

The *New* McGraw-Hill Telecom Factbook

Second Edition

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PREFACE

You're reading the second edition of the best-selling *McGraw-Hill Telecom Factbook*. Shortly after its 1993 debut, the *Factbook* ranked sixth in sales among McGraw-Hill's broad selection of technical books. In more recent years, despite an unparalleled rate of technological advance and market development, the original *Factbook* has repeatedly captured the monthly "bestselling technical title" spot at Amazon.com, the highly successful Internet-based bookseller. Perhaps most significantly, McGraw-Hill has received more requests for update of the *Factbook* than for any of its other technical books.

Why such a high level of interest in the *Factbook*? There are two principal reasons. First, while most enterprises need telecommunications products and services, a rapidly growing number can't exist without them. Maintaining competitive edge and improving profitability are increasingly dependent upon telecommunications resources, thus making the topic of critical interest to enterprise decision-makers.

The second reason for the *Factbook's* popularity is that its originally stated objective—to present telecommunications technologies in a manner easily understood by business people with nonengineering backgrounds—has been met with a level of success rarely achieved in the technical publishing industry.

Benefiting from the Telecommunications Revolution

The United States telecommunications industry, currently growing at 8 to 12 percent per year, reached \$450 billion in 1999 and is projected to be worth \$690 billion by 2004. As the established leader for new telecommunications technologies, products, and services, the United States accounts for nearly one half of the global market. Because businesses expend a large share of the dollars that create the market, business people have a vital need for knowledge that permits them to select the array of services providing the greatest benefit and competitive advantage at the lowest cost.

To succeed in today's workplace, people must be able to exchange information quickly and accurately. Job content is therefore increasingly influenced by telecommunications. Required business management skills now include knowledge of available telecommunications services, their application to changing organizational needs, the ability to work with technical professionals, and the expertise to acquire and use telecommunications services efficiently and cost-effectively. The pivotal role that telecommunications plays in private and business arenas is amply demonstrated by its spectacular growth-rate statistics, a few of which are mentioned below.

Over the past decade or so, U.S. telecommunications usage has grown at an unprecedented rate. From 92,000 cellular telephones in 1984, the number of wireless subscribers grew to 86 million by 2000, a growth rate of 60 percent per year! Complimenting these impressive U. S. statistics, by 1998 worldwide wireless subscribers totaled over 200 million with 50,000 new subscribers added per day.

Matching eye-popping wireless growth, starting with 80,000 in 1989, by 1998 the number of devices accessing the Internet reached 147 million, increasing by 67,000 per day. With 850 million Internet World Wide Web (Web) pages to peruse, in 1998 the average call duration was 30 minutes, an increase of 55 percent over 1997. Even more startling is a recent prediction, published by Motorola, that there will be more mobile devices than PCs connected to the Internet by the end of 2003.

To place current growth rates in perspective, consider that although it took a century to reach 700 million wired telephone subscribers, respected industry leaders predict the next 700 million will be added in just 15 years. And, in those same years, 700 million new wireless subscribers will also be added. To keep pace with this demand, between 1998 and 2000, over 1,000 new service providers have appeared. The evidence then is compelling. A telecommunications revolution of astonishing proportions is now underway, a revolution propelled by its own dynamics, and augmented by similar developments in the data processing industry.

What becomes evident in reading this book is that the revolution consists not just in exploding service, subscriber, network, and product statistics. Rather, these skyrocketing numbers presage an even more profound revolution, that is one in which information technologies are being applied in ways that radically alter how business advantage is created.

On the plus side, growth, rapid technological development, and sweeping regulatory changes are creating an astounding number of

new opportunities for technology providers and consumers alike. On the down side, so many options are being created that merely remaining abreast of developments has become a major managerial challenge.

Even for telecommunications professionals, keeping up-to-date on the plethora of public and private offerings for the delivery of voice, data, imagery, video, and other telecommunications services is now a formidable task. Moreover, among engineers with such technical expertise, rarely does one find sufficient business acumen to, on their own, adapt information technologies in ways that lead to new and innovative business processes and capabilities.

By the same token, it is difficult for business people to articulate their needs in terms that telecommunications professionals can understand—and that suppliers can address with accurate, competitive proposals. What is required is a “knowledge bridge” between business needs and the growing spectrum of telecommunications offerings. *The New McGraw-Hill Telecom Factbook* is designed to satisfy that requirement.

Objectives

The principal objective of this updated book remains to provide a comprehensive introduction and insightful perspectives into modern telecommunications services and their underlying technologies. A second objective—no less important than the first—is to employ a presentation style easily understood by government and commercial telecommunications planners, managers, users, and professionals who do not have the time to sift through multiple publications, complex formulae, and mathematics only to be forced to draw their own conclusions regarding technology, performance, and market alternatives.

All important telecommunications services and technologies are treated, but the quantity of information is limited to that needed for a complete understanding. In addition, rather than just treating topics individually, expert interpretations provide a valuable grasp of “bottom line” relationships among emerging services, technologies, and industry standards.

Simplicity of presentation style does not sacrifice the ability to familiarize readers with industry terminology and essential concepts—which is often the case with introductory material. To accomplish this, we systematically present basic definitions as part of expla-

nations of larger concepts. This equips the reader not only with terminology, but also with rationale behind real-world applications, a tremendous advantage for thorough understanding and memory retention.

In this respect, perhaps the feature of the original *The McGraw-Hill Telecom Factbook* contributing most to its popularity and effectiveness is the rich array, quality and clarity of its over 160 figures. Using these figures the book goes far beyond simply identifying and defining panoplies of services and technologies. Inimitable technology taxonomy charts form the basis for uncommonly clear explications that fully apprise readers of essential differences and the practical advantages among alternative technology options.

Plan of the Text

Although many of its topics are subjects of individually published textbooks, as noted our book's material has been carefully selected so that readers do not have to deal with more information than necessary to achieve learning objectives.

Under this approach, new material is placed into the context of material already presented, highlighting topic interrelationships while minimizing text length and complexity. Accordingly, the book begins by defining telecommunications and its essential terms. Telephony and the historical development of voice networks are treated next. This ordering is selected since the majority of U.S. network traffic is still voice, and the lessons-learned in achieving the impressive capacity, quality of service and reliability characteristics, so long associated with today's voice networks, apply to and must be embedded in tomorrow's integrated information networks. Furthermore—at least during some transition period—the next-generation networks will evolve from, or at least be required to “interwork” with existing voice networks.

Thus Part 1, Introduction, begins with terminology and background material that can be covered in several hours. Because government legislation and regulation have had such profound impacts on U.S. telecommunications, a historical review of the structure it has imposed is presented as a foundation for succeeding technical material.

Part 2, Telecommunications Fundamentals, describes and explains the primary telecommunications systems “building-blocks,” that is the transmission, multiplexing, switching and advanced networking ele-

ments. If these terms are unfamiliar, you need not be concerned since Part 2 begins with an easily understood expository of basic concepts, techniques and devices. This knowledge enables readers, even those with no engineering background, to fully understand the operational principles and performance characteristics of all elements upon which telecommunications networks—and the services they render—are grounded.

Does that mean that reading this book prepares one to design “packet switched,” “circuit switched,” or “asynchronous transfer mode” networks? No it doesn’t! But what the first edition proves it will do for even non-technical readers is impart a clear understanding of the purpose, operation, applications and advantages of all major telecommunications technologies.

With Part 3 the book’s focus shifts from telecommunications fundamentals and building-block technologies to the truly vast number of telecommunications services of relevance to business and residential users. Parts 3 and 4 present voice and data services at the premises, metropolitan and wide area level, with supporting traffic engineering, service selection criteria and methods. In Part 5, all forms of terrestrial and satellite-based wireless service are identified, explained and compared. The terrestrial category treats cellular, PCS, paging, specialized mobile service, mobile data, and existing and emerging fixed-location wireless services. The satellite-based category addresses handheld or vehicular terminal, transportable terminal, and VSAT-based services.

Of course, writing about any rapidly developing technical subject is much like aiming at a moving target. While much of its content addresses telecommunications principles and terms of reference that are relatively unchanging, the updated book retains the first edition’s modular structure, one designed to facilitate new editions to take into account ongoing U.S. and global telecommunications developments.

To help readers anticipate new developments and minimize “future shock,” Part 6, Outlooks for the Future, presents summary conclusions and postulates likely trends and outcomes. As in the first edition, this part incisively examines past super-performers to determine what characteristics earned them “killer,” or less violently, “key” technology/application status. The analysis not only facilitates a pedagogically effective summary, but in fact reveals a number of attributes that appear to be “common denominators” in many of the most successful developments to date. Finally, all parts and chapters of the book emphasize available telecommunications services, and corresponding business applications.

As you begin this book, please know that its authors have expended every effort to make it both a highly rewarding learning experience and as enjoyable and as easy to read as possible. Should this second edition be as popular as the first, there will no doubt be future updates. McGraw-Hill and the authors earnestly solicit your comments and suggestions. The authors e-mail addresses are appended to the bios located on the last page.

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