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CHAPTER 3

The present state of 3G

3.1

What is 3G?

What is understood by 3G?

3G, understood as third generation, is a collective term for new procedures in communication, new standards, and new devices that will enhance the quality and speed of services in mobile telephony.

3G terminals will combine the functionality of a mobile telephone with that of a PDA¹ and a personal computer with broadband connection to the Internet, while the communication networks, according to the International Telecommunications Union (ITU), will enable devices thus prepared to transmit or receive data at 144 kbps² or above. (In practice the technology is facilitating ratios around 384 kbps, very much above the 14.4 kbps of GSM or the 53.6 kbps of GPRS.)



ITU requirements for 3G	
144 kbps	High velocity (cars)
384 kbps	Low velocity (pedestrians)
2 Mbps	Stationary wireless transmission

Table 1. Minimum velocities set by the ITU for 3G transmission.

Some of the most interesting functionalities with 3G, apart from improvement in the quality of voice transmission, will lie in its instantaneous communication capacities (fax, email, transmission of large files, transmission of images, etc.), broadband connection to the Internet (news, videos), videoconference, multimodality³, processing capacities that facilitate complex applications by telephone as if with a personal organizer (PDA), GPS functionalities, payment systems, identification systems, communication with radiofrequency, infrared, transmission by commutation with packets greater than point-to-point (always online), global roaming, etc.

¹The Personal Digital Assistant is a pocket computer that acts as a personal organizer.

²Kbps, kilobytes per second. At the end of the present document there is a glossary containing definitions of the technical terms here used.

³By multimodality is meant the capacity that telephones will have in the future to interact with the user in various manners simultaneously, e.g. facilitating access to telephone application menus via keyboard or voice, according to preference.

It should be taken into account that while 3G is associated mainly with the availability of greater bandwidth for the transmission of data and voice via mobile devices, the development of these networks will be accompanied by an increase in the processing, memory, and multimedia content capacities of the terminals. This increase will lead to the appearance of a more attractive mix when the time comes to design new uses in the context of mobility.

Acronym soup

In many cases the popularization of a new technology is preceded by the appearance of a strange soup of acronyms. With time the situation becomes simpler. Some acronyms disappear, others acquire a more precise meaning. In some cases the original meaning is replaced by a popular one.

Such a soup has come forth with third-generation mobiles. And perhaps it is being made yet thicker by the long wait between the first mention of services associated with the new generation and their actual availability for the majority of users. UMTS, 3G, CDMA, WCDMA, EDGE, I-mode, and many more are among the ingredients.

In the present chapter we'll take a quick look at all the technologies involved, at the various work groups and fora, at the devices, and so on, the aim being to sort out this confusion. At the end of the document there is a glossary of those terms, used throughout the text, that are newer or more technical.

3.2 3G networks

ITU has approved, as official 3G standards, a set of systems that have arisen from agreement between various companies, grouped under the general name International Mobile Telecommunication 2000 (IMT2000), including five radio-transmission technologies:

IMT 2000 radio-transmission technologies

IMT-DS Direct Sequence (referred to as UTRA-FDD, W-CDMA, UMTS-FDD)
 IMT-MC Multi-Carrier (referred to as CDMA2000)
 IMT-TC Time Code (referred to as UTRA-TDD) and China's TD-SCDMA
 IMT-SC Single Carrier (referred to as UWC-136/EDGE)
 IMT-FT Frequency Time (referred to as DECT)

Of these five standards, basically three technologies have been popularized, namely CDMA2000⁴, WCDMA⁵ and EDGE.

CDMA2000.

The plan is to introduce this protocol into countries with cdmaOne⁶ networks, since it is a natural development from the latter, approved by the ITU as standard IMT-2000.

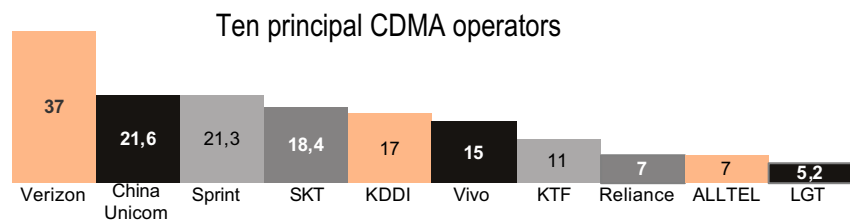


Fig. 1. Source: QUALCOMM, May 2004.

⁴ Code Division Multiple Access 2000.

⁵ Wideband CDMA.

⁶ Current mobile communication standard in some countries, especially America and Asia.

Two phases are envisioned for the takeoff of this protocol. First, introduction of CDMA2000 1X, which offers approximately double the bandwidth of the current cdmaOne, with 144 kbps (back compatible). The second phase will include two further developments of the protocol, namely the DO version and the DV version of the CDMA200 1xEV (Fig. 2).

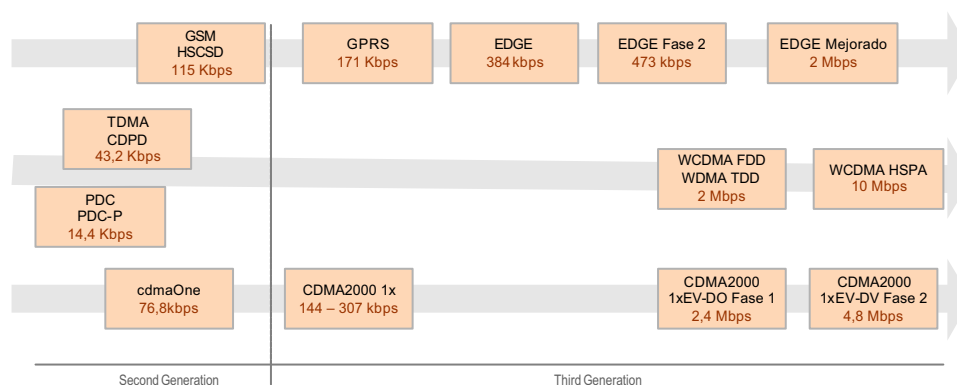


Fig. 2. The evolution of the various protocols available, with their theoretical maximum velocities. Note how 3G protocols follow on from certain of today's 2G protocols. Source: UMTS World.

WCDMA

The idea behind this 3G technology is to offer high bandwidth for voice and data, with velocities up to 2 Mbps, sufficient for such applications as videoconference. This technology is a good choice for the mid term or long term, since it offers greater possibilities. This in spite of its greater complexity. For example, the receptor algorithm is computationally more complex than that of telephones of the preceding generation.

EDGE

This is not really a 3G protocol, since the aim behind its design was to enable GSM and TDMA, networks of the second generation, to transmit data at 384 kbps within their frequency space. Ericsson developed this technology for those operators of 2G networks that were outside the 3G spectrum auctions, hence it will be adopted mainly by those companies that encounter problems in having available a spectrum that will allow them to transmit with CMDA2000 or WCDMA, perhaps as an intermediate solution until they have a spectrum.

3.3

3G applications



Concepts such as ubiquity, locating, and identification are associated with the new mobile telephones. Along with the capacity of the new terminals for high-speed data transmission and multimedia (music, photos, video), they will revolutionize the applications and services offered to 3G users.

It is general opinion in the industry (as reflected in UMTSWorld⁷) that 3G will not introduce a killer application⁸ that might tip the balance in favour of this technology, as has occurred with others. Rather it is a large group of them that will take advantage of the new bandwidth available as well as the capacities in processing, memory, and multimedia of the new terminals.

The UMTS Forum divides possible applications into two large groups: connectivity contents (the telephone as a unit of equipment that can exchange information) and mobility contents (the telephone as a portable unit that "we always carry with us"). And these in turn into six groups:

- Personal applications that combine entertainment and information.
- Multimedia message services.
- Mobile access to intranets and extranets..
- Mobile access to the Internet.
- Locating systems.
- Enriched voice.

It is possible, of course, to find many other classifications. For example, through agreement with NOKIA, 3G applications and services will be divided into six large groups:

- Wireless advertising.
- Mobile information.
- Business solutions.
- Mobile transactions.
- Mobile entertainment.
- Person-to-person communications.

⁷ UMTSWorld is an important and known forum, independent of the Internet, whose aim is to provide free and independent information regarding 3G industries and technology (<http://www.umtsworld.com>).

⁸ See the glossary at the end for a definition of the term killer application.

It may be concluded that mobile applications of the future will be based on what it means to have a mobile telephone of the present generation, i.e. with the capacities and service available today. We can thus identify four broad uses for the mobile of the future:

The various functions of a mobile	
The mobile as multimedia computer	Games, organization, office automata, music, video
The mobile as telecommunications equipment	Voice enhancement, videoconference, radio and digital TV, Internet surfing, access to intranets, transactions, geolocating, navigation
The mobile as remote control	Interactions with local equipment at home or in the office, automatic tellers, vending payment in shops
The mobile as container	Purse, credit card, container for certificates

Notes

3.4 Market division

Introduction

It is not simple to give any single figure for the distribution of the 3G market for the simple reason that there are different opinions as to exactly what 3G is. In addition there are many details regarding the telephony contracts of operators that are not public, or else they are statistics supplied by operators or manufacturers but based on estimates and not on solid data.

However, the UMTSWorld forum has endeavoured to compile statistics on the deployment of UMTS/3G networks. These fall into three types:

Communications infrastructure.
Users' terminals.
Operators and subscribers.

The makers of infrastructure for mobile communications

Here the undisputed leader, whatever the generation, is Ericsson. According to sources in the Yankee Group, its share in 2002 was 27% (Fig. 3). It is followed by Siemens, Nokia, and Motorola.

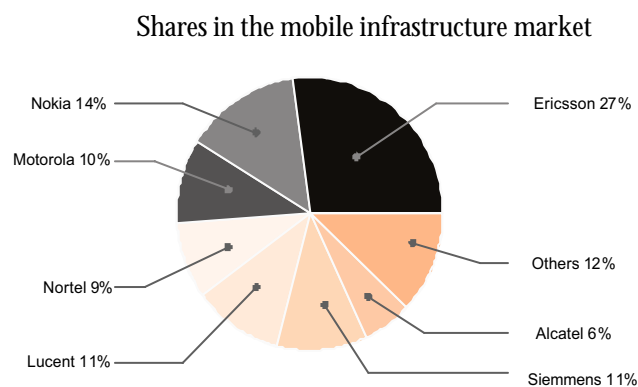


Fig. 3. Source: Yankee Group. Data: 2002.

In 3G, Ericsson has known how to maintain this leadership. It was leader for example in 3G WCDMA in 2003 with 38% of the market (Fig. 4). In addition it is the leader in EDGE technology, so that it is in a position to offer a 3G solution to operators that with 2G GSM or TDMA networks not have secured broadband in the WCDMA spectrum.

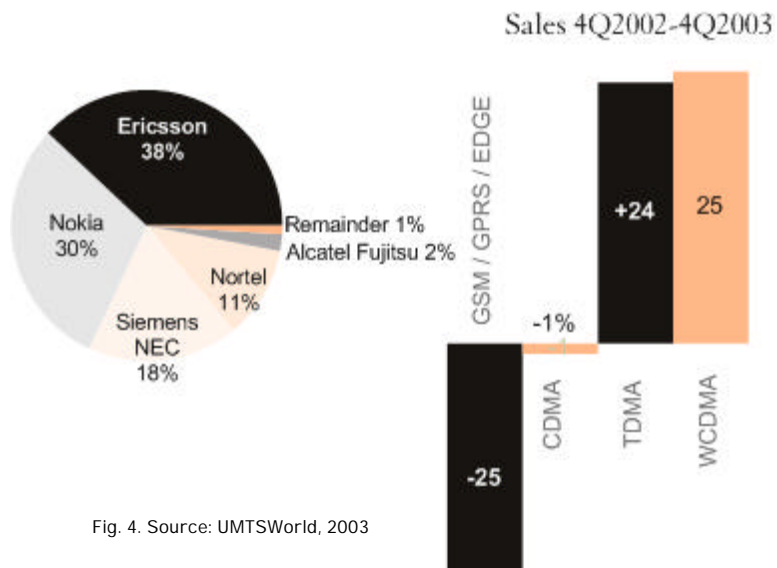


Fig. 4. Source: UMTSWorld, 2003

The makers of mobile terminals

In recent years the global market⁹ for mobile terminals has grown beyond all expectation. More than 515 million mobile telephones were sold in 2003¹⁰, 20% up on the previous year. It is in Europe, the Near East, and Africa that the market shows the strongest growth (and Gartner Dataquest reports that sales in EMEA grew by 35.5% in 2003). Also, terminals are in strong demand in China.

⁹World market for mobile telephones of every generation. More than 600 million terminals are predicted for 2004.

¹⁰ Average figures on the basis of studies carried out by the Gartner Group and Strategy Analytics.

Where companies are concerned, Nokia in Finland remains undisputed leader with more than 179 million telephones sold in 2003 (19% up on the previous year). With a market share of 34%, it is followed by Motorola in the US, Samsung in Korea, and Siemens in Germany. (See Fig. 5 for global market figures.)

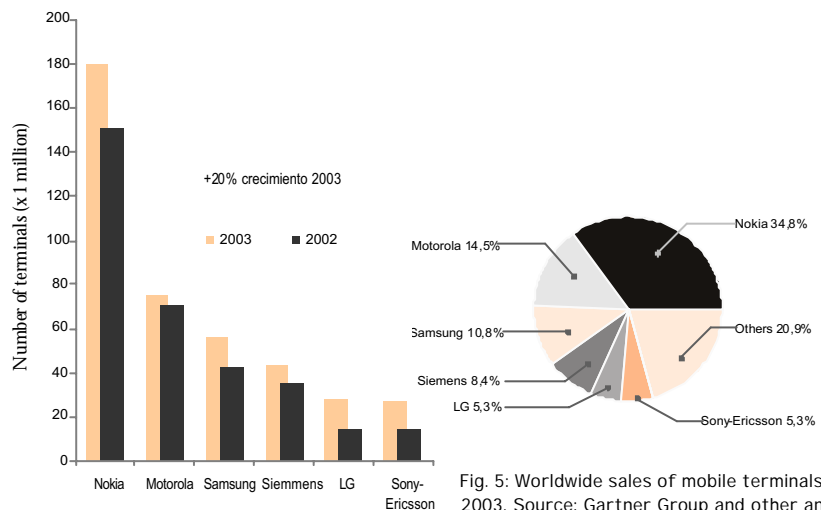


Fig. 5: Worldwide sales of mobile terminals 2002-2003. Source: Gartner Group and other analysts.

All the leading makers of mobile terminals have hurried to develop new models compatible with 3G technologies. However, the major penetration of 3G in Korea and the high levels of telephone turnover there mean a boost for the Korean firms Samsung and LG in the race for the broadband telephone market.

Operators and subscribers

The mobile market

Various sources estimate that by late 2004 there will be 1379 million subscribers to mobile telephones throughout the world, up 186% in five years.

In China, though penetration there is low in percentage terms, there are almost 300 million subscribers. It is thus the biggest market on the planet, followed by the US with 164 million, Japan with 82, and Germany with 64.4 (Fig. 6).

A multitude of operators are to be found in this vast market. At the end of 2003 the biggest in terms of subscription were China Mobile, Vodafone Group, and China Unicom (See chart).

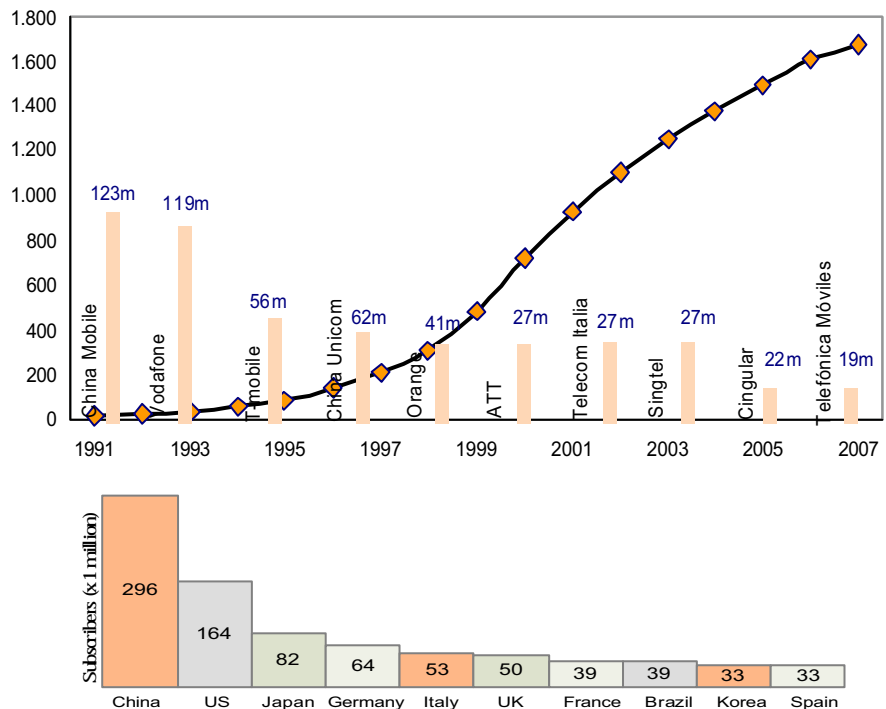


Fig. 6: Principal markets and operators. Sources: UMTSWorld and eMarketer, November 2003.

3G

Where countries are concerned, the leader in 3G is without doubt South Korea¹¹, with 21% penetration among the population. Thirty per cent of the mobile telephones in South Korea are 3G, followed by other countries in Asia, Canada, and northern Europe. (See Fig. 7 regarding mobile broadband penetration.)

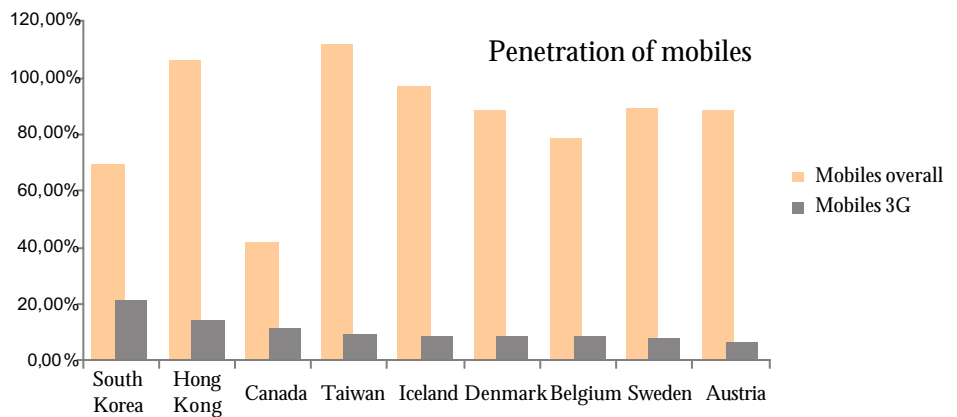


Fig. 7. Showing the nine countries with highest 3G penetration in 2003 in comparison with overall mobile penetration, in each case in relation to population. Note that in some countries, e.g. Taiwan and Hong Kong, there is more than one mobile per inhabitant, which gives us figures over 100%. (Source: ITU, late 2003.)

¹¹ See Appendix A for a study of 3G in Korea.

3.5 Demand

The considerable growth of mobile second-generation telephony in recent years, leading almost to saturation in many developed countries, suggests a promising future for solutions in 3G telephony, mainly data applications. It is clear that there are various factors that will facilitate this development, such as the following:

Social

Emergence of a society with a computer culture.
Among the population, an increase in mobility and travelling.
Digitization of many processes¹².

Technologies

Falling price of electronic devices.
Appearance of integrated multimedia applications.
Appearance of devices that are steadily richer in features, more usable, and more attractive.

Market trends

Rapid penetration of mobile telephones.
Adoption of the Internet.
Development of electronic trading.
Development of portable devices and PDA

Also there are inhibiting factors, however, such as the following:

In many cases there is no clear business model (hence there are not sufficient incentives for the content developers).

For many of the services offered there is no well-defined demand. (We find ourselves faced with a supply market. Such a situation, with its attendant bad experience, arose with electronic trading on the Internet.)

The question is one not of technological rupture but of technological growth, for which reason it is not so easy to persuade people to adopt the new technology.

It may prove expensive, i.e. the consumer may see the price as exceeding his/her own value appraisal.

The consumer with whom advanced mobility triumphs is the city user, who in many cases has a high level of technological knowledge and spends a lot of time on public transport (Japan, Korea). This profile is unlikely for some time to show up in Europe or the US.

¹² See the glossary at the end for a definition of the term digitization of processes.

3.6 The sector

Introduction

The deregulation of communications, the rapid and forceful penetration of mobile telephony, and the emergence of new businesses, such as that of data via mobile, have encouraged, especially in recent years, many firms to become part of this sector. Operators, generators of content, the makers of infrastructure technology, and the makers of mobile terminals crowd into the value chain of this industry.

Most of these companies are taking up positions in readiness for the third generation. Operators are choosing the technologies most conducive to the takeoff of their networks, looking for their business models in the new applications and services, and planning for penetration into the markets. Manufacturers are developing technologies and preparing for any redeployment of investments (Fig. 8). And naturally the generators of content, who at present assume greater importance with the appearance of many new applications and services that exploit the advantages of 3G, are also getting ready.

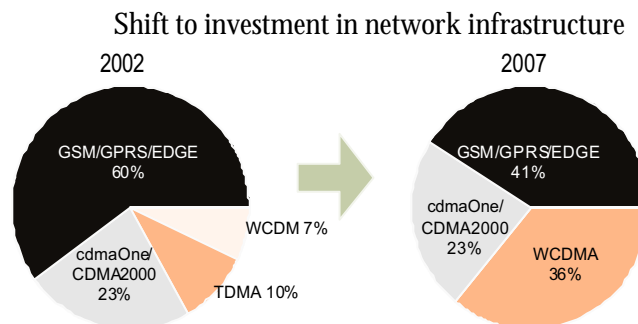
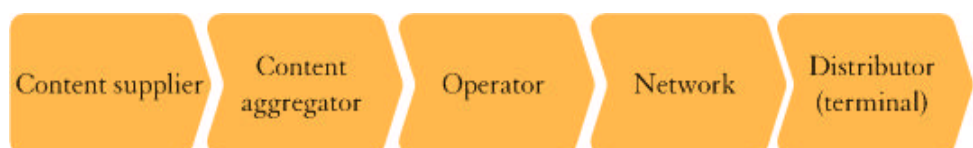


Fig. 8. Source. The Yankee Group

Value chain

One of the keys to the success of 3G lies, without doubt, in establishing a suitable business model, one that is valid for all those making up the value chain.

Here the value chain can be seen as made up of five great links, namely content suppliers, content aggregators, suppliers of communication services (operators), suppliers of communication infrastructure (network), and final distributors (see figure below).



The content providers undertake to design and develop services via mobile. Although voice, the principal service at this time and killer application¹³ in mobility, is a service provided by the actual operator. Data services, including mBanking, mCommerce, GPS, the Internet, music, and video, are provided by third parties.

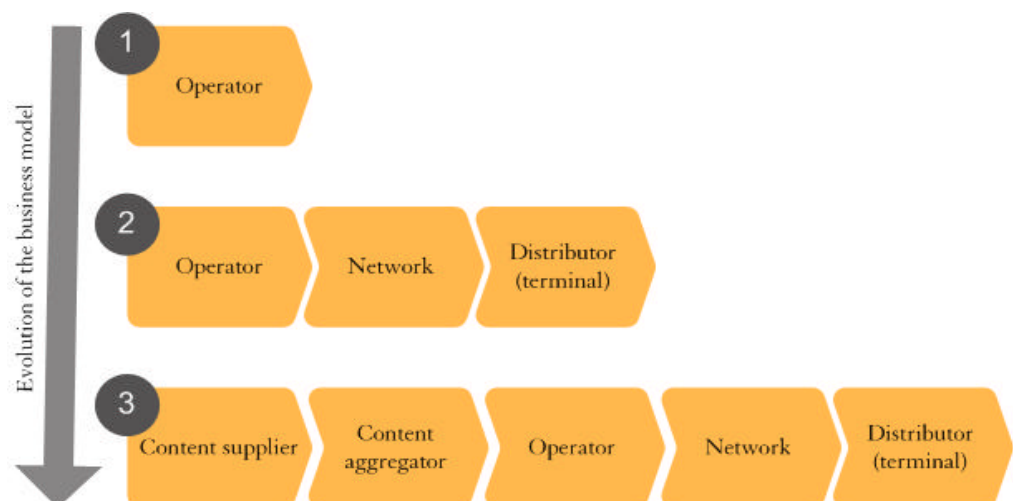
The content aggregator is the value chain link that makes it possible to group all the services on offer in such manner that the user may easily find what he needs. This is the case, for example, with the Internet sites on mobiles¹⁴, the searchers or aggregators of various types of information.

Operator and network are basic infrastructure links, normally dominated by telephone companies. In most countries today they are the parties in charge of invoicing the client. The success of the business model depends to a great extent on how they organize this invoicing, and on what part is transferred to the other links.

The final link in the chain is the distributor of the service, basically the telephone terminal. In the case of 2G, noteworthy success has resulted from the contribution made by other links to its costs. However, the client has in consequence got used to the idea of paying little for the hardware (the telephone), although he pays somewhat more for the service (normally in the form of calls). This will have to be taken into account in the development of the 3G business model.

The business model

The business model in telephony (fixed and mobile, voice and data) may be illustrated as follows:



¹³ See the glossary for a definition of the term killer application.

¹⁴ As is the case of I-mode (referred to as E-moción in Spain) and Vodafone Life.

- 1 Initially a single company held a monopoly in all telecom services.
- 2 Later the operator and the access network became disjoint, and in addition the terminals were freed. This model appeared both in cable telephony and in wireless telephony.
- 3 The value chain becomes complicated when data services are offered, at which point the content supplier is clearly distinguished from the operator. Also it is possible to discern an extra link with the function of content aggregator (or site), initially offered by the operator.

The business model insofar as concerns data via mobile telephone, and this clearly is the 3G model, would appear to rest on a set of starting points:

The content supplier receives a part of the operator's invoicing, so that, on the one hand, its business may be profitable.

The user must continue paying a single invoice (the phone bill), though in reality he is paying for all the value services he receives. The operator has to distribute these revenues along the value chain.

The terminal continues to be subsidized by the other elements in the chain, since the user does not ascribe too much value to the hardware.

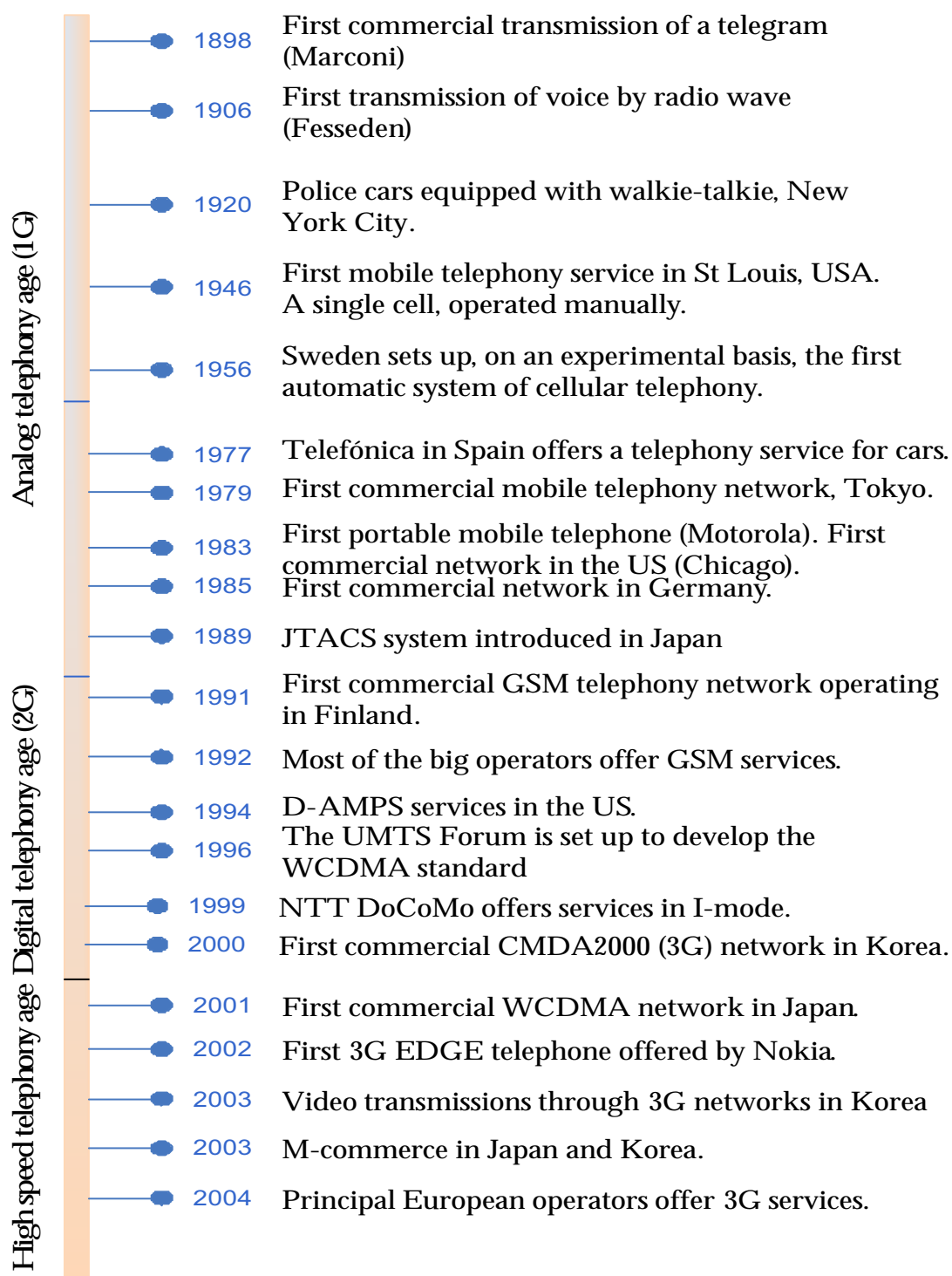
A problem for coming years is that of deciding whether this business model will have to be altered.

Lessons to be learned from the success of Internet via mobile in Japan

In the appendices we look at the considerable success of surfing via mobile in Japan (especially with NTT DoCoMo's I-mode). >From this model we can derive lessons for possible application to incipient 3G business in Europe and the US.

In Japan there is no legislation already worked out. Rather there is swifter deregulation, and the competition is admitted more swiftly than in other countries¹⁶.

¹⁶ The deregulation of various aspects of mobile telephony began sooner in Japan than in other countries.



3.7

Conclusions to the chapter

"3G" is a collective term embracing new communication procedures, standards, and devices aimed at enhancing the quality and velocity of mobile telephony and at facilitating the development of new applications, such as videoconference.

With a few exceptions, such as Korea and European Nordic countries, 3G is still more a promise than a reality in most advanced countries, and, although few analysts expect it to take off in the short term, generally there are seen to be many factors that will in time heighten the demand for these services and products, such as the digitization of many services and the high penetration of second-generation mobile telephony.

The leaders in 2G know that there will be heavy investment in 3G, and they carefully watch developments in the field.

Finally, it is clear that the basis necessary for 3G to take off is to be found in the establishment of the right business model, one in which account is taken of all elements in the value chain. It will have to be understood that the 2G model is not necessarily susceptible of extrapolation to the new model, and that what works well in one country (Japan) may fail to work well in others (e.g. in Europe).