2 Making voice portable: the early history of the cell phone

Gerard Goggin, Cell Phone Culture: Mobile Technology in Everyday Life (London: Routledge, 2006)

> New Take-Along Telephones Give You Pushbutton Calling to Any Phone Number . . . Fishing offshore, driving home from work, or riding horse-back – this phone user could place and receive calls anywhere . . .
>
> (Motorola's DynaTAC gracing the cover of *Popular Science* magazine, quoted in Murray 2001: 22)

> Have we reached the day and age when a key accessory in every schoolkid's pocket is a mobile phone?
>
> (Gibson 1997)

> While it took the domestic telephone approximately thirty years to migrate from an instrument most often in the hallway of the home in the 1960s, to its ubiquitous position today in the living room, kitchen and bedroom, the mobile telephone found it way into our pockets in less than half that time.
>
> (Lacohée, Wakeford, and Pearson 2003: 203)

In the nineteenth century, the telegraph emerged as a communication technology with pervasive implications for the spatial organisation of society, but also how news, information, and entertainment were circulated (Blondheim 1994; Coe 1993; Hubbard 1965; Kieve 1973); in short an important predecessor to the cell phone. There was a close relationship between the telegraph and the railways, both important technologies and infrastructures for communication; one communicating signals, codes, and messages; the other communicating people, goods, materials, and texts. With the first working mechanical telegraph created by the Chappe brothers in the 1790s, and the first telegram sent in August 1794, by the middle of the nineteenth century the telegraph had approximately 5000 km of line with 354 stations across France (Solymar 1999: 22–31). The French's antagonists in the Napoleonic wars, the British, responded with an extensive shutter telegraph system by the time of the Treaty of Paris in 1814 (1999: 34–8). The first commercial electric telegraph, devised by Cooke and Wheatstone, was in operation by 1839, providing communications for railway operations (1999: 52–3; Hubbard

1965). From 1840 to the late 1860s, telegraphy expanded greatly, especially with the laying of submarine channels, pioneered, like commercial telegraphy, by Britain (Headrick 1991: 11–49). By the end of the nineteenth century the telegraphy had become a truly global communications network, intimately involved in the intricacies of global trade and war, colonialism and the intensification of imperialism (Headrick 1991: 50–72) no less than nationalist movements (Livingston 1996).

In the closing years of the century, a new communications technology was developed which displaced the telegraph, and gave today's modern industrialised cities their nervous systems – the telephone. The appearance and rise of the telephone is especially associated with the United States, the scene of Alexander Graham Bell's famous 1877 demonstration, involving songs and conversation between himself located in a Salem lecture hall and his assistant Watson in nearby Boston: 'As I placed my mouth to the instrument it seemed as if an electric thrill went through the audience, and that they recognized for the first time what was meant by the telephone' (Bell quoted in Bruce 1973: 217). The dominant telegraph company Western Union was initially not interested in the new invention, but then did enter the telephone business until their 1879 loss to Bell in a protracted patent case. Bell and his partners continued to defend vigorously its patent rights as well as to consolidate its business, founding American Telephone and Telegraph Company (AT & T) in 1885 (Bruce 1973: 258–87; Garnet 1985; Smith 1985). Eventually, after a period of widespread competition from 1884 to 1912, AT & T was able to achieve legitimacy for its eventual regulated monopoly status under the catch-cry of its president Theodore Vail of 'one system, one policy, universal service' (Mueller 1997).

Though the invention of the telephone was famously credited to Alexander Graham Bell, a number of other individuals and companies around the globe also developed important innovations in this technology. The telephone was an instrument that allowed sound to travel along wires, and so people to use telephones to speak to each other. Telephones were installed in a home or office, and connected by lines – copper wires – to the telephone system. The phone system connected individual subscriber telephones through switches. Initially one picked up the phone, and an operator answered and made the connection with the desired number, opening a circuit between the two telephones for voice communication. Eventually the switching process was automated, electromagnetically, and then become digitalised (that is, through digital technologies and computer software). The term 'telecommunications' was coined in 1932 to designate voice telephony, but also referred to other sorts of communications at a distance over networks. Connected by wires to their networks, telephones were inset in their places in houses, offices, or public payphones. However, the dream of ease of communication in different places, or while on the move, was long nourished. After all, new sorts of mobility had emerged in the late nineteenth and early twentieth centuries, as represented by conveyances such as the automobile.

By 1914, the number of telephone subscribers in the USA had reached 1 per cent of the population, well outstripping most European countries in this period except Sweden and Denmark (Solymar 1999: 111–13). The first reliable figures show that there were 10 million telephones in use worldwide in 1910, with the USA accounting for almost 70 per cent of these: 'The worldwide number of telephones reached the 20 million mark in 1922, the year that Alexander Graham Bell died, the 50 million mark in 1939, and 75 million in 1950' (Huurdeman 2003: 228–9; citing AT & T's *Telephone Statistics of the World*).

There is much to say about the development of the telephone, how communicative and cultural practices and norms emerged, and how voice communication at a distance became an important part of daily life. What I wish to reflect upon briefly are the imagined and actual uses of this novel instrument. It is worth noting that there was a multitude of emotions, affects, and ideas about the telephone, and telephonic communication, both hundreds and thousands of years before its materialisation, but also in the early years before its now customary identity reached a stable form.

Claude S. Fischer's social history of the telephone in the United States bears out that in 'several ways, the telephone industry descended directly from the telegraph industry' (Fischer 1992: 81); for example, key figures in the development, building, and marketing of the telephone industry were formed in the telegraph industry, and many companies involved also shared this lineage. The importance of this lay in the early uses those championing and financing the telephone imagined for this instrument. According to Fischer, the uses conceived by marketers very much revolved around the business uses, modelled on the example of the telegraph: 'the uses for the telephone these men first proposed and then repeated for decades largely replicated those of a printing telegraph: business communiqués, orders, alarms, and calls for services' (1992: 81). Businessmen were the first target of the marketers, as in its 'earliest years the industry paid only secondary attention to marketing residential service' (1992: 67). When the industry did seek to persuade households of the benefits of telephones, it 'emphasized the "business" of the household, the ways in which the telephone could help the affluent household manager accomplish her tasks' (1992: 67).

In contrast the telephone industry did not in general, in the USA at least, envisage or encourage what became one of the most important uses of the telephone: namely, its use for sociability. Early on, for instance, the telephone was used for social and familial contact, and relationships, for 'visiting'. Fischer suggests that:

> Industry leaders long ignored or repressed telephone sociability . . . because social conversations did not fit their understanding of the technology. Feeding these attitudes, no doubt, was the common perception that women made most social calls and their conversations were not serious. That view, in

> turn, may have reflected a general close-mindedness towards people different from themselves. Many early telephony company officers, in correspondence or other comments, dismissed immigrants, blacks, and farmers as people who could not use or perhaps could not comprehend the telephone. The dissidents were the ones who suggested that such people . . . were plausible customers.
>
> (1992: 81)

It was not until the 1920s that the use of the telephone for sociality, and its place as in the private, domestic sphere of the household, become an important, accepted focus. The history of the uses of the telephone discerned by Fischer offers instructive lessons for thinking about its mobile successor:

> the promoters of a technology do not necessarily know or decide its final uses; that they seek problems or needs for which their technology is the answer, but that consumers themselves develop new uses and ultimately decide what will predominate . . . vendors are constrained not only by its technical and economic attributes but also by an interpretation of its uses that is shaped by its and their histories, a cultural constraint that can persist over many years.
>
> (1992: 85)

There are other forces at work, of course, in the social and cultural shaping of the telephone, as with other technologies. An important dynamic which I touch upon in later chapters is the relationship between representations of technology (not least images, dreams, and fantasies), and embodied practices and uses. Carolyn Marvin provides an important account of discourse about the telegraph, telephone, and electric lamp in Anglo-American culture in the late nineteenth century, and how these new communicative devices and the imagining of their possibilities function as 'vehicles for navigating social territory in the late nineteenth century' (Marvin 1988: 8). For Marvin, this is evidence of the 'process of social adjustment around new technology' (233) and the 'history of continuous concern about how new media rearrange and imperil social relationships' (235).

There is a great deal more to be said about how the telephone developed its cultural and social arrangements, and vitally important rituals, practices, vocabularies, and meanings. What I wish to end this passage of the argument with here, however, is a famous instance of the use of the telephone for broadcasting in the early period before it had been enshrined as a voice communication medium (first with party-lines on which conversations could be easily overheard, then ultimately with secure two-way, dyadic conversations). Pioneering attempts to use the telephone for broadcasting entertainment in Britain and the USA were not profitable, but a viable and relatively popular enterprise that did offer such a service was the

Telefon Hirmondó in Budapest (Hirmondó being a Magyar word for the medieval town crier). Established in 1893, Telefon Hirmondó involved the transmission of daily programming of various sorts of news and announcements as well as concerts, attracting sizable audiences of telephone subscribers over the next two or more decades (Marvin 1988: 222–31). Compared to other telephonic experiments in broadcasting events or entertainments (what Marvin terms 'occasions'):

> The Telefon Hirmondó was a hybrid of newspaper practices, conventional modes of oral address, and telephone capabilities that anticipated twentieth-century radio . . . In its time it was seen as a novel newspaper form, but it was radically forward-looking in its continuous and regularly scheduled programming, the origination of some programs from its own studios, and the combination of news and entertainments in the same service.
>
> (1988: 231)

Such alternative histories and uses of the telephone not only have important resonances and resemblances for thinking about later developments in broadcasting such as cable or pay television, as Marvin reminds, but also prefigure possibilities of the cell phone beyond a portable device for voice telephone conversations.

Making voice communications portable

If histories of media have their difficulties, there are peculiar challenges and characteristics in seeking to formulate histories of the newer media (Flichy 2002). This is certainly the case with doing the histories of the cell phone. Despite its relatively recent commercial availability and consumer adoption from the early 1980s onwards, the cell phone has been in development for at least fifty years. It also recursively adopts and reconfigures habits, expectations, and cultural forms from the telegraph and the telephone, these two other technologies central to modernity I have just briefly reviewed.

One particular difficulty in writing histories of telecommunications is that, while there have been many institutional, technical, or national histories of telecommunications, studies that take the social and cultural dimensions of telecommunications are relatively scarce compared to a wealth of literature on other media (notable exceptions include Fischer 1992; Marvin 1988; Sconce 2000; the history of telecommunications also features in Winston's important 1998 history of media technology). As for work on cell phone and mobile technology history, this is very much in its infancy. There is one lively and accessible book devoted to the subject (Agar 2003), coverage of the subject in a number of other books (for example, Steinbock 2003), an evolving website on the topic (Farley 2005), special issues of journals devoted to the history of the technical and standards development

of mobiles (such as Lehne 2004; Lyytinen and King 2002), and the histories and politics of mobiles (Goggin and Thomas 2006), as well as suggestive treatments in various articles and collections on social aspects of the mobiles (Goggin 2006; Hamill and Lasen 2005; Ito, Okabe and Matsuda, 2005; Katz 2002 and 2003; Lacohée, Wakeford and Pearson 2003; Ling 2004). Given this relative dearth of material, I will discuss some of the features I think are important for understanding cell phone culture.

As a form of radiocommunications, the beginnings of the cell phone are found in the extraordinary career of Guglielmo Marchese Marconi, who dominated the early development of radio. The young Italian brought his wireless telegraphy instrument to England in 1896, patenting his invention and founding his own company the next year (Baker 1970; Huurdeman 2003: 207ff). Marconi also developed the use of wireless telegraphy in maritime communications, with clever, if anti-competitive tactics, to ensure ships adopted Marconi sets and operators (by requiring operators not to communicate with wireless operators of other companies) until this policy was countermanded by a resolution of countries participating in the new International Radiotelegraph Conference (Huurdeman 2003: 232; 357–8; Solymar 1999: 134–6). The sinking of the Titanic on 14 April 1912 underscored the importance of wireless telegraphy at sea, and it led to the next Conference where sweeping regulations were put in place because of failures to heed radio warnings (Huurdeman 2003: 282–3). In 1919–22 there was a trial of radiotelephony to ships as an extension to the existing Bell Telephone System, followed by the commencement of public telephone service to ships on the Atlantic Ocean in 1929 (Huurdeman 2003: 284).

Portable and transportable telephones had already been developed on land in the late 1890s. They were used by telephone companies to test lines, as well as by armies in battle (in the Boer War, for instance) (Attman et al. 1977; Steinbock 2003: 73). Marconi is credited with the first mobile car radio: 'A steam-driven wagon was equipped with a transmitter, a receiver, and a cylindrical antenna about 5 m high mounted on the roof' (Huurdeman 2003: 285, 287; Michaelis 1965: 133). In 1909 the US Army Signal corps experimented with radio equipment mounted on horse carriages, and '[m]ilitary mobile and transportable radiotelegraph equipment was used widely during World War I' (Huurdeman 2003: 286). In 1911, Lars Magnus Ericsson, eponymous founder of the famous Swedish telecommunications equipment manufacturer, and his wife Hilda, tried to develop a car phone: 'Hilda used two long sticks, like fishing rods to hook them over a pair of telephone wires. Lars Magnus cranked the dynamo handle of the telephone, which produced a signal to an operator in the nearest exchange' (Steinbock 2003: 73). As Ågar remarks:

> When Lars Magnus Ericsson was driving through the Swedish countryside, he still had to stop his car and wire his car-bound telephone to the overhead lines. If he had pressed his foot on the accelerator, the wire would have whipped out, wrecking the apparatus.
>
> (Agar 2003: 16)

The first radio telephone was that used by Bell Laboratories in 1924 (Steinbock 2003: 73). Land mobile use, however, was not pioneered by the American telephone company AT & T; rather it was the Detroit Police Department that did so in 1921, for police car despatch. Patrolmen would be paged, and once alerted they would need to find a wireline telephone to call back (Steinbock 2003). By the early 1930s in Detroit, New York, and elsewhere, police cars were regularly using one-way mobile radio communication. A leader in car radio communications was Galvin Manufacturing Corporation in Chicago, which designed a less bulky two-way radio for the mass market in 1931. Galvin called the radio 'Motorola', and this was how the company was renamed also in 1947 (Huurdeman 2003: 286). In 1933, the first two-way radio communications were established in New Jersey. This was at a time when radios in automobiles were becoming popular and the Frequency Modulation (FM) band was devised. Motorola officially entered into police radio communications in 1937, quickly becoming the market leader, with emergency services, government agencies, and essential services using two-way land–mobile radio (Noble 1962; Steinbock 2003: 78–9).

New technical advances in wireless communications came during World War II, with the design and manufacturing of two-way radio sets for the American forces by General Electric and Motorola, in particular the latter's 'Handie Talkie' (or Walkie-Talkie), the first portable radiotelephone launched in 1943 (Huurdeman 2003: 286). After the war, civilian organisations took up the new radio technology, especially taxi cabs for despatch, and by 1952, 350,000 two-way private mobile radios were in use, usually for brief calls or communication (Steinbock 2003: 82–3). The first commercial mobile radiotelephone service in the USA was offered in 1946 in St Louis, Missouri, by AT & T and Southwestern Bell, allowing calls from fixed phones to mobile users. Even in its improved version, the service had relatively poor voice quality and was quite inefficient in its use of radio spectrum. Another system was introduced in 1956, which had almost 1.5 million users by 1964, when AT & T introduced an 'Improved Mobile Telephone System':

> Operation was in a manual mode; an operator could establish a call between two mobile subscribers or between a mobile subscriber and a subscriber on the PSTN. The mobile terminals equipped with electronic vacuum tubes were large, heavy, had high power consumption, needed shock-protected mountings, and were expensive.
>
> (Huurdeman 2003: 519)

Making more productive use of mobile radiocommunications by dividing spectrum

into cells, what was to prove a vastly more efficient and reliable method of mobile communications, was an idea first devised in the Bell Laboratories in 1947 (Farley 2005; Lucent Bell Labs 2004).[1] Transmission of signals was organised around a grid of interlocking, polygonal cells, rather like the honeycomb of bees. A phone would send and receive signals via the transmitter tower that provided dedicated service to the cell in which it was located. When the user moved location and passed from one cell to another, the responsibility for maintaining the reception of the phone would be passed from one cell base station to another. Radio spectrum could be shared far more efficiently, with greater overall capacity.

The Bell Laboratories were renowned for many scientific achievements and innovations, not least in 1948 Shannon and Weaver's famous theorem central to modern communication theory. Bell Labs developed a number of other technologies that also made the cell phone possible, such as important work on computers, computer languages, and software in the aftermath of World War II, 'programming them to switch telephone calls, turn radios on and off, change radio frequencies and automatically connect radios to the telephone system. These applications were the building blocks for what would ultimately become a network of mobile telephones' (Murray 2001: 18; cf. Bernstein 1984). Bell Labs scientists were responsible for pivotal research that went to the heart of the portability of cell phones, namely the replacement of bulky, unwieldy vacuum tubes with the transistor through the 1970s, making the mobile phone much easier to use (Brock 2003). Bell Labs scientists tried to address the issue of limited radio channels, such as finding ways to improve non-cellular mobiles by allowing phones automatically to find an open channel without the caller having to search manually for one (Murray 2001: 19). With improvements and the opening up of additional frequency bands (Brock 2003), subscriber numbers worldwide were estimated at 600,000 by 1985, but at the cost of severe network congestion (Huurdeman 2003: 519). In the late 1970s, trunking, or the organised sharing of channels by professional mobile users (such as taxi drivers, trucks, emergency services), was introduced, something which has survived into the present day (Huurdeman 2003: 519–20). Other countries developed their own versions of radio mobile telephones, but the prices of terminal equipment remained relatively high.

For all Bell Labs' technical innovations, however, AT & T for various reasons did not have the prescience, motivation, or conditions to capitalise on the beginnings of commercial cellular telephony, when it finally eventuated. AT & T had been enduring anti-trust investigations by the Justice Department, stretching over many years that culminated with Judge Harold Greene's famous consent decree that dictated the break-up of the monopoly. By January 1984 AT & T was forced to divest itself of its local telephone service, and created seven independent regional Bell Operating Companies (RBOCs; also known as Baby Bells). AT & T retained long-distance service and also its equipment manufacturing concern Western Electric (now Lucent Technologies, housing Bell Labs as its 'corporate

research' laboratories). The thorough and turbulent transformation AT & T was experiencing in the 1980s is one important factor in explaining why the company failed to position itself adequately in the new wireless services market. AT & T dramatically underestimated the future demand for cellular (cf. Murray 2001: 26), though it certainly would not be the first corporation to have difficulty forecasting the future (definitely captured at this time in de Sola Pool's striking 1983 study of earlier forecasts for telephony). Famously, AT & T's chairman Charles Brown indicated that the company would pass on offering cellular services, saying in a television discussion in January 1982 that AT & T would not compete for the custom of local businesses: 'all we'll do is to make the technology available' (quoted in Murray 2001: 27). The irony was palpable: 'The company that invented cellular telephony would have no part in the industry it spawned . . . until it would buy its way back into the industry a decade later, at a staggering price' (Murray 2001: 27).

While cellular telephony continued to be developed, and telecommunications policy and regulation moved towards market liberalisation, other mobile communications technologies became popular. In the mid-1970s, the Citizens' Band radio become popular, as a form of communications in trucks but also cars, immortalised in the movie *Smokey and the Bandit* (featuring Burt Reynolds) and its theme song, C.W. McCall's 'Convoy':

> Simple push-to-talk radios that allowed users to talk on a kind of party line system (no private conversations and no telephone connections were possible) . . . They were relatively cheap to buy and easy to use; they had no per-minute charges; they came with their own catchy jargon; and they were embraced by Hollywood and the music industry.
>
> (Murray 2001: 23)

As Murray notes, CB radios were made possible by integrated circuits, now also incorporated in other consumer goods: 'This new wave of microtechnology included smaller transistor radios, clocks, calculators and, eventually, two-way radios' (2001: 23). At the height of the CB craze, there were an estimated 50 million users in the USA, with as many as one in seven cars equipped with the technology (2001: 23). Murray interestingly suggests, however, that the enthusiasm for CB was seen as a popular culture fad and not worthy of serious recognition despite its extraordinary takeup (cf. Owen 1999 on the CB fad as a cautionary tale): 'the FCC [Federal Communications Commission] and most communications executives saw it as no more than a blue-collar fad; no one really recognized it as a clear indicator that Americans were clamouring to drive and talk on the phone' (Murray 2001: 24). Interestingly, we see the conventions of CB radio use, including the possibility of communicating with a wide group of listeners overhearing conversations – reminiscent of telephony party-line culture

that survived in rural areas until the 1990s – being reactivated in the push-to-talk mobiles of the late 1990s and early 2000s.

Paging services also attracted millions of users in the 1980s and early 1990s. The first telephone pager-like device was patented in 1949 by Alfred J. Gross, the Canadian also credited with inventing the first walkie-talkie, CB radio, and cordless telephone. Gross's devices were used in the Jewish Hospital in New York City (FCC 2004). The FCC approved the spectrum for public use in 1958 (FCC 2004), but it was Motorola that coined the term a year later when they made a small receiver to which radio messages could be transmitted. In 1974 Motorola introduced its Pagebay 1, the first successful pager for the consumer market (FCC 2004). As it achieved a stable definition as a technology, the pager was a form of messaging. It allowed a person to phone an operator and request a text message be sent to another person. The receipt of the message was announced with a sound (characteristically a 'beep', so pagers became called 'beepers'), and the person could then read the message. However, they needed to find a phone to call the originator of the message, or someone else, or to page someone else, until the development of two-way pagers.

The pager became widely used in business and industrial contexts. Pagers became, and still remain, part of the communicative and management practices and identities of some professions. Most notable, even iconic, is the use of pagers by doctors and other medical personnel in hospitals. Because doctors are engaged in various tasks away from their fixed phones (or not wishing to use their cell phones, and so be engaged in conversation), in meetings, or consultations, or treating patients on their rounds, they are contactable by pager (often needing to be so for reasons of emergency). In the 1970s, especially, with improvements in technologies, there was a growth in both pager demand and supply. According to the FCC, there were 3.2 million pagers worldwide in 1980, rising to 61 million by 1994 (after wide-area paging was invented in 1990) (FCC 2004). In the USA, for instance, in the lead-up to the Federal Communications Commission's auction of spectrum in the early 1980s, a number of aspirant wireless carriers applying for licences established or acquired paging businesses.

There was also some use of paging by residential customers, for personal and social reasons without the ostensible rationale of business or professional needs. A leading instance of this was in Japan, where paging culture was especially important for teenage girls and young women in the 1990s, co-existing with the emerging text message culture (as discussed in chapter 4). Thus, as a set of communicative and cultural practices, paging not only prefigured the potential mobility of cell phone devices; it also anticipated, and shaped, narratives and meanings that began to appear with text messaging.

Mobiles to market in the 1980s

In 1978, the US FCC called for industry proposals for a better land and mobile telephone system. AT & T's proposal was called the Advanced Mobile Phone System (AMPS), and was based on the cellular idea first conceived some decades before (Young 1979). In 1978, the first commercial cellular telephone systems were trialled, in Bahrain, and then in the USA, with Bell and AT & T piloting services in Newark, New Jersey and Chicago, and car-mounted telephones following within six months (Steinbock 2003: 97). In 1981, the US regulator awarded licences to service different areas. Ameritech, one of the 'Baby Bells' formed from the break-up of AT & T, offered the first commercial cellular service in Chicago.

The Japanese, however, had already begun what has been seen as the world's first cellular radio service in December 1979, with the Mobile Control Station system. Radio paging had been introduced in Japan in 1968 but the country had not otherwise had a public mobile radiotelephone system (Huurdeman 2003: 520; Steinbock 2003: 143–51). NTT's Electrical Communications Laboratories had been researching land–mobile systems since 1953, and in 1967 a technical paper was published proposing a nationwide cellular system (Araki 1968; Pempel 1978). This indigenous cellular system was piloted in 1975, leading to the 1979 launch.

Analogue cellular radio systems were introduced in other countries. The Nordic Mobile Telephone (NMT) was introduced in 1981, but was used in over forty countries (including those in Asia, Russia, and Eastern Europe); Total Access Communication Systems (TACS), a British version of AMPS, was first used in the UK in 1985, and then taken up around the world; various proprietary systems were mainly used in the countries that devised them, especially in France (Radio-Com 2000), Germany (C 450), and Italy (RTMS) (Huurdeman 2003: 521–4; Steinbock 2003). These systems were incompatible with each other, but played an important function in international competition as well as the buttressing of patriotic industrial pride (Funk 1998, 2002). The neat boundaries of national innovation systems started to blur considerably in response to forces of globalisation (Nelson and Rosenberg 1993; Niosi and Bellon 1994) and also to initiatives to learn the lessons of first-generation cell phones and devise common standards (Fig. 2.1).

Indeed other countries quickly outstripped the USA in cell phone subscription. Although from the 'pre-cellular era to the end of the analog era, US leadership in mobile communications paralleled the monopoly era in telecommunications' (Steinbock 2003: 111) by the early 1990s, there was a widespread perception that an opportunity had been squandered. One of the companies most associated with mobile phones in the 1970s and 1980s, and with first-generation cellular telephony, was the American firm Motorola. It was a Motorola chief executive, Martin Cooper, who in 1973 made the 'world's first' call on a portable, hand-held cell

Figure 2.1 Mobile telephone user on Westminster Bridge, London, c. 1986.

phone. This was the DynaTAC, a nearly two-and-a-half pound object, which soon received the moniker of the 'Brick'. Motorola promised that the DynaTAC system 'will ultimately permit personal radiotelephone service to be offered to hundreds of thousands of individuals in a given city' (quoted in Steinbock 2003: 223).

The importance of the portable device to subsequent cell phone culture cannot be overstated. However, it took some time for the portable cell phone to become widely adopted by companies and network operators. Even until the mid-1980s, there was a strong assumption among engineers, marketers, and managers shaping second-generation digital systems that cell phones would continue to be installed

and used in cars, and that portables were not viable.[2] Motorola did establish the portable cell phone as the dominant design (see Steinbock 2005: 43–4), and so became the market leader in first-generation systems. In 1989 Motorola followed up with the MicroTAC personal cellular phone, 'the smallest and lightest portable on the market . . . the size of a wallet and weighed less than eleven ounces', and then in 1996 the first wearable cell phone, the 3.1 ounce StarTAC (Steinbock 2003: 228–9). Despite these achievements, as Steinbock convincingly argues, Motorola was not well placed to move with the intense competition and globalisation of second-generation cell phones, finding it difficult to slough off its preoccupation with the USA, despite its presence in a number of jurisdictions as well as pioneering the Chinese market (2003: 213–41).

Digital cell

Broadly, the features of first-generation cell phones revolved around voice communications. A limitation of first-generation cell phones was not only the relatively low functionality, large size, and quality of handsets and the stage of evolution of mobile networks, but also the capabilities of the rest of the telecommunications network (known as the public switched telecommunications network or PSTN).

The telecommunications network had been engineered over a century for voice communication over circuits. From the 1960s onwards, data communications via the telecommunications network emerged as increasingly important, whether by telex, fax, computers, or modems. Decisive changes were transpiring because of a combination of technical, industrial, economic, and social factors. Telecommunications had become central to how people communicated with each other for friendship, family, civil society, government, or business purposes. Digitisation of networks in the 1980s and 1990s allowed their architecture to be changed, with fewer switching centres and hubs, greater use of computing and software, more network functions, and automated and remote maintenance. There also emerged new possibilities for information storage, and voice and data communications, and new forms of control (Mansell 1993). For instance, 'intelligent' network software allowed features such as calling number display, where the number of the calling party could be displayed or captured in a computer.

The processes of digitisation also involved cell phones. The second generation of cell phones was predicated upon digital technologies. Sound from a cell phone receiver was digitally coded, compressed, and transmitted via radio waves, then received and decoded, and could be heard by the receiver. Sharing of the radio spectrum could also be more efficiently managed through precise allocation of channels and transmission of data. The process of digital encoding and encrypting of the signal made it a more secure form of communication than its first-generation analogue predecessors, far more difficult to be intercepted (certainly by amateurs).

Various standards for second-generation cell phones were implemented, including the widely used Global System for Mobiles (GSM) standard (developed in Europe but deployed worldwide), the Code Division Multiple Access standard (CDMA; used in the USA but also in Latin America and elsewhere), and the Time Division Multiple Access standard (TDMA; also used in the USA and a number of other countries). Each standard represents different ways to deal with key problems of sharing spectrum and ensuring good connectivity. The new digital cell phone technology was accompanied with promises of better reception and voice quality, but brought problems too. For instance, the European GSM standard was designed to provide reception for the relatively densely populated countries of its region, and so the effective range of reception from base stations was approximately 30 kilometres. By contrast, analogue cell phones were designed for a range of reception of 50 kilometres, but often had an effective range of 70 or even 100 kilometres in some instances. Whereas the digital signal tends to break up altogether and reception becomes very difficult at 30 kilometres, an analogue signal 'fades' slowly rather than abruptly, a substantial problem for countries with many remote, sparsely populated areas.

The new standards for mobile telecommunications networks and the technical innovations they represented, not least with digital technologies, were closely related to new possibilities in the handsets. The cell phones themselves offered a much greater range of features. Most obvious was the address book, allowing phone numbers but also other details of contacts to be stored in the phone. Phone numbers could be stored in the subscriber identity module (SIM) card too, allowing the data to be easily transferred from one phone to another (Dietze 2005).[3] The capabilities of the cell phone were integrated with those of the network, so a person was now able to call up a friend's stored number and dial it, but also to store the details of a received phone number. Other features of digital cell phones included the clock, alarm function, calendar, calculator, and games. With greater sophistication in their displays, interfaces, and menus, digital cell phones, combined with the possibilities of intelligent telecommunications networks, were replete with new modes for controlling telephonic interactions. Key attributes of calls could be tracked, and data collated, such as calls sent and received, and the numbers associated with these; missed calls; the duration of calls. Voice messages (or 'voicemail') functions were integrated into the phone and network.

The cell phone in the 1990s, then, extended its range of features, and the repertoire of voice telephony it supported and shaped (Lindholm, Keinonen, and Kiljander 2003). Digital technology in cell phones also made possible something much talked about with respect to new media more generally: multimedia, or communication and cultural exchange through text, image, sound, and touch, as well as voice. In the immense activity and din around communications, culture, and media – whether under the banner of 'being digital', 'Information superhighways', 'the Internet revolution', the 'new economy', or the 'dot.com' boom

– the social and technical system of the telephone had become absolutely pivotal by the close of the twentieth century.

One of the most prominent of these new dimensions of digital mobile communications is text messaging. Text messaging allows phone users to key-in characters via the alphanumeric keyboard of their device, compose short messages, and send these to other phone users. The widespread adoption of text messaging from the early 1990s onwards was roughly contemporaneous with the explosion in another form of writing and text, namely electronic mail over the Internet (see chapter 4 for a discussion of mobile messaging cultures). As the capabilities of digital cell phones were steadily augmented and elaborated, a new term was developed to describe them – 2.5 (or second and a half) generation cell phones. 2.5G services especially feature multimedia applications, such as the ability to receive and send images or short videos, as well as audio capabilities (the most popular of which is probably downloading music to customise the ringtone of a phone). From the late 1990s to 2003–4 mobile messaging and other mobile data services became a lucrative segment of the industry. The narrative of an upward march through progressively advanced 'generations' of the cellphone was interrupted here. The 3G of mobile networks and phones was premised on technical systems and standards that finally made 'picture' phones a commercial reality (a long-cherished dream since their first appearance in the late 1960s). 3G phones offered the possibility of interactive video communications wherever the user happened to be located. As I discuss in chapter 10, the promoters of 3G have faced a number of challenges, not least the cost of licences and relatively slow take-up of video and valued-added rich data services.

Before closing this brief history of the development of the cell phone, it is worth noting that there are many other mobile communication devices that are articulated with or overlap with cell phones. Walkie-talkies and pagers, as I have already noted, but also portable digital assistants (PDAs), Blackberries, computers with wireless access, and digital cameras. Especially in the realm of digital technologies, there are many devices that have multiple functions and distinctive cultures of use – and there is much debate about whether these devices will converge into hybrid equipment or keep a separate function, or how such 'convergence culture' will be navigated by consumers (Jenkins 2005).

Imagining users

I have covered much ground in giving a potted history of the cell phone's development. What I would like to do now is to draw upon some vignettes of how cell phones were received, especially in the late 1980s through to the mid-1990s when they became much more commonplace and so came to public notice and prominence. For this purpose I often draw on examples from Australia, a country neither an early nor a late adopter of cell phones – but I am certainly aware of and am

keenly interested in the differences in how cell phones were received and imagined across different countries, a worthy project still to be undertaken.

Reminiscent of the telephone before it, the attention of those involved in marketing cell phones was first on the business user. As Lacohée, Wakeford, and Pearson observe, in its early days the 'mobile telephone was an elitist device mainly used for business by middle and upper class males' (2003: 205). In 1965 in the UK,

> an exclusive (and expensive) service called System 1 was launched in West London that was used primarily by the chauffeurs of diplomats and company chairmen. By 1967, use had trickled down to 14,000 privileged and wealthy users of the System 4 mobile telephone.
>
> (Lacohée, Wakeford, and Pearson 2003: 205)

When cell phones arrived on the scene, and started to become more visible in the mid to late 1980s, they quickly became tagged as a 'yuppie' status symbol:

> The yuppie age reached its zenith on the morning of October 18 last year. Standing among the rubble of San Francisco's earthquake was a posse of stockbrokers doing deals on portable phones. Undeterred by the restriction order that had been slammed on the San Francisco Stock Exchange until construction engineers could assess the extent of the earthquake damage, these young bloods were making the most of the available technology to carry on business as usual.
>
> (Head 1990)[4]

A 1987 survey of US cell phone users by the Cellular Telephone Industry Association found that 'fully 70 percent of cell phone users made more than $50,000 per year – well above the national average of $18,426' (cited in Murray 2001). The role of the cell phone as status symbol, and the mere fact of its possession as evidence of conspicuous consumption, took some years to shake off. In Australian debates on the reform of telecommunications, one consumer lobby group depicted mobile phone users as the very epitome of the new rich, winning at the expense of low-income and older people:

> The winners will be the yuppies and forex dealers and the broader business sectors. They are the principal user of long-distance and international services, and the owners, or rather the taxpayer-subsidised lessees, of all manner of mobile services . . . Prominent among [the losers] will be the low-income and housebound older people of Australia, who use the phone as a lifeline, rather than a business or recreational tool.
>
> (Barber 1990)

Yet at this time the cellular mobile was already starting to move beyond the circle of wealthy business users, executives, and the reviled figure of the merchant banker, to be avidly used by tradespeople: 'Yuppies, beware. Those carphone-toting merchant bankers are actually carrying a tradesperson's tool . . . the bulk of Australia's 80,000 mobile phone subscribers are sales staff, carpenters, plumbers and technicians' (*Business Review Weekly* 1989). With falling prices of phones, small-business and blue-collar workers started to use cell phones heavily. *New York Times* reporter Calvin Sims summarised the trend: 'When cellular mobile telephones were introduced four years ago, they were gadgets only of the rich and powerful. Now everyone from drug dealers in Miami to the taco vendor in Rockefeller Plaza has one' (cited in Murray 2001: 211).

If a technology is to become a 'black box', rather than a relatively unstable and unfinished project (Latour 1996), it needs to enrol supporters, especially users, who are completely taken with it: 'From the BMW-driving yuppie showing his latest status symbol on the freeway to the tradesman taking calls out on the job, we have fallen in love with cellular phones' (Kavanagh 1989). Telephones had become unremarkable by the 1980s, and their reconfiguration and expansion could pivot on this achieved domestication (Haddon 2003): 'Today's lifestyle revolves around the phone and there are few homes in Australia which can function comfortably without one' (Gibbs 1990). The discourse on the mobile phone quite quickly shifted to emphasising its usefulness, indeed that this technology was essential. This is clearly observable in the articles by specialist technology writers, reliant on industry marketing information: 'mobile phones have become a permanent part of life. They have been essential for business and even social communication, with users ranging from corporate executives to the one person company, from tradespeople to husbands and wives' (Cantlon 1992).

Writers sought to address the perception of the technology as a species of conspicuous consumption: 'The age of mobile communications is, however, not solely the preserve of the yuppie. Small business people are finding the ability to communicate with their office or customers at any time is not a luxury but a necessity' (Head 1990). Testimonials were offered to underline the point. Cell phones were a must not only for builders, for instance, but also for their wives, as this risible account of gender and the phone reveals:

> Mr Hamilton, a builder, finds it handy to have one phone in the car and one he can take up ladders, Mrs Hamilton said. She has just begun working again, now that her two children are at school, and she has found she needs a phone.
>
> 'I'm running around and visiting people for my mother-in-law, and I've found I need to be in contact', she said. 'I need one of my own. Jim's is so bulky and it won't fit in my handbag without bending the aerial . . . I like to know I can be contacted anywhere', she said.
>
> (Powell 1992)

As cell phones diffused through different demographic groups, there was a shift in how the device was perceived and represented. Reviewing media coverage of cell phones in the late 1980s and early 1990s, for instance, it is hard not to be struck by the many articles that report and turn upon the novelty of the technology, such as this representative item:

> On Thursday afternoon, as he was being wheeled in a humicrib from a delivery room at Royal North Shore [hospital] three minutes after birth, Kai McConnell was howling into a phone held by his grandmother and listened to by his great-great-aunt.
>
> (Column 8 1992b)

Stories began to be told about the ways that mobiles reconfigured place. A real estate agent could not find the builder he had arranged to meet – only to discover eventually he was in Richmond, New South Wales, rather than the town by the same name in another state entirely (Column 8 1992a). The posturing of the mobile phone user became a commonplace for social satire: 'About 300 people turned up for lunch, bringing their mobile phones for company. It was rumoured that . . . they had instructed their office to phone them every 15 minutes' (Robertson 1991). Later a discourse was commenced on the ubiquity of mobile phones in everyday life, but disquiet was voiced too: 'Portable telephones have come a long way – but now they're trying to take over our whole lives' (Jones 1998). Mobiles were seen as a symbol, or indeed a cause, of the changing boundaries between work and leisure, public and private spheres. For some they offered new possibilities for flexible working. For others they signalled problems with paid work increasing and invading the domestic sphere: 'Busy schedules, mobile phones, laptop computers and job insecurity have also made us reluctant to take holidays' (*Daily Telegraph* 1997). New groups, not culturally coded as technologically adept, were newsworthy for their enlistment into mobile practices:

> Elderly people of the 90s have embraced the electronic age with gusto and marketers are hot on their heels. In the build-up to Christmas, the elderly have been targeted as a group who prefer gifts such as mobile phones and Internet link-ups instead of comfy cardigans or bath salts.
>
> (*Daily Telegraph* 1996)

Even the poor might be a possibility, with a Telecom marketing manager citing the 'example of the British television programme called Bread where the Boswell family of Social Security dependants rely on the mobile phone for almost all their communications' (Head 1990). Nonetheless, the whiff of fatuity or uselessness did persist, after the yuppie label became less common, and sometimes applied to specific groups whose behaviour deviated from the norm: 'Childless couples will

make up almost 30 per cent of the population by 1999 and are splurging on toys such as mobile phones, new research shows' (Bye 1997).

As the cell phone began to become popular in the early to mid-1990s, for young people it became an object of considerable commercial desire: 'Mobile phones are no longer exclusive to the business community and Yuppies, with young people representing the market's highest growth segment . . . [Telstra's] new commercial speaks to young people in their own language, using big, bright and bold images' (Hornery 1995). This raised mixed feelings, however, among the wider community. In Australia, as elsewhere, the use of mobiles in schools, for instance, became the 'great mobile debate' (Wood 1997), with phone companies targeting teens and pre-teens (though not necessarily being keen to acknowledge this): 'Newington College [a private school in Sydney] is gearing up for a bunch of 10-year-olds who want to keep in touch with the Jones boy. That's Todd Jones, 10, who never leaves home without his mobile' (Wood 1997). One columnist reproved dominant provider Telstra for its juvenile marketing, when it offered a NEC 'Sportz Digital' as a special back-to-school deal: 'I'd have thought Telstra could sell enough mobile phones to adults in this country, without homing in on the school kids' (Gibson 1997). What especially raised the hackles of the scribe were early intimations of girl-power:

> But there's no prize for guessing why Telstra used a young lady in their advertisement. It's because young ladies spend most of their waking lives on the phone. Young ladies pick up the telephone when they turn 11, and don't put it down again until they're 18. Giving a young lady her own personal digital mobile is like giving Saddam Hussein a scud missile. Someone is going to get hurt.
>
> (Gibson 1997)

As cell phones became widely used by young people, the financial consequences of heavy use became apparent – not least because this is often one of the first contracts into which young people enter. Spending on cell phones appeared in omnibus national surveys as a significant area of expenditure (Eastway 1997), and credit management problems began to raise concerns (Cox 1999; Funston and MacNeill 1999), but by this time cell phones were an integral part of youth culture – and subject to frequent moral panics because of it (as I shall discuss later in the book).

Cellular uses

I have only been able to offer a few impressions of the ways that the cell phone was discussed and represented as it became incorporated into everyday life and popular life. I will take up this aspect of cell phone culture later on, especially in

chapters 6 and 7 (not least concerning representations of cell phones and young people). To draw to a close this account of the early diffusion of the cell phone, I would like to consider how too often we narrowly define what we mean by such a technology, and what tends to lie outside conventional histories.

Much research and public discourse on cell phones has been entranced by the novelty of the device. It is not saying anything new to observe that there are real problems with this approach, of course. We need to be attentive to the career of a technology as we write its biography. The settled, more-or-less agreed upon (or still disputed) form of a technology takes some time to emerge, and is historically, socially, and culturally very specific. In considering how researchers establish the limits of the cell phone as an object of study, Leslie Haddon asks: 'what might be the boundaries of what we consider to be a communication practice within this repertoire? . . . how broad a vision should we have of what elements count as communication?' (Haddon 2005: 8). Haddon argues that 'we should always try to imagine what could count as communications-related practices that go beyond, but help to make sense of the more detailed patterns of communication' (2005: 8). Reflecting on the history of computing, and how researchers grappled to understand popular computing as it emerged in the mid-1980s especially, Haddon makes the point that computing is not just what happens in a narrow dyad between the computer screen and the user. Rather it was important to 'consider all the acts related to "computing" ' (2005: 8). As a number of studies of computing and the Internet bear out (Hine 2000; Lally 2002; Miller and Slater 2000), especially those influenced by anthropological and ethnographical approaches, we need to think more broadly about communication. Haddon suggests that:

> Thinking of the mobile phone more generally, we might include the way in which we control mobile use, such as controlling who the mobile number is given out to, switching it off and switching it to voice mail. These can all either shape 'use' or may be considered to be a part of an expanded definition of 'use'. We might also include how people talk about communications, such as the way they exchange information about how best to exploit mobile tariff structures. Then there are practices such as changing SIM cards or else people borrowing someone else's mobile phone if the mobile phone network of the person being called means this is cheaper or effectively 'free'.
>
> (2005: 8–9)

We will consider a multitude of such practices in relation to texting in chapter 3, but for the present it is worth considering such a broader conception of communication and use. Haddon counsels researchers to look at how such broader sets of actions can 'modify the communication act' (2005: 8). In tandem with this approach, we might care also to bring culture to the fore as a key concept. Some

of the practices Haddon indicates here, and others I will proceed to mention, can also be seen as cultural practices, associated as they are with matters of articulation, expression, identity, and meaning. Cultural studies practitioners have been especially interested in the practices of everyday life and the constitution of popular culture, and so I would like to reframe Haddon's useful account from this standpoint. Accordingly, a history of the development of cellular voice telephony needs to bring together a number of prosaic yet important things.

First there is the dialectic between adoption (whether of the avid, uncaring, or reluctant variety) versus resistance to cell phones. Foreswearing technology of different sorts, but especially in recent times of computers, the Internet, and phones, has been a recurrent motif of discourses, shaping meanings and uses of cell phones. Such a discourse has been especially acute with the cell phone, as we noted from the conversations and even clamour accompanying its appearance on the scene, and is still continuing. Perhaps this is due to its potential greater ubiquity than some other information and communication technologies; but especially because the cell phone represents a challenge to and transformation of the accepted cultural place and social relations of voice telephony and telecommunications.

Second there is the relationship between 'use' and 'non-use'. When is it appropriate to switch a cell phone on or turn or leave it off? Or under which circumstances do users choose not to receive calls? What do such acts or omissions signify? And when did they develop?

Third, what of the many uses designed, devised, or arising unexpectedly, during the domestication of the cell phone? During the 1980s and 1990s, for example, telephone answering machines were introduced as an adjunct to the telephone instrument and telecommunications network. The machine could receive a call automatically, and record a message for the subscriber to play back at leisure. The introduction and diffusion of telephone answering machines occasioned a debate in its own right, now perhaps forgotten for the most part. Many people took great offence at being asked by a machine to leave a message, rather than being able to speak to their intended interlocutor. Others welcomed the facility for its ability to relieve them from staying at home or in their office waiting for the phone to ring. Or for the possibility simply to record or overhear who was calling, or even to dodge unwanted calls, rather than to need to be a slave to the telephone and always answer. Answering machines were incorporated into the cell phone via a network answering and recording device that became widely known as 'voicemail'. Given it resided in the network, voicemail could also be used in conjunction with wireline phones, and grew in popularity. It is arguable that voicemail has been much more closely affiliated with the cell phone, not least, latterly, because of the possibilities for alerts (beeps, tones) to indicate when a message has been received.

In carefully observing the cultural practices that are associated with the cell

phone, we find that the boundaries around what counts as a cell phone, or is constellated by such a technology, can look quite different depending on where these are drawn. For instance, the customisation of cell phones is a vital part of cultural practice, representation, and identity, as the work of Larissa Hjorth and others have shown (Hjorth 2005 and 2006), yet is still not often taken seriously. Similarly the framing of the cell phone as a part of the codes of dress and cultural field of fashion became extremely significant from the mid-1990s, as I discuss in chapter 3. For the most part, detailed cultural histories of the early uses and representations of cell phones have yet to be undertaken, yet how such uses were imagined, and what cultures of use did actually emerge, exert much influence upon the production of such culture – even in the realm of the production of commodities and consumer and brand identities to which we now turn.

3 Cool phone: Nokia, networks, and identity

> . . . a little Le Corbusier, a little Matrix . . .
>
> (*Vogue* on the Nokia 8860, Sullivan 2000)

> Just as Marimekko had rethought the idea of the dress, Nokia rethought the idea of the telephone.
>
> (Steinbock 2001b: 272)

> The name rings a bell but can't say why? Maybe, because one has been glued to the box watching the test match at Old Trafford . . . Off the field it's the largest mobile telecommunications network company in the world with interests in mobile networks in 29 countries across five continents. Vodafone has just signed a three-year sponsorship deal with Ferrari Formula One to adorn the team's cars with its quote mark logo . . .
>
> (Pandya 2001)

Culture is something that is actively produced and consumed. In contemporary capitalism this production of culture involves large-scale, systematic relations of the creation of image, significance, sensuousness, and tactility, with many actors involved. For producers of the sorts of commodities that communications technologies have become, this involves intense, creative labour and capital around the discourses and practices of advertising (Frith and Mueller 2003); identities of things and the corporations that marshall their production and circulation; branding; imagining audiences, users, and consumers (Cronin 2004); and the reflexive and recursive recuperation of knowledge about consumption in the production of culture. Such an enterprise was demonstrated in *Doing Cultural Studies*, through du Gay et al.'s analysis of the different sorts of corporate myths, brands, and advertising that were devised and deployed to make the Sony Walkman attractive for prospective buyers.

The roles of image-creation, advertising, and design have been fundamental in the production of cell phone culture. To open up this topic, this chapter looks at two key case studies that illustrate the cultural design and production of mobile

Notes

2 Making voice portable

1 Apparently D. H. Ring devised the idea of cellular radio in a Bell Laboratories technical memorandum entitled 'Mobile telephony – wide area coverage', dated 11 December 1947 (Farley 2005).
2 One of those integrally involved in the European second-generation GSM digital system, Hillebrand records that the support of hand-helds as a mandatory requirement of the GSM system only occurred in June 1985. However, 'for a long time it remained unclear, whether the basic technology choices would really allow the building of small and cheap hand-helds with a low power consumption' (Hillebrand 2001e: 273).
3 The subscriber identity module (SIM) is a smart card that stores the relevant details of the phone subscriber and network, allowing these to be transferred to, and used by, a different handset.
4 For further discussion of the history of cell phones in Australia, see Goggin 2006.

3 Cool phone

1 On Nokia I rely in particular on two thorough studies: Martti Häikö's *Nokia: The Inside Story* (2002), an English abridgement and translation from the Finnish of his three-volume official corporate history (Häikö 2001); and Dan Steinbock's *The Nokia Revolution* (2001b).
2 Good information, modification software, manuals, and illustrations related to these and other early Finnish phones can be found at the 'Finnish Made PMR, Trunking and Cellular (NMT) Phone Amateur Radio Conversion' website: http://oh3tr.ele.tut.fi/english/modifications.html.
3 In a later study, Steinbock notes the similarities between Motorola's humanistic 'people values' of the mid-1980s and the late 1990s 'Nokia Way', surmising that the former's values 'became benchmarks for Motorola's Nordic rivals, including Nokia, as they engaged in internationalisation efforts of their own' (Steinbock 2003: 214).
4 For my understanding of Vodafone corporate development, I am indebted to Trevor Merriden's lively 2003 study of the corporation through the figure of CEO Chris Gent, and also Peter Curwen's succinct, useful case study focusing on the firm's reorganisation in the 1997–2001 period (Curwen 2002: 162–93).
5 Those involved in a web of interlocking share holdings and directorships included French mobile operator Vivendi (through CEO Jean-Marie Messier) and the Hong Kong conglomerate Hutchinson Whampoa (owned by billionaire Li Ka-Shing). Hutchinson held a 44 per cent stake in Orange at that time (see Merriden 2003: 49–64 for discussion), but also held stock in Vodafone (Doward 2001).
6 Given the Orange mythology of simplicity, it is interesting that by 2005 observers were discerning a jaded company no longer having distinctive brand connotations:

> 'The problem is, Orange is all over the place,' says one leading agency chief. 'There's nothing to hold on to, no core strategy. It's almost impossible to say what the brand stands for any more. It's a real shame, because Orange used to be the best case study for a brand launch we'd ever seen . . . you find that there's still some cool left over from that original campaign even though it's over ten years old.'
>
> (Armstrong 2005)

7 Vodafone had also been negotiating with Formula One racing team Jordan, who in 2003 sued the phone company for breaking a verbal agreement when it signed with Ferrari instead (Blackstock 2003).
8 Bird formed a partnership with French defence communications technology Sagem and later with Korean and Taiwanese manufacturers and designers for components (Spurgeon and Keane 2005).

4 Txt msg

1 As well as these issues that Hillebrand chronicles, he also notes the complacent attitude in the ISDN community, as many 'saw the GSM service as a small service compared to ISDN and did not co-operate intensively' (2001e: 273). This was reinforced by the rhythms and assumptions of the traditional telecommunications culture with its enshrining of the standards setting, and so much of the technology shaping process, in the International Telecommunications Union (ITU): 'The market needs of GSM had no weight in the definition of such timetables' (2001c: 273). A delegate with an electronics background involved in the design of GSM remarks that 'we were modelling GSM on ISDN, but there were no textbooks on ISDN then – the knowledge was mainly in the PTTs [post-telegraph-telephone administrations; that is, the government-owned national carriers]' (Cox 2001: 287).
2 Another GSM standards participant, Kevin Holley, remembers that:

> During 1988 interest also increased in the cell broadcast service. The basic concept was to make text available to all phones in a particular area when they are idle (i.e. not in any kind of call). The text could be general information or 'teasers' which encourage users to make revenue-generating phone calls . . . it was envisaged that a whole range of information could be made available to users, however as the service proceeded to market it hit problems with handset implementation and investment by network operators.
>
> (Holley 2001: 418)

3 Regarding 'immediate display messages', Holley surmises that these 'caught the imagination of the more technically aware teenagers, who call them "flash text" ' (2001: 420).
4 Unicode is a common character code standard defined in 1992 that seeks to be universal in covering all major written languages, across all computer platforms and programs (see http://www.unicode.org/).