75%	0.18
Households with fixed line	44%	0.43
Mobile per 100 inhabitants	37%	0.41
Households with internet	14%	0.67
Mobile internet per 100 inhabitants	5%	0.84
Households with PC	20%	0.59
internet users per 100 inhabitants	16%	0.59
Fixed broadband as % of total internet	28%	0.68
Mobile broadband as % of total mobile	2%	0.96
Overall DOI Index	0.37	0.28

Table 3.2: Scarce resources: How technology and deregulation are helping to stretch them further

Examples of how technological and regulatory change are easing the scarcity of ICT resources

Resource	Technological assistance	Regulatory assistance
Spectrum	<ul style="list-style-type: none"> • Development of digital signal processing and spread spectrum techniques, such as Code Division Multiple Access (CDMA) or UltraWideBand (UWB). • Development of technologies that can make economic use of spectrum at higher frequency ranges. • Development of new types of cognitive and software-defined radio techniques for transmission. • Design of new antenna arrays. 	<ul style="list-style-type: none"> • Use of market mechanisms, such as auctions or spectrum trading, that create incentives to use spectrum more efficiently. • Managed “farming” of spectrum to bring under-used portions back into economic usage. • Creation of license-exempt parts of the spectrum for “experimental” use (including bands currently used by Wi-Fi). • Allowing for (or mandating) the sharing of spectrum bands between different types of use.
Numbering & identification	<ul style="list-style-type: none"> • Development of computer-based algorithms for converting alphanumeric input (e.g. E-mail addresses) to numerical format, and <i>vice versa</i>. • Design of IPv6 numbering system to supersede IPv4 and the design of other numbering systems (such as barcodes and the newer electronic product code (EPC) and ucode). • Development of authentication and user identification technologies, e.g. for billing. • Development of RFID tags and readers and other contactless card systems. 	<ul style="list-style-type: none"> • Adoption of global standards (based on ITU-T Recommendations) for telephone numbering. • Competition among registrars for internet domain name registration, and creation of additional top-level domains. • Separation of responsibilities for management of domestic numbering plans from the incumbent operator to regulatory agency or another independent body.
Rights of way (wayleaves)	<ul style="list-style-type: none"> • Development of wireless transmission to supplement and replace wireless transmission. • Development of technologies to extract higher capacity throughput from copper cabling (e.g. DSL) or to replace it (e.g. fibre optics). • Development of mini-trenching and similar techniques to optimise creation of ducts for cables with minimum of disruption. 	<ul style="list-style-type: none"> • Local loop unbundling (LLU) and similar policies designed to ensure fair access to the incumbent’s basic infrastructure. • Development and enforcement of procedures for sharing of basic wireless infrastructure, including high sites, transmitter masts etc. • Urban planning processes designed to coordinate requests among many players and services for digging up roads and cable-laying.

Note: These examples are intended to be illustrative, of trends in many countries, and not exhaustive or specific to a particular country.

Source: ITU

a people-centred, inclusive and development-oriented information society, where everyone can create, access, utilize and share information and knowledge” (*Geneva Declaration of Principles*, para 1)¹⁷ and to “turn the “digital divide into a digital opportunity” (para 10). But how can these worthy goals be achieved if the developed countries are always moving further ahead in terms of the quality of the networks they are installing?

The reality is that there is a much greater digital divide in terms of the newer, more advanced services—such as broadband or 3G mobile—than for the older, basic ICT services. The extent of the digital divide for a particular ICT therefore is related to the diffusion process, with the divide being greater for newer, less diffused services than for older, more diffused ones (figure 3.5).

However, this analysis also suggests that the nature of the digital divide is shifting from a primarily quantitative phenomenon (some countries and some regions have more ICTs than others) to a qualitative one (users have access to better quality, more affordable ICTs in some countries and regions than in others). In this context, the narrowband/broadband divide is a key measure. Two of the indicators used in the Digital Opportunity Index,

a composite index for measuring the digital divide (box 3.3) capture this divide:

- Fixed broadband users as a percentage of all fixed internet users;
- Mobile broadband users as a percentage of all cellular mobile users.

Box figure 3.3 (lower chart) shows the leading ten economies for the former of these two indicators together with the so-called BRICs (Brazil, Russian Federation, India and China), which are among the major developing countries. Although the BRICs still have a long way to go in developing their domestic internet and IP-based services, they are catching up with, and even overtaking, developed countries in terms of upgrading to broadband.

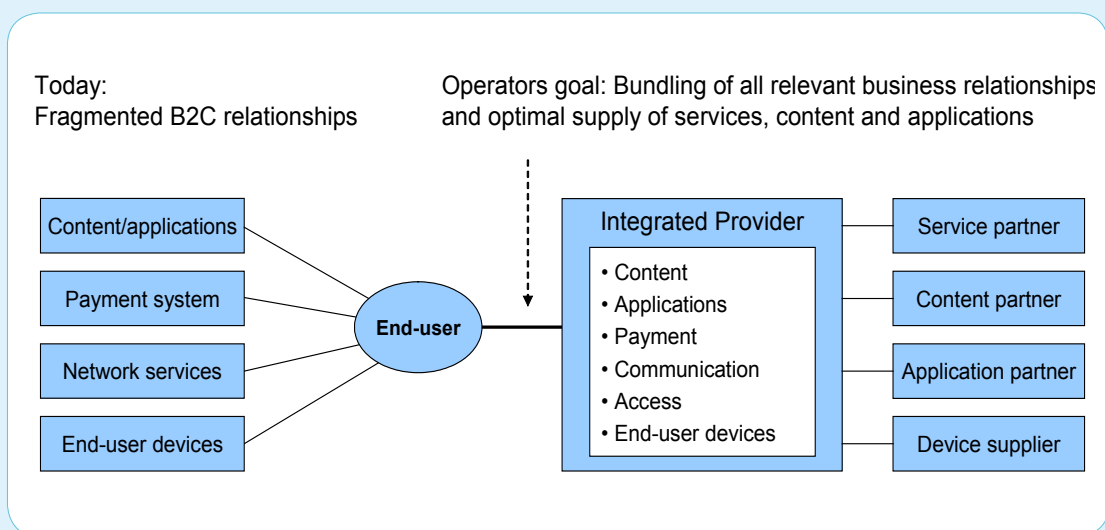
3.3 Defining policies

3.3.1 From “command and control” to “live and let live”

Perhaps the most valuable non-human resource, as we head towards living the digital world, is one that

Figure 3.6: Simplifying end-user relationships

Moving from fragmented to unitary end-user relationships in a next generation network



Source: ITU (2006) “Regulating new and emerging markets in the telecommunication sector”, background paper prepared by Wey, Christian et al (available at www.itu.int/osg/spu/ngn)

we take for granted, namely the air around us. This provides the basic platform for services delivered wirelessly: the radio spectrum. Another resource, without which the digital world would still be an analogue one, is the base ten numbering system that provides the means of identification for users, either directly (for the telephone and mobile networks) or indirectly (for the IP addresses that underlie the internet). A third resource to which we hardly give a second thought is the highways and byways between human habitations. They started as physical communication networks and have latterly become information superhighways. “Rights of way”, or more correctly “wayleaves”, are also a scarce resource, insofar as digging up a road to improve electronic communications may impede the physical communications or building a radio antenna on a high site might impair environmental amenity.

“Living the digital world” means that we are obliged to share the scarce resources that humanity holds in common. These three resources—spectrum, numbering plan and wayleaves—lie at the heart of the digital world and help to explain why the establishment of the first telecommunication company was followed quite quickly by the establishment of the first government department with responsibility for regulating the industry.¹⁸ All three resources are scarce, in the sense that they are finite. However, in each case, technological advances and policies based on deregulation have helped to stretch the resources further and reduced the effect of bottlenecks that might create natural monopolies.

As illustrated in Table 3.2, this combination of technological and regulatory change has permitted a move away from a system of centralised “command and control” which has characterised traditional regulatory regimes, particularly for spectrum management. The newly emerging regime does not have a specific name, but might be better described as “live and let live”. It is a critical part of the digital world because it creates the basis for innovation and diversity and also of greater security. Although the offices of government may no longer be directly controlling these resources (e.g. through ownership of the incumbent operator or through direct exploitation of the spectrum), nevertheless the framework of

light-handed government regulation, backed up by consumer protection and competition policy, provides assurance for users.

3.3.2 Next-generation regulation

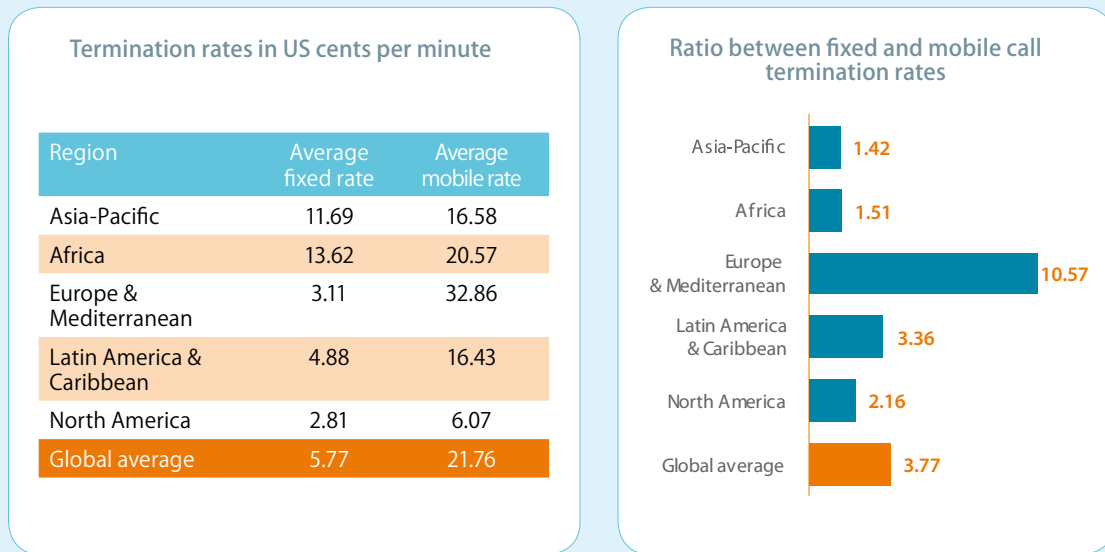
At one level, the move from a “command and control” to a “live and let live” regulatory regime is making the regulator’s job easier. If the problem of scarcity can be overcome, then there is less of a requirement for regulation, for licensing, for state ownership or for any other form of state intervention. One reflection of this is that a number of economies are combining together a variety of sector-specific regulatory functions. For instance, this can be done on the basis of network and transport utilities (e.g. Germany, Jamaica) or on the basis of information-related sectors (e.g. Hong Kong SAR, Malaysia, UK). Countries are also relying more on general consumer regulation and competition policy rather than sector-specific regulation.

However, at another level, a “live and let live” regulatory environment introduces a whole new set of issues and emerging problems, as technology creates the ability to bypass existing regulations and as regulatory distinctions become outdated. So-called next generation networks (NGNs) are likely to require next-generation regulation¹⁹ as the problems of scarcity are replaced by dilemmas of abundance and complexity. The concept behind NGN is a shift away from an era of separate networks (such as narrowband fixed, broadband fixed, cellular mobile, cable TV), bearing different services (voice, video, text, data) to multiple devices, e.g. fixed handset, mobile handset, PC. NGN moves towards a unitary IP-based network in which the common features of the user environment (for example user preferences, contacts, databases, files and so on) are accessible as the user moves around, say between home, car and office, or between desk and meeting room.²⁰ This concept is expressed graphically in figure 3.6. The idea is to present a single interface to the end-user that is at once “portable” and integrated.

Although the implementation of the NGN concept is still some way off, the complexity of the new environment already exists today. For instance, today’s most widely diffused IP-based network—

Figure 3.7: Spot the odd one out

International fixed and mobile call termination rates in different world regions, 2006



Note: The regions used in this analysis refer to the ITU regional tariff groups (TAS, TAF, TEUREM and TAL) and do not correspond precisely to those used for analysis elsewhere in the report. The “North America” region is not a regional tariff group, and this includes also jurisdictions and carriers regulated in North America.

Source: ITU-T Study Group 3 research, based on January 2006 questionnaire of ITU Member States

the fixed-line internet—can also be used to carry, voice, video, text and data. It does so without respecting international borders, and without necessarily being subject to national regulations, on advertising content, interconnection or taxation. However, tomorrow’s most widely-diffused IP-based network is more likely to be one that is primarily accessed from mobile devices and may not have the open nature of today’s internet.

A wireless-driven internet is likely to be a more commercially-oriented environment (“internet with billing”) than today’s primarily fixed-line internet, and the possibility to have access to it irrespective of location raises a new series of regulatory questions, primarily related to privacy and data protection.²¹ For instance, in order to make use of location-based services, the user must, consciously or otherwise, be willing to be tracked and possibly have their location at different times recorded and stored. Who should have access to this data, and for how long should it be stored? Similarly, the multimedia capabilities of today’s multifunctional mobile handsets mean that they can easily be used

for taking candid snapshots or for recording private meetings. Not surprisingly, some organizations such as fitness gyms or lap-dancing clubs have taken steps to ban the use of camera phones on their premises.²²

Furthermore, although it is fondly believed that the public internet is fundamentally a “neutral” network, in reality, this is far from the truth.²³ In many of its fundamental design characteristics—such as differentiated interconnection and connectivity or the ability for filtering and blocking to control abuse—the internet has never been strictly neutral and is becoming even less so. For instance, the results of internet searches, and even the speed with which they run, can easily be manipulated for commercial interests. Another fond belief is that the internet is somehow immune to the natural processes of capitalism whereby private businesses seek monopoly profits. Again, this comfortable belief can easily be challenged, for instance, in the market power exercised by Google in internet searches²⁴, or by the increasing concentration of ownership among tier one internet backbone providers.²⁵

Box 3.4: Digital boom, digital bust?

Avoiding the next ICT bubble

The spectacular growth in the ICT sector in the late 1990s, followed by the equally spectacular collapse in the first part of the new millennium, has many causes that are not yet fully understood. What is not disputed, however, is that the consequences of the bubble were experienced well beyond the ICT sector, in terms of the collapse in stock market and investor confidence, job losses, bankruptcies and accounting fraud cases. But what caused the bubble in the first place and how can a similar pattern of events be avoided?

Bubble economies have been seen in many different fields and different periods but they are particularly common in the area of network industries and they are associated with the early development stages of a new technology. Examples include the railway bubble of the mid 1800s or the wireless bubble of the 1980s. The development of the World Wide Web in the early 1990s sparked a similar investment fever. Bubbles tend to be generated by over-exuberant investment and over-valuation of stock market assets. Although the bubble affected the technology sector as a whole, it was particularly acute among *dot.com* companies which seemed to spring up overnight, float on the stock market with great razzmatazz and then promptly disappear. Among the *dot.coms* that boomed briefly were companies like WebVan, eToys and ePets, but more established companies like WorldCom were also dragged under.³⁰

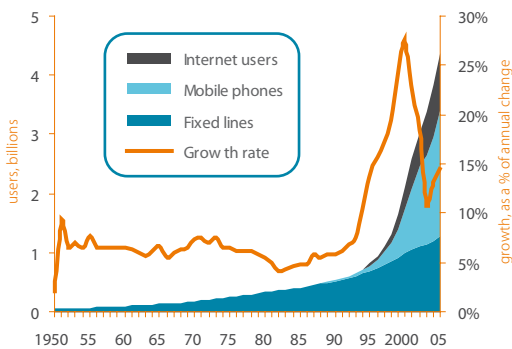
The peak of the boom, as measured by the US NASDAQ index, was around 10 March 2000, though the precise timing can be disputed. The contributory factors to the boom and subsequent collapse included:

- Unprecedented high levels of growth in the late 1990s in the ICT sector, particularly for mobile phones and internet users. As the left chart below illustrates, growth rates that had averaged around 5-7 per cent per year for most of the post-war period suddenly jumped to over 20 per cent as mobile and internet use expanded the overall ICT market.
- High levels of investment. In 2000, investment in ICT networks open to the public exceeded USD 200 billion for the first time. Investment was particularly high in international private lines, which carry most international IP traffic. As shown in the right chart below, international circuits to the US grew by 38 times between 1995 and 2004. More than half the available circuits were "idle", further forcing down prices, and this does not even take into account the so-called "dark fibre" that could be switched on as demand required.

digital life

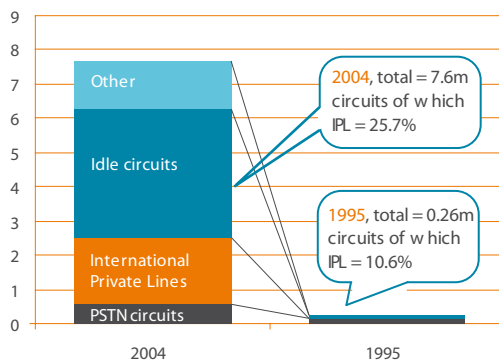
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The ICT bubble economy, 1950-2005



Note: Service totals are cumulative

Availability & status of international circuits from the United States (64 kbit/s, in millions)



- The high levels of investment were, in turn, founded on exuberant growth forecasts. In some cases, such as for e-commerce, these predictions turned out to be accurate, but in other cases (such as the myth that "Internet traffic was doubling every 100 days") they were based on false data and misleading claims.³¹
- In the UK, at least, the peak of stock market prices was actually 31 Dec. 1999 rather than the later date. It is possible that the ICT sector was sustained, in the lead-up to 2000, by the investment in preparing for the "Y2K bug", when it was feared that legacy ICT systems would collapse because of the change of date.³²

- The period 2000-2001 also coincided with the spectrum auction licenses for 3G in many European countries. Some commentators felt that the winning bids overvalued the licenses available, especially as WRC-2000 had made additional allocations and because regulators were introducing the possibility of non-facilities based licenses (e.g. mobile virtual network operators) in many countries. Prices at subsequent auctions were lower.³³

In reality, as shown in the upper chart, the decline in growth rates ended around 2003, and the subsequent growth (from a much larger installed base) has been at a level that is more than twice that sustained between 1950-1995.

Source: ITU Information Society Statistics Database (upper chart); ITU adapted from FCC circuits status report, available at www.fcc.gov/ib/pd/pf/csmanual.html (lower chart)

Traditional regulation was concerned with the establishment of prices, either directly for retail customers (tariff control) or indirectly for wholesale rates (interconnection). Next-generation regulation is likely to be less concerned with price control directly (at least where markets are competitive) and more concerned with price transparency and ensuring that customers are aware of what they are purchasing. As indicated in Figure 3.6, the NGN vision foresees an integrated service provider acting as the single point of contact with the user, and therefore as the unified billing agency for a variety of different service, content and application providers. Users may like the simplicity of having a single bill for all their electronic communication services, but will it be possible to identify the price of individual services when they are all bundled together? Multiple play is an attractive proposition, but it also implies cross-subsidy between services and creates a potential monopolistic bottleneck, especially where a proprietary set-top box or conditional access system is used to “lock in” the customer to a particular service provider. Both of these are traditional regulatory concerns.²⁶

Indeed, it is ironically the lack of price transparency and harmonization between different service regimes that is probably the biggest single barrier to realizing the NGN vision in the first place. For instance, a fundamental precept of the NGN is that it should be possible to move seamlessly between fixed and mobile environments. But as ITU research shows, there remain huge differences between the cost of terminating a call on a fixed-line device and on a cellular mobile device (figure 3.7). In the case of Europe, the average difference is a ten-fold order of magnitude. Thus, although fixed call termination in Europe is on average around US 3 cents per minute, mobile call termination is around US 33 cents per minute. In this context, it should be noted that the call termination rate is equivalent to the “wholesale” rate for the call and sets a minimum price level for the call origination price, which might be regarded as the “retail” rate. When the price of roaming, which is particularly high in Europe²⁷, is added to these already inflated charges for mobile call termination, it is apparent that Europe is quite out of line with the rest of the world.

Significantly, it is the Asia-Pacific region where the ratio between fixed and mobile call termination rates is lowest. This gives the carriers of this region a massive advantage in developing converged NGN services. It is likely therefore to be Japan or the Republic of Korea that will be the NGN test beds rather than Europe unless the problem of excessive mobile termination rates in Europe is addressed effectively.²⁸

3.4 Drawing lessons

This chapter has looked at the evolution of business opportunities in the “*digital.life*” market, the subject of this report. It can be seen that the potentially addressable market is enormous, and that the world’s stock markets currently place greater value on those companies concerned with digital content rather than with transmission or equipment manufacture. Given that the stock markets operate on the expectation of future, rather than current, value creation, it can be expected that digital content is where much of the future revenue growth will lie. The chapter has also shown that the platforms for future growth (i.e. broadband fixed and mobile networks) are already in place in developed countries and are quickly being deployed in developing countries too, though the digital divide is now expressed more in terms of differences of quality rather than quantity. Business models and pricing frameworks are also evolving. Finally, regulators are moving away from old regulatory models, based on the allocation of scarce resources, and are confronting new challenges, borne of abundance, such as the need to ensure pricing transparency or protect consumer privacy.

The biological ecosystem thrives through diversity and the constant creation of new niches. The same can be said of the digital ecosystem. Indeed, the market environment increasingly resembles a digital “ecosystem” in which companies must cooperate to provide jointly-provisioned services at the same time as they compete for resources and for markets. Equally, customers become suppliers and suppliers become customers in evolving relationships of bewildering complexity. An ecosystem in which resources are scarce, such as

a desert or a polar ice cap, is one where individual species dominate and where species elimination is a constant risk. But in an environment where resources are abundant, domination by a single species is unusual and there is much more scope for diversity, innovation, and for the creation of new species. The market described in this report is one characterised by abundance rather than scarcity.

But can we be sure that another slump similar to the bursting of the *dot.com* bubble is not just around the corner? Certainly there are some ominous signs, such as the high market valuations of some digital content companies such as Google or Yahoo! (figure 3.2) or the threat of trade wars in the light of growing ICT trade imbalances and the collapse of the latest round of World Trade Organisation negotiations (the Doha Development Round). However, the preconditions that led to the 2000-2003 slump were quite unique and are unlikely to be repeated anytime soon (box 3.4). Furthermore, the big difference is that the internet of 2000 operated at a maximum speed of around 56 kbit/s (the speed of a dial-up modem) whereas today's internet is increasingly moving at light speed, as growing investments in fibre to the home are added to existing DSL networks²⁹. Perhaps the greatest reason for confidence is that more than around a billion new mobile phone

users have been added since the start of the new millennium and they are all hungry for new services.

The rate of growth in the ICT industry may never attain again the heady heights of the late 1990s, but at the same time, it is likely to remain at a higher rate than during the previous fifty years. The "internet bubble" may not have been sustainable beyond a few years, but the impact of the "internet economy" will be felt for a long time to come. ITU TELECOM WORLD exhibitions tend to act as milestones which track the growth and decline of different business cycles in the ICT World. TELECOM WORLD 1999 in Geneva represented the height of over-confidence as the industry crested the *dot.com* wave. TELECOM WORLD in 2003 marked the nadir of that cycle following the bursting of the technology bubble and a fear that the mobile market in particular had become saturated. This report will be published in time for ITU TELECOM WORLD 2006, to be held for the first time outside Geneva, 4-8 December 2006. The signs are that the level of confidence of the industry is now much higher than in 2003, but not at the same levels as in 1999. The internet and the mobile phone have lifted the ICT industry as a whole on to a entirely new level. In today's digital world, growth opportunities abound.

Endnotes for Chapter three

- 1 See Ritzer, George (1993) "The McDonaldisation of Society", Thousand Oaks, CA: Pine Forge Press.
- 2 Moore's Law is named after Gordon Moore, a co-founder of Intel, who first made the observation and prophecy in 1965 (see: http://en.wikipedia.org/wiki/Moore's_law).
- 3 See ITU (2001) "Pinoy internet: Philippines Case Study", 58 pp (available at www.itu.int/asean2001/reports/material/PHL%20CS.pdf).
- 4 See Toby Poston (16 May 2006) "Big Brother's Big Earners", on the BBC website (at <http://news.bbc.co.uk/1/hi/business/4762375.stm>).
- 5 For China, per month usage is based on the annual total divided by 12, whereas for Hong Kong, it is the average for December each year. For China, the total volume of SMS usage from China Mobile is measured, whereas for Hong Kong, only outgoing messages from users are registered (excluding messages sent by operators).
- 6 For more detailed analysis, see also Xu, Yan (2006), "The regulatory environment for future mobile multimedia services: The case of Hong Kong SAR and China" (available at www.itu.int/multimobile).
- 7 For an analysis, see OECD (2006) "Multiple play: Pricing and Policy Trends", 75pp (available at www.oecd.org/dataoecd/47/32/36546318.pdf).
- 8 In this context, "mobile broadband" is defined as cellular mobile services offering speeds of above 56 kbit/s. This covers Wideband Code Division Multiple Access (W-CDMA), CDMA 1x EV-DO (Evolution, Data Only) and CDMA 1x EV-DV (Evolution, Data Voice).
- 9 For details, see the NTT DoCoMo website (at www.nttdocomo.co.jp/english/charge/discount/pake_houdai/index.html). The package specifically excludes usages such as voice communications, roaming or web-browsing.
- 10 In Switzerland, for instance, a requirement to provide broadband has been included by the Federal Council in the new definition of universal service, to be applied from 1 January 2008 onwards. See "Broadband in the universal service" (at www.ofcom.admin.ch/dokumentation/medieninformationen/00471/index.html?lang=en&msg-id=7308).
- 11 See, for instance, "100/100 going twice as far", in DSLPrime newsletter, 24 July 2006 (at www.dslprime.com/News_Articles/news_articles.htm).
- 12 For more information on Korea's intensely competitive broadband market, and the reasons for its pioneering success, see ITU (2005), "Ubiquitous Network Societies: The case of the Republic of Korea", 51pp (available at www.itu.int/osg/spu/ni/ubiquitous/Papers/UNSKoreacasestudy.pdf).
- 13 For more information on the ITU's Digital Opportunity Index, see www.itu.int/doi
- 14 The DOI is presented in the ITU (2006) World Information Society Report (available at www.itu.int/wisr).
- 15 See Cho, Cheung-Moon (2006) "Development of a DOI-based policy", presentation made at 2006 KADO/ITU Digital Opportunity Forum (available at www.itu.int/osg/spu/digitalbridges/materials/drcho-ppt.pdf).
- 16 Brazil ranks 36th globally on "fixed broadband as a % of total fixed internet", compared with 76th on the indicator "GDP per capita". Similarly the scores for Russian Federation are 46/76, for India 76/134 and for China 48/110.
- 17 The WSIS outcome documents are the *Geneva Declaration of Principles*, the *Geneva Plan of Action*, the *Tunis Commitment* and the *Tunis Agenda for the Information Society* (they are available at www.itu.int/wsis/promotional/outcome.pdf).
- 18 ITU itself, as the "club" of regulatory agencies, celebrated its 141st birthday in 2006.
- 19 For an analysis of the regulatory implications of NGN, see the results of the ITU New Initiatives workshop "What rules for IP-enabled NGN?" (available at www.itu.int/osg/spu/ngn/event-march-2006.phtml).
- 20 A formal ITU definition of a next generation network is provided in ITU-T Recommendation Y.2001 as: "a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility that will allow consistent and ubiquitous provision of services to users".
- 21 For a review of the issues, see ITU (2006) "The regulatory environment for future mobile multimedia services", (available at www.itu.int/osg/spu/ni/multimobile/papers/ITU_MMSissuespaper_60606.pdf); issues paper prepared by Srivastava, Lara et al for the ITU/BNetaA New Initiatives workshop on the same topic, held Mainz, Germany, 21-23 June 2006 (see www.itu.int/multimobile).

- 22 See "Furtive phone photography spurs ban" (at <http://news.bbc.co.uk/2/hi/technology/2916353.stm>).
- 23 See, for instance, the discussion in McTaggart, Craig (2006) "Was the internet ever neutral?" paper delivered at the 34th research conference on Communication, Information and internet Policy, George Mason University, US (available at <http://web.si.umich.edu/tprc/papers/2006/593/mctaggart-tprc06rev.pdf#search=%22Craig%20McTaggart%22>).
- 24 See, for instance, Markoff, John and Hansell, Saul (June 14 2006) "Google's quasi-secret power play" (available at www.signonsandiego.com/uniontrib/20060614/news_1n14supercom.html).
- 25 See, for instance, Buccrossi, P. et al (April 2005) "Competition in the internet Backbone market", available at www.cocombine.org/pdf/World%20Competition%20Accepted%20Version.PDF#search=%22Concentration%20among%20tier%201%20internet%20backbone%20providers%22
- 26 As an example of regulatory concerns over bundling of services and price transparency, see "On the question of bundling again", May 2005, on the website of the Hong Kong telecom regulator, OFTA, at www.ofta.gov.hk/en/dg_article/au_articles/article.html. See also the discussion in the 2006 edition of the OFCOM annual review of the UK communications market at www.ofcom.org.uk/research/cm/cm06/main.pdf
- 27 High roaming charges in Europe have recently been the subject of a European Commission investigation, which has resulted in a new proposed regulation (see: http://europa.eu.int/information_society/activities/roaming/roaming_regulation/index_en.htm).
- 28 Europe's Achilles heel in the form of excessive mobile call termination rates has been recognized for a long time. For instance, fixed-mobile interconnection was the subject of an ITU New Initiatives workshop as long ago as September 2000 (see: www.itu.int/osg/spu/ni/fmi/index.html).
- 29 In 2005, net new additions of FTTH subscribers in Japan outnumbered net new DSL additions for the first time, and a similar pattern is forecast for Europe by 2010; see for instance, "European municipalities lead FTTH charge" in September 2006 edition of Lightwave (at: http://lw.pennnet.com/Articles/Article_Display.cfm?Section=ARTCL&ARTICLE_ID=271114&VERSION_NUM=2&p=13&dcmp=FTTXNews).
- 30 See, for instance, "Top 10 dot.com flops" (at www.cnet.com/4520-11136_1-6278387-1.html?tag=cnetfd.sd).
- 31 The economist and mathematician, Andrew Odlyzko, has done much to explode this particular myth. See, for instance, his 2003 paper "Internet traffic growth: sources and implications" (at: www.dtc.umn.edu/~odlyzko/doc/itcom.internet.growth.pdf). He shows that the myth that "Internet traffic doubles every 100 days" may have been true for a period of a few months in the mid 1990s, but similar statements continued to be reported, without solid proof, for the next five years or so and were used to support the ambitious investment plans and inflated share valuations of some of the leading companies in the field, most notably WorldCom. Such exponential growth is rarely sustainable for more than a brief period.
- 32 At the time, estimates of the level of expenditure in preparing for Y2K were around USD 300 billion (see for instance: "Y2K: Overhyped and oversold" (at http://news.bbc.co.uk/2/hi/talking_point/586938.stm).
- 33 The US auction of 3G spectrum in 2006 raised some USD 13.8 billion compared with the more than USD 100 billion raised from similar auctions in Europe, 2000-2001. In terms of price per megahertz per capita, the US auction valued the spectrum at around 50 US cents compared with USD 4.22 in the United Kingdom or USD 3.86 in Germany. See, for instance, "Air Supremacy" in the 9 September 2006 edition of *The Economist* (at: www.economist.com/business/displaystory.cfm?story_id=E1_SRRSJV&CFID=90344009&CFTOKEN=22fffbf-16e76902-4f0a-4359-afb7-1fecdd11a607).