

Mobile Communications

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MOBILE COMMUNICATIONS

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Part 1

**MOBILE
TELECOMMUNICATIONS**

1 INTRODUCTION

1.1 COMMUNICATION WHILE TRAVELLING

The pace of our daily life has been increasing for several decades. Our needs have multiplied as new products have appeared and then been replaced after a few years, or even months, of existence by a more fashionable product or one of higher performance. The life cycles of the technologies used in consumer and professional electronic products are also becoming shorter. This acceleration is an inherent fact of our consumer society.

Lifestyles and the relationship between people and machines are changing due to the multiplicity of ephemeral consumer products. Objects no longer have a history; they are merely tools which fulfil a predetermined function.

Personal portable products are of a new type which has appeared among these impersonal objects. This category includes watches, pens, wallets, handbags, calculators, portable radios and pocket telephones.

As these products for the pocket are carried on one's person, they belong in a very personal way and have, therefore, a specific identity corresponding to the image which they are given.

In the evolution of lifestyles, the explosive increase of travel and time management are major factors. The pocket telephone is, therefore, remarkable for two reasons. It is not only an impersonal tool or product but is also very much a personal portable product. The possibility of distant communication while travelling, being able to call or be called at will anywhere at any time permits the pocket telephone to be often considered as a desirable, almost magic, personal item.

The end of the twentieth century will see the appearance, as stated by Jacques Attali in *Lignes d'horizon*¹, of mobile devices; the pocket telephone is one example of these. These next ten years will see the explosive growth

¹Fayard (1990).

of mobile services which affect the general public. This book, therefore, attempts to define the evolution of current and future mobile services which have led, or will lead to, the birth of the pocket telephone market for both the professional and general public.

1.2 COVERAGE AND OBJECTIVE

This book is concerned with all civil mobile telecommunication services and products. Radio and satellite broadcasting systems and mobile systems for military use are intentionally not covered.

To analyse the current position of mobile products and services in Europe and the developments in this area during the next few years with the emergence of European telepoint, paging and digital radiotelephony services, some basic technical aspects of these systems will be presented in the first part of the book. The statutory aspects associated with the provision of European telecommunication standards will also be addressed.

The second part includes an exhaustive analysis of civil mobile services, including the outlook and strategy of those involved in this sector—standards organisations, operators, manufacturers, distributors and users of mobile telecommunication services and products.

The third and last part attempts to describe the foreseeable developments of this changing sector to the year 2000. The emphasis is on the birth of the pocket telephone and its industrial and political implications for the European economy in the face of world markets.

The object of this work is to present, thoroughly analyse and assess the prospects for the mobile civil communication sector at European level together with an overview of those involved. The ideas and opinions presented in this book are personal to the authors.

The book is not, therefore, restricted to communications professionals; it is for all who wish to know more about their telephone and seek a solution to their mobile communication requirements.

1.3 MODE OF USE

To assist the novice reader, the book has been planned with several entry points. Reading is not necessarily sequential, although unity is provided by three linked parts. These parts can initially be considered to be independent. The work may be approached as follows.

The first part may be reread in order to grasp the implications of the technical and statutory constraints on the development of current and future mobile services as described in the second and third parts.

Similarly, the chapters in the second part can be tackled separately according to the needs or interest of the reader. Each chapter covers one particular type of mobile service (radio paging, private radio communication, cellular radio communication, cordless telephony, marine, satellite and aircraft communication) which is treated comprehensively and independently.

The third part presents the evolution of mobile services and their economic and political implications. This can also be tackled separately from the rest of the work but it does require previous knowledge of mobile telecommunications.

1.4 HISTORY AND IMPORTANCE

In the next ten years, mobile communications will experience an upheaval comparable to that experienced by aviation and the motor car since the start of the century, and computing since 1950.

Mobile communications using private networks remained in their infancy until 1970. Subsequently it has seen a large increase with the introduction of radio telephone networks and cordless telephones. In the next ten years there will be an explosion of mobile services under the combined pressures of technological progress in information processing and strong market demand.

Experts predict that in the year 2000, from 20 to 40% of telecommunications operators' revenue will be from mobile services with fifty million subscribers in Europe and one telephone in two will be cordless.

1.5 PROSPECTS FOR THE EUROPEAN POCKET TELEPHONE

There are four aspects to the European pocket telephone; these are technological, economic, manufacturing and sociological.

In the technological area, finalisation, validation and establishment of European standards to permit the installation of easily usable infrastructures and miniaturised low cost terminals are being realised for various mobile radio communication services and products; this was a very ambitious gamble initiated in the 1980s.

In the economic area, the pocket telephone represents a considerable opportunity: of the order of 60 thousand million ecus per year is envisaged for products and services by the year 2000. It is the fastest growing telecommunication sector, of the order of 20% per year.

In the manufacturing area, the pocket telephone is an opportunity for European industry provided that European regulations and initiatives are put in place. A lack of short term vigilance would be disastrous for the European terminal industry whose main weakness is associated with the European electronic component industry.

Finally, from the sociological point of view, our way of life will be made easier for some and restricted for others by the portable pocket telephone. Previously limited to public authorities, government and the armed forces, the cordless telephone became available to the professional and the general public in the years between 1970 and 1980. In its pocket version, the telephone becomes multidimensional, both a tool bringing knowledge and power to the bearer and a fashionable, fun object, indicative of our ubiquity.

2 TECHNICAL CONCEPTS

2.1 DEFINITIONS

2.1.1 The radio communication system

There are numerous definitions of telecommunication systems in general and radio communication systems in particular. The most general is a set of facilities which permits terminals to be interconnected via at least one cordless or radio interface, called the air interface. Here, the use of 'terminals' implies radio or other types of communication terminals if communication between a wired terminal, a telephone receiver and a cordless terminal is involved. Fig. 2.1 illustrates this general definition.

This definition applies to the different networks and types of radio communication described in Part 2—personal pagers, private radio communication, cellular radio telephone, cordless telephone systems, mobile communication by satellite and in aircraft. It is clearly evident that the terminals are not part of the network although their specification depends on it, particularly by its physical characteristics and communication protocols used at the air interface.

2.1.2 The constituent elements of a system

There are two classes of network—public networks and private networks. Public radio communication networks are connected to the public communication networks such as the telephone network and other public networks of the X.25 and ISDN type. Private networks are not authorised for connection to the public networks. A public radio communication network is thus often represented as a specific subsection of a more general public communication network.

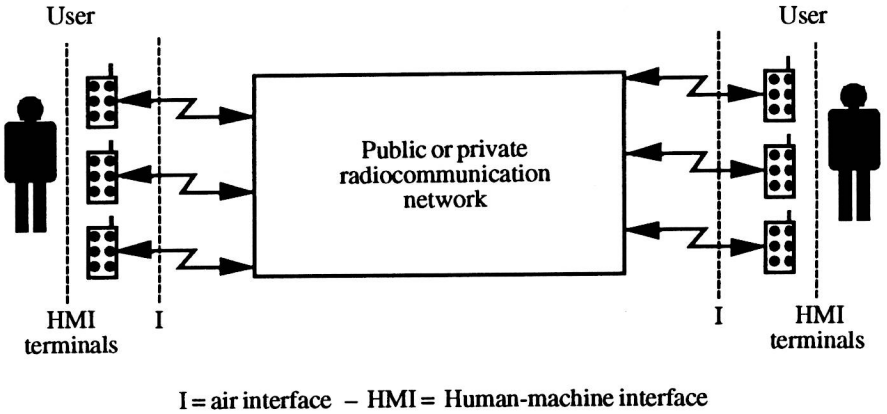


Figure 2.1 General definition of a radio communication system

The radio communication network itself can be subdivided into three subsections or subnetworks: the switching subnetwork, the radio subnetwork and the operating and control subnetwork.

- 1. The function of the switching subnetwork is the routing of calls. It updates the data concerning users of the service, their subscriptions and their location. It is sometimes integrated into the public network as in the case of radio pagers.

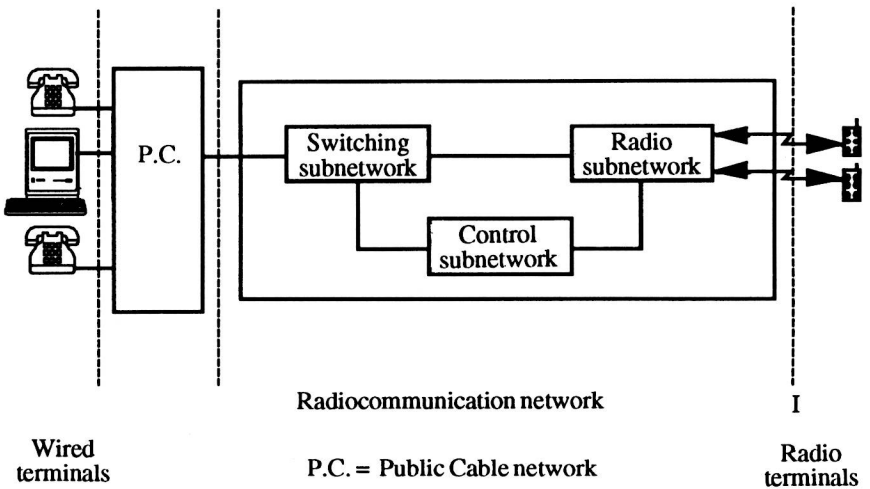


Figure 2.2 The constituent elements of a system

- 2. The function of the radio subnetwork is transmission and reception; it consists of radio equipment called base stations. There can be up to 600 in a national cellular radio telephone network.
- 3. The operating and control subnetwork has the function of supervising and controlling the radio and switching subnetworks. It permits centralised control by the operator.

2.1.3 The constituent elements of a terminal

As with networks, terminals can be divided into subsections: the radio subsection, the logic subsection, the power supply, the user interface and the network interface.

- 1. The functions of the radio subsection include reception and demodulation, modulation and transmission (if provided) and frequency synthesis.
- 2. The radio subsection is controlled by the logic subsection; this includes, in the case of digital terminals, signal processing elements for coding and decoding of the information to be transmitted, encryption, error protection and error correction mechanisms.
- 3. The power supply subsection is sometimes included in the logic subsection; it includes the necessary interfaces with the various types of power supply such as portable batteries, vehicle batteries, the mains and battery chargers.
- 4. The user interface often includes a keyboard and numeric or

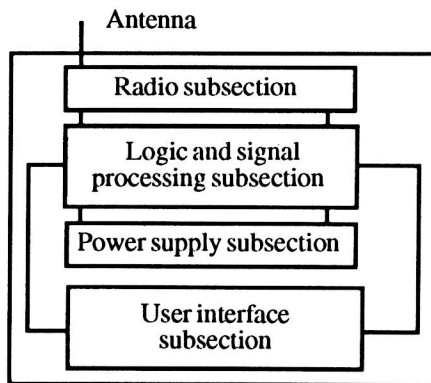


Figure 2.3 The constituent elements of a terminal