Reflections and Trends in the Expansion of Cellular Wireless Services in the U.S. and China

Charting the evolution of business capabilities and communication technology and standards.

The wireless industry is experiencing a tremendous technological expansion and growth in adoption. With telecommunications services revenues totaling $1.2 trillion in 2004 in the U.S. alone [1], it is important to understand how these services are impacting technology users and what changes these services may bring to individuals, businesses, societies, and the world economic landscape. Wireless connectivity is driving innovation and business opportunities both in the U.S. and abroad. This growth is driven by the advent of broadband mobile telephony enabling voice and data exchanges in an ultra-convenient fashion. Business capabilities are evolving from mobile voice and email to mobile intranets where users access corporate data and, eventually, to totally mobile business applications. The implications for developing economies, such as China, and its potential for moving past other nations with established, traditional telecommunications architectures are significant. In this column, we compare and contrast the growth of wireless technologies and mobile services in the U.S. and China. In particular, the economic changes, including market size and growth, are highlighted with respect to technological changes from evolving national and international standards.

SUBSCRIBERS AND ADOPTION RATES IN THE U.S. AND CHINA

Mobile phone service in the U.S. has gradually evolved from the introduction of Advanced Mobile Phone System (AMPS) analog cellular services in 1984 (first genera-
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1The Global System for Mobile communications (GSM) is a second-generation standard (2G) enabling voice and limited data rates. 2.5G systems such as General Packet Radio Service (GPRS), Radio Transmission Technology (1xRTT), and Enhanced Data GSM Environment (EDGE) are digital networks, which couple voice with faster data transfer rates. Broadband cellular 3G networks use Code Division Multiple Access standards (CDMA2000 and W-CDMA) to reach a throughput up to 2Mbps. CDMA 2000 allows existing GSM and GPRS antennas and architectures to be upgraded over time. W-CDMA—which has support in Japan and Europe [6]—requires rebuilding the existing architecture.

21% in 2003 to 38% in 2005 with an estimate of approximately 49% of the Chinese population by the end of 2006. This equates to an increase of 28% points in only four years. The figure here shows this rapid Chinese penetration growth as compared to mobile phone subscribers in the U.S. based on the number of subscribers and cellular penetration as a percentage of population.

While penetration rates in China are lower than the U.S., the yearly growth rate—once aligned with the U.S.—is now higher. In absolute numbers, the size and revenue potentials differ significantly, with over 400 million current users in mainland China alone. Overall, China appears to be leapfrogging into newer and better communication technology and standards. While Europe and the U.S. experimented with, and invested heavily in, emerging, but not mature technologies designed to work with small portable devices providing access to mobile Internet sites (for example, with the wireless application protocol investments), the Chinese government played the laggard role in embracing new technologies and standards. However, China appears to be now fully committed to investing in the national communication infrastructure [4] and is rapidly pushing the global adoption of a homegrown cellular wireless standard: TD-SCDMA (Time Division Synchronous Code Division Multiple Access). TD-SCDMA, developed by the Chinese Wireless Technology Standard Group and approved by International Telecommunication Union-Radio Communication Standardization Sector (ITU-R) in 2000 as a third-generation (3G) standard [2] is designed to dynamically optimize network traffic maximizing throughput. This standard purportedly provides significant advantages over other third-generation standards (such as Code Division Multiple Access types CDMA2000 and Wideband-CDMA) in terms of costs, spectrum efficiency, capacity, and quality of service. It is also touted to provide a smoother migration path from Global System for Mobile Communications (GSM) systems [2]. TD-SCDMA does have some disadvantages such as a drop-off in data rates for faster-moving mobile users as compared to the competing technologies and a limited commercial base of support. While each of the three CDMA-based de facto 3G standards (W-CDMA, CDMA2000, and TD-SCDMA) is being adopted in China, analysts and researchers believe that TD-
SCDMA has larger growth opportunities because of its cost-effective migration from GSM networks [2].

The critical growth of wireless communications in China is paired with a tremendous growth in production of the supporting handsets that will enable service adoption. China’s two government-regulated mobile operators, China Mobile and China Unicom, are both experiencing rapid growth in new subscribers and overall revenues. China Mobile is currently using GSM and China Unicom has deployed both CDMA and GSM. They rely on Internet providers such as Netease.com and Sohu.com to provide content on networks that have moved beyond basic voice applications and now fuel an economy based on information technology.

WIRELESS SERVICES AND WORK EVOLUTION COMPARISONS

These trends also drive changes in the workplace. In the U.S., the evolution of mobile services and their adoption by mobile workers has been cautiously progressive. Typically, employees’ access to company applications was tied to the work location. The ease of remote access to company data through intranets allowed workers to use mobile laptop computers and personal digital assistants to work outside of the office. This opened opportunities for telecommuting, working in remote locations with global teams, and being able to outsource service provisioning to companies that could be remotely connected to the company networks. Workers were therefore less bound to the office premises. Only recently have mobile workers been able to work (almost) anywhere through the pervasive connectivity. Companies are now adjusting to this more mobile work force and its corresponding advantages and disadvantages.

In China, this evolution has resembled more of a revolution driven by a rapid adoption of 3G cellular technologies, skipping entire generations of technologies and products. This evolution is being spurred by three key trends: China is producing 600,000 engineers each year compared to 70,000 in the U.S. [5]; the Chinese national government has a strategy to promote wireless including 3G mobile technologies; and the different Chinese local governments are becoming major customers for the new services. Foreign and locally educated technical expertise, inexpensive labor, and a specific strategy by the government are also contributing to the country’s growth by enabling China’s transformation from a fixed economy that relied on “brick and mortar” enterprises to a more flexible and competitive economy. The first two factors allowed telecommunications hardware and the corresponding infrastructure to be created in a cost-effective manner and to move the country out of the “fixed” mode by providing access to goods and services beyond local stores and businesses. A strong and focused governmental agenda is also quickly allowing the country to deploy agile and pervasive connectivity [6].

REFLECTIONS AND CHALLENGES

China’s transition is only starting. Large areas of the country still do not have either a fixed-line infrastructure or access to 3G services. Although China Unicom operates the largest CDMA-based network in the world, the speed and ease of communication is still not at a state to support extensive business operations in a truly distributed, mobile environment. However, based on earlier experiences and rapid growth, it will not take long for China to reach pervasive business mobility. Before 1990, China did not have a comprehensive national information policy to govern wireless communications as well as other forms of telecommunications and the Internet. China initially started by upgrading its fixed-line infrastructure, but more recently has focused on the advantages of expanding a wireless communications infrastructure rather than the fixed line. While the country has not yet fully implemented laws regarding telecommunications operations, it has been able to boost its economy through the growth of the telecommunications infrastructure [6] and, in particular, wireless technologies.

The U.S. market has progressively moved from a regulated telecommunications environment to a free market place where multiple service providers compete to bring cost-competitive services to...
the population. A deregulated market also presents its own challenges, particularly in terms of long-term sustainability of telecommunications service providers, which requires heavy investments in infrastructure. While telecommunications providers have been successful and profitable, the market has also been faced with a large number of mergers and acquisitions pushed both by financial speculation, but also the need to integrate infrastructure, reach customers, and gain access to new markets. The establishment of new partnerships, which has expanded the market growth across the U.S. and Europe, may create challenges in China where business opportunities are related (and determined) by governmental intervention. The regulated/deregulated nature of the telecom business also presents challenges related to the collection and management of the large amount of personal information and data that mobile services collect and store.

Lastly, the U.S. mobile providers have the unique challenge of integrating different standards as they move toward deployment of 3G broadband cellular. The difficulty of integrating and agreeing on an interoperable standard may force the U.S. to withdraw integration efforts and try to move directly to fourth-generation (4G) technologies, currently under requirements definition, which will be deployed beginning in 2010 [3]. The Chinese government is taking an accelerated approach to transitioning to 3G services, avoiding limits caused by older network standards. The plan is ambitious and aggressive, but by building its own 3G standard, TD-SCDMA, the Chinese government envisions that 3G will provide the foundation to position China as the world leader in wireless telecommunications technologies.

REFERENCES

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