# China's Telecom Industry on the Move: Domestic Competition, Global Ambition, and Leadership Transition

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China's telecom sector has been one of the country's fastest-growing industries during the past two decades. Recently, a number of large, rapidly expanding Chinese firms have emerged to compete successfully in the global market despite heavy competition from multinationals. As the business leaders of China's flagship telecom companies become famous within China, their personal stories are beginning to influence the leadership styles and management practices of a new generation of Chinese entrepreneurs. This paper examines the rise of China's leading telecom firms (such as Huawei and ZTE) and the characteristics of their CEOs. Although the senior managers of China's telecom industry do not have significant international exposure, they have not been deterred from adopting a "Go Out" strategy for expanding their business operations overseas.

China's economic rise has been accompanied by the growing competitiveness of Chinese enterprises in global markets.[1] This trend is particularly evident in the case of the Chinese telecom industry. Gone are the days when Chinese telecom firms produced nothing but cheap, low-quality imitations; today, some Chinese flagship telecom enterprises—especially several large telecom equipment makers—have not only adopted a "Go Out" strategy to invest in foreign countries, but many have also acquired cutting-edge technologies and expanded into high-end products. The rapid growth of China's telecom industry will further enhance China's economic power and will thus have profound implications for the rest of the world.

Three factors make the study of China's telecom industry especially important and timely. First, China's telecom sector has been one of the country's fastest-growing industries during the past two decades. The competition among major telecom companies (both Chinese and multinationals) for a share of China's burgeoning domestic market has become increasingly acute in recent years. According to the 2001 World Trade Organization (WTO) agreements, the six-year schedule for gradually opening up China's telecom service market requires the Chinese government to end the state monopoly and allow a competitive market to emerge in 2006–2007.[2] Even more importantly, after a prolonged "waiting game," the Chinese government is expected to launch the commercialization process of the third generation (3G) of mobile communications in the country in the near future.[3] Based on the Chinese government's estimation, the total investment of the 3G operation in China may be somewhere between 500 billion and 1 trillion yuan (between US$62.5 and US$125 billion).[4] The Chinese government's

decision to license 3G mobile communications, and its selection of particular technology standards, are important indicators that will allow the outside world to assess China's role in economic globalization and the country's trend toward techno-nationalism.

Second, the intense competition will not be limited only to the telecom market within China. Supported by the government, Chinese telecom enterprises, such as Huawei Technologies and ZTE, have very aggressively competed with brand-name multinational firms. Although still in the early phase of their "Go Out" strategy, these Chinese companies have already emerged as major players in the telecom equipment business on the world stage. For example, Huawei, a private telecom equipment company that was established in Shenzhen in 1987 with registered capital of only 21,000 yuan,[5] now has total registered assets of 3.2 billion yuan and revenue of 47 billion yuan.[6] Huawei has established 85 overseas branch offices, research centers, and factories; and has deployed wireless terminal technologies in over 100 countries, providing services for roughly 1 billion customers.[7] In the first half of 2006, Huawei had total sales contracts for US$5.2 billion, and approximately 65 percent of these sales were in overseas market.[8]

Huawei's aggressive overseas expansion is causing serious concern for its international rivals. It is believed that the recent merger and acquisition deals between Ericsson and Marconi, Alcatel and Lucent, and Nokia and Siemens were at least partly designed to "fight off competition from Huawei and ZTE."[9] Huawei's rapid rise to international prominence is extraordinary, but its global strategy and ambition have been widely shared by other major Chinese companies. An analysis of telecom firms such as Huawei highlights the broad contours of the strategies adopted by China's emerging global firms and sheds light on the future of the global economy.

The third reason China's telecom industry merits greater attention is that the leadership of the industry is in the midst of a generational transition—a process that has arguably occurred sooner than has been seen in all other industries in the country due to the nature of the information technology (IT) business. Young, well-educated professionals with substantial experience in this rapidly developing industry have already emerged in the top leadership of China's Ministry of Information Industry (MII) and in the country's six major telecom companies. Additionally, a large number of major telecom manufacturing firms will soon undergo generational changes in the top leadership as many of the founders of these firms are due to retire.

The new generation of chief executive officers (CEOs) and other senior policymakers in China's telecom companies will differ profoundly from their predecessors in terms of formative experiences, professional backgrounds, leadership skills, business behavior, and worldviews. To a great extent, the quality of this new generation of CEOs will be crucial to their companies' competitiveness in the global market. Some recent studies show that the shortage of senior managers with international experience in the rapidly developing economies (RDEs) such as China, India, Russia, and Brazil will constrain the future development of large companies in these countries.[10] Knowledge of the biographical characteristics of top managers in China's flagship

telecom firms can be enormously valuable in making an assessment of the trajectory of China's emergence as an economic powerhouse.

## Domestic Market: A Playing Field for Growth, Protection, and Competition

The rapid growth of China's telecom industry is a fascinating story. The Chinese government has always considered the telecom sector to be one of the most strategically important and commercially lucrative industries in the country. In 2005, the six leading Chinese telecom operation providers: China Telecom, China Mobile, China Netcom, China Unicom, China Railcom, and China Satcom, all of which are state-owned enterprises (SOEs), reported that they had total assets of 10.6 trillion yuan, revenues of 6.6 trillion yuan, and profits of 600 billion yuan.[11] These six companies constituted one-sixth of the total assets, and 20 percent of the profits, of all of the enterprises directly under the leadership of the State-Owned Assets Supervision and Administration Commission.[12] Table 1 shows the huge increase in sales value and the rapid growth of China's telecom industry during the past decade. The sales value of the industry increased from 156.2 billion yuan in 1998 to 1.157 trillion yuan in 2005, with two-digit growth rates every year.

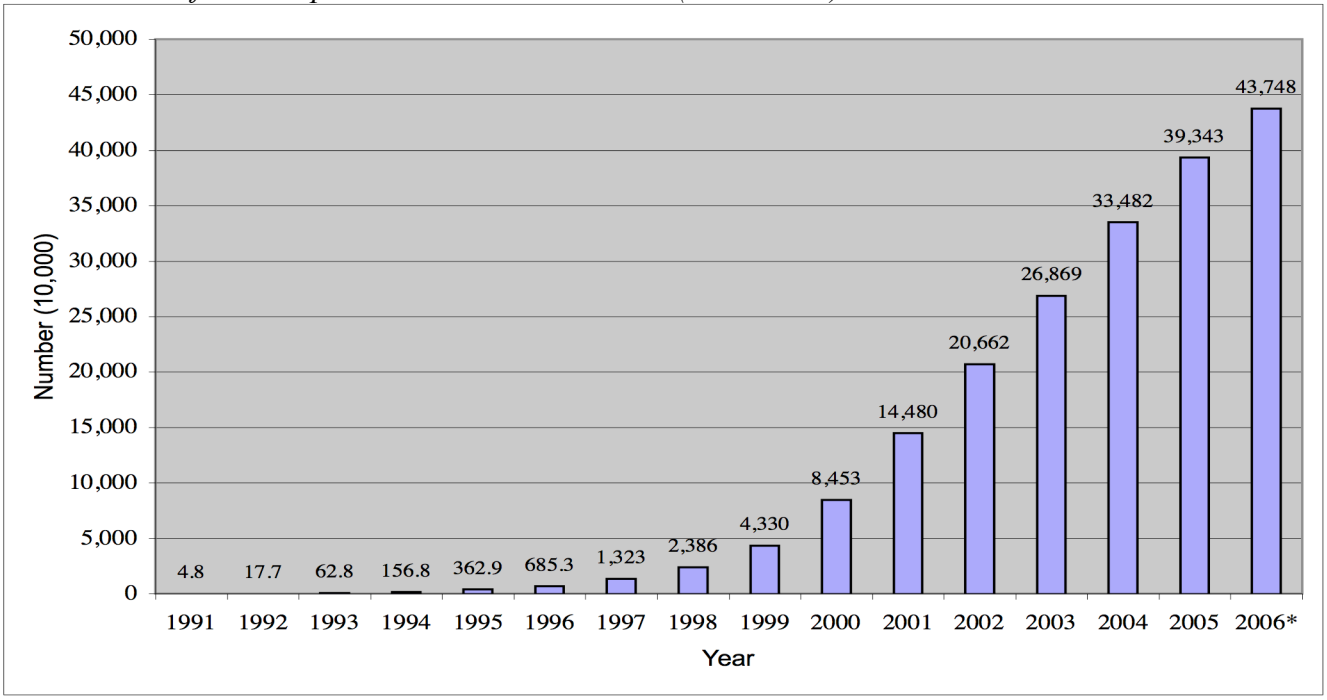
**Table 1**
*Sales Value and Annual Growth Rate of China's Telecom Industry (1998–2005)*

| *Year* | *Sales value (billion yuan)* | *Annual growth rate (%)* |
|---|---|---|
| 1998 | 156.2 | -- |
| 1999 | 216.0 | 38.3 |
| 2000 | 314.5 | 45.6 |
| 2001 | 409.9 | 30.3 |
| 2002 | 520.1 | 26.9 |
| 2003 | 647.9 | 24.6 |
| 2004 | 914.8 | 41.2 |
| 2005 | 1,157.5 | 26.5 |

*Sources and notes*: http://www.mii.gov.cn/col/col169/index.html; and Hu Zhuangjun and Huang Chuanwu, *Zhongguo dianxin fazhan fenxi* [An analysis of the development of china's telecommunications sector]. Beijing: Social Science Academic Press, 2006, p. 57.

The number of mobile phones in China has grown exponentially over the past 15 years. Figure 1 shows the dramatic surge in the number of mobile-phone subscribers in the country, from 48,000 in 1991 to almost 438 million in 2006. China's two mobile-phone service providers, China Mobile and China Unicom, have joined the club of the most profitable companies in the world. China Mobile's ranking in the *Fortune* Global 500 has moved up continuously in recent years—from number 336 in 2001 to number 287 in 2002, to 224 in 2005, and finally to 202 in 2006.[13]

**Figure 1**
*The Growth of Mobile-phone Subscribers in China (1991–2006)*




*Based on data from the end of August 2006.

By the end of June 2006, China had a total of 805 million telephone subscribers, including 368 million fixed-line connections and 437 million mobile-phone users, easily topping any other country in the world in both categories.[14] The penetration rate of mobile phones in the country increased from 6.7 per 100 people in 2000 to 32.6 per 100 people in 2006. The number of Internet users reached 123 million, second only to the United States. All these statistics are even more impressive if we consider the fact that 20 years ago there was no mobile-phone network and the penetration of fixed phones in China was only 0.6 per 100 people. [15] Even in the early 1990s, the installation of a fixed phone in some major cities cost almost the equivalent of an average worker's annual salary, and use of fax machines, at least in theory, had to be licensed.[16]

For most of the last two decades, multinational companies have largely been prohibited from providing telecom services in China. Economic protectionism and political concerns have led the Chinese government to exercise stringent control over foreign investment and operations in the country's lucrative telecom service sector. It was

not until the end of the 1990s that the Chinese government seriously considered opening the telecom operations and Internet services markets to foreign companies. Although the WTO market-opening agreements have forced the Chinese government to gradually open up the service sector, fair competition has hardly ever existed in this playing field. With the aim of promoting competition among Chinese telecom companies, Chinese government regulations specify that there should be at least two companies in each major telecom sector, including long distance, data and Internet services, and short message services (SMS). In fact, however, taking an example from the domain of the mobile-phone business, the two Chinese "competitors" are anything but equal. China Unicom simply cannot compete with the gigantic China Mobile. In 2005, China Mobile had a net profit of 53.6 billion yuan, which was ten times greater than China Unicom, the other company operating in the mobile-phone business.[17]

China's telecom operations sector has been severely monopolized by the Chinese government and the major SOEs, but China's telecom equipment sector, in contrast, has often been seen as one of the most open and competitive markets in the world.[18] While foreign firms have had little involvement in China's telecom services sector, they have been instrumental in the development of China's physical telecom infrastructure. Almost all major multinational telecom equipment makers have established manufacturing facilities and/or joint venture operations in China.[19] In 2003, foreign telecom equipment manufacturers (including those from Taiwan, Hong Kong and Macao) accounted for 23 percent of the total number of telecom manufacturing firms in China.[20]

Not surprisingly, China has become a major revenue base for foreign telecom companies such as Ericsson (Sweden), Lucent (US), Siemens (Germany), Alcatel (France), BTM (Belgium), Nortel (Canada), NEC (Japan) and Fujitsu (Japan).[21] Motorola, for example, was one of the largest foreign investors in China (US$3.4 billion) in 2004 and had total revenues of US$7.7 billion resulting from operations in China in the same year.[22] The Chinese government has adopted many favorable policies to attract foreign telecom equipment companies.

China's intent to lure foreign telecom equipment makers to invest in the country has been no secret. Chinese policymakers have explicitly stated China's strategy, known as "Providing market access in return for technology" (*yi shichang huan jishu*). Specifically, the Chinese government and telecom manufacturers adopted a three-stage priority plan: 1) "importing and transferring," 2) "digesting and absorbing," and 3) "growing and exporting" with the hope that the Chinese homegrown firms would eventually catch up with foreign companies. A recurrent pattern in the industry, as some scholars observed, was that any specific new products are initially added and imported to China "as high-end ones and then downgraded to medium-end or low-end ones over a period of time."[23]

Nevertheless, foreign companies dominated the telecom equipment markets in China for over a decade. For example, foreign-made handsets accounted for 93 percent of the 60 million handsets in China's market in 2000. About 80 percent of them were the products of three major foreign companies (Motorola, Ericsson, and Nokia).[24] In 2004,

foreign-owned electronic and telecom equipment companies had total sales income of 1.758 trillion yuan, accounting for 82 percent of the total, while the Chinese homegrown companies had sales income of just 388.3 billion yuan (18 percent of the total).[25]

To a great extent, the Chinese homegrown companies were only marginal players in the competition for a share of the country's telecom equipment market over the past two decades, especially in the 1980s and the early 1990s. "How could it be possible for a small Chinese firm with a total of 21,000 yuan and 14 employees to compete with multinational telecom giants?" Huawei's CEO Ren Zhengfei often made his point by reminding others of the humble beginnings of his now gigantic enterprise. According to Ren, the Chinese government's favorable policies toward foreign investors put homegrown telecom equipment manufacturers such as Huawei at a disadvantage.[26] In his words, "Huawei had no capital, no technology, no 'identity'" (meaning that the company was not a state-owed company with the support of the Chinese government).[27] Although Ren had a personal connection with the party secretary of Shenzhen, he could not get much support from local banks. Instead, he had to borrow from large enterprises with a high interest rate (20–30 percent) in the early years of the development of Huawei.

Ren is one of the most charismatic business leaders in China. In a way, he is to Huawei what Bill Gates is to Microsoft. Although Ren has always tried to maintain a low-profile approach in terms of public relations and has conducted hardly any interviews with the media, the Chinese public is well aware of his leadership style and business strategies. Approximately a dozen Chinese books about Ren's leadership style and Huawei's rise have been published during the past few years.[28] In 2005, *Time* magazine selected Ren Zhengfei as one of the top "100 Builders and Titans" in the world. Ren was the only Chinese to be selected for the list.

Born into a school administrator's family in poverty-stricken Guizhou Province in 1944, Ren attended the Chongqing Institute of Posts and Telecommunications prior to the Cultural Revolution. He spent most of his youth in the military where he was mainly engaged in engineering research. He joined the Chinese Communist Party (CCP) in 1977 and later was promoted to regiment-level officer. Five years after being demobilized from the PLA in 1982, at the age of 43, Ren founded Huawei Technologies in a shabby, one-room workshop in Shenzhen. For the next five years, Ren and his colleagues primarily experimented with making stored program-controlled (SPC) switches—an essential equipment system in telecommunications. Following the success of this first main product of the company, Huawei has gradually expanded into the production of other essential telecom infrastructure equipment that had previously been produced only by foreign companies. By 2002, Huawei had achieved substantial market shares in the country's telecom sub-sectors: 50 percent in optical transmission systems, 44 percent in SPC switch systems, 70 percent in access systems, 42 percent in broadband access systems, and 50 percent of mobile data communication facilities.[29]

Huawei's successes have largely been due to Ren's sound business strategies. When asked who has influenced him the most, Ren Zhengfei reportedly said: "Chairman Mao and President Louis Gerstner" (the former CEO of IBM).[30] Ren has said that he used Mao's guerrilla war strategy in Huawei's "battles" with multinational companies in the

telecom business. Inspired by Mao's ideas of "occupying the countryside first in order to encircle the cities" and the "mass campaign," Ren targeted markets in small cities and county towns (*xiancheng*) in the remote provinces, areas to which multinational titans did not even bother to seek access. In 1992, for example, Ericsson had only three or four employees who worked on telecom networking systems in Heilongjiang Province. By contrast, Huawei had over 200 people who not only focused on servicing the province's telecommunications market, but also lived and worked in county towns and small cities across the province.[31] This "mass campaign" helped Huawei build up large supply chains in the province. In addition, Huawei established joint ventures or other forms of partnership with local bureaus of posts and telecommunications. This business practice by Huawei, though controversial, was not banned. Due to their shared business interest, these local governmental institutions helped promote the sale and maintenance of telecom equipment made by Huawei.

Ren Zhengfei was also significantly influenced by Louis Gerstner's ideas of modern management in an increasingly competitive business environment, especially the "customer-centric approach" that Gerstner developed while running IBM. After visiting IBM headquarters in 1997, Ren launched a campaign at Huawei to learn from the customer-centric service ideas of IBM. He urged the employees in the company to be more responsive to customers' needs, and argued that Huawei should continue to maintain its image of producing "low cost and low priced, but high-quality and high-tech products."[32]

Research and development (R&D) has always been greatly valued in this technology-intensive company. Huawei's "company law" allocates at least 10 percent of revenue to R&D every year. In 2005, Huawei spent US$558 million on R&D, accounting for 14 percent of total revenue. Between 1998 and 2005, Huawei spent a total of US$725 million on 3G-related research projects, and a total of some 6,000 researchers participated in these projects.[33] The company established R&D centers in Beijing, Shanghai, Nanjing, Hangzhou, Xi'an, and Chengdu as well as at its headquarters in Shenzhen. In the summer of 2006, Huawei built a new R&D center in Shanghai jointly with Motorola, focusing on 3G-related projects.

Huawei's large spending on R&D is unusual among Chinese telecom firms. In 2002, for example, the top 100 Chinese telecom companies spent an average of 3.8 percent on R&D, much lower than their counterparts in the West such as Cisco (25.3 percent), Intel (17.5 percent), Microsoft (15.5 percent), and Nokia (10 percent) did during the same year. In 2005, among the 37,000 employees of Huawei, about 18,000 (48.6 percent) are members of the research staff, a number almost equal to the staff at AT&T Bell Labs.[34] In addition, Huawei requires each of its employees to spend 7 percent of their time pursuing job-related training every year. For many years, Huawei has attracted many of the best and brightest Chinese college students to work in the company. In 2005, about 60 percent of Huawei's employees held MA or Ph.D. degrees and an additional 25 percent held bachelor's degrees.[35]

Huawei's emphasis on R&D and its strength in human resources seem to suggest that this homegrown company will be even more competitive in the years to come. Huawei's case may be unique in certain aspects, but it does suggest that some of China's telecom equipment companies have made remarkable progress in sharing the domestic market with foreign companies during the past few years. Domestic-brand handsets, for example, represented only 2 percent of the Chinese market in 1998, but seven years later they accounted for 51 percent.[36] The revenues of China's telecom firms and IT companies increased dramatically over the past decade. For example, among the top 100 Chinese telecom and IT firms in 1986, only one had annual sales revenues exceeding 500 million yuan; by 1996, the number had increased to 58. In 2006, 22 companies in the top 100 had revenues of more than 10 billion yuan each.[37] Domestic Chinese telecom equipment providers are expected to have an even larger portion of market share in the country after China commences the commercialization of 3G mobile communication.[38]

## Global Ambition: The Rise of Chinese Enterprises

Huawei and other large Chinese enterprises will certainly not stop their business expansion at China's national borders. It is no secret that they want to have a bigger share in the global market. Even in the early 1990s, Ren Zhengfei claimed that the "future global telecom equipment market will largely be divided and shared by three major players, and Huawei will be one of them."[39] During the past decade, Huawei established its research centers in Silicon Valley, Dallas, Moscow, Stockholm, and Bangalore. In 2006, Huawei had a total of 40,000 employees, 10,000 of whom were based outside of China.[40]

Chinese enterprises' overseas expansion has received strong support from the Chinese government. In 2000, the Chinese government made the decision to shift its trade and industrial development priorities from the policy of "Welcome In" (*yinjinlai*) to a combination of both "Welcome In" and "Go Out" (*zouchuqu*).[41] At the Third Plenum of the 16th Central Committee, held in 2003, the Chinese leadership called for the promotion of China's overseas enterprises. In the same year, the Chinese government approved the establishment of 510 new overseas firms with a total investment of US$2.087 billion.[42] In 2004, the Ministry of the Information Industry issued an official document specifying the levels of industrial, informational, financial, and fiscal support it would provide for Chinese companies' overseas expansion efforts.[43]

Some major Chinese enterprises have been seen as emerging challengers on the world stage, which may undermine the interests of large "incumbent" multinational companies. In a recent report by the Boston Consulting Group (BCG), among the top 100 emerging global companies based in rapidly developing economies, 44 are Chinese companies, 18 (41 percent) of which are in the telecom and IT industries. These include telecom equipment makers (Huawei, UTStarcom, and ZTE), telecom service companies (China Mobile and China Netcom), computers and IT components manufacturers (BOE, Founder, and Lenovo), and consumer electronics and home appliance companies that also

produce large numbers of telecom end-products (BYD, Galanz, Gree, Haier, Hisense, Konda, Midea, Skyworth, SVA, and TCL).[44]

Huawei, UTStarcom and ZTE are the only telecom equipment makers among the 100 companies listed. BCG's report states, "These companies are no longer poised on some far horizon; they are globalizing fast and are determined to stay the course."[45] According to the authors of the report, these new players in the global economy will reshape the playing field, rewrite the rules of the game, and force incumbent champions to respond.

Most of these Chinese companies, including Huawei, ZTE, and China Mobile are still in the early stages of globalization. ZTE, for example, began to establish its foreign offices and research centers as recently as in the late 1990s.[46] Only five years ago, in 2001, the company adopted a development strategy with a focus on its three principal objectives: globalization (*guojihua*), 3G, and handsets. To a certain extent, these companies' strategies for overseas expansion are similar to Huawei's aforementioned strategy for domestic market penetration: to begin with a relatively "weak" target, and then to challenge a "strong" market. Huawei began its overseas adventure with Russia (Commonwealth of Independent States) in 1995. The first contract that Huawei signed there was worth a mere US$38! But 10 years later, in 2005, Huawei had total sales of US$600 million in Russia.[47] In addition to Russia, Huawei also considered emerging markets in South America, Africa, and the Middle East as target regions for the company's initial overseas expansion.[48] After gaining some experience in overseas sales, Huawei gradually expanded its business operations to Southeast Asia and Europe. In 2006, Huawei signed a number of large contracts, including one with Brazil's Vivo to build the largest GSM network in South America; an agreement with Britain's Vodafone to construct a WCDMA network in Spain; and a deal to build a 3G communications systems with Leap (United States), eMobile (Japan), and KPN (Holland). Among the 12 contracts involving 3G that Huawei signed in the first half of 2006, half of the partners were European countries. Huawei plans to intensify its effort to access the North America market in 2007 as the next major strategic move.[49]

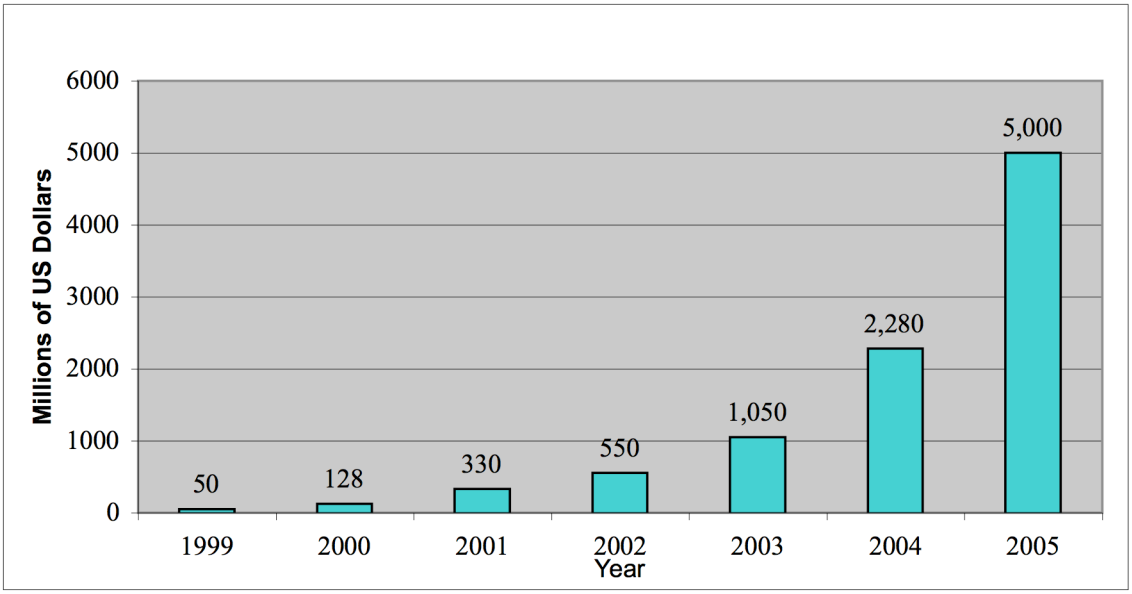
Similarly, ZTE and China Mobile also have three-step plans for overseas expansion in terms of geographic focus. ZTE first targeted the markets in Asia, Russia, and Africa, then moved to Eastern Europe and South America, and finally pursued investment and other kinds of business development in Western Europe and North America.[50] For China Mobile, the three steps were, first Hong Kong and Macao; then expanding into Southeast Asia and South America; and finally targeting Europe and North America.[51] It seems likely that all three of these companies will soon focus mainly on Europe and North America in their competition for international markets.

Both Huawei and ZTE have gone through similar three-phase overseas expansion of their business areas as well. Usually they first exported a single telecom product, then engaged in contracting for telecom infrastructure projects and/or exporting a multitude of products, and finally expanded to broader arenas of collaboration.[52] Participation in foreign markets by Chinese telecom manufacturers has taken several different forms,

including investment, R&D, project contracting, joint venture, mergers and acquisitions, and full telecom management and operation.[53]

It is perhaps too early to assess the performance of the Chinese companies in these specific areas. However, the exponential growth in the overseas sales of Huawei and ZTE during the past few years is astonishing. Figure 2 shows that Huawei's overseas sales increased from US$50 million in 1999 to US$ 5 billion in 2005, a hundredfold growth within six years. The growth pattern of ZTE's overseas sales during the past few years has been quite similar to that of Huawei, although on a much smaller scale (see Figure 3, next page).

**Figure 2**
*Huawei Overseas Sales (1999–2005)*

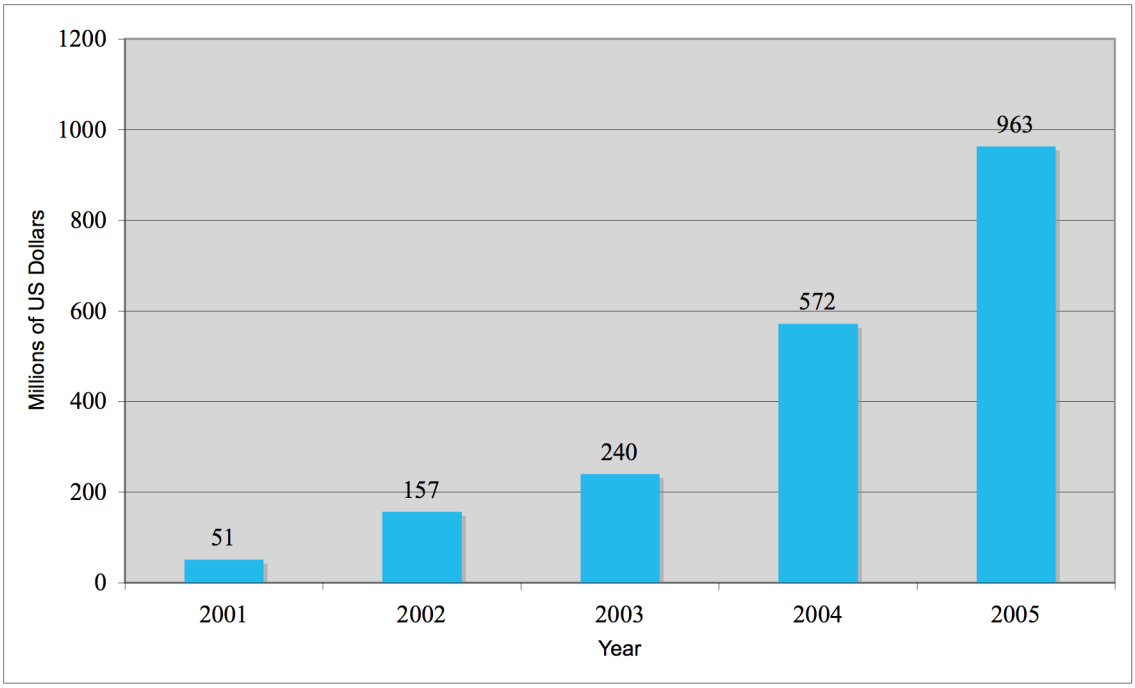



*Sources*: http://xhs.anhuinews.com/system/2006/08/14/001535239.shtml and http://www.thldl.org.cn/news/06/02/5841.html

It should be noted that the exponential growth of the foreign sales of Huawei and ZTE illustrated in Figures 2 and 3 stems partially from the fact that these two companies started their overseas businesses from scratch only a few years ago, and therefore this growth pattern cannot continue indefinitely. Despite the rapid growth of Chinese telecom manufacturers such as Huawei and ZTE, their overall revenues and profits in absolute terms are still much lower than those of foreign telecom giants. For example, in 2003, the total revenue of China's top 100 companies in the information industry was US$79.6 billion, but this was only 89 percent of the annual revenue of IBM that year. The total profit of these 100 Chinese companies was US$3.4 billion, which was only 38 percent of the profit of Microsoft in the same time period.[54] According to the Chinese official media, the total revenue, profit, and assets of China's top 500 companies in 2005 was only 8 percent, 7 percent, and 6 percent of those same categories in the world's top 500

companies that year.[55] While Chinese challengers in the world market may have an advantage in terms of their access to a low-cost, high-quality labor force, a majority of Chinese companies lack both brand-name recognition and their own "core products" (*hexin chanpin*). According to a recent study conducted in China, more than 80 percent of export-oriented Chinese firms do not have their own "core products"[56]

**Figure 3**
*ZTE Overseas Sales (2001–2005)*




*Sources*: http://xhs.anhuinews.com/system/2006/08/14/001535239.shtml, http://www.thldl.org.cn/news/06/02/5841.html.

At the same time, China's flagship telecom companies such as Huawei and ZTE are determined to compete with foreign multinational giants on their own turf rather than just in China's homeland in the years to come. According to Huawei's strategic plan, the ratio between the company's overseas and domestic sales after 2008 will be 7:3.[57] Of course, their future success in global market competition is by no means guaranteed. These Chinese firms have learned to thrive despite tough competition and other difficulties at home, but it should also be remembered that they are now entering into territory that is largely unfamiliar to them. Nonetheless, incumbent champions cannot afford to be complacent as the global economy undergoes a profound landscape change.

## Leadership Transition: Toward a Globally Capable Management Team?

The future global competitiveness of Chinese telecom companies depends on many factors, but a "globally capable management team" will be essential to Chinese firms' success abroad, as many China watchers have observed.[58] Chinese policymakers and business leaders seem to understand this. During the past few years, there have been major personnel changes in the top leadership of both the Ministry of Information Industry and the six leading telecom operations companies. More recently, China's flagship telecom equipment companies and other IT firms have made a concerted effort to recruit young, experienced professional managers to the senior level of leadership in their firms. An analysis of the backgrounds and other characteristics of the leadership of China's telecom industry will help us assess the strengths and weaknesses of the industry in general, and some flagship firms in particular.

Table 2 shows the backgrounds and career experiences of top leaders (the minister and four vice-ministers) of the Ministry of Information Industry. Minister Wang Xudong currently serves on the Central Committee of the CCP as a full member and Vice-Minister Xi Guohua is an alternate member. With the exception of Minister Wang, who is 60 years old, the other four leaders of the Ministry are in their late 40s or early 50s, and their average age is 53.6. Most of them were appointed to their current positions within the past four years. All of them received their education in the fields of either engineering or science, and three of these five top leaders (vice-ministers Xi Guohua, Lou Qinjian, and Jiang Yaoping) hold Ph.D. degrees.

Jiang Yaoping, for example, attended college in Guangxi as an English major during the Cultural Revolution. He spent most of his career in the administration of posts and telecommunications in Guangxi, and later studied at the Norwegian Business School of Management in the late 1990s, receiving a master's degree in telecommunications management in 1999. Subsequently, through part-time studies, he earned a Ph.D. in engineering and management from the Harbin Institute of Technology in 2005. Among the five top leaders in the ministry, Jiang was the only one who studied abroad as a degree candidate. Vice-Minister Xi Guohua went abroad twice for advanced managerial and technical training, the first time to Italy for six months in 1985, and the second time to the United States, where he attended a yearlong program for senior managers run by AT&T in 1990–91.

**Table 2**
*Background of Top Leaders of the Ministry of Information Industry (2006)*

| *Position* | *Name* | *Born* | *Tenure since* | *Previous position* | *Main experience* | *Ed. Degree* | *School(s)* | *Professional title* |
|---|---|---|---|---|---|---|---|---|
| Minister | Wang Xudong | 1946 | 2003 | Hebei Party Secretary ('00–02) | Dir. of Research Inst. of Min. of Electronics, Tianjin Dep. Party Secty. ('91–93), Vice Dir. of CCP Org. Dept. ('93–00) | B.S. | Tianjin Institute of Science and Technology (part time) | Engineer |
| Vice-Minister | Xi Guohua | 1951 | 2003 | CEO of China Netcom ('02–03) | Head of Shanghai Telecom Bureau, Vice CEO of Shanghai Bell ('00–01) | Ph.D. | Hefei Institute of Technology, Shanghai Jiaotong University (part time) | Professor |
| Vice-Minister | Lou Qinjian | 1956 | 1999 | Director of Research Center of the Minister ('98–99) | Various research institutions in telecom industry | Ph.D. | Institute of Central China Technology | Senior Engineer |
| Vice-Minister | Gou Zhongwen | 1957 | 2002 | President of Chinese Acad. of Electronic & Info. Tech. ('00–02) | Various research institutions in telecom industry | M.S. | Xi'an Institute of Electronic Science & Technology | Senior Engineer |
| Vice-Minister | Jiang Yaoping | 1952 | 2004 | Director of Dept. of Policy and Regulations of the MII ('02–04) | Head of Guangxi Telecom Bureau, Office Director of State Internet Security Work Group ('00–02) | Ph.D. | Norwegian Business School of Management, Harbin Inst. of Tech. (part time) | Senior Engineer |

*Notes*: Acad. = Academy; CCP = Chinese Communist Party; Dep. = Deputy; Dir. = Director; Ed. = Educational; Info. = Information; Inst. = Institute; Min. = Ministry; MII = Ministry of Information Industry; Org. Dept. = Organization Department; Secty. = Secretary; Tech. = Technology; Univ. = University.

All of these senior leaders have advanced their careers in the area of telecommunications, although Minister Wang also served as deputy party secretary in Tianjin, vice-director of the CCP Organization Department; and party secretary of Hebei Province. Vice-Minister Xi Guohua, for example, began his career as a technician at a telecom lab in Shanghai in 1977 and spent his entire adult life working in the telecom sector. He played an important role in the establishment of Alcatel Shanghai Bell in 2000–2001, the largest merger of two joint ventures in the history of China's telecom industry. Xi was appointed to be Vice-Minister of Information Industry in 2001, but

served as CEO of China Netcom for a year prior to being reappointed as Vice-Minister of Information Industry in 2003.

**Table 3**
*Background of Top Leaders of China's Six Largest Telecom Operation Companies (2006)*

| *Company* | *Position* | *Name* | *Birth year* | *Tenure since* | *Previous position* | *Education* | *Foreign study/work experience* | *Main experience* |
|---|---|---|---|---|---|---|---|---|
| China Telecom | Board Chair & CEO | Wang Xiaochu | 1958 | 2004 | Vice president of China Mobile | BS | None | Telecom Management |
| China Netcom | Board Chair & CEO | Zhang Chunjiang | 1958 | 2003 | Vice-minister of Information Industry | BS | None | Telecom Management |
| China Mobile | Board Chair & CEO | Wang Jianzhou | 1948 | 2004 | Board chair & CEO of China Unicom | BS | None | Telecom Management |
| China Unicom | Board Chair | Chang Xiaobing | 1957 | 2004 | Vice president of China Telecom | MBA | None | Telecom Management |
| | CEO | Shang Bing | 1956 | 2004 | Vice president of China Unicom | MBA/MS | Graduate Studies at SUNY | Trade and Foreign Investment |
| China Railcom | Board Chair | Zhao Jibin | 1953 | 2004 | Head of Zhengzhou Railway Bureau | MA | None | Railway Management |
| | CEO | Zhang Yongping | 1961 | 2004 | General manager of Shandong Netcom | BS | None | Telecom Management |
| China Satcom | Board Chair & CEO | Rui Xiaowu | 1960 | 2006 | Assistant president of Aerospace Science & Technology Corp. | MS | None | R&D in Aerospace Industry |

*Notes*: SUNY = State University of New York, R&D = Research and Development.

Table 3 shows the backgrounds of the top leaders of China's six largest telecom operation companies. In four of these six companies, the posts of CEO and chairman of the board are held by the same leader. The oldest of them, CEO and chairman of the

board of China Mobile Wang Jianzhou, is 58 years old; the youngest is China Railcom CEO Zhang Yongping, who is 45 years old. The average age of all eight leaders is 49.6 years. Most of these leaders graduated from top engineering schools in China, and several (Wang Xiaochu, Zhang Chunjiang, and Zhang Yongping) attended the same school (Beijing University of Posts and Telecommunications). Only one of these eight top administrators had the opportunity to pursue foreign study. Shang Bing, the CEO of China Unicom, attended the State University of New York, where he received an MBA in 2002.

Most of the top leaders of China's largest telecom service providers have worked in the telecom industry for over two decades. None of these top administrators, however, were appointed to their current posts more than three years ago, indicating the frequent leadership reshuffling in the administration of China's SOEs. Indeed, CEOs and board chairs of the major telecom operation providers have often rotated across companies. For example, the CEO of China Telecom, Wang Xiaochu, was transferred to his current position from a slot at China Mobile, where he served as vice president. Similarly, the CEO of China Mobile, Wang Jianzhou, was previously the CEO of China Unicom, and the chairman of the board of China Unicom, Chang Xiaobing, previously served as vice president of China Telecom.

In contrast, the top administrators in China's leading IT companies and telecom manufacturers have usually advanced their careers from within the same companies that they now head. Table 4 (next page) includes background information on the top leaders of the 15 largest Chinese electronics and IT companies in 2006.[59] "The top leader" of a company can be either the CEO or the chairman of the board, depending largely on who has the higher status or greater influence in the company's decision-making process. For example, in Haier and Huawei, board chairs are less influential than CEOs, but in BOE and Hisense, the opposite is true. Six leaders in the list hold the posts of both chairman of the board and CEO concurrently.

The ages of these leaders differ significantly. The oldest, CEO and chairman of the board of Galanz, Liang Qingde, is 69 years old; the two youngest leaders, Zhao Yong from Sichuan Changhong and Liang Guangwei from Shenzhen Huaqiang, are only 43 years old. The average age of these 15 leaders is 55 years old, which is older than the average age of ministerial leaders (53.6 years old), and also older than the average age of the top leaders of the six largest telecom providers (49.6). This is understandable because some of these top 15 companies are privately owned and CEOs of these firms usually have no pressure to step down. Many of them have worked in the same companies for over a decade.

Six top leaders, including Legend's Liu Chuanzhi, Haier's Zhang Ruimin, Huawei's Ren Zhengfei, Midea's He Xiangjian, ZTE's Hou Weigui, and Galanz's Liang Qingde not only run their companies but are also the founders of these firms. They are all among the most celebrated entrepreneurs in China's transition to a market economy, and are now in their 60s. Legend and ZTE have already made arrangements for the impending generational transition facing their companies' top management teams.
*(text continues on page 17)*

**Table 4**
*Background of Top Leaders of the 15 Largest Chinese Electronics and Information Technology Companies in 2006*

| *Name* | *Company* | *Position* | *Birth year* | *Tenure since* | *Association with the company* | *Ed. level* | *Expertise & main experience* | *Company revenue (billion yuan)* |
|---|---|---|---|---|---|---|---|---|
| Liu Chuanzhi | Legend Holdings | Board Chair | 1944 | 1984 | 1984 (Founder) | BA | Management | 108.2 |
| Zhang Ruimin | Haier Group | CEO | 1941 | 1984 | 1984 (Founder) | MA | Management | 104 |
| Wang Dongsheng | BOE (Beijing Orient Electronics) Group | Board chair | 1958 | 1993 | 1993 (Founder) | MA | Accounting | 54.8 |
| Li Dongsheng | TCL Group | Board chair & CEO | 1957 | 1997 | 1993 | BS | Marketing | 52.1 |
| Ren Zhengfei | Huawei Technologies | CEO | 1944 | 1988 | 1988 (Founder) | BS | Management | 47 |
| He Xiangjian | Midea Group | Board chair | 1942 | 1995 | 1968 (Founder) | BS | Management | 42.5 |
| Zhou Houjian | Hisense Group | Board chair | 1957 | 1995 | 1994 | BS | Management | 33.4 |
| Xu Weihu | SVA Group | Board chair & CEO | 1946 | 1993 | 1992 | BS | Management | 29.3 |
| Li Anjian | Panda Electronics Group | Board chair & CEO | 1953 | 1999 | 1999 | MBA | Management | 28.1 |
| Wei Xin | Founder Group | Board chair | 1956 | 2001 | 1999 | MA | Academic | 25.9 |
| Hou Weigui | ZTE | Board chair | 1942 | 2004 | 1985 (Founder) | BA | Management | 21.6 |
| Zhao Yong | Sichuan Changhong | Board chair & CEO | 1963 | 2004 | 1991 | Ph.D. | Technical Research | 18.1 |
| Liang Guangwei | Shenzhen Huaqiang | Board chair & CEO | 1963 | 2000 | 1992? | Ph.D. | Finance & Investment | 15.7 |
| Chen Zhaoxiong | Great Wall Technology Co. | Board chair | 1961 | 2004 | 2004? | Ph.D. | Technical Research | 15.1 |
| Liang Qingde | Galanz | Board chair & CEO | 1937 | 1988 | 1988 (Founder) | Junior College | Management | 13.5 |

*Sources and Notes*: The top 15 largest Chinese electronics and information technology companies in 2006 were based on the revenues of these companies in the previous year. For the whole list of the top 100, see http://www.ittop100.gov.cn/200605/188766.shtml.

The current CEOs of Legend and ZTE, Yang Yuanqing and Yin Yimin (both 42 years old), are often regarded as appointed successors to Liu and Hou, respectively. Both Yang and Yin have received much credit for their companies' recent overseas expansion, largely resulting from their successful strategic initiatives in marketing and sales.[60]

The much-anticipated leadership succession in both Haier and Huawei, however, is unclear as to when it will occur and who will succeed Zhang and Ren. Huawei reportedly once had as many as about 100 vice presidents.[61] Currently, there are two leaders who are seen as the top candidates to succeed Ren, who is not only the CEO but also the founder of the company. One is Sun Yafang, who has served as the chairwoman of the board of Huawei since 1998 and is generally regarded as the "No. 2 leader" in the company.[62] Sun, now in her early 50s, graduated from Chengdu University of Electronic Science and Technology. She worked in the Ministry of State Security in the area of telecommunications prior to joining Huawei in 1992. She served as director of the training department, director of Huawei's office in Changsha, and executive vice president of marketing and human resources in the company. It is believed that she helped Ren Zhengfei obtain loans and resolve major financial crises in several critical periods of Huawei's development. Sun's weakness lies in the fact that she is not an expert on telecommunications.

The other possible successor to Ren is Li Yinan, who is widely regarded in China as being a "genius" in the fields of technology and telecommunications. Born in Hunan in 1970, he was enrolled at the Central China University of Science and Technology at the age of 15. After receiving a master's degree in 1993, Li began to work at Huawei. Within two weeks of his beginning work at the company, he solved a major technical problem; because of his extraordinary contribution, Li received the title of senior engineer, which usually requires many years of professional experience. At the age of 27, he was named Vice President in charge of R&D of the company and was seen by many as a possible successor to Ren.[63] Under Li's leadership, Huawei made many technological breakthroughs in the late 1990s. In 2000, however, Li decided to leave Huawei and move to Beijing, where he established a high-tech company called Harbour Networks. A group of young technical experts from Huawei also left the firm to join Li's new start-up company. It was widely believed that Ren Zhengfei tried various ways to lure Li back, including a legal effort to sue Harbour for violation of intellectual property rights, and an attempt to block Huawei's financial revenue stream. In 2006, Li decided to sell Harbour Networks to Huawei, and he has now resumed his position as vice president and chief technology officer of Huawei.

Ren Zhengfei's concerted effort to have Li Yinan return to Huawei seems to suggest that Ren has seriously considered how best to effect a smooth leadership transition in his firm, although he has hardly ever discussed this issue openly within the company. This case also indicates how intense the competition for talented senior managers and top-notch technical experts is within the telecom industry, especially for those in the up-and-coming generation. Although some of the leading telecom manufacturing companies are still headed by "old-timers" such as Ren in Huawei and Hou Weigui in ZTE, the senior leadership at the vice president level has been filled by younger managers like Li Yinan.

Table 5 lists all the members of the senior management team of ZTE, including the president and all of the vice presidents. Only one vice president is over 50, and the average age of these senior leaders is only 41.1 years. All of them have advanced their careers within the company and most have been engaged in R&D. A majority of them obtained their college educations in China, and they generally do not have much in the way of foreign experience. Among these 16 senior leaders, only two, Chen Jie and Ye

**Table 5**
*Background of the Senior Management Team of ZTE (2006)*

| *Name* | *Current position* | *Sex* | *Age* | *Tenure since* | *Degree* | *Most recent position* | *Main experience* |
|---|---|---|---|---|---|---|---|
| Yin Yimin | President | M | 42 | 2004 | Master's | Vice president of ZTE | ZTE R&D |
| Xu Huijun | Vice president | M | 32 | 2004 | Master's | Director of ZTE R&D Beijing Branch | ZTE R&D |
| Zhao Xianming | Vice president | M | 39 | 2004 | Ph.D. | Product Manager of ZTE CDMA Department | ZTE R&D |
| Zhang Chuanhai | Vice president | M | 39 | 2002 | Master's | General Manager of ZTE Third Sales Department | ZTE Sales |
| Tian Wenguo | Vice president | M | 36 | 2002 | Bachelor's | General Manager of ZTE Second Sales Department | ZTE Sales |
| Chen Jie | Vice president | F | 47 | 2002 | Master's | General Manager of ZTE Network Department | Director of AT&T Lab |
| Wei Zaisheng | Vice president | M | 43 | 2001 | Master's | ZTE Finance Director | ZTE Finance |
| Xie Dasheng | Vice president | M | 42 | 2001 | Master's | General Manager of ZTE CDMA Department | ZTE R&D |
| Ye Weimin | Vice president | M | 42 | 2001 | Bachelor's | General Manager of ZTE Mobile Communications Department | ZTE R&D |
| Fang Rong | Vice president | F | 41 | 1999 | Bachelor's | General Manager of ZTE Shenzhen Headquarters | ZTE Management |
| Ni Qin | Vice president | M | 46 | 1999 | Technical School | Deputy General Manager of ZTE Mobile Communications Dept. | ZTE R&D |
| Qiu Weizhao | Vice president | M | 42 | 1998 | Master's | General Manager of ZTE Kangxun Electronic Co. | R&D |
| Ding Mingfeng | Vice president | M | 36 | 1998 | Master's | General Manager of ZTE First Sales Department | ZTE R&D |
| He Shiyou | Vice president | M | 39 | 1998 | Master's | Director of ZTE R&D Shanghai Branch | ZTE R&D |
| Shi Lirong | Vice president | M | 41 | 1997 | Master's | General Manager of ZTE New Telecom Equipment Co. | ZTE R&D |
| Zhou Susu | Vice president | F | 51 | 1997 | Master's | Deputy General Manager of ZTE New Telecom Equipment Co. | ZTE R&D |

*Notes*: Dep.=Deputy; Dept.=Department; and R&D=Research and Development.

Weimin, worked abroad for a substantial period of time, with Chen having served as the director of an AT&T lab in the United States while Ye was at one point in charge of ZTE's research center in Europe.

Despite the Chinese government's attempts to recruit "returnees" (Chinese nationals who have studied abroad but return to China for work), the number of such returnees in the senior leadership of the major telecom firms in the country is still very small. One exception is Edward Tian, currently vice chairman of China Netcom. Tian earned a Ph.D. in natural resource management at Texas Tech University in the United States, and as a returnee has played an important role in China's telecom industry.

Very few foreign nationals currently serve on senior management teams or on the boards of directors in major Chinese telecom manufacturing firms. Exceptions include William Amelio, an American who previously worked in Dell, Honeywell, and IBM and who currently serves as the CEO of the Lenovo Group; John Thornton, former president of Goldman Sachs, who currently serves as a board member of China Netcom; and Andreas Wente, Royal Philips Electronics' regional executive for the Asia-Pacific region, who currently serves as a director on the board of directors of TCL.

Although many IT and telecom companies have recruited returnees and foreign nationals, these employees usually work at the middle levels of administrative leadership or in the technical or accounting departments of the companies. For example, about 100 accountants from Hong Kong now work in Huawei. Huawei also recently appointed a former purchasing director of IBM to be the company's vice president, but he resigned after working there for only a few months. In the fall of 2006, Huawei appointed Mick Reeve to be its strategy advisor. Reeve is a Fellow of the United Kingdom's Royal Academy of Engineering. He recently retired from British Telecom (BT) after working there for over 36 years. Reeve's track record in technical innovation in the telecom industry is extraordinary. He was often seen as the "chief architect" responsible for BT's overall network and systems architectures, including optical systems, switching and intelligence, and operational support systems.[64] It remains to be seen whether this appointment reflects Huawei's intension to more aggressively recruit leading international telecom experts in the future. But for now, this case is an exception rather than a norm.

There are many reasons that major Chinese enterprises do not generally place foreign nationals or returnees in positions of high authority within their management teams. These reasons include political distrust, the concern over a large salary gap in the company's senior leadership, and the growing difficulty of attracting foreign managers or Chinese returnees due to the localization strategy of multinational companies in China. In recent years, major multinational companies in China have generally been inclined to recruit local talent rather than send foreign expatriates to China to run their operations there as they used to do in the 1980s and early 1990s.[65] At present, China has 950 registered headhunter firms, and these firms mainly help foreign companies to find local talent.[66] Consequently, China's homegrown companies have a tough time in recruiting and keeping the best and brightest.

Since 2003, the State-Owned Assets Supervision and Administration Commission made several global search efforts, attempting to hire some senior managers for the companies under their watch, but in the end neither foreign nationals nor Chinese returnees were hired, nor have any ever been hired prior to or since that time.[67] The jobs have usually gone to "insiders" who worked in the same company for a long time; very few "outsiders" could meet the firms' requirements such as five years of work experience in lower-level leadership positions in the same industry.

## Contrasting Perspectives and Final Thought

The shortage of senior managers with international experience among the emerging Chinese global firms will sooner or later undermine the competitiveness of their overseas operations. However, one may argue that U.S.-based multinational corporations do not have many foreigners who serve as senior managers or directors of the board either. One recent study of U.S. *Fortune 100* companies found that although 85 percent of these companies had non–U.S. sales, only 20 percent had one or more non–U.S.-based director(s) on their boards.[68] At the same time, however, the study also found that the most successful global companies often expose promising young corporate managers to opportunities to work in foreign countries early in their careers. According to this report, top executives of global companies usually "have had tours of duty in overseas markets before assuming their current roles."[69]

Chinese companies expanding their operations into overseas markets seem to be particularly in need of a large number of senior managers with substantial international experience because Chinese firms usually lack what some analysts have called "global infrastructures" or worldwide economic and financial networks. Many multinational companies have established these global infrastructures over the past few decades, or even longer time periods.[70] The lack of knowledge of the foreign economic environment may partially explain why China has very few globally recognizable brand-name companies, even though Chinese-made products have spread all over the world.[71]

A truly global company should not be too provincial or nationalistic in terms of its senior management team. As more and more Chinese firms expand their business operations beyond China's borders, the thirst for globally capable managers will grow much stronger in the years to come. A recent report by McKinsey & Co. estimates that Chinese companies will need about 75,000 leaders who can work effectively in the global environment within 10 to 15 years, but also noted that at present China has only 3,000 to 4,000 managers who are so qualified.[72] From this perspective, it would appear that Chinese companies have a long way to go before they will become truly dynamic global firms capable of operating overseas as easily as they do in China.

But as a matter of fact, Chinese flagship enterprises such as Huawei, ZTE, and Haier are already significant players in the global market. Although the senior managers of China's telecom industry do not have significant international exposure, they have not been deterred from adopting a "Go Out" strategy for expanding their business operations

overseas. This paper's review of the odyssey of China's telecom industry over the past two decades, especially its remarkable catch-up on the technological front and its growing penetration of the world market, suggests that the greater impact of China's economic rise is still yet to come.

## Notes

[1] The author is indebted to Luke Forster and Yinsheng Li for their research assistance. The author also thanks Sally Carman, Scott W. Harold, and David Sands for suggesting ways in which to clarify the article.
[2] As part of the WTO agreement, by 2007, foreign ownership of up to 49 percent will be permitted in telecom service networks in China. "Telecoms & Technology Forecast Asia & Australia," *Industry Forecast*, December 2005, p. 28. See http://www.eiu.com.
[3] China's Minister of Information Industry Wang Xudong promised in the spring of 2005 that 3G mobile communications will be in full service during the 2008 Beijing Olympics. This will allow a year or two for experimentation, marketing, and promotion prior to the Olympic games. *Ershiyi shiji jingji daobao* [21st century economic herald], 5 July 2005. For a discussion of the delay on the part of the Chinese government in issuing licenses for 3G, see Andrew McGinty and Donald Da Nona, "3G Licensing in China: A Waiting Game," *Computer Law and Security Report* 20, No. 6 (2004): 480–81.
[4] *Ershiyi shiji jingji daobao* [21st century economic herald], 5 July 2005. Another Chinese official source states that "China's telecom firms will invest nearly 400 billion yuan (US$50 billion) in 3G services in the first five years of operation." "Telecoms & Technology Forecast Asia & Australia." *Industry Forecast*, December 2005, p. 28. See http://www.eiu.com.
[5] For a detailed study of Huawei's early development, see Cheng Dongsheng and Liu Lili. *Huawei zhenxiang* [The truth about Huawei]. Beijing: Dangdai Zhongguo chubanshe, 2003.
[6] Huawei's total assets are based on 2004 data. See Zhongguo chanye ditu bianweihui and Zhongguo jingji jingqi jiance zhongxin. *Zhongguo chanye ditu—IT 2004-2005* [Industrial maps of China—Information technology 2004–2005]. Beijing: Social Science Academic Press, 2005, p. 64. For Huawei's revenues in 2005–2006, see http://www.ittop100.gov.cn/200605/188766.shtml.
[7] *Xinjingbao* [New Beijing daily], 12 September 2006, p. 3.
[8] Ibid.
[9] *Business Daily Update*, 27 July 2006, p. 1.
[10] For example, Marcos Aguiar and others, "The New Global Challengers: How 100 Top Companies from Rapidly Developing Economies Are Changing the World." Report published by the Boston Consulting Group, May 2006, p. 23.
[11] *Tongxin chanyebao* [Information industry daily], 28 December 2005, p. 1.
[12] Zhu Jinzhou. *Dianxin jingzhengli pingjia yu duice* [Telecommunication competitiveness: Assessment and policy]. Beijing: Posts & Telecoms Press, 2006, p. 164.
[13] The ranking is based on revenue. http://money.cnn.com/magazines/fortune/global500/2006/full_list/201_300.html.
[14] Based on a speech by the vice-minister of the Information Industry Yang Yaoping, delivered at China's 2006 Internet Conference held on 21 September 2006. See http://tech.sina.com.cn, 22 September 2006. See also the monthly statistical report of the Ministry of the Information Industry of the People's Republic of China, http://www.mii.gov.cn, 21 September 2006.
[15] The penetration rate of 0.6 per 100 people refers to the year 1985. See Zheng Qibao, ed. *Cong longduan dao jingzheng—Dianxin hangye guizhi lilun yu shizheng yanjiu* [From monopoly to competition: Empirical study and theoretical discussion of the telecommunications industry]. Beijing: Posts & Telecoms Press, 2005, p. 344.
[16] "Telecoms & Technology Forecast Asia & Australia." *Industry Forecast*, December 2005, p. 28. Also see http://www.eiu.com.
[17] The net profit of China Unicom was 4.93 billion yuan in 2005. *Tongxin xinxibao* [Telecom information daily], 15 August 2006. Quoted from http://www.sina.com.cn, 15 August 2006.
[18] Michael Wang, "Telecommunications and Broadcasting Regional Market Brief: China." *International Market Insight*. 2004, p. 1.

[19] In 2004, 90 percent of the major IT companies that were listed in the *Fortune 500 Global* had invested in China. Zhongguo chanye ditu bianweihui and Zhongguo jingji jingqi jiance zhongxin. *Zhongguo chanye ditu*, p. 8.
[20] Huai Tiezheng. *Xinxihua: Zhongguo de chulu yu duice* [Information: China's path and policy]. Beijing: China Machine Press, 2006, p.132.
[21] These foreign companies were called "seven countries with eight systems" (*qiguo bazhi*). See Cheng and Liu, *Huawei zhenxiang*, p.25 and p. 29. Also see "Telecoms & Technology Forecast Asia & Australia." *Industry Forecast*, December 2005, p. 36. See http://www.eiu.com.
[22] "Telecoms & Technology Forecast Asia & Australia." *Industry Forecast*, December 2005, p. 36. See http://www.eiu.com. For more discussion on the distribution of foreign-directed investment in China's telecom industry, see Zixiang Alex Tan, "Product Cycle Theory and Telecommunications Industry: Foreign Direct Investment, Government Policy, and Indigenous Manufacturing in China." *Telecommunications Policy*, Issue No. 26 (2002): 17–30.
[23] Tan, "Product Cycle Theory and Telecommunications Industry," p. 24 and p. 29.
[24] Caijing zazhi bianjibu. *Guanzhi de huanghun: Zhongguo dianxinye wanyiyuan chongzu shilu* [The dwindling of regulation: Witness to the restructuring of China's multibillion dollar telecommunication industry]. Beijing: Social sciences academic press, 2003, p. 87.
[25] Zhongguo jingji jingqi jiance zhongxin. *Zhongguo chanye ditu*, p. 9.
[26] Peilei Fan, "Catching up through Developing Innovation Capability: Evidence from China's Telecom-Equipment Industry," *Technovation*, No. 26 (2006): 363.
[27] Cheng and Liu, *Huawei zhenxiang*, p. 25.
[28] For example, Cheng and Liu, *Huawei zhenxiang*, Cheng Dongsheng and Liu Lili, *Huawei jingying guanli zhihui* [The wisdom of business management in Huawei]. Beijing: Dangdai Zhongguo chubanshe, 2005; and Tang Shengping, *Zouchu Huawei* (Beyond Huawei). Beijing: Social Science Academic Press, 2004.
[29] Lang Xianping. *Kehuan—Zhongguo gaoxin jishu qiye fazhan zhanlue pingpan* [Technological imagination: Assessment of the development of new and high-technology enterprises in China]. Beijing: Dongfang chubanshe, 2006, p. 43; and Tang, *Zouchu Huawei*, p. 56.
[30] Cheng and Liu, *Huawei jingying guanli zhihui*, p. 5.
[31] Wang Yukun, *Quanqiuhua zhi wu—Xianghai ersheng de Zhongguo qiye* [Dance with globalization: Overseas expansion of Chinese enterprises]. Beijing: Beijing Normal University Press, 2006, pp. 19–21.
[32] Cheng and Liu, *Huawei jingying guanli zhihui*, pp. 5-9.
[33] See http://tech.sina.com.cn, 17 September 2006.
[34] Ibid.
[35] Fan, "Catching up through Developing Innovation Capability," p. 366.
[36] Liu Weiping and Wang Lili, *Quanqiu lingdaoli* [Global leadership]. Beijing: Qinghua daxue chubanshe, 2005, p. 70.
[37] *Zhongguo jisuanjibao* [China computer news], 6 June 2006.
[38] Three technology standards for 3G mobile communications will be selected, likely in different proportions, by the Chinese government. They are WCDMA (Wideband Code Division Multiple Access), backed by European and Japanese firms; CDMA (Code Division Multiple Access)2000, favored by U.S. firms; and the Chinese homegrown technology TD-SCDMA (Time Division Synchronous Code Division Multiple Access). TD-SCDMA is expected to have 10 percent of market share in the early years of the commercialization of 3G, but will expand to nearly a quarter by 2010. For more discussion of 3G licensing in China, see "Telecoms & Technology Forecast Asia & Australia," pp. 28–29; and "3G in China Update." http://www.pyr.com/pa 09feb 3gchina.htm, 18 September 2006.
[39] Cheng and Liu, *Huawei jingying guanli zhihu*i, p. 203.
[40] http://lightreading.com, 18 September 2006.
[41] For more discussion on the strategic shift, see Zhu, *Dianxin jingzhengli pingjia yu duice*, pp. 183–184.
[42] Zhu, *Dianxin jingzhengli pingjia yu duice*, p. 246.
[43] Huawei, for example, recently received a loan of US$600 million from the China Import-Export Bank, which will be used for overseas expansion.
[44] Aguiar, "The New Global Challengers," p. 7.
[45] Ibid., p. 26.

[46] In 1998, ZTE established three research units in the United States. They are located in New Jersey, Silicon Valley, and San Diego. Mi Zhou and Yin Sheng. *Zhongxin tongxun* (ZTE). Beijing: Dangdai Zhongguo chubanshe, 2005, p. 269.
[47] *Huawei renbao* [Huawei employee news], No. 178, 21 July 2006, p. 1.
[48] *Zhongguo dianzi bao* [China electronic news], 31 May 2006. See also http://www.sina.com.cn, 29 August 2006.
[49] See http://www.sina.com.cn, 31 July 2006.
[50] Mi and Yin, *Zhongxin tongxun*, pp. 59–69.
[51] *Diyi caijing ribao* [First economic and finance daily], 26 May 2006. Also see http://sina.com.cn, 7 June 2006.
[52] Zhongguo qiye pingjia xiehui and Dewuhua jingji xinxi yanjiuyuan youxian gongsi. *Zhongguo daxing qiye (jituan) fazhan baogao 2004–2005* [2004–2005 development report of China's largest enterprises]. Shanghai: Shanghai caijing daxue chubanshe, 2005, pp. 223－24.
[53] Zhu, *Dianxin jingzhengli pingjia yu duice*, pp. 240–41.
[54] Zhongguo qiye pingjia xiehui and Dewuhua jingji xinxi yanjiuyuan youxian gongsi. *Zhongguo daxing qiye (jituan) fazhan baogao*， p. 95.
[55] *Renmin ribao* [People's Daily], 22 August 2005, p. 6.
[56] Ibid.
[57] Cheng and Liu, *Huawei jingying guanli zhihui*, p. 233.
[58] Aguiar, "The New Global Challengers," p. 24.
[59] Rankings were based on the revenues of these companies in the previous year.
[60] For example, see http://www.businessweek.com/it100/2005/company/ZTE.htm.
[61] Tang, *Zouchu Huawei*, p.13.
[62] For more discussion of Sun Yafang, see Tang, *Zouchu Huawei*, p.13, and pp. 30–31.
[63] For a recent discussion of Li Yinan, see http://www.southcn.com/job/careercenter/elite/200609140683.htm.
[64] http://tech.sina.com.cn/t/2006-10-07/01571170214.shtml and http://www.itbusinessnet.com/articles/viewarticle.jsp?id=69391.
[65] Zhongguo qiye pingjia xiehui and Dewuhua jingji xinxi yanjiuyuan youxian gongsi. *Zhongguo daxing qiye (jituan) fazhan baogao*, pp. 2-3. But some other studies have contrasting findings. According to a recent report made by the Boston Consulting Group, although the local talent pool in rapidly developing economies such as China is expanding, most multinational companies in these countries are still run by expatriates. Arindam Bhattacharya and others, "Organizing for Global Advantage in China, India, and other Rapidly Developing Economies." Report published by the Boston Consulting Group, March 2006, p. 20.
[66] See http://chinesenewsnet.com, 29 August 2006.
[67] *Jingji guanchabao* [Economic observer], 17 July 2006, p. 2.
[68] Bhattacharya, "Organizing for Global Advantage," p. 12.
[69] Ibid., p. 21.
[70] Dominic Lenton, "Get the Balance Right." *IEE Review* 52, No. 2 (February 2006): 27.
[71] For an excellent study of this topic, see Joshua Cooper Ramo, "Brand China." London, Foreign Policy Center, 2006. See also http://fpc.org.uk.
[72] Diana Farrell and Andrew J. Grant, "China's looming talent shortage," the *McKinsey Quarterly*, 2005 Number 4, pp. 70–79. The quote is from Andrew J. Grant's interview, see http://www.mckinseyquarterly.com.