
INTERNATIONAL TELECOMMUNICATION UNION
ITU
ITU INTERNET REPORTS
INTERNET FOR A MOBILE GENERATION
EXECUTIVE SUMMARY
2002

This is the Executive Summary of the ITU Internet Reports 2002: Internet for a Mobile Generation, the fourth in the series produced by the ITU Strategy and Policy Unit (SPU). Other publications in the ITU Internet Reports series and the ITU New Initiatives series include:

ITU Internet Reports (previously known as "Challenges to the Network")

ITU Internet Reports, 2001: IP Telephony ..... 100.– CHF

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ITU INTERNET REPORTS:

INTERNET FOR A MOBILE GENERATION

Executive Summary

September 2002

INTERNATIONAL TELECOMMUNICATION UNION

This Executive Summary gives a brief *résumé* of the main conclusions of the ITU ***Internet Reports 2002: Internet for a Mobile Generation.*** It includes a selection of charts, tables and boxes and a table of contents of the full Report.

The full Report (240 pages) gives an in-depth technical background to the history and current development of the mobile Internet including an analysis of market and regulatory trends. It contains the latest data on the licensing and deployment of third-generation mobile systems and services. Individual country case studies serve to illustrate these various aspects. Finally, the Report contains an 80-page statistical annex with data on over 200 economies worldwide.

The ITU ***Internet Reports 2002: Internet for a Mobile Generation*** was written by a team from the ITU Strategy and Policy Unit (SPU) led by Lara Srivastava, including Joanna Goodrick, Tim Kelly, Tad Reynolds and Yoshihisa Takada. The statistical tables were compiled by Tad Reynolds, with the assistance of Esperanza Magpantay and Nathalie Delmas. The report was edited by Joanna Goodrick, and formatted by Yolanda Azélart. The cover design is by Jean-Jacques Mendez.

Most of the data contained in the report is taken from the ITU *World Telecommunication Indicators Database*. The database is available on CD-ROM, or via the Internet as a subscription service.

The Internet Report may be ordered by using the order form included at the back of this summary, or electronically from the ITU website at www.itu.int/osg/spu/.

The views expressed in the report are those of the authors and do not necessarily reflect the opinions of ITU or its membership.

International Telecommunication Union (ITU), Geneva

1 The Big Gamble

"It requires no great leap of the imagination to believe that the convergence of mobile communications and the Internet will produce something big… but it may take longer than you think"

Mobile communications and the Internet were the two major demand drivers for telecommunication services in the last decade of the twentieth century. Combine the two—Mobile Internet—and you have one of the major demand drivers of the first decade of the twenty-first century. That's the theory, at least.

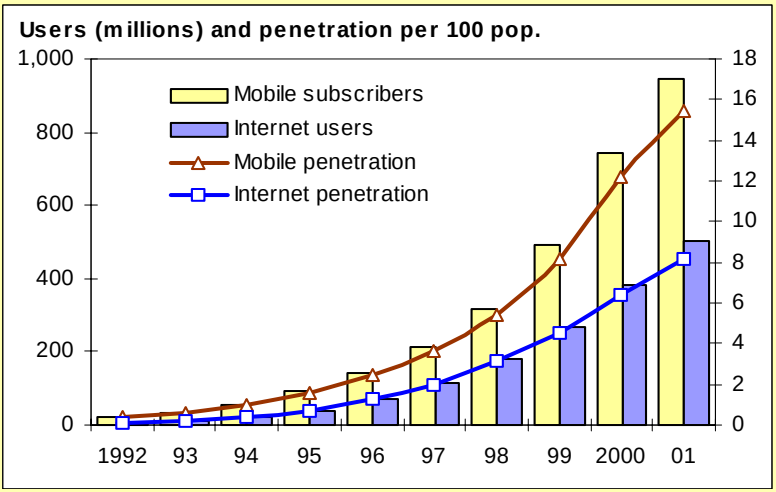
As Figure 1 shows, the two industries have exhibited remarkably similar growth patterns since the start of the 1990s, but with a lag of about two years. So, it requires no great leap of the imagination to believe that the convergence of mobile communications and the Internet will produce something big, perhaps even the mythical "sum that is bigger than its parts". In this view, the convergence of mobile communications and the Internet would produce innovations, new applications and new services that would not otherwise be possible. For instance, the service of knowing the location of a particular mobile user, combined with the service of targeted advertising, should theoretically make it possible for local businesses to attract users that are passing by, within a certain radius. Similarly, multimedia messaging services will open up visual, more exciting person-to-person communications. Thus, the mobile Internet could give birth to a whole new family of services.

Exploiting the new opportunities offered by the mobile Internet will require high levels of capital investment, possibly higher than ever before in the telecommunication industry. Investors want to see proof that a market for mobile Internet services exists. But operators can't provide that proof until they build the networks. Because of this "chicken and egg" conundrum, the mobile Internet is potentially the biggest gamble the telecommunication industry has ever taken on. The lesson so far is that the pioneers get burnt fingers: to date, more than US$ 100 billion has been invested in acquiring 3G licences, even before network construction and service roll-out costs are taken into account. The timing of 3G investment could hardly be worse, with venture capitalists running scared of anything that has the word "telecom" or "Internet" in it. Consolidation is on their menu, not expansion.

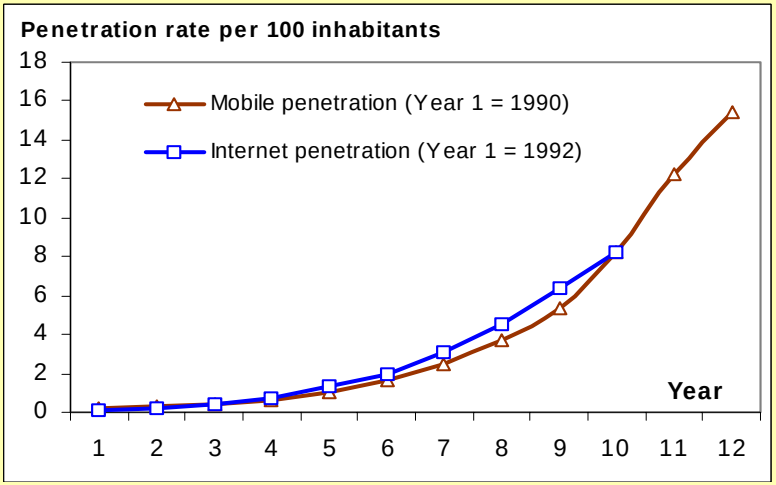
As previous waves of technological convergence have shown, we should not necessarily expect to see the commercial fruit of the mobile Internet for some ten or fifteen years yet. It will not happen straight away, but that does not mean it will never happen. It is worth remembering that the "hype" generated by a particular technological development often falls flat before market development begins to take off. Consequently, the popular view is that a particular development has "failed", whereas the more accurate explanation is that market development has not yet got going properly. Those who forget their history are condemned to repeat it. So it is with some caution—and long-term vision—that the pioneers of this new wave of convergence must prepare their business plans.

Figure 1: Mobile and Internet—identical twins, born two years apart

Mobile subscribers and Internet users (millions)



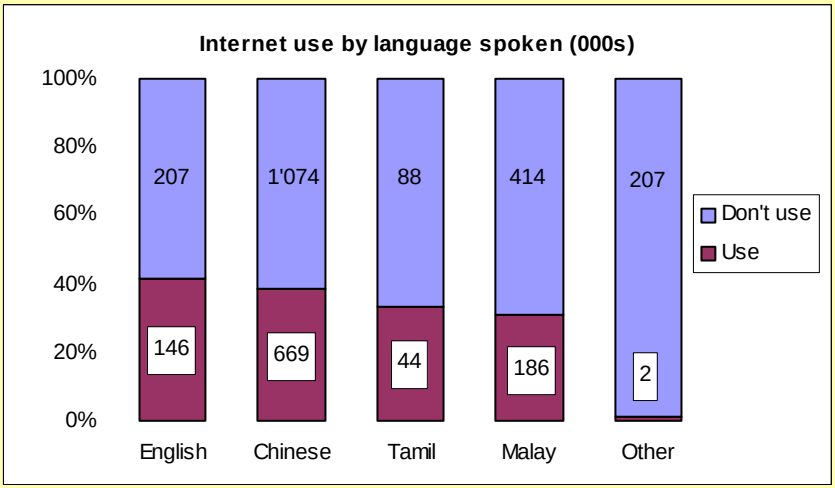
Penetration rates (per hundred inhabitants), worldwide



Source: ITU World Telecommunication Indicators Database.

Box 1: Singapore—e-ready, but not so Internet mobile…

Singapore has almost 70 per cent mobile phone penetration, over 50 PCs per 100 inhabitants, and over one-third of its inhabitants are Internet users, making it one of the most ICT-connected and -adept nations worldwide. Internet use has been actively promoted by the Government, with evident results: Singapore is considered a world leader in ICT use in education, with innovative programmes run in schools and universities. Moreover, the high level of literacy in English means that Internet content can be easily accessed. The importance of the language factor is also highlighted by the fact that almost half of Singaporean adults whose first language is English are online (see chart below). Singapore is a world leader in e-government applications. In line with its vision of becoming an "intelligent island", the Government has promoted the creation of a broadband backbone network—Singapore One—available to all citizens.



Rather surprisingly though, the take-up of mobile Internet has been lukewarm. Although all three mobile operators, SingTel (the former incumbent), MobileOne (M1), and StarHub, obtained 3G mobile licences when these were auctioned in April 2001, none have yet proceeded to roll out 3G networks. There has even been pressure on the regulator, the Infocomm Development Authority of Singapore (IDA) to delay or abolish the 31 December 2004 deadline for national 3G network roll-out. The IDA, however, held to its position, arguing that European and Scandinavian regulators have not modified their 3G roll-out requirements, and that operators in those countries are on schedule to provide services according to deadline. Notwithstanding the optimistic regulatory stance, the operators themselves are not yet proceeding with 3G network roll-out, more cautiously opting to further exploit the possibilities offered by WAP and GPRS. SingTel Mobile, for example, plans to introduce MMS services in 2002.

Source: Adapted from ITU Internet case study on Singapore. See www.itu.int/casestudies.

2 Towards convergence and interoperability

"We have learned from 2G that person-to-person messaging, simple interfaces and timely content delivery will be the key to 3G success… On a technical level, continued efforts towards the interoperability of radio interfaces and the evolution to an IP-based core network will be crucial"

Although the shift to 3G is a radical one, in most cases entailing the construction of new networks, the transition from 2G to 2.5G services is likely to be accompanied by a more significant conceptual shift than that from 2.5G to 3G, introducing the concept of "always-on" mobile communications. This is already beginning to bring the Internet and mobile communications onto a more common ground. The shift to 3G mobile will take this concept even further, but will essentially involve convergence and interoperability.

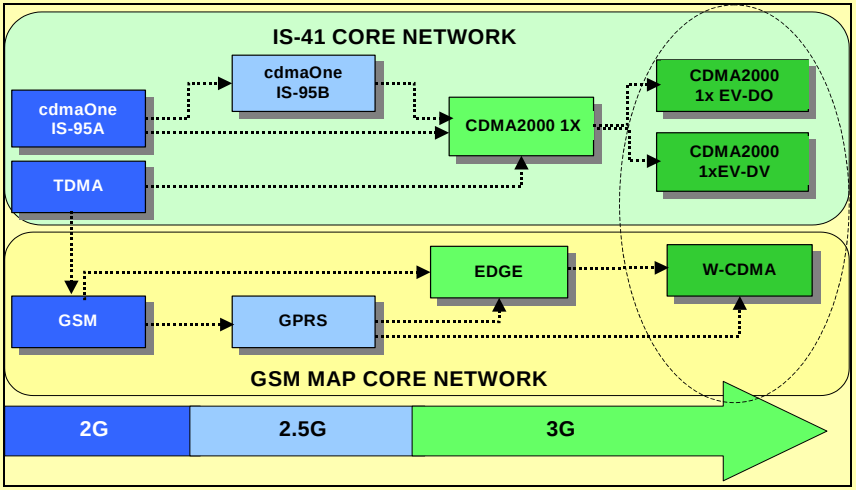
Although mobile data services are already available on 2G platforms through WAP, i-mode and short messaging service (SMS), it is through the advent of 2.5 and 3G that users will begin to fully reap the benefits of the mobile Internet, through high-speed communications and multimedia applications. Figure 2 shows possible migration paths from 2G to 3G technologies. What we have learned from the success and failures of 2G technologies is that person-to-person messaging, simple interfaces and timely content delivery will be the key to future service development and revenue generation. A mere simulation of the fixed-line Internet experience will not compel users to take up mobile data services. The development of an adequate payment system for mobile devices is also crucial: for "always-on" applications, per-minute billing may have to give way to volume-based billing.

The combination of mobile and Internet technologies—for instance in the form of SMS messaging—is already transforming the way people interact and the way business is done. Some 24 billion SMS messages were sent worldwide in the first quarter of 2002. Messaging services have also brought information technology closer to groups that have traditionally had limited access to it, such as children and the deaf community. High-speed data services combined with additional functionality, such as location technologies and improved security, will further enhance the user experience.

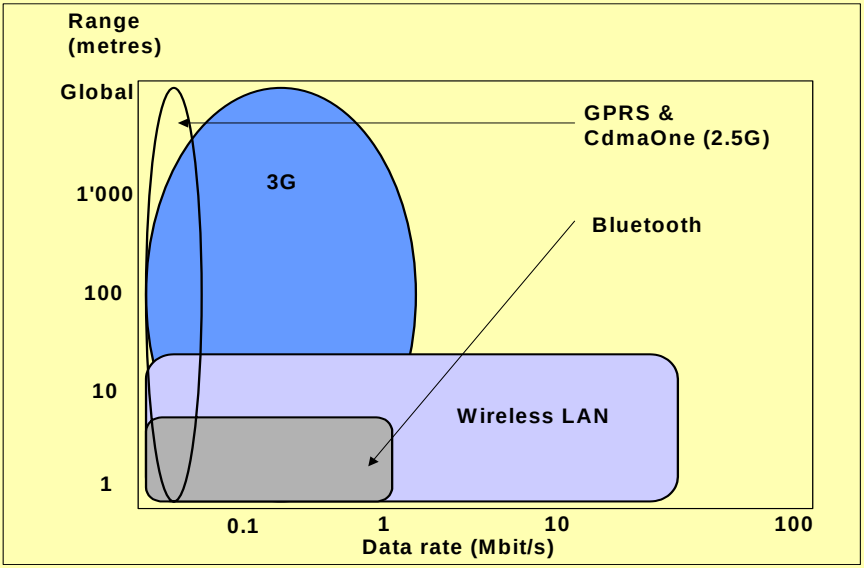
On a technical level, the viability of future 3G services will rely on continued efforts towards the interoperability of radio interfaces, the evolution to an IP-based core network and the harmonization of formats for content delivery. At the service level, convergence between the fixed and mobile Internet is already happening, through services such as mobile instant messaging and fixed-line SMS. This interoperability will eventually encompass complementary and alternative network technologies, such as wireless LANs, short-range connectivity technologies, fixed broadband networks, etc. Regulators and industry players alike need to realize that there are a number of different options for providing mobile Internet services, and that 3G services must be considered in their global context. As Figure 2 indicates, 3G technologies are only a part of the overall picture.

Figure 2: Radio access systems for mobile data

Possible migration paths from 2G to 3G



Ranges and data rates



Note: Bottom chart uses logarithmic scales.

Source: ITU. Bottom figure adapted from European Information Technology Observatory 2002.

3 Market trends

"The mobile Internet should not be considered as a substitute for the fixed-line Internet…"

There are a number of factors that will enable the rapid and successful development of the mobile Internet. First and foremost, the rapid deployment of high-speed 3G networks will be crucial to the facilitation of mobile multimedia services. Second, the availability and affordability of adequate Internet-enabled handsets will be a prerequisite for users. Third, unrestricted and non-proprietary mobile Internet content needs to be fostered; players should be discouraged from imposing commercial restrictions on content providers or establishing "walled gardens" of content. Finally, simple and transparent billing models are required, taking into account the difference between voice and data services and the growing importance of content. In all cases, the mobile Internet should not be considered as a substitute for the fixed-line Internet.

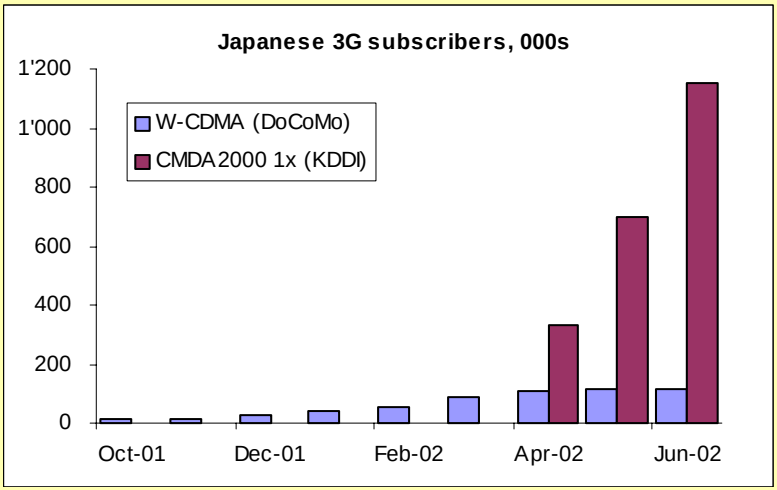
Nevertheless, valuable insights can be gleaned from the evolution of the fixed-line Internet, notably relating to its early development. Initially, users were charged per-minute for browsing the Internet. In most countries, operators then moved to a subscription model with call charges for time spent online. In countries where local calls are unlimited, like the United States and Canada, flat-rate plans were introduced in December 1997. Countries in Europe and Asia soon followed suit. It can be said that the mobile Internet is following a similar trajectory. In the early days of WAP over GSM, users were billed for every minute they spent online. Services such as i-mode combine monthly subscription with volume or packet-based billing. Always-on GPRS billing models have evolved with the introduction of volume-based charges. With high-bandwidth applications and increased spectrum efficiency, will flat rates become the norm for mobile data, as they have done for fixed data? Flat-rate schemes for data services are already being considered by a number of mobile operators. But users will have to wait some time before these become widely available.

With regard to content, the fixed-line Internet established a tradition of largely free and non-proprietary information access, though this is now changing. In particular, virtually unlimited messaging (e-mail) is still available free of charge. Mobile communications, by contrast, have always come at a premium. Users seem quite willing to pay per message for SMS, per packet for i-mode content and premium rates for voice calls while roaming. Moreover, a direct relationship exists between the individual user and the mobile operator, facilitating billing for a variety of add-on services. This was not typically the case with fixed Internet access. On the whole, this bodes well for the future of paid digital content services on mobile devices. Combined with high worldwide mobile penetration and short-range technologies, it may mean greater success for mobile business-to-consumer commerce than has hitherto been seen over the fixed-line Internet.

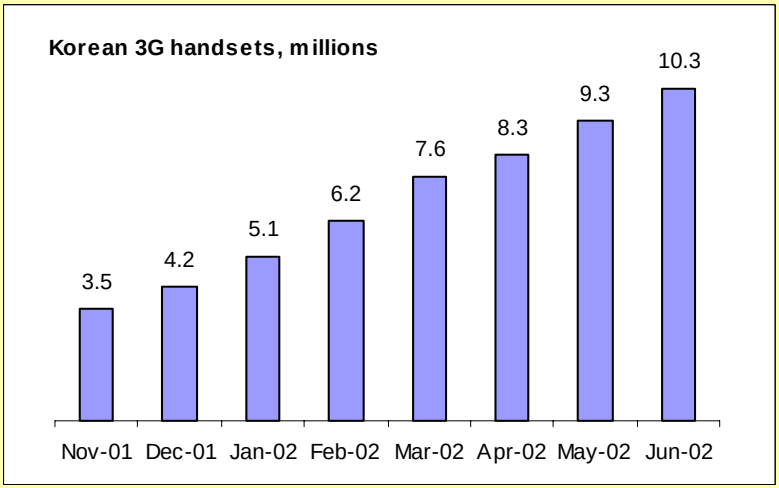
Figure 3 shows 3G subscribers and handset sales of the two earliest 3G pioneers, Japan and the Republic of Korea.

Figure 3: Early 3G pioneers

Japan



Republic of Korea



Note: In Korea, there are no subscription charges for 3G mobile Internet services (CDMA2000 1x and 1x-EV-DO). The figures show the number of handsets theoretically capable of supporting these services.

Source: ITU.

4 Regulatory and policy aspects

"Regulators' first mission is to ensure fair competition throughout all stages of the licensing process… but the story does not end with licensing"

Fair competition policy has been what has worked best in the development of both the mobile and Internet markets. In the mobile Internet era, it will still be regulators' first mission to secure fair competition throughout all stages of the licensing process. During licensing, when selecting the participants in the mobile Internet market, regulators should ideally select operators using market-based methods. Table 1 shows the third-generation licensing methods applied in selected countries worldwide, illustrating the wide range of fees charged and methods used, including auctions, "beauty contests" (comparative selection), and mixed or "hybrid" approaches.

But the story does not end with licensing. After licences have been awarded, regulators have a crucial role to play in a number of ways. One of these is the need to monitor the mobile market structure so as not to allow dominant operators to abuse their market position over less established operators. The introduction of Internet access into the mobile market creates potential new bottlenecks such as portals, and new breeds of billing system. Mobile operators have a strong potential influence on the market for Internet platforms, and regulators are responsible for ensuring that platforms are as open to competition as possible.

Regulators also need to cooperate and harmonize approaches to global roaming and terminal circulation capabilities internationally. In an increasingly globalized economy, both these capabilities will be necessary for the mobile Internet market to flourish. International and regional organizations have a role to play in guiding regulators in this regard.

Security is also a key issue, both in terms of network vulnerabilities and of data privacy. As interconnection between wireless, and wired networks becomes easier, so hitherto controlled and traceable information becomes more vulnerable to malicious usage.

With mobile data services, including future m-commerce services, providers have more information than the average user, and therefore have greater bargaining power. Marketing tools, such as spamming, can overstep the line of acceptability and become a nuisance to users. Assuming that most mobile users have little knowledge of mobile technology and legal issues, it is imperative that consumer rights be protected by appropriate measures. Regulators should therefore establish recognized consumer protection rules, for example by providing charters or guidelines on protection of consumers' legal rights. The Organisation for Economic Co-operation and Development (OECD) has, for instance, produced a set of *Consumer Protection Guidelines*, outlined in Box 2.

Box 2: Consumer protection for m-commerce

There are a number of differences between e-commerce using PCs, and m-commerce using mobile phones. One of these is the relative speed of terminals. Another is the potentially large number of users with limited experience and insufficient technical and legal knowledge about m-commerce. A further difference relates to the limited screen capacity of mobile terminals to display items, such as forms or contracts, as well as limited keypad functions for entering data (e.g. the absence of specific "delete" or "enter" keys). This affects the way in which personal information might be solicited or captured. For these reasons, special regulations for mobile Internet consumers may be required, although established e-commerce guidelines may provide a good basis for similar provisions to protect m-commerce consumers.

One example of such protection in the case of e-commerce is the OECD's *Consumer Protection Guidelines*, issued in December 1999. Its recommendations, outlined below, are designed for inclusion in possible legislation. It recommends that governments, business communities and consumer groups work together nationally and internationally to implement the guidelines and make companies and the general public more aware of consumer protection laws. In many countries, various entities have developed similar guidelines to protect consumers in e-commerce.

- Businesses should not act, or make any representation or omission that might be deceptive, misleading, fraudulent or unfair. Information about companies, products or services should be "clear, conspicuous, accurate and easily accessible". Businesses should comply with policy/practice statements made and be aware of global e-commerce regulations.
- Consumer requests to stop unsolicited commercial e-mail messages (spamming) should be respected.
- Information on transaction terms, conditions, delivery and costs should be sufficient for the customer to make an "informed choice" about whether to proceed with a purchase.
- The consumer should be able to check precisely the goods/services they are buying before completing the transaction and be able to cancel if they desire to.
- Companies should provide secure payment methods.
- Consumers with a complaint should have access to "fair and timely" redress and not face "undue cost or burdens". Governments should assess current legal frameworks to verify that e-commerce consumers are given the same protection as other consumers.

Source: OECD Guidelines For E-Consumers, OECD. See http://www.oecd.org/EN/home/0,,EN-home-29-nodirectorate-no-no--29,00.html.

Table 1: Allocation of 3G mobile licences in selected economies worldwide

Country	No. of licences	Mobile incumbents	Method	Date awarded	Amount paid, US$ million
Australia	6	3	Regional auction	March 2001	610
Austria	6	4	Auction	November 2000	618
Belgium	4	3	Auction	March 2001	421
Czech Republic	2	2	Auction	December 2001	200
Denmark	4	3	Sealed bid auction	September 2001	472
Finland	4	3	Beauty contest	March 1999	Nominal
France	4 (2 pending)	3	Beauty contest + fee (Revived auction for 2 pending)	July 2001 (Results of revived auction due in September 2002)	4'520 (subsequently reduced to 553 million each, plus 1 per cent of revenue
Germany	6	4	Auction	August 2000	46'140
Greece	3	3	Hybrid	July 2001	414
Hong Kong, China	4	6	Hybrid	September 2001	Minimum 170 each plus royalties
Israel	3	3	Beauty contest + fee	December 2001	157
Italy	5	4	Hybrid	October 2000	10'180
Japan	3	3	Beauty contest	June 2000	Free

Table 1: Continued…

Country	No. of licences	Mobile incumbents	Method	Date awarded	Amount paid, US$ million
Korea (Rep.)	3	2	Beauty contest + fee	August 2001	2'886
Malaysia	3	3	Beauty contest	December 2001	Nominal
Netherlands	5	5	Auction	July 2000	2'500
New Zealand	4	2	Auction	January 2001	60
Norway	4	2	Beauty contest + fee	November 2000	88
Singapore	3 (+1?)	3	Cancelled auction	April 2001	165.8
Slovenia	1	2	Cancelled auction	December 2001	82
Spain	4	3	Beauty contest + fee	March 2000	480
Sweden	4	3	Beauty contest	December 2000	44
Switzerland	4	2	Auction	December 2000	120
Taiwan, China	5	4	Auction	February 2002	1'400
United Kingdom	5	4	Auction	April 2000	35'400
Total (25)	99 +	79	13 auctions, 9 beauty contests, 3 hybrid	—	105'330 +

Source: ITU, European Commission, UMTS Forum and 3GNewsroom.com.

5 Worldwide lessons for a new generation

"Many of the operators in the countries that have yet to initiate 3G deployment are taking a more gradual, or cautious approach"

The major Asian economies are the clear first movers in 3G licensing, with Japan and Korea being the first to actually deploy 3G services. But Hong Kong, China also awarded 3G licences early on, in an exemplary licensing process. Singapore, another ICT-friendly economy, may not make the move to 3G as rapidly as might be expected (see Box 1 on page 5). Some of the less developed Asia-Pacific economies, such as China, the Philippines, and Thailand, are less ripe for 3G roll-out, and are in no rush to award 3G licences owing to their particular market contexts.

In Europe, many countries opted for an auction approach to licensing, and sold them off at prices that might have seemed justified at the height of the mobile boom during 1999 and 2000, but which have since been crippling to operators left with huge costs to recoup. In Latin America, a number of countries have fully embraced mobile telephony (see the examples of Chile and Venezuela in Figure 4, top chart), experiencing a mobile boom in relation to fixed-line growth. Africa has also seen high mobile growth rates, testifying to the capacity of mobile to substitute fixed-line telephones in developing economies, where fixed-line infrastructure is often lacking (see Figure 4, bottom chart).

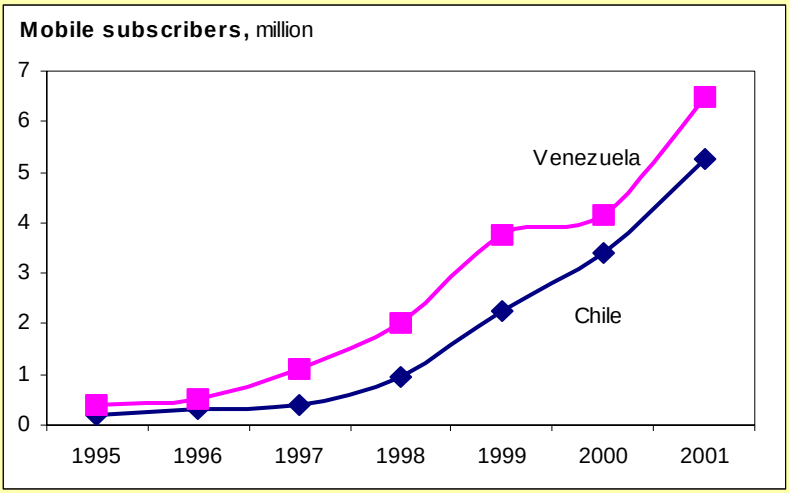
Although the experience of Japan and Korea would suggest the huge potential of the mobile Internet, the high hopes for 3G have been somewhat dampened by the slump of recent years in the telecommunication sector as a whole, as well as evidence that some mobile markets are reaching saturation. Many operators in countries that have yet to initiate 3G deployment are taking a more gradual or cautious approach, concentrating their efforts on new multimedia-type applications over existing 2G platforms. Many are choosing to upgrade their systems to support higher data transmission speeds needed for images. This approach may be a useful way to "test the waters" for 3G, or to exploit more fully the potential of 2.5G technologies without the need to invest heavily in new 3G networks.

But driving mobile growth alone is not enough: Internet content also needs to be accessible, and relevant, and efforts need to be made to lift language barriers. Thailand is one example of a country where the limited knowledge of English has been an obstacle to SMS use. This is in contrast on the one hand with Singapore, where English is widely understood, and on the other hand with Korea, where efforts to develop Internet content in Hangeul, and the availability of handsets that support the language characters, have contributed significantly to the success of mobile data applications.

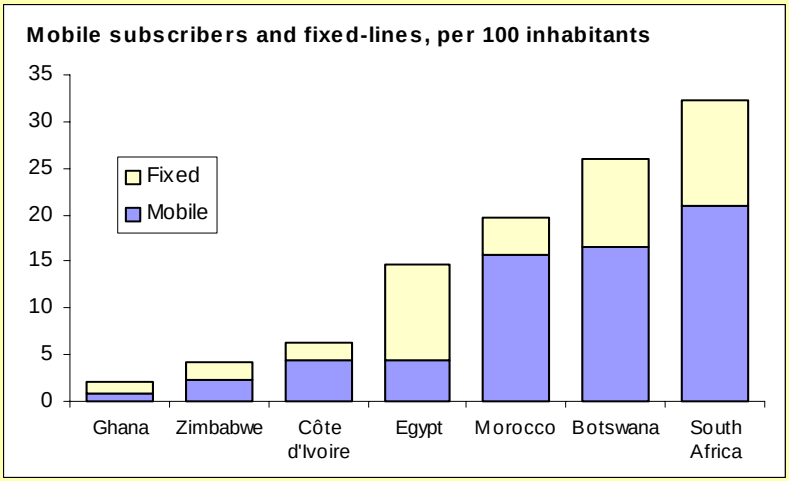
In a number of countries, SMS has been the unexpected "killer application" that has sometimes—ironically—effectively delayed the introduction of 3G services. Prepaid schemes have also played a part, as exemplified by the case of the Philippines, but also borne out elsewhere. The "SMS phenomenon" shows that finding the elusive "killer application", along with ensuring affordability of services, will be key factors for the success of 3G.

Figure 4: Latin American and African mobile markets

Mobile subscriber growth in Chile and Venezuela, 1995-2001



Mobile and fixed telephone penetration in selected African countries, year-end 2001



Source: ITU World Telecommunication Indicators Database

6 Towards a mobile information society

"In the future, we may each own dozens of miniaturized mobile communication devices. A new era of pervasive computing is dawning with huge implications for our personal lifestyles and values"

The mobile revolution is changing the way we live and work. Mobile phones are already pervasive in all major developed economies and in an increasing number of developing ones too. But with the advent of the mobile Internet, wireless gadgets are set to invade new areas of personal life and work. The mobile Internet is a powerful enabling technology that will make possible new services and applications. But it may also threaten traditional values of privacy, security and courtesy. The mobile Internet is an intrusive technology.

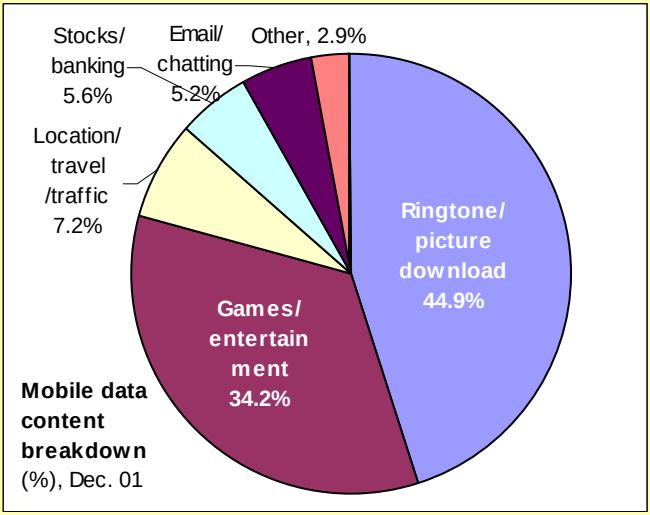
In the 1980s and 1990s, the microchip spread from the computer into hundreds of other devices, from computers to washing machines to cars. The average car, these days, has as much computer power as some of the early Apollo rockets. Most families in developed nations already own dozens of microchips embedded in different devices. The next stage in this process of pervasive computing is for those microchips to gain the ability to communicate and to report on their location and status. The technology to make this happen is already available—for instance, nanotechnology, cellular communications, cheap processing power, location-tracking systems—but the networks and the billing systems are not yet in place. The mobile Internet will make that possible.

But are we ready for a world in which an intelligent fridge sends out the grocery-shopping list, or a mobile phone tells parents that their children are not yet home from school? In the mobile information society, the amount of data about our personal lives that could theoretically be collected, stored and traded will increase dramatically. We may want to use that data ourselves, for instance for improved health or security, but who else do we want to have access to it?

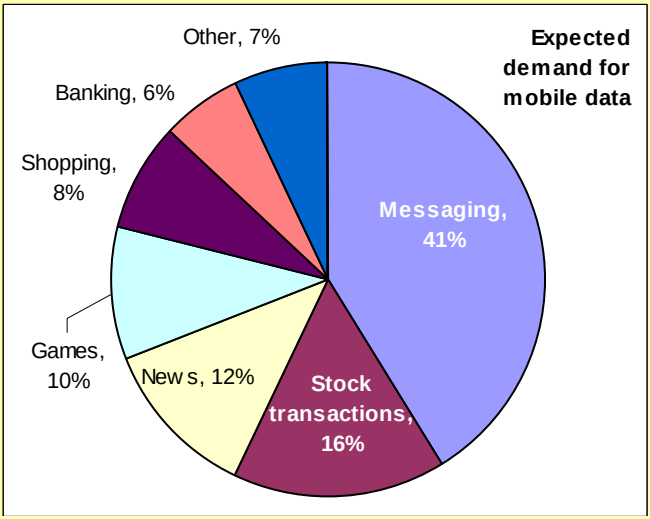
The major uses of the 2.5G mobile Internet are likely to be messaging (see the example of China, Figure 5, bottom chart), but the extra bandwidth of 3G will allow for download, video streaming and multiplayer games (as in Korea, Figure 5, top chart). Initial experiences with 3G mobile Internet services, in Korea and Japan for instance, indicate that it is teenagers who are driving the market. In Korea, for instance, although teenagers have lower disposable incomes than older age groups, they are spending around three times more per user on mobile data services. In Japan, video messaging has proved immensely popular among young people. What this suggests is that the younger the user, the more likely they are to be comfortable with the intrusive nature of mobile communications. Youngsters also have more time for playing games and sending frivolous or flirtatious messages. The key question is whether they will continue to use the mobile Internet when they are older and have more spending power. If they do, then the 3G gamble will seem like money well spent for the operators. If not, then it is time for investors to start worrying.

Figure 5: How people use the mobile Internet

Republic of Korea (3G)



China (2.5G)



Source: Top: SK Telecom. Bottom: China Mobile.

Statistical Annex: Top 20 Mobile/Internet Index rankings, worldwide*

Economy	Mobile/Internet score (/100)	Ranking
Hong Kong, China	65.88	1
Denmark	65.61	2
Sweden	65.42	3
Switzerland	65.10	4
United States	65.04	5
Norway	64.67	6
Korea, Rep. of	63.42	7
United Kingdom	63.00	8
Netherlands	62.25	9
Iceland	62.03	10
Canada	61.97	11
Finland	61.22	12
Singapore	60.58	13
Luxembourg	58.58	14
Belgium	57.80	15
Austria	57.72	16
Germany	55.53	17
Australia	55.40	18
Portugal	55.13	19
Japan	54.94	20

**Note:* The above table is an extract from the ITU Mobile/Internet Index included in the full *Internet for a Mobile Generation* Report. The Index measures how each economy is performing in terms of information and communication technologies (ICTs) while also capturing how poised it is to take advantage of future ICT advancements. The Index covers 26 variables sorted into three groups: infrastructure, usage, and market structure. These three components combine for a score between a low of 0 and a high of 100. The table is taken from the Statistical Annex to the Report, which provides comprehensive data on network and service development for over 200 economies.

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STATISTICAL ANNEX: MOBILE INTERNET STATISTICAL TABLES

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