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THE E-TRANSFORMATION OF WESTERN CHINA

Western China is a vast area of just over four million square kilometers traditionally associated with the historic Silk Road connecting traders, manufacturers, and consumers in Europe and Asia. But for the past few hundred years, the Silk Road has largely been forgotten. Today, however, China's opening to the outside world and general trend toward technological modernization is starting to be felt in these far-western regions. The emergence of e-commerce in coastal China is well-documented [7]. Here, we report on the technological changes taking place in Western China, assessing the prospects for its economic and social development ahead. We focus on what we term the e-transformation of the Tibetan (Xizang), Xinjiang Uygur, and Ningxia Hui autonomous regions and Qinghai and Gansu provinces (see the Figure). These areas cover 43% of the land mass

It depends on the healthy synthesis of modern technology and traditional cultural and community values.

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The 23 provinces (including Taiwan), five autonomous regions, three municipalities, and two special administrative regions of China; chinapag.nexcess.net/map/province-english.jpg.

with solar-powered technology. These efforts are coordinated with tribal elders so as to ensure the preservation of their cultural and community values [6].

Similar development is taking place in Western China whereby technology enables a leapfrogging process with the potential to rejuvenate the Silk Road as a conduit for global trade. Traditional practices, values, and markets could be complemented by Internet-based communications. Web sites would offer many of the same products as traditional

of China, yet include only 4% of the country's overall population of more than 1.3 billion.

E-transformation is a remarkable phenomenon characterized by the application of information and communication technologies, including the Internet, to traditional business and communication processes, with the intention of bringing about significant improvement in their efficiency and effectiveness. E-transformation has proved viable in many countries, notably in the developing world (such as Bangladesh and Malaysia) that often lag behind other places in terms of technological development. In Bangladesh, for instance, Grameen Bank provides support for the development of mobile phone kiosks in villages that have historically lacked any telecommunications service. In this way, entire communities have been able to leapfrog into the information age, bypassing several generations of technology [3]. Similarly, in Bario, Malaysia, local Kelabit people are using the Internet to market and sell their local products globally via a village telecentre operated

markets, including silk carpets, musical instruments, camel-hair blankets, mittens, slippers, ox skulls, and sheep tails (www.trademile.com/tmnet; elvis-ablimit.jozan.net; www.tibetweb.net; www.potalacarpets.com).

A nation's technological development is often measured by its teledensity, or the number of people with access to telephones. Fixed-line teledensity in Western China ranges from approximately 12% in Tibet to 32% in Xinjiang, compared to a national average of 33% (see Table 1 for more detailed comparisons across China). This recent surge in teledensity represents a dramatic improvement over the 1986 statistics when national teledensity was only 0.66%. Wireless services are particularly important in Western China, given the low population density. China-wide, there are now more mobile subscribers (334 million) than fixed-line subscribers (316 million), according to research firm TeleGeography (www.telegeography.com). Regional figures are difficult to come by, but it's worth noting that in Tibet, CDMA450-D technology is being rolled out by Tibet Telecom, which added 90,000 new customers in 2004, most in sparsely inhabited rural areas. Meanwhile, China Mobile operates a GSM ser-

Province/City	Area in 1,000 km ² (% of total area)	Population in millions (% of total population) in 2002	Teledensity (%) in 1986	Teledensity (%) in 2002
China	9,326	1,261	0.66	32.78
Beijing	17 (<1)	13.82 (1)	4.63	105.77
Shanghai	6 (<1)	16.74 (1.3)	2.99	97.57
Zhejiang	100 (1)	46.77 (3.7)	0.85	61.17
Fujian	121 (1)	34.71 (2.7)	0.52	49.89
Guangdong	178 (2)	86.42 (6.8)	0.82	66.31
Sichuan	480 (5)	42.88 (3.4)	0.24	20.16
Shaanxi	205 (2)	36.05 (2.9)	0.75	27.38
Gansu	390 (4)	25.62 (2)	0.22	20.40
Qinghai	720 (8)	5.18 (<1)	0.94	25.52
Ningxia	66 (<1)	5.62 (<1)	0.79	27.62
Xinjiang	1,660 (18)	19.25 (1.5)	0.31	32.27

Table 1. Area, population, and teledensity of selected Chinese cities/provinces [5]; www.unescap.org/esid/psis/population/database/chinadata/intro.htm.

vice in Tibet with 320,000 customers [2].

Many government initiatives also promote e-commerce development in Western China. For example, SparkIce (www.sparkice.com), which describes itself as the Chinese e-hub for global commerce, is leveraging online business and information traffic. It has forged a strategic partnership with Metro, one of Europe's largest retailers, to become an interactive marketplace for global e-commerce. SparkIce has also set up a subsidiary dedicated to facilitating trade in Western China (www.21cwn.com). Chinese manufacturers and suppliers can use the same platform to sell their goods. Spurred by recent government investment, newly built (and rebuilt) roads and rail networks, extending via Kashi/Kashgar to Bishkek in Kyrgyzstan and via Urumqi to Almaty in Kazakhstan, are also now in place [9].

E-transformation extends beyond simple e-commerce to embrace the social and political fabric of Western China. While fiber-optic connections are prevalent in China's urban areas, wireless technology is particularly valuable in rural areas lacking any form of legacy telecom infrastructure. Connectivity for traditional business, education, and general communication extends across the country, including high mountain valleys where nomadic groups still reside in yurts (circular felt tents) during the brief summer season. These people promote community-based tourism (CBT), whereby tourists engage with their host communities, living and even working with them, experiencing their lifestyles firsthand (www.wildchina.com; www.cbtkyrgyzstan.kg). Conserving the community's natural environment and indigenous cultural heritage is a critical success factor for CBT. Nomads and tourists alike benefit from the e-infrastructure. Nomads communicate with one another, sell local goods and services, and search for information on market prices. Tourists stay in touch with the outside world. A particularly important aspect of CBT is the preservation of local control (and local receipt of profits) while sustaining traditional cultural values. Local empowerment and control are important for sustaining value-added economic growth and viability [5].

Although e-transformation got off to a positive start, it is by no means the solution to all of the region's social and economic problems (see Table 2). E-transformation depends not only on technological requirements but on social and political success factors. With respect to technology, the cost of utilization remains a significant barrier to widespread adoption

Technological/Financial	Social/Political/Logistical
Payment and banking systems are lacking	Cash is the preferred currency
Internet access is costly	Few end-to-end delivery services
Credit cards are rare	Military and separatist tensions
Cross-border standards vary	Bureaucracy can be stifling

Table 2. Key barriers to the e-transformation of Western China.

and use. Furthermore, e-transformation requires a financial infrastructure, including payment and banking systems, that are only slowly being rolled out. In this respect, serious gaps in the financial sector persist throughout Western China, where cash is traditionally the dominant form of exchange and savings, and there is little in the way of credit card use. Cards are generally used only in high-end department stores, luxury hotels, and restaurants and on a few select Web sites. The result is that most users are not local residents but overseas tourists and businesspeople. The local people may order goods online but usually end up paying cash over the counter in the local post office when returning to collect their goods.

Many pressing social and political concerns persist in Western China and throughout the Central Asian region. At an August 2004 meeting in Beijing of the Shanghai Cooperation Organization (China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan), the six member states agreed to work toward economic integration within 20 years.

Chinese interest in such cross-border cooperation stems from three strategic issues: trade, security, and natural resources [1]. Since China began to open itself up to the outside world in the early 1980s, much attention and capital has been focused on Eastern China, particularly along the coastal strip running from Dalian in the north through Qingdao and Shanghai to Xiamen and Hong Kong in the south, as well as in select inland cities (such as Chongqing and Nanjing) [8]. Western China has been largely ignored, due not only to the region's physical remoteness and limited transportation infrastructure but to its potential for social unrest. Separatist groups fighting for an independent East Turkestan in Xinjiang have on occasion attacked prominent government targets, charging that their culture, religion, and language are being marginalized [1]. Investor enthusiasm for the region has been further dampened by a highly bureaucratic system. In the late 1990s, Xinjiang was touted by the central government, as well as by private investors in Hong Kong, as a high-growth region, with 110 Hong Kong firms investing in excess of \$160 million (U.S.). Oil exploitation, petrochemicals, textiles, grain production, chemicals, machinery, electricity, and forest products were viewed as key industries. However, the search for quick profits has not been successful, and there has been a consequent cooling of foreign direct investment, notably from Hong Kong.

The e-transformation of Western China depends on cooperation with regions beyond China, raising fresh challenges and opportunities. Military tensions

and disruptions in the area (such as the conflict in nearby Afghanistan and various separatist activities) have an especially chilling effect. Nevertheless, there have been regional successes. Kazakhstan and Kyrgyzstan have relatively successfully emerged from the former Soviet Union, with burgeoning ties westward with Europe, along with technological competence and global recognition as a potential business hub. Each shares a border with Xinjiang, the largest province in Western China. Notwithstanding their connections to European markets, cross-border transport difficulties are legion, reflecting incompatible railway gauges and the local bureaucracy. The vast majority of goods headed west from Western China begins by first heading east for thousands of kilometers to ports (such as Dalian, Tianjin, and Qingdao) for trans-shipment.

Nevertheless, circumstances are changing and solutions are beginning to emerge that highlight the potential for e-transformation, with technology as a catalyst for change. For example, the customs and excise domain increasingly relies on technology. The European Union serves as a model for cooperation at many levels within and between China and its neighboring countries. Current cross-border discussions within the Shanghai Cooperation Organization focus on developing shared protocols intended to facilitate trust and enable effective and efficient ways of conducting cross-border commerce. Young technology-savvy employees are eager to change systems no longer capable of dealing with contemporary demands (such as heightened customer service expectations involving accurate and comprehensive information). Satellites are in place to handle information transfer in regions not otherwise connected through landlines. As governments embrace technology to help provide services (such as the means to collect taxes, tariffs, and information regarding the transit of goods), we can expect increased cooperation and integration of cross-border customs information. Tariffs can (and will) be dealt with electronically and funds routed throughout Western China. Meanwhile, Kazakhstan is opening its borders for transit following its admittance into the financial committee of the World Customs Organization (www.kazakhembus.com).

Driven by private initiatives, progress in e-logistics (such as radio frequency identification technology), increasingly common in China's Pearl River Delta, Shanghai, and Hong Kong regions, will help further the national goal of creating an countrywide integrated environment leveraging the Internet and embracing Western China. Cross-border warehouses and low-cost RFID readers are being developed by private concerns, notably in the manufacturing sector, as

a model for adapting the Hong Kong and Pearl River Delta experience into Western China. Information systems and communication protocols are being developed to deal with the terabytes of data associated with the large-scale collection and management of extended RFID networks. In the same way Wal-Mart and other global companies and various governments are beginning to mandate RFID use, Western China can expect to be part of and to benefit from the scaled-up domain in which e-logistics plays a leading role.

Conclusion

The e-transformation of Western China is a complex social, technological, political undertaking that cannot succeed by focusing exclusively on technology; technological and social solutions must be interwoven to ensure that cultural values and traditions are preserved, even as new ways of communicating and doing business are enabled (see the sidebar). No single issue dominates, but Internet connectivity (whether via landlines, wireless, or satellite) and knowledge about leveraging technology are critical. ■

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State Censorship of the Internet in China

The Internet represents a double-edged sword for the government of the People's Republic of China. It is "a cornerstone of the drive for economic development," according to its current Five Year Plan and has been cited repeatedly as critical for modernization by the country's top political leaders. For example, scientists and IT professionals alike need accurate and timely technical information. The state has undertaken three major Golden Projects—Golden Card, Golden Customs, and Golden Tax—as well as nine smaller Golden Projects since 1991 to develop a national information infrastructure (www.chinagate.com.cn/english/147.htm). It has also led by example with its Government Online initiative (www.gov.cn) launched in 1999. However, the Web sites of the government's ministries and state agencies tend to emphasize providing basic information and touting recent achievements, rather than offering online services.

The Internet is also the first medium to realize the principles of free speech and self-governance, effectively breaking the Communist Party's monopoly on public information. Nevertheless, state authorities still monitor the Internet closely and censor undesirable content and usage (such as criticism of the Communist Party and calls for political reform). Research at the Berkman Center for Internet & Society at Harvard Law School [2] suggests that up to 15% of foreign Web sites have been rendered inaccessible to Web surfers in China. The state is also trying to consolidate and gain control of Internet cafés while systematically deleting discussion of Taiwan, Tibet, the Falun Gong spiritual movement, and democracy from online chatrooms.

In late 2004, Beijing also launched a nationwide crackdown on online computer games, banning foreign games with sensitive political content as part of its attempt to shield the country's youth from "harmful" influences.

Internet users in China play a cat-and-mouse game with the authorities. For example, with U.S. Vice President Dick Cheney's June 2004 speech in Shanghai, the authorities removed such sensitive phrases as "expanding political freedom" and "yearning for democracy," before allowing it to be published or posted anywhere. Netizens quickly eluded the state's automated censorship software, posting the complete speech online by replacing the first character in Mr. Cheney's Chinese

name, "qie ni," with a similarly pronounced character.

The Chinese government maintains the world's biggest prison for cyberdissidents. Amnesty International has identified more than 50 people imprisoned there for posting subversive messages or articles. For example, Huang Qi set up a Web site in 1998 that quickly became a magnet for discussion of sensitive topics, from human rights to democracy. It attracted the attention of the Ministry of Information Industry, whose responsibilities include being the "great firewall of China" [1]. Huang Qi was arrested in June 2000 and found guilty in August 2001 of attempting to subvert state power. On May 9, 2003, a Sichuan court sentenced him to five years in prison; he has been detained ever since.

The state goes to great lengths to control Internet use by ordinary people in China. Nevertheless, this new medium not only enables economic growth but expands freedom of expression and transforms information exchange. Suppressing information about major events and disasters is increasingly difficult. For example, large demonstrations at U.S. diplomatic buildings in Beijing, Chengdu, Guangzhou, Shanghai, and Shenyang began less than an hour after NATO bombed the Chinese Embassy in Belgrade in 1999. Despite official news blackouts, online sources also informed tens of millions of Chinese about the Severe Acute Respiratory Syndrome, or SARS, epidemic in the spring of 2003, repeated outbreaks of Bird Flu, and the death of the Chinese Communist Party's former General Secretary, Zhao Ziyang, on January 17, 2005. **C**

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