

Universal Service Policy in China: Building Digital Bridge for Rural Community

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After seizure of power in 1949, the Communist Party of China (CPC) painted a blueprint with its people, pledging them with a life of “Upstairs and downstairs; electric lights and telephones” in the near future¹. More than half a century later, Chinese telecommunications industry has witnessed a rapid expansion and growth, especially since its deregulation in 1994, resulting in even broadened digital divides between varied groups, particularly between urban and rural areas. In urban areas, the blueprint has been actualized, however, in many rural areas, especially those in the “Old, Ethnic, Remote, and Deprived”² areas, people are struggling for sustenance, and telephone is still a luxury that they never started to dream of. This paper examines dilemmas and practical issues faced by Chinese government in its effort to implementing universal service obligation (USO) and takes a systemic look at a series of policy issues regarding the universal service objectives, service definition, choice of technology, support mechanism, government’s role and regulatory structure.

1. Introduction

1.1. Country Background

China is a developing country with a land of 9.6 million square kilometers, roughly one quarter of Asian land area, ranking the third largest country on the planet, after Russia and Canada. The physical topography of the land is formed into three ladders, descending from west to east with diversified terrains. The mountain and plateau areas that cover roughly 70% of the counties account for 66% of the land surface and are primarily concentrated in western China. There are 31 provinces (or municipalities and autonomous regions) and 56 ethnic nationalities with a total population of 1.3 billion (as of 2004), skyrocketing from 0.45 billion in 1949 when the Republic was established. There are 732.7 thousand rural administrative villages consisting of 5 millions natural villages with rural households of 0.21 billions and rural population of 757 millions that accounts for 58.2% of the total population³. The exponential growth of population was curbed by the “Family Planning” launched in 1970s. However, due to large population base already formed, Chinese population will still be growing at a high speed until 2050.

During the past century, foreign evasions and civil wars drove China into deep economic depression and social turbulence that lasted until the end of 1970s when “Cultural

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¹ “Upstairs and downstairs; electric lights and telephones” has been a buzzword for about half a century among Chinese people. It used to be a vivid description of what a happy life has to offer, although nowadays what people pursue is quite beyond that.

² The first word “Old” refers to the areas that hosted the CPC’s revolution in its early stage, especially before the second civil war with Kuomintang; “Ethnic” refers to the areas of ethnic minority that are usually located in relatively underdeveloped regions; “Remote” refers to the areas distant from major cities. “Deprived” refers to the areas that are extremely underdeveloped and poor.

³ See “China Statistics Yearbook 2004” and statistics issued by the State Council Leading Group Office of Poverty Alleviation and Development.

Revolution” was officially ended. Since then, the CPC adopted a reform and opening-up policy and decided in 1992 to construct so-called “Socialist Market Economy with Chinese Characteristics”⁴, which results in exponential influx of foreign capitals and extensive reforms on SOEs (State-Owned Enterprises). Mainland China’s GDP grew at an annual rate of 9% since 1978 to USD1650 billions as of 2004, with a per capita GDP of USD1269. Nevertheless, marked gaps in terms of income existed between urban and rural areas as well as between different regions. Until 2004, average annual disposable income per capita for rural areas was USD 358 as compared against USD1149 for urban areas. GDP per capita has reached USD4000 in relatively developed regions such as Beijing, Shanghai, Guangdong whilst in some extremely deprived areas annual household income is under USD50⁵.

The government is comprised of the State Council, National People’s Congress, and National People’s Political Consultative Congress. Hong Kong and Marco was reunited with the mainland in 1997 and 1999 respectively. Currently, economy in the mainland is largely government-dominated in terms of ownership that has been a prominent issue on government reform agenda. In the aftermath of the entry of WTO in 2002, Chinese government is now endeavoring to further advance its economic reform and liberalize its industries including telecommunications, civil aviation, railroad transportation, energy and power, and even cultural sector.

1.2. Liberalization of Telecommunications

China incepted telecommunications deregulation in 1993, marked by opening up part of the VAS (Value-Added Services) services for competition, and followed shortly afterward by the incorporation of China Unicom in 1994. This preludes the beginning of a series of drastic structural changes and governance transition that roughly fall into three phases.

First phase started in 1993 when the former Ministry of Posts & Telecommunications (MPT) deregulated nine non-basic telecom services which encompass radio paging, 800 MHz trunk telephone service, 450MHz radio mobile communications service, domestic VSAT service, telephony information service, computer information service, electronic mail, electronic data interchange, videotext, and other services at the MPT’s discretion. As a result, many small companies piled into this lucrative market and grew rapidly. The paging industry can serve as an example that was burgeoning to saturation within just a few years.

Following deregulation, China Unicom was formally incorporated in 1994, signaling the second phase of the reform crusade. The former Directorate General of Telecommunications (DGT) of the MPT was also registered as a company under the name of China Telecom, which was intended by Chinese government as an initial step to separate government function from business operation. This ended up with a duopolistic telephony market (though China Unicom later found that it was actually competing with the regulator). China Unicom is a share-holding company with investments from the former Ministry of Electronic Industry (MEI), the Ministry of Railway, the Ministry of Electrical Power, and 13 other large-scale state-owned institutions including the Chinese Academy of Science. As for China Telecom, it did not actually own any networks, let alone provide service. The national network, including three international gateways at that time, were owned and operated by provincial or municipal Posts & Telecommunications Administrations (PTAs) that report directly to the MPT. Therefore, the MPT still assumed a dual status as both regulator and operator. This context

⁴ See (a) Jiang Zemin, “Speed up the steps in reform, opening-up and the construction of modernization to achieve more triumphs in the cause of building socialism with Chinese characteristics”, speech at the first Session of the CPC’s 14th Congregation, October 12~18, 1992. (b) Communist Party of China Central Committee, “The decision on various issues concerning building socialist market economic system”, issued at the 3rd Session of the 14th Congregation of the CPC, November 11~14, 1993.

⁵ Abridged from statistics published at the website of the State Administration of Statistics. <http://www.stats.gov.cn>

had left China Unicom at a very unfavorable position in competing with China Telecom, as it was de facto competing with the regulator—the MPT.

This paradox lasted until 1998 when a new round of government reform was launched for further separation of government and business and reinforcing industrial regulation. In so doing, the former MPT and MEI were merged into the Ministry of Information Industry (MII), which was accompanied by the breakup of China Telecom into four service-specific companies and the entry of China Netcom and China Railcom, culminating a market featuring seven service-specific companies. Competition was still limited, though, largely due to the longtime ambiguity of government-business relations.

In 2002, in the wake of China's entry into the WTO, the MII issued its most ever ambitious maneuvering as to further break up China Telecom into two companies, i.e. the "South" and the "North", with the south company inherited the brand name as China Telecom while the north one renamed as China Netcom that also integrated the former China Netcom as one of its subsidiaries. Competition is supposed to happen not only among long-distance carriers but also among local operators and across services. Thus far, China's telecommunications industry has become structurally competitive, although meaningful competition remains elusive. At the present moment, since the deployment of 3G (third generation mobile) and full-service operation have been believed by Chinese government to be sources of corporate competence for telecom industry, a new round of market restructuring is allegedly in the pipeline.

The impact of the regulatory transition on universal service is apparent. Before 1994, Chinese telephony sector was monopolized by the DGT, and later, China Telecom. With mandate from the central government, the DGT or China Telecom was providing universal services through internal cross-subsidization. Under competition, however, the provision of universal service is prone to market failure as business seeks to maximize return on investment. A thorough reexamination of universal service regime is therefore necessitated.

1.3. The Ideal of Universal Access: A Century of Commitment

Narrowing digital divide to create a harmonious society is becoming a shared belief worldwide. The developmental impact of telecommunications on rural areas has been reported in numerous studies (see, for example, Hudson, 1984, 2000). The political and economical rationales for providing universal services can vary across nations. The mission faced by Chinese government has been under a unique historical context. The success of the CPC's revolution happened half a century ago attributes considerably to the compassionate participation of farmers wishing to acquire an equitable social status and happy life after the revolution. Nevertheless, gaps between various social groups, particularly between urban residents and rural ones, workers and farmers, intellectuals and physical labors that are generally referred to as the "Three Gaps"⁶, are broadened as the market reform unfolds. The existence of the gaps is impairing social harmony and long-run development, therefore, the new generation of CPC's leadership has promulgated the "Three Represents"⁷ as the guiding party doctrine and put the "Three Nongs"⁸ issue on its top agenda.

⁶ The term "Three Gaps" is used as general abbreviation of the gaps between the urban and rural, workers and farmers, intellectuals and physical laborers.

⁷ "Three Represents" refers to the visionary objectives of the party to "represent the development requirement of advanced productive forces, the most advanced cultural trend, and the fundamental interest of the people" which was first put forward by the former president and party secretary, Jiang Zemin. The "Three Represents" has been written into the Constitution along with the "Marxism, Leninism, Mao Zedong Thought, Deng Xiaoping Theory" during the 2nd Session of the 10th National People's Congress held in March 14, 2004.

⁸ Refers to the developmental issues concerning "Agriculture, Villages, and Farmers", all of the three words start with a "Nong" in Chinese pronunciation.

Now that the envisioned “Upstairs and downstairs, electric lights and telephones” still stand aloof from many rural areas and gaps regarding telecom consumption are broadening as the industry is exponentially growing. In addition to the gaps among different groups based on demographic variables such as occupation, gender and income, the gaps between the urban areas and the rural areas have become a spotlight and are gradually drawing intensive public attentions. In these rural areas, especially those in so-called “Old, Ethnic, Remote, and Deprived” areas, digital divide has emerged as the “Fourth Gap” in addition to the “Three Gaps”.

1.4. Facts on Digital Divides in China

Digital divides in China can be broadly identified from three perspectives, i.e. digital divide between China and countries elsewhere in the world, digital divide between western, central and eastern regions within China, and digital divide between the urban areas and rural areas.

Now that the number of telephone subscribers has reached 0.7 billion (as of June 2005), among which, 337 million are fixed-phone users and 363 million are cellular subscribers that make national average fixed-phone and mobile-phone penetration reach 26% and 28% respectively. While inter-regional gaps are apparent, inter-provincial gaps are more remarkable, e.g. fixed and mobile phone penetration in Beijing already reached 62.4% and 95.2% respectively whereas the same numbers are 11.3% and 12.4% (Table 1) for Guizhou, a province located in south-western China.

Table 1: Inter-regional divides in fixed and mobile phone penetrations (as of June 2005)

	Provinces Covered	Average Fixed-phone Penetration	Average Mobile Penetration
Eastern China	<i>Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan.</i>	38.7%	44.7%
Central China	<i>Hebei, Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan.</i>	20.8%	20.2%
Western China	<i>Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shan'xi, Gansu, Qinghai, Ningxia, Xinjiang</i>	18.4%	20.2%

Source: Ministry of Information Industry, 2005. <http://www.mii.gov.cn/mii/hyzw/tongji/yb/tongjiyuebao200506.htm>

Digital divide between urban and rural areas are salient (Table 2), where sharp contrasts are demonstrated with regard to income, fixed-phone penetration, household penetration of personal computer (PC), and Internet services penetration. Average annual incomes in urban areas are roughly 3 times as large as that in rural areas, which is similarly the case for fixed-phone penetrations that are a little below 3. Gaps in PC and Internet service penetrations between urban and rural areas are even greater. The latitude of urban-rural gap also corresponds to regional differences. For example, the national average per-hundred-villages-penetration of telephone was 77.9% (fixed and mobile combined) as of 1999, while this number was 47.09%, 80.1% and 95.41% for western, central and eastern regions respectively; as of March 2005, the average per-hundred-inhabitants-penetration was 37.45%, 40% and 82.26% for the respective regions.⁹

By the end of 2004, the coverage-per-hundred-inhabitants of radio and television already reached 100% in urban areas, while in rural areas, the coverage of radio and television are 92.4% and 94.3% respectively¹⁰. It is astounding that urban-rural divides for the coverage of

⁹ Data compiled based on statistics issued at the website of the Ministry of Information Industry, China. <http://www.mii.gov.cn/>

¹⁰ See Zhang Haitao, 2005, “Speech at the summit on radio and television services and the ‘Three Nongs’ issue”.

radio and television in China are much smaller as against telephone penetration, thanks largely to the deployment of new technologies and ideological emphasis of the party/government on mass media and propaganda¹¹.

Table 2. Urban / rural contrast in telecommunication consumption

	Average Annual Income	Fix-phone Penetration	PC Ownerships Per Hundred Households	Internet Services Penetration
Year 2002	3.11	2.71	16.6	146
Year 2003	3.23	2.72	19.9	151
Year 2004	3.21	2.90	16.3	143

Note: The values in the table are ratios using the urban area as times of the rural area.
Sources: China Statistics Yearbook 2002-2004; CNNIC report 2005.

From international perspective, both fixed and mobile phone penetrations in China are lower as compared against those in other typical countries (Table 3). Although the gaps have been greatly narrowed during the recent years, there are still large differences between China and developed economies such as the United States and Germany. The divides on mobile penetration are expanding between China and other countries listed in Table 3 except the United States. This is probably because of the tremendous rural population in China that diluted the national mobile penetration ratio, even though in urban China, preferences have been shown to the adoption of new media technologies (Leung, 1998).

Table 3. Telephone penetration: a cross-country comparison

	2002		2003		2004		2005 (forecast)		2006 (forecast)	
	F	M	F	M	F	M	F	M	F	M
China	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
United States	4.16	3.34	3.69	2.98	3.33	2.77	3.05	2.65	2.83	2.54
Brazil	1.44	1.36	1.38	1.33	1.35	1.35	1.32	1.37	1.32	1.36
Germany	3.94	4.70	3.56	4.04	3.26	3.63	3.02	3.34	2.83	3.11
South Korea	2.78	3.93	2.44	3.23	2.18	2.80	1.97	2.53	1.80	2.32

Note: Using 1.00 as telephone penetrations in China. "F" for "fixed phone penetration" and "M" for "mobile phone penetration".
Source: The Ministry of Information Industry, China Communications Yearbook 2004, Beijing.

Although digital divides in China can also be identified based on other variables, rural communications, however, has become the primary focus of universal service. The severity in terms of the deprivation of telecommunications service in rural areas is in ascending order from eastern, central to western regions and therefore priorities need to be given to these areas accordingly. The rationales is threefold:

- *Political.* In the sixteenth Congregation of the CPC, the Party put forward the goal of establishing an equitable society with comfortable standard of living and proposed guidelines for the tenth Five-Year-Planning (FYP) which stipulates that national average village telephone penetration should reach 95% by the end of 2005¹², which, among others, was intended as a sign of the Party's drive in addressing the important "Three Nongs" issue.

The file can be accessed online at <http://www.sarft.gov.cn/manage/publishfile/163/2897.html>. Mr. Zhang is the vice minister of the State Administration of Radio, Film and Television.

¹¹ See also Zhang (2005).

¹² See "Outline of the 10th five-year-plan on national economy and social development of the People's Republic of China", passed at the 4th Session of the 9th National People's Congress, March 15, 2001.
http://news.xinhuanet.com/zhengfu/2001-10/18/content_51471.htm

- *Economical.* The growth of agricultural industry is way behind that of other industries in China and it has become the main impediment in overall economic growth. Rural economic growth responds heavily to infrastructure investments including telecommunications that has been regarded as an important contributor to rural economic growth (Liu, 2004).
- *Developmental.* Developments of urban and rural areas are interdependent. An equitable and harmonious society can only be achieved with simultaneous developments in both urban and rural communities.

1.5. Paper Structure

The rest part of the paper will examine dilemmas and practical issues faced by Chinese government with extensive discussions on issues within current and future universal service regime in China regarding rural access. Part 2 provides a systemic description of the past and current developments in rural access with particular attention being paid to the problems and difficulties encountered in the implementation of the currently ongoing village access project. Part 3 seeks to define the universality and target recipients based on current circumstances surrounding China from a public policy perspective. Part 4 looks at issues concerning the choice of technologies under China's unique conditions in rural areas. Part 5 examines the alternative mechanisms to support the USO programs in China with a special emphasis on the possible implementation of the Universal Service Fund (USF). Part 6 explores various issues underlying the universal service governance in China including agency problems and government's role, and the author's insights about the possible governance structure will also be offered. Part 7 concludes the paper by taking a brief look at the future challenges and trends faced by Chinese government in implementing USO.

2. Current Dilemmas and Practical Issues in Rural Access in China

2.1. A Brief History on Rural Access in China

Before 1998, rural communication witnessed a period of rapid growth, particularly from 1995 through 1997, supported by internal cross-subsidization mechanism of the former wireline monopolist—former China Telecom. The introduction of competition and removal of the initial access charge as a direct result of government reform in 1998 led to the ending of cross-subsidization such that the former China Telecom slowed down the pace in investment in rural networks. Annual growth of rural connections in terms of village telephone penetration plummeted from 10% before 1999 to 2% afterward. Former China Telecom was frustrated by tremendous business loss incurred by providing telephone services to rural areas, for example, the total amount of loss in five relatively developed provinces including Guangdong, Shanghai, Jiangsu, Zhejiang and Shandong mounted to USD 2244 million in 2001, from USD1793 million in previous year¹³.

In 2000, the *Telecommunications Regulation* was issued. Although USO on carriers is stipulated in Article 44 of Chapter 2 of the Regulation, it does not specify the objectives, let alone support mechanisms and governance. A “regulatory vacuum” regarding universal service—primarily rural communications, therefore emerged, as a result, no carriers care to provide rural services and some remote areas which were originally connected retrograded to disconnection when losses piled up. Due to agency problems in government organizations that are often influenced by interest groups (Laffont and Tirole, 1991), an explicit universal service regime remains elusive. With the approaching of the deadline for the fulfillment of

¹³ MII, “China Communications Yearbook 2004”.

95% village telephone penetration as pronounced in the 10th FYP, the MII launched the Village Access Project (VAP)¹⁴ in 2004. To meet the deadline, about 40 000 new administrative villages have to be connected within two years including 2004 and 2005 which has been allotted 40% and 60% of the total tasks respectively.

2.2. Barriers to Rural Access

In economics terms, the barriers to rural access are combined consequences of technology and market—cost (technology) of providing rural services is relatively high whereas rural demand (market) for telecommunication services is relatively low, a scenario attributing to a spectrum of factors including the economic, natural, technological and cultural in China.

Rural economies, particularly those in less-developed regions, are predominantly agriculture, without much exchange with outside. Meanwhile, income is relatively low in rural areas—only one third of that in the city (Table 2), so rural demand for telecom services is modest. For example, in Lishui County, Zhejiang Province, rural telephone traffic is mainly generated from local-calls and nearly half of the subscribers never made a long-distance call, some subscribers never made calls beyond the number of free-calls coming with the monthly access charge¹⁵ (see also Zhou, 2004).

Extreme natural conditions also pose barriers for rural telecommunications. Those rural villages that are still unconnected are usually located in remote areas with complex land terrain, extreme weather and low population density. This causes high construction and maintenance cost of telecommunication network, as it is difficult to expand coverage of existing networks to these areas, and sometimes, the cost can go as high as USD122 000 for connecting one telephone¹⁶. Besides, the supply of parallel infrastructures such as power and water are poor in these areas.

Thus far, not a single so-called rural technology has been able to demonstrate superiority in both technological and economical traits for rural communications in China. Current wireline technologies such as cables are high in cost for rural areas and even technologically infeasible for some areas, while wireless technologies such as Global Standard for Mobile (GSM), Code Division Multiplexing Address (CDMA), Very Small Aperture Terminal (VSAT), are also expensive. As an alternative, although satellite technology seems to be more applicable for areas with extremely low population density, constraints are demonstrated in terms of technological immaturity and limited transmitting capacity.

Rural communities in China are unique subculture groups that distinguish themselves in a number of ways from the city (see also Zhu, Gong, et.al, 1998). Many of rural dwellers treat telephone call simply as a mere expense and little utility beyond the value of the message carried itself will be generated by making a call. In many rural areas, farmers are still not accustomed to reaching out through telecommunications. Those households who do choose to have a telephone installed where possible are largely in the hope of being able to receive calls from family members working in the cities. For this reason, the average number of inbound-calls is three times as large as that of outbound-calls in rural areas. In addition, the orientations of rural dwellers toward adopting new technologies are relatively passive as compared against urban dwellers.

¹⁴MII, 2004, "Rural universal communications service—a guideline to the implementation of the rural access project". The document can be accessed at <http://www.mii.gov.cn/mii/zhuanti0516/cuntong/xgwj/xgwj4.htm>

¹⁵MII, China Communications Yearbook 2004.

¹⁶Li Jinliang, 2003, "Wireless access is the optimal technological solution for telecommunications universal service", People's Posts & Telecommunications. The article can be accessed online at <http://www.cnii.com.cn/20030526/ca157905.htm>

2.3. The Village Access Project

Apparently, rural communications cannot be left to market force it is but a government responsibility. The fact of tremendous underserved rural population forces the policy-maker in China to define the objectives of universal service on a step-by-step basis, i.e. instead of defining the objectives of universal service directly on an individual or household penetration basis, it is probably more reasonable to define the objectives on a community penetration basis as a first step so as to make sure that at least every administrative village is connected by a telephone line.

Under absence of an explicit support mechanism, the MII decided to distribute the total USO tasks—which are roughly 40 thousand rural administrative villages, among the six incumbent carriers including China Telecom, China Netcom, China mobile, China Unicom, China Satellite and China Railcom, based on revenues and geographical locations of their networks. In areas covered by the Project, every administrative village is supposed to secure at least two connected telephones, one of which should be manned, and transmission technology can be either wireline or wireless and terminal either fixed or mobile. The carriers are free to negotiate about transfers of their assigned tasks with each other. To promote competition, no carrier is supposed to prevent other carriers from providing services in areas that are originally assigned to the said carrier, and connections made in areas other than designated ones by certain carrier can also be counted to the final accomplished tasks of the same carrier.

Following Chinese government's consistent idea of "trial before action", the VAP was initially launched in January, 2004 on a trial basis in five provinces including Shan'xi, Inner Mongolia, Sichuan, Guangxi and Henan, and expanded later in middle 2004, to another eight provinces including Gansu, Jiangsi, Hebei, Hunan, Guizhou, Qinhai, Xinjiang, Ningxia. After two phases of trial, the VAP was officially launched on a full scale in early 2005. Thus far, a total number of 33741 unconnected administrative villages have been distributed to six carriers (Table 4).

Table 4. Distribution of unconnected villages among carriers. (number of villages)

	China Telecom	China Netcom	China Mobile	China Unicom	China Satellite	China Railcom
Total Tasks	10240	3169	19927	4074	132	199
Tasked already Finished in 2004	5636	457	2823	298	58	85
Remaining Tasks	4604	2712	17104	3776	74	114

Source: MII, 2005, "A notice on the full promulgation of the village access project in 2005."

Administration of the VAP is primarily the MII's responsibility while participations from the local governments are also expected. There are division of labors between the MII and provincial communications bureaus (PCBs) in this regard. Under direct supervision of a deputy minister of the MII, the Department of Telecommunications Regulation (DTR) of the MII acts as the specific acting body while the PCBs are to take in charge of supervising and evaluating developments on the VAP within their jurisdictions as well as lobbying other local governmental agencies for assistance including capital and supportive taxation policy. It is also instituted that, despite the expected active involvements of governmental departments at all levels, carriers may implement their assigned tasks independently.

Carriers are expected to first consider the expansion of their existing networks and the application of wireless technologies including satellite will also be permitted by the MII if

they prove to be indispensable. Where wireless technologies are necessary, the MII would encourage the use of those with domestic proprietary intellectual property. SCDMA 400MHz, for example, commercially launched in middle 2004, it fits the domestic profile and has been delivered by the MII on many possible occasions¹⁷. The MII also provides privileges to those carriers who are and will be supplying services to rural areas in the use of radio spectrum unless it is applied otherwise more important¹⁸.

To ensure affordability of telephone services to areas already connected, the MII exercises a price cap regulation on the pricing of rural services, instituting that tariffs of rural services should not be higher than the carriers' existing tariff schemes. Carriers should secure interconnection of the VAP with existing networks and are prohibited from dismantling or disconnecting, at any excuses including unpaid tariff, rural telephones.

As of July 2005 since the VAP launched, 19609 unconnected administrative villages that account for about 52% of the total tasks have been newly provided with telephone services, hoisting the village telephone penetration to about 92%. The remaining 48% of tasks are reportedly to be accomplished within 2005¹⁹.

2.4. Problems and Difficulties

The VAP was minted and launched under the context where no explicitly defined universal service policy is present. Due to the absence of effective organization and enforcement mechanism with incentive compatibility, the implementation of the Project has been unsatisfactory to the MII and carriers opt to wait and see. Even in those areas that have been connected, fallbacks to disconnection have been reported. Although inhabitants in many rural areas have already benefited from the Project, there is no sustainable guarantee for the objectives of universal service due to limitations demonstrated by the current regime. On the other hand, the award of USO through simple administrative order has probably been nourishing hidden problems for the future implementation of universal service policy, since the approach used in task distribution under current regime is forging rigidity instead of flexibility in the patterns of USO award mechanism which would be detrimental to the possible competitive supply in the future. Even if temporarily parking the questioning of the rationales for the USO objectives as demonstrated in the VAP, problems still exist with regard to government's roles, support mechanism, governance and incentive, technological solution that are underlying the current regime.

In China, the central-local relations have been subtle in terms of infrastructure investment (Zhang, 1996; Ma, 1995). Although participations from governments and carriers at both central and local levels are expected, an effective coordination mechanism between them is still wanted, especially when conflict of interests arises. As a division of provincial governments, the PCBs report directly to the MII, however, many of local assistances such as supportive taxation policy, land and power are actually supposed to be from other divisions of the local governments that are beyond the PCBs' reach. Meanwhile, the division of responsibilities between the central offices of the carriers and their provincial subsidiaries are ambiguous and the VAP's tasks are assigned by the MII to the central offices that are further distributed among the provincial branches not based on measurable variables such as revenues

¹⁷See, for example, (a) Xi Guohua, 2005, "Speech at the Sichuan national special work-meeting on the village access project", <http://www.mii.gov.cn/mii/zhuanti0516/cuntong/djhdj1.htm>; (b) Su Jinsheng, 2005, "Concluding remarks on the Sichuan national special work-meeting on the village access project", <http://www.mii.gov.cn/mii/zhuanti0516/cuntong/djhdj3.htm>. Mr. Xi is the deputy minister of the MII and Mr. Su is the director of DTR of MII.

¹⁸CDMA 450MHz, for example, has been allotted for military and public security applications and therefore is prohibited from civil applications by the carriers. See also Xi (2005) and Su (2005).

¹⁹MI, "Report on the development of the VAP for the months of June and July 2005". <http://www.mii.gov.cn/mii/zhuanti0516/cuntong/gcjb/gcjb4.htm>

but assigned by the central offices to those who are geographically adjacent to the tasks. This has resulted in disproportionate burdens among branches, which has been one of the practical reasons for delays.

The central-local conflicts are further fueled by the absence of an explicit support mechanism, for which, government even does not have a timetable. The enforcement of the VAP has been receiving resistance from carriers and their branches avowing serious funding deficiency. Since the expected return on investment in rural telephone network can barely cover the cost committed, it will be reasonable for carriers and their branches choose to postpone their obligations as they possibly can. In response, the MII pledged to raise certain amount of funding in the year of 2005 for the subsidy of the current obligations of 33741 administrative villages.

Without incentive compatibility and participation constraint, the consequent equilibrium of the USO gaming is for the stakeholders in the VAP—carriers' central offices, their branches, and local governments, to choose wait-and-see strategy. As a result, opportunistic behaviors such as suspension or delay occurred among most carriers. For those provincial branches that are assigned tasks, one paradox is that, the less-developed areas are they located, the more burdens are they to bear, because the VAP tasks are located mostly on deprived areas. Carriers' central offices have not established financial resources specifically for the funding of the VAP, and more often than not, they simply assigned the tasks to their branches based on geographical locations and without supplying any subsidies. Without funding in prospective, the optimal strategy for the branches is probably to wait. Meanwhile, despite the MII is responsible agency for the fulfillment of the village-penetration goal (95%) cooperation and assistances are also expected from other central departments. However, due to pervasive agency problems with both governments and business organizations in China, responsible attention to the USO has not been adequate.

Government-business relations in China have long been ambiguous and implicit which is also the case with rural access project, for which, current institutional arrangement lacks of long-run sustainability when the economy and the industry are undergoing market reform. This regime goes back on competitive neutrality and is bound to give rise to bundles of hidden problems for future policy and it will be further blurred by historically-inherited ambiguity between regulatory officials and business leaderships in telecommunications industry.

Current business culture and property system are also nurturing difficulties. The current six carriers are without exception government dominated firms where ownerships are highly concentrated. For this reason, a business culture featuring entrepreneurship and professionalism remains elusive in this conventionally government-run industry. On the other hand, unattended agency problems with SOEs sometimes make cooperation between SOEs difficult to happen, even if it accords with interests of both sides. In practice, it is not uncommon to see this scenario where no telecom companies take the initiative to reach out to others for cooperation that is probably beneficial to all. Interconnections, for example, took longer time than needed to happen and yet at this point mobile subscribers in China still cannot access toll-free numbers provided by wireline operators²⁰. It seems that this phenomenon is by no means to dissipate with the VAP. It is clear that ownership system in China is not only impeding the progress on market reform in the long-term, but also impairing the preceding of current rural access in the short-run.

Technological constraint is another impediment. Those areas that need help from USO programs are mostly located in the "Old, Ethnic, Remote, and Deprived" areas with complex

²⁰ The unwillingness of wireline carriers to provide access for mobile subscribers to its toll-free numbers is because of competition consideration, since customers would look to wireline operators if they wish to make a toll-free call.

land terrain and extreme weather where parallel infrastructures are sometimes absent or poor. Although there have been great strides in the advancement of so-called “rural technologies” over the last decade, rural areas have their own unique features and would therefore require their own unique solution (Andrew and Petkov, 2003). However, not a single standard has been able to provide a cost-effective solution to these areas in China thus far. Infrastructure investment and maintenance costs are so pricey in these areas that it will be financially impracticable for carriers to maintain the connections with reasonable quality of services after the accesses are actually made.

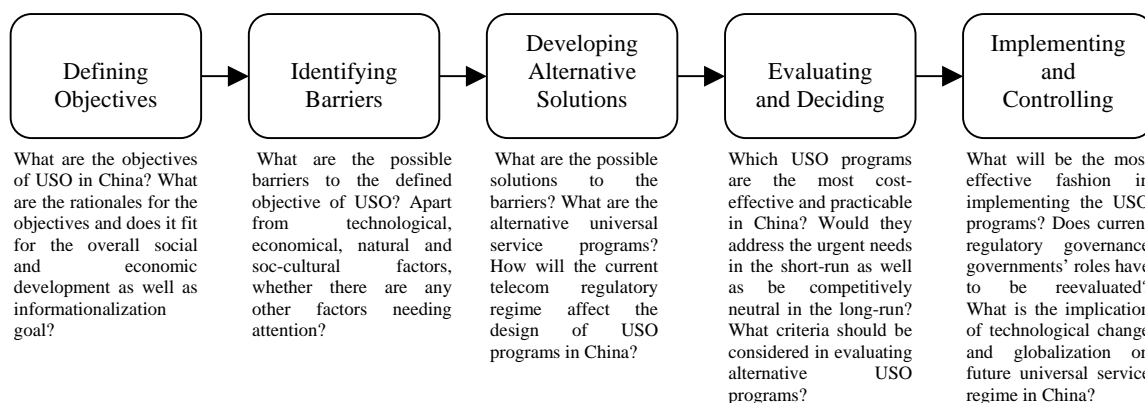
These problems and difficulties would inevitably have to be addressed by the Chinese government in its effort to implement USO where the objectives, support mechanisms and governance are among the major policy issues to be rethought.

3. Universal Service as a Public Policy: Defining Universality for China

3.1. The Nature of the USO

Access to telecommunications services increasingly sets the threshold for citizen participation in the democratic process, economic marketplace, as well as social and cultural activities that enrich the quality of life (Benton Foundation, 1996). The need for the universality of telecom services derives from human being’s ideal of equal access to communications tools. Universal service obligation is an integral part of national telecommunications policy that has directly impacts on market, technology, and investment. Basically, the pursuit of USO is out of the goal of equity, which means promoting social parity in access to telecom services. The welfare nature of USO defines itself as a quasi-public good that cannot be efficiently supplied if left alone to market force (see also Rapp, 1996). This makes USO a government’s responsibility for the adequate supply of services through implementing a policy that can help ensure availability and affordability of telecom services to a greater fraction of population at a cost-effective fashion.

Figure 1. Process of designing USO programs in China



Despite the welfare nature, the provision of universal services also serves efficiency goal due to strong network externality, which means the larger the number of people connected the greater the network value (see also Schement, 2004). The deployment of telecommunications can stimulate, as well as being an indicator of, development. In China, the deployment of telecommunications network in rural areas has contributed remarkably to economic and social development (Liu, 2004). The diffusion of telecommunications is therefore not a mere trade-

off between equity and efficiency but also complementary between the two goals. Nevertheless, telecommunications has been largely ignored by planners and theorists and ranked far below roads, power, water, and sanitation as investment priorities (Hudson, 1984). In China, public attention to and debate on universal service issues is only a event of recent years (see, for example, Cai, 1998; Kan, 2000; Xia 2001). While consensus has been on the necessity to provide universal service under deregulation, the objectives, support mechanism and regulatory governance are still to be contemplated. In doing so, a scientific decision-making process needs to be followed by China in designing USO programs (Figure 1)(see also OECD, 1995; Scott, 1998).

3.2. Defining Basic Services

For most of the 20th century, universal services meant access to voice grade access to the Public Switched Telephone Network (PSTN) including accesses to emergency and operator services, and directory assistance (Blackman, 1995). However, the emergence of advanced technologies and convergence happened in the end of last century has led to worldwide rethinking of universal service policy so as to include recent services such as broadband and internet access. Nowadays, e-commerce has been bringing revolutionary changes in how companies conduct business (Lu, 1999). In this regard, the status of social-economic development and national infromationalization strategy are two major considerations for China. Telecommunications have now become so crucial in economic development and social inclusion that every member and household is entitled to share what modern science and technology has to offer. However, due to such barriers as accessibility, affordability, and profitability, most rural communities, especially in relatively less developed regions in China, are way underserved; in some extremely remote areas, people even never heard of telephone. For those individuals and households who currently have no access to any telecom services, even the provisioning of plain old telephony would bring meaningful changes to their lives²¹. When defining services, value judgment is inevitable which can vary from country to country. Given the current circumstances surrounding China, this definition needs to meet two basic criteria:

- Technologically, services that come under USO do not have to be the most advanced ones; instead, the scope should demonstrate a basic level of services that responds to regional uniqueness. The concept of universal service is evolving over time, resulting in different generations of universal service policy (Mueller, 1997; Milne, 1998). Although in principle, these services should be mature and currently used by majority of people, this does not rule out the possibility to include Internet access which can also become “basic” and “mature” over time. Decision on this matter relies heavily on cost-benefit analysis and the definition is not a static concept but evolving one that is contingent on status of technological and economic development.
- Economically, the scope of services should be limited only to those services where market force fails when firms do not voluntarily opt to supply. When the services can be effectively supplied through market force, they should not come under the USO. In other words, the purpose of the USO is to provide services to those groups who are underserved or not served whatsoever under a deregulated telecommunications market.

As already shown above, despite the laggard rural access witnessed in China, it is encouraging to see that radio and television has already been made available to most rural areas²², thanks to the Party’s ideological propaganda initiatives which leveraged decades long

²¹ See, for example, Xi (2005) and Su (2005)

²² See relevant reports published by the State Administration of Radio, Film and Television at its website.

joint efforts of the government at all levels, and sometimes, military units. The State Administration of Radio, Film and Television (SARFT) is also running a “village access project” that focuses on expanding radio and television coverage to rural villages. This is done largely through satellite technology, although the channels of selection are still limited in some areas. Compared with radio and television, the diffusion of Internet service in rural China lags way behind. Despite the effort from relevant governmental agencies to call for urban businesses and individuals help rural primary and middle schools to go online, contribution from this sympathy project to rural Internet access is still far from being adequate.

Based on technological and economic principles and the current circumstances surrounding China, a two-phase concept can be followed in defining basic services for China. The short-term objective (from now up to 2010) is to make voice grade access to PSTN available, either through wireline or wireless, at a reasonable quality and rate, to all communities no matter their geographical locations and social-economic standings. This kind of access should come with emergency and operator services and directory assistance. The long-run objective (beyond 2010) is to promote household penetration and to provide Internet access.

3.3. Targeting Rural Community

Now that the short-term goal of universal service in China is defined as the provision of voice grade access with relevant complementary services, the primary target is apparently rural community. Due to vast disparity between urban and rural areas as previously indicated, rural communities, particularly those in the “Old, Ethnic, Remote and Deprived” areas, where there are roughly 60 000 (as of 2004)²³ administrative villages still unconnected to basic telephone networks, have unequivocally been identified as the current focus of universal service efforts. Consequently, in the near future, the goal of rural access is primarily based on village penetration instead of household penetration, which means universality for the time being in China means community accessibility.

The rationale for village penetration instead of household penetration is sensible when costing of rural access is pondered. According to estimation, about USD20 billion of infrastructure investment (given wireline technology is applied) is required to increase rural per-hundred-households penetration only by an extra two percentage points, and this amount skyrockets to USD2400 billion if access to every household is desired, without considering time constraint²⁴. On the other hand, businesses are concerned over return on investment that is expected to be extremely modest in rural areas. It is therefore apparent that, local-loops are bottleneck of universal service for rural regions. Consequently, it lacks of both economic feasibility and political urgency for the government to take on household penetration as the objective for the time being. In this sense, the objective of the VAP has been pragmatic as well as implementable.

Some practical issues arise as to the specific location (which translates into convenience) where the recipients (village members) can access the services. This concern is even highlighted by the fact that a number of unconnected villages are located in areas with complicated geographical conditions and low population densities. According to ITU (1998), universal access can be defined as a telephone available within 20km, within a traveling distance of 30min or a telephone in every locality of more than 500 people. In the case of China, for the convenience of administration and maintainability, telephone terminals can be installed at the points where village governments and / or village schools are situated.

Despite the adoption of village penetration concept, again, the definition of universality should respond to regional differences, primarily in terms of income. Therefore, in most

²³ MII, “Communications Yearbook 2004.”

²⁴ See Li Jinliang (2003)

western and central regions, the USO goal is to ensure every village has at least one telephone line connected, which is the focus of current universal service efforts; while in relatively affluent areas, such as those in eastern China, the USO goal may include household penetration and Internet diffusion, even though voice grade access is the focus of present universal service effort. The central government has issued a list of poverty-stricken counties in 12 central and western provinces that need urgent attention in poverty alleviation²⁵. The listed counties happen to cover most of the unconnected villages, which, the current USO program targets.

Based on the definition of universality, a schedule can therefore be drawn for the implementation of universal service in China. Before the end of 2005, the government has to fulfill its commitment of 95% village penetration. For the period of 2005 through 2010, every village in this country is to be connected to PTSN, while in some relatively developed areas, household penetration and Internet application is to be promoted to embrace the tide of convergence and new technology. For the time beyond 2010, the focus of universal service will be shifted to the pursuit of an explicitly defined national informationalization objective while a reasonable ratio of nationwide telephone penetration is sustained.

To conclude analysis in this section, we summarize the objectives of USO in China as to: ensure in the near future all people in the country, especially those in rural regions, no matter their economic conditions, geographic locations and profitability, enjoy access with reasonable convenience, quality and rate upon reasonable request to basic telecommunication services, while in the long-run, to Internet services.

4. Choice of Technology: Cost Vs. Benefit

Because of the uniqueness of rural areas as compared against urban areas, it requires the selection of appropriate technology that will provide the most cost-effective network within the constraint of rural conditions in designing rural telecommunication services. Although the principle of technological and competitive neutrality are advocated by policy-makers in most countries, the choice of technologies currently in China is by and large determined by two factors, i.e. one is the availability from firm's current technology portfolio while the other is government's preference towards certain technologies. Challenges also exist with regard to the transference of advanced equipments currently used in urban areas to rural communities with shortage of skilled labor and parallel infrastructures and sophistication in physical terrain and low density in residents. Demand for telecom services can also pose challenges after the connections are made when sustainable streams of revenue are needed for network maintenance and operation.

Thus far, not a single access technology is perfect enough to address all the requirements laid by rural access in China, either economically or politically. Wireline technologies are often pricey in rural application in terms of both substantial infrastructure commitments and maintenance efforts. Calculated on a cost-per-household basis, wireline infrastructure investment can sometimes go as high as USD1200, a financial burden that rural areas cannot afford²⁶. Operating cost can also be remarkable due to high maintenance expenditure and low ARPU (average-revenue-per-user). Currently, no carrier in China can make the ends meet in providing services to rural areas. In 2002 alone, wireline carriers in nine provinces and autonomous regions in western China lost about USD38 million by providing rural services,

²⁵ See materials published at the website of the State Council Leading Group Office of Poverty Alleviation and Development at <http://www.cpad.gov.cn/>

²⁶ MII, "China Communications Yearbook 2004"

skyrocketing from about USD22 million in previous year²⁷. Even if in relatively developed eastern region, five provinces including Guangdong, Shanghai, Jiangsu, Zhejiang and Shandong also suffered from exponential business loss by providing rural telephony. This is also the case with mobile carriers, for example, China Unicom, a mobile duopolist, finds the capacities of its base stations at rural township and village level are often in idle or extremely underused.

In a survey with relevant incumbent telecom carriers over the choice of technologies, the author finds that the responses are almost unanimously similar—privileges have been given to current norms and standards in designing rural telecommunication systems²⁸. Under circumstances where simple transference and extension of current technologies (especially wireline technologies) are infeasible, firms usually look to wireless and satellite technologies. There has been a tendency during recent years in China that firms prefer wireless accesses than simply wireline extensions. This is primarily because of the cost-effectiveness exhibited by mobile technologies such as Global System for Mobile (GSM), Digitally Enhanced Cordless Telephony (DECT)²⁹, and Code Division Multiplexing Address (CDMA). For some remote areas with low population density, satellite access (VSAT, for example) has been sought to serve the purpose at relatively high terminal and transmitting cost. To contain this kind of cost, carriers need to collaborate on the importation of foreign equipments and rental of satellite relay capacity.

Nevertheless, firms are not always free to choose whatever technologies they see appropriate in planning rural networks. According to report, CDMA 450MHz is a technology with relatively extended coverage (over 50 kilometers) and cost-effective access (1000 to 3000 users-per-base-station, averaging USD180 of investment-per-user). By means of this technology, some localities achieved remarkable progress on rural access, e.g. in Yuxi, Yunnan province, village penetration was raised to over 90% from below 50% after sixteen of CDMA 450MHz base stations were built in 2002³⁰. Working at the spectrum of 450MHz, this technology used to be regarded as so-called ideal rural technology and was well embraced by the industry before 2005 but not beyond due to decree from the MII pronouncing the spectrum be allotted for military and public security applications.

Government would also intervene in the choice of technologies by explicitly encouraging firms to adopt certain standards usually with domestic proprietary intellectual property. SCDMA 400MHz can serve as an example. Commercially deployed in middle 2004, it is vowed as a solution specially designed for rural communications³¹. The industry has formed an industrial consortium consisting of 14 firms engaging in developing the technology, and a complete value chain has emerged. Top officials from the MII would take every opportunity to ask carriers to use this technology since it is both effective and domestic. Although as interim contingency, government interventions in the choice of technologies may, in one way or another, expedite the process of village access, however, if taking a forward-looking view, competitive neutrality eventually has to be honored either as a China's stance towards its WTO commitments or as a means to nurture corporate competence of domestic manufacturers

²⁷ MII, "Analysis on the Development of Communications Industry in 2003 in China".

²⁸ The survey was conducted in collaboration with the MII in early 2001 soliciting responses from carriers and their branches and PCAs on a series of questions regarding the implementation of universal policy in China.

²⁹ Digitally enhanced cordless telephony, generally referred to as Personal Holding System (PHS) or "Xiao Ling Tong" in China, has been deployed nationwide in recent years with about 81 million subscribers as of July 2005. The introduction of PHS has been a direct consequence of the current telecom regulatory regime that prohibits wireline licensees from operating wireless networks, whereas PHS used to be defined in China as wireline technology under technological-orientation. See also Tang Gang, 2004. "Market Environment and Prospect of Little Smart in China", *Telecommunications World*, 17(4)

³⁰ Based on author's interview with a research fellow from the China Academy of Posts & Telecommunications Science and Technology.

³¹ See Xi (2005) and Su (2005).

through competition which will especially be the case in the era of new technology and convergence. Home protectionism with limited exposure to competition in China is probably trading the long-term competence of the industries for short-term candies.

In the case of the VAP, priorities should first be given to technologies eligible for the effective extension of current networks, whether they being wireline or wireless. This strategy can avoid incompatibility between different norms and standards as well as make human and organizational skills accumulated with current technologies more transferable for rural applications. Emphasis on current norms does not necessarily rule out the possibilities of alternative applications uniquely suitable for rural access. When there is any request demonstrated by firm for using certain technology that falls out of its current license, government should encourage, instead of discourage, the firm to choose whatever technology it sees appropriate, given a reasonable quality of service can be ensured with the said technology. The government's role here lies in facilitating the information exchanges and process of trade.

5. Supporting the USO Programs

5.1. Considerations in Evaluating Mechanisms

Since the USO is a remedy to market failure, a public support mechanism is therefore needed to ensure the provisioning of universal services. Historically, support mechanisms are realized through cross-subsidization within a monopolized telecom system, usually with long-distance services subsidizing local services, business customers subsidizing household consumers. Whatever forms the cross-subsidization might appear, one focal issue is that who should pay for the provisioning of universal services. Now that cross-subsidization that was workable under monopoly has lost functionality under a competitive telecom market, a new support mechanism has to be found.

Discussion on support mechanisms has long been an academic and political topic and abundant in supply. For example, in evaluating a support mechanism, OECD (1995) put forward the criteria for consideration should include: transparency, equity, efficiency, cost effectiveness, flexibility, incentive compatibility, predictability, accountability, and costs of implementation and administration; while Benton Foundation (Egan 1997) points out what beneficial characteristics a support mechanism should have: contributory and distributive fairness, political sustainability, funding mechanisms should promote economic efficiency, and not discourage investment and experimentation in new technology. In China, the initial debate on the issue dates back to 1998 when China started to deregulate its telecommunications industry. The former Research Center of Posts and Telecommunications Economy, and the China Academy of Posts and Telecommunications Science and Technology—two think-tanks for the former MPT, conducted several researches on the implementation of universal services for China in the era of deregulation³². While these researches have invariably been focused on rural access, no cohesive regulatory regimes are provided. Since then, funding mechanisms have become one spotlight in telecom policy arena, especially in recent years when the USO funding issues surfaces with the ongoing VAP.

Currently, the unique circumstances surrounding Chinese government in formulating universal service policy are characterized by following factors:

³² Reports of the researches were submitted to the MII and are not publicly accessible.

- *Economic reform as a trend.* The telecommunications industry is now undergoing a drastic transition from planning to market, monopoly to competition where universal service is not supposed to impede, if not expedite, the transitional process.
- *Property system and political governance.* Property system and governances at both corporate and government level are characterized by party dominance and this would have substantial influence on USO regime.
- *The WTO commitments.* China already became a member of WTO and is expected to honor WTO rules and practices.
- *Competition policy.* An explicitly defined competition policy in telecommunications is still elusive. The current *Telecommunications Regulation* is vague in aspects such as policy objectives, implementing strategies as well as governance, and neither does China have a general competition law thus far.
- *Historical legacy inherited from during and after the monopoly era.* During these periods, carriers have committed certain amount of investments in rural telecom infrastructures that have to be maintained and operated under coming universal service regime.

All these factors have to be taken into consideration in designing support mechanisms. In this case, not only should China learn from experiences of other countries, but figure out its unique mechanisms as well. Following factors need to be considered in designing support mechanism in China:

- *Continuity and Sustainability.* Support mechanism is eligible for the smooth transition of current regime with predictable flow of necessary funding in the long-run.
- *Fairness and Transparency.* Processes of contribution and distribution are fair and transparent.
- *Efficiency.* Effects of the regime on competition, investment, and technological development are neutral.
- *Low Enforcement Cost.* The policy can be enforced at a lowest possible cost.

5.2. Sources of Funding

Probably it would be more equitable if universal services were funded by general revenue. Some pragmatic factors, however, have to be taken into account in this regard. Funding of the USO was traditionally regarded as a sector-specific issue, where negative responses from other governmental departments are expected if it looks to general revenue. China is a developing country with myriads of communities and individuals requiring assistance, in one aspect or another, it does not seem to make sense if telecom services take recourse to public subsidy. In China, telecommunications sector has long been given priorities and privileges over other industries for investment of network and deployment of new technologies, now it probably would be the time for the sector to return favors to the society simply by not soliciting to the general public. These factors, among others, determine that it lacks of sound warrant to resort to general public for the time being.

One alternative source of contribution includes limiting the contributors only to current players within the telecommunications market. Again, question arises here as to who will be the specific persons to pay. Is a discriminative policy based on category of carriers or service

classifications desirable? Are manufacturers eligible to pay? Should local services and IAPs (Internet access providers) pay? Should competitive new entrants pay? Arguments have also been on whether charges on telecommunication resources such as telephone number and radio spectrum can be the source of funding³³. As a matter of fact, these kinds of resources are intrinsically common property rights and it will be none other than public subsidy.

Although disparate as they first appear to be, general revenue or levies on telecommunications industry alike are de facto two forms of cross-subsidization, while actual differences lie in who will be the contributors and recipients. For example, contribution from telecom market exhibits a cross-subsidization between current telecom users and current non-users. Since the incidence of the levy on carriers would ultimately be transferred to consumers, the heavier a consumer use the services, the higher the consumer contributes. In the case of contribution from general revenue, however, the subsidizers do not necessarily have to be the users of telecom services, but general taxpayers. On the other hand, the effect of intra-industry contribution mechanism on equity is more direct since it directly levels the divide between telecom users and non-users, even though there is a recent trend for the expansion of funding sources.

5.3. Universal Service Fund

Universal service fund are becoming a norm for administering the USO support mechanisms. Some countries in the world, such as the United States, Brazil and South Africa, seek USF as support instrument, while other countries, such as the United Kingdom, do not have a USF. China began to consider establishing the USF since the promulgation of its first-ever *Telecommunications Regulation*³⁴ in 2000. To facilitate this process, the MII established in 2000 a center focusing on USF matters and relevant policy affairs. The center is proclaimed as an affiliate to the MII rather than a division of the MII—namely, it is not intended as a government branch. One mission of the center is to develop, in collaboration with other MII departments such as the Department of Financial Clearance, Liquidation and Economic Adjustment (DFCLEA) and the Department of Policy and Law, proposals to the MII on universal service policy. Intensive discussions can be found on media coverage at that time with wide consensus on the establishment of the USF, while argument still exists on aspects like contribution, distribution and governance of the fund. The zest for the USF is even hoisted since the kick-off of the VAP in 2004 when funding is beginning to appear as a major impediment. Favorable attitude towards establishing the USF in China comes from government agencies, the telecom industry as well as from scholarly circle.³⁵

Several factors are contributing to the favors signaled to the establishment of the USF. Firstly, the MII's initiative in sponsoring research in this area is inadequate and public arguments are sometimes anecdotal and subject to careful study on domestic unique conditions and experiences and lessons demonstrated elsewhere. Secondly, the expected bureaucratic expansion as a result of establishing the USF is probably in the regulator's favor—a phenomenon that has been one characteristic of communist economy. Thirdly, the USF has been a standard mechanism with experiences elsewhere ready to be borrowed. The fourth, but not last, reason is that incumbent carriers are inclined to take a wait-and-see strategy regarding rural infrastructure investment due to piled-up-losses incurred in doing so, whereas USF appears to be the most anticipatable funding opportunity in the foreseeable future.

³³These questions are covered in the same survey mentioned above.

³⁴The *Regulation* does not specify the universal service objectives, let alone support mechanisms and governance. See Article 44 of Chapter 2 of the *Telecommunications Regulation*. Chinese government is currently considering formulating its first-ever *Telecommunications Act* and an advisory board consists of 26 expert members has been formed to provide advisory support to the MII.

³⁵See, for example, MII and State Council, 2001, "The Scheme on Telecommunications Reform".

Despite the expectation that the establishment of the USF in China may address the current dilemmas faced by the MII, the primary challenge is probably the perceived high regulatory cost stemming from accounting and duplicate administrative activities. It would be difficult for the regulator to assess the cost of providing services under asymmetric information and shortage of workable cost modeling, arbitration and subjectivity would therefore be inevitable and fairness cannot be guaranteed. Challenges also arise from uncertainties associated with regulatory vagueness permeating through the sector. Policy-makers are faced by a trade-off between regulatory convenience and regulatory cost that is often ignored under soft-budget-constraints.

5.4. Contribution and Distribution

As indicated above, contribution and distribution should not impede competition and discourage investment. To determine the sources of contribution, the eligible services have to be first decided. The levies can be limited on service providers but not telecom manufacturers. The considerations for this include: firstly, it is hard to distinguish the boundary of the “telecom” manufacturers from otherwise; secondly, burden on telecom services would eventually be transferred by service providers to manufacturers and telecom consumers, the incidence of the levy would therefore be shared with manufacturers and consumers. Actually, all basic telecom services should be qualified as eligible services, which means, all telecom carriers that have been granted a license in China, either as wholesaler or retailer, are bearers of the USO. On the other hand, new entrants and vulnerable small competitors are eligible for waiver of the obligations if competition can be improved.

Assessment of the contribution can be based on annual funding budget as share of eligible revenues, where, the responsible regulator prepares the annual USF budget based on forecasted cost of universal services, and a contribution factor can therefore be determined as a share on eligible revenues of the previous fiscal year (see also ACMA, 2005). Any surplus or deficit of the budget will be deferred to the succeeding fiscal year while the infringement on contribution will be punished. Contribution factor usually ranges from 1% to 3%. In the survey of early 2001 soliciting responses from the PCAs on a proposed range of 2%~3%³⁶, most PCAs voiced that the range is too high while the former China Telecom³⁷ asserted it is too low. It is as matter of fact a predictable response since the PCAs do not want to see a large portion of telecom revenues, which could be used otherwise locally, go to the USF, whereas the former China Telecom perceived itself as the potential universal service provider (USP) and therefore wish to receive as much funding as possible. Giving small companies with revenues under certain threshold wavier of the USO may expedite the administrative process and lower cost, since levies on these companies may barely cover the costs incurred in administrative activities. In the same survey asking the PCAs’ opinions on a proposed threshold of USD12 million, most PCAs believed the number should be further lowered.

The USF should be distributed based on the cost of the carriers in providing universal services. The cost of providing rural services broadly falls into three parts in China, i.e. historical cost, infrastructure investment, and maintenance expenses³⁸. Historical cost refers to the cost inherited from before 1998 when the former China Telecom was a monopoly in the wireline market and embarked on the promotion of rural access through internal cross-subsidization. This part of the cost is now borne by new China Telecom and China Netcom after the former China Telecom was broken up in 2002. The second part refers to investment committed in

³⁶ It is also recommended that the contribution factor should be ranging from 1%~2% for China. See Dong Aizhou, 2003, “ Using mobile technology to address universal service issue”, People’s Posts & Telecommunications. <http://www.cnii.com.cn/20030526/ca157831.htm>

³⁷ It was further broken up into two companies in 2002.

³⁸ See also You Wuyang, 2002, “How to cost the universal services”. People’s Posts & Telecommunications. Accessed on July 1, 2005 at <http://www.cnii.com.cn/20030526/ca157657.htm>

rural telecom infrastructure after the market restructuring in 2002, especially after 2004, when the VAP was launched. Finally, cost involved in the maintenance of network also accounts for a substantial proportion of the funding demand. All of the three parts are now competing for funding. In most rural areas, infrastructures constructed before 1998 are now becoming obsolete and require substantial maintenance and replacement before they completely break down. Some rural areas originally connected by former China Telecom before 1998 are now going disconnected once more due to avowed funding shortage for duly maintenance. In comparison, the demand from infrastructure investment would have greater impact on new initiatives of village access, as carriers and their provincial branches are complaining of connecting without funding. Maintenance, however, would determine the availability of services after rural accesses have been actually made. All of three parts are interdependent in affecting the provision of rural services.

Assessment of universal service cost has proved to be an arduous task that relies heavily on sophisticated cost modeling as well as collaborations from carriers in providing cost information. Forecasting cost based on historical data can sometimes be misleading due to changes in marketing environments, while cost proxy models (for example, Laffont and Tirole, 2000; Gamsi, Kennet, et al, 2001;) provide alternatives to conventional regression techniques in that they are based on engineering economics and take forward-looking vision on cost formation. Nevertheless, due to the complexity, the implication of cost proxy models is probably more theoretical than practical, which is particularly the case in China.

Who should receive subsidies from the USF? The subsidies are targeted at rural areas where the cost of providing telecom services is high while the household income is low. It would not necessarily culminate in the consumption of telecom services if the subsidies go directly to rural members, though, since the funding would probably be used otherwise if rural members receive money as subsidies. Due to positive externality of telecom consumption on community development, individual rationality does not necessarily lead to collective rationality when consumers have a say in where the subsidy goes. Therefore, rural community in general would probably become better off if the subsidies are directly translated into telecom consumption. To guarantee the actual consumption in rural areas, funding should be applied to subsidize carriers in providing rural services. Questions arise here as to which part of the costs are to be recovered and does potential benefit of providing universal services have to be taken into account. Under current scenario, we propose the USF be used primarily to cover basic infrastructure investment but not include terminals that are supposed to be covered by the carriers. The proposal of partial, instead of full, subsidy, is out of the consideration of implicit benefits received by providing rural services due to strong network externality and positive brand effect. In this regard, countries such as Australia and the United Kingdom are two of the pioneers in modeling net universal service cost as direct costs minus benefits (ACA, 2000; Ofcom, 2005). Partial subsidy also embodies the principle of risk sharing and incentive compatibility that would encourage carriers' effort in improving efficiency.

5.5. Award of USO

Currently, the VAP tasks are designated by the MII to six incumbent operators. To achieve the goal of 95% village penetration ratio by the end of 2005, about 40 thousand of administrative villages have to be connected under the time frame of 2004 (40%) through 2005 (60%). The distribution of the tasks is as follow: China Telecom (25.63%), China Netcom (7.93%), China Mobile (56.18%), China Unicom (9.31%), China Railcom (0.62%), and China Satellite (0.33%)³⁹. This award mechanism is effective under current regulatory

³⁹MI, 2005, "The Distribution of Rural Access Tasks." <http://www.mii.gov.cn/mii/zhuant0516/cuntong/xgwj/renwufenpei.htm>

regime in telecommunications while a forward-looking vision needs also to be taken as the telecom reform unfolds in China.

In the future, USO programs can also be awarded through bidding process that would better reflect market laws (see, for example, Weller, 1999; Nett, 1998). In the meantime, a mixture of “beauty contest” and bidding can also be considered. For example, the regulator first qualifies the eligibility of potential bidders for providing universal services in certain areas before bidding process actually begin. Eligible carriers are then invited to bid for providing universal services in certain areas. By means of this, regulator does not have to possess complete information about costs so long as the number of bidders is large enough. Nevertheless, no matter what approach is applied, government still needs to accumulate appropriate level of cost information, especially when designation is used.

Given current economic and political climate in China, selecting the USP through designation is probably more pragmatic, even though designation has been an interim solution in the award of USO, mainly because of its arbitrary nature often characterized by “cheap vote” problem. Therefore, bidding is advocated as it may better serve the purpose of competitive neutrality and political transparency. It is also widely agreed that services like emergency number (e.g. 110, 112, 122), directory services (114), and operators’ assistances should be unanimously imposed upon all carriers, whether they have been selected as the USPs.

5.6. Alternative to the USF: USO Task as an Assignment

One alternative to the USF is to directly designate USO tasks without subsidies to eligible carriers. Under this approach, the tasks are distributed among carriers based on factors such as market shares and geographical locations of networks, and it can also be bundled with licenses. Once the USO tasks are distributed, either through designation or license bundling, every carrier is free to transfer its tasks with other carriers on conditions agreed with among the parties involved. In this way, high-cost firms would choose to transfer their rural access tasks to firms with low cost. This approach can also be an alternative to what is followed in the ongoing VAP project, where universal service tasks have been assigned to six carriers under the pledge that they will be subsidized, one way or another, sooner or later. This pending pledge has actually been sending a negative signal to the USPs who would take refuge in this “universal excuse” and opt to wait and see.

The rationale for “no-subsidy” policy is out of considerations of two factors—benefits received by the USP and savings in regulatory cost. Despite the difficulties in assessing the potential benefits of providing rural services in China, what is certain is that network externality and brand effect would advance network value and business competence. In addition, another perceivable benefit has been from the longtime regulatory protectionism in the industry, since during and before deregulation, telecommunications has been given numerous regulatory privileges in terms of supportive taxation policy and protective pricing regulation⁴⁰ and exponential government-sponsored investment⁴¹. It is now probably the time for the industry to “repay” the society by contributing to universal services. Meanwhile, the savings of regulatory cost in universal service administration can be substantial, considering the complex nature of funding administration and duality in regulatory organization.

No-subsidy policy can be functional under current market structure featuring only six oligopolists as well as under future market where the number of players in the industry would also be strictly limited, despite the imminence of industry restructuring with advent of new

⁴⁰ This protective pricing regulation includes implementing a high price-floor and initial-access-charge that deepened the pocket of the former China Telecom for years.

⁴¹ Before 1998, the former MPT is authorized to sponsor infrastructure investment in telecom industry. Tremendous capital flowed into the industry during that period.

technologies and convergence. The disadvantage, however, is that it only applies to a relatively static regulated market with limited number of carriers, or with high concentration, since it is not competitive neutral when there are new entries, particularly small competitors.

The key to the successful implementation of this regime lies in continuous supervision and assessment on the development of universal service programs as the market and its environment is evolving. To counteract the drawbacks of “no-subsidy” policy and maintain consistency of overall universal service policy, Chinese government may concurrently consider to impose levy on carriers so as to deal with funding problems historically inherited in pledges and commitments by the government, and be prepared for possible transitions. In the future when the levy on carriers become the primary support mechanism, the transition can be made without much difficulty through reassessment of net cost of providing universal services, and based on which, funding can be distributed.

6. Administering the USO Programs

6.1. Competition Policy and Governance

Universal service administrative regime is associated with the general regulatory structure of telecommunications that is framed under competition policy that defines the basic missions of the USO. The purpose of competition policy in telecommunications is to advance efficiency through effective competition by restricting the abuse of market power and protecting small competitors from been predated by big firms (see also Economides, 1998). As two implementing paradigm of competition policy in telecommunications, sector-specific-regulation and general competition authority sometimes interplays with one another, e.g. in the United States, telecom market is supervised by the Federal Communications Commission (FCC) as well as other governmental agencies at both federal and local levels, while in some other countries such as New Zealand, telecom market is solely watched out by general competition authority (ITU 2002). When the world economy is heading into the 21st century, there seems to be a trend for the convergence of sector-specific-regulator and general competition authority.

As the biggest communist economy, China started market reform in 1992 and telecommunications liberalization in 1994, moving relatively behind those developed countries. Ideological arguments still exist regarding exactly to what extent the country will go to “market”—an economic system that has been regarded as a mixed blessing by some observers. Arguments on theoretical soundness about so-called “socialist market economy” have been a decades long hot topic. Somebody comments that, to “build market economy with socialist characteristics” is something like “making a right turn with left signaling on” (see, for example, Zhang, 1997). The inevitability of uncertainty—both political and economical, would apparently exert substantial influences on the dynamics in competition policy in telecommunications and its governance. Currently, one sign of this uncertainty is probably the absence of a general competition law—one symbol of exercising “market economy”. Whereas difficulties arise under these ambiguities, room for maneuvering still exists, for example, on lessening agency problems underlying current policy-making process and regulatory governance that has been an issue crying for urgent attention.

6.2. Agency Problems and Government’s Role

Agency problems arise when there is a separation of control and claimcy that can translate into conflicts in interest between the policy maker (and regulator) and the beneficiary of universal service. An institutional arrangement that is incentive compatible to all stakeholders including policy-makers, general public, regulators, industry players, is

therefore to be made so as to achieve an optimal outcome (see, for example, Bovaird, 2005). Among all the possible issues, the definition of government's role in universal service is a crucial factor. Consensus has been on the fact that governments, as institutions, have their own objectives and goals. Blizinsky (1995) proposes three points that should be taken into account when consider government's role: "[w]hat level of government is best able to make these policy and implementation decisions?.....what group is best able to implement a universal service policy?.....who, if anyone, does government represent in this decision?" The objectives of telecom policy would not be fulfilled until the role of government is explicitly defined.

Incentive issues underlying universal service are similar to that of other public policy efforts in China, but differ from that within a business organization where efficiency may be achieved by selecting appropriate management and offering them with optimal incentive packages (Fama, 1980; Williamson, 1996). In the case of universal service, as a public policy, the MII is bona fide the policy-maker, although by constitution, the central Congress is supposed to be the paramount legislative body⁴². Institutional arrangement of this fashion often handicaps adequate public inputs that are even sabotaged under dictatorship political system. The current telecommunication regulatory regime in China has been a focus of controversies with much heeds being paid during the recent years to the issue of separation of policy-making and implementing, which has been perceived as a solution to lessening agency problems. Nevertheless, under current political climate, it is probably that this kind of separation would merely culminate in more voluminous government bureaucracy.

Two macro-factors, i.e. party-ruling system and ownership structure, have to be born in mind when consider universal service governance in China. Putting aside ruling system, current government-dominant economy has given rise to numerous dilemmas in governance at both corporate and government level. For a typical government dominated firm, the principal-agent chain originates, theoretically, from the public—the nominal ultimate owners, and ends at corporate management team including boards of directors and supervisors and management. This type of ownership system ends up with the absence of conscious supervision from responsible investors, and collusion among the boards and managements is pervasive. In some extreme cases, boards and managements are bona fide the claimers of their companies, a dilemma also embodied in political governance where boundaries between legislation, enforcement and administration are ambiguous.

Agency problems are even complicated by regulatory capture that happens especially when a revolving door is open which has been a prevailing and striking phenomenon in China, particularly in highly regulated industry such as telecommunications (Stigler, 1971; Posner, 1974; Becker, 1983; Laffont and Tirole, 1991; Hu, 2005; Xia, 2005a). For example, among the six carriers, four of them are defined by central government as the "Gigantic SOEs", which means the rank of top management of these companies are equivalents of vice-ministerial officials under regular bureaucratic hierarchy of government. Transfers of cadres between the industry and regulator happens frequently, e.g. one former vice-minister of the MII and former president of China Netcom switched their positions in 2002, and similarly, a number of officials at divisional level of the MII went to companies either as middle managers or promoted to top management while several cadres were transferred from the industry through governmental chain of command to fill the positions of equivalent capacity in the MII.

⁴²The Congress is usually referred to as a "Rubber Seal" in China, which means it does not actually enjoy any power in legislation that is often the responsibility of relevant governmental agencies. In the case of universal service policy-making, while other governmental departments such as the State Commission on Development and Reform and the Ministry of Finance are also supposed to be the participators, the MII is de facto playing the leading role.

Uncertainties are further blurred in the wake of new technology and convergence when China has to make decision on the deployment of 3G and regulatory convergence. Chinese government has adopted a wait-and-see strategy towards the timing of 3G licensing that would restructure the industry. Current debates provide varied versions of the possible restructuring of telecom market while one consensus has been on reducing the current firm number of “six”—that has been believed to be inducing dual-construction and inefficient allocation of resources, to less players where each one will be awarded a full-service license. Since the general communications market in China is currently governed by not only the MII but also the SARFT that oversees the construction and operation of radio and TV network, the impending convergence would actually bring about opportunities for breakthrough in lessening governmental agency problems.

Despite central government is expected to play a leading role in universal service policy-making, substantial participation from local government is also crucial in the successful implementation of the USO programs. Not only are local governments stakeholders in USO programs but in better position in leveraging local resources including offering supportive taxation policy. Local government’s initiative in participating USO programs comes from its concern over local development, which is even so when the ruling party has put the “Three Nongs” issue on top political agenda since it is believed to be crucial to social stability. Politically as well as economically, the promotion of rural access can serve as an ideal icon project for the local leadership to distinguish themselves from counterparts. The rationale for local participation also lies in the fact that local areas may differ from one another in population density, economic development, parallel infrastructure availability, and land terrain, and with tailored knowledge and jurisdiction, local governments may complement what central government cannot.

6.3. USO Governance Structure

The administration of USO is largely predetermined by the objectives of universal service and its support mechanism. Certain objective and support mechanism require certain paradigm of administration. In the United States, for example, the administration of USO programs is delegated to the Universal Service Administrative Company (USAC) which manages the provision of universal service through the USF, while in the United Kingdom, no such independent agency and fund are currently utilized. The case of China is quite different where policy choreographers actually have little room to maneuver under current scenario in designing either overall telecom policy or the USO governance, largely due to the rigidities rooted in its political and economic system. Nevertheless, if a taking a forward-looking vision, the USO administration should demonstrate such traits as incentive compatibility, professionalism in processes and personnel, and consistency with overall telecom policy and universal service objectives, openness to public input and inquiry, and efficiency in implementing the USO programs.

There are two alternative options for the institutional arrangement of universal service in China. The first option does not require the establishment of an independent agency, but integrate the USO administrative activities into the MII’s line-ministry system. To strengthen the administration of universal service, a universal service commission can be created at the central level, with members coming from the ministerial, divisional, and local leadership. This model can be efficient in operation as the responsibility of USO administration is set into the paramount regulatory tree. The main disadvantage, however, is that this institutional arrangement offers less professionalism.

Another option is to establish an independent universal service administration agency that specializes in implementing the USO programs, either through the USF or otherwise. This

agency will be responsible for the award of USO, evaluation of performance on the goal of universal service, recommendation of improvement on universal service policy, and so on. The organizational process should be as transparent as possible and embody incentive compatibility and balance of power. With mandate from the telecom regulator, the agency is supposed to be an implementing body that by no means to overstep its authority to perform government functions in policy-making that is a responsibility of the Congress. Instead of being a subordinate division of the regulator as that happens under conventional line-ministry hierarchy, the agency conducts independent consultation on universal service issues to the Congress and regulator.

With regard to the ongoing rural project, no matter whether a USF or other type of funding mechanism will be established, the daily oversight on the VAP can be delegated to the relevant divisions of the MII, such as the DTR and the DFCLEA. The establishment of independent agency is not recommended for the time being, though, primarily due to concerns over high regulatory cost and possible coordination deficiency. Nevertheless, an administrative transition should sooner or later be initiated as the overall economic reform and telecom deregulation unfolds.

7. Concluding Remarks: Challenges and trends

Technological changes and convergence are reshaping global telecommunications market, and therefore, regulatory regime. The deployment of disruptive technologies—3G or its beyond, is bound to intrigue a fresh round of market restructuring and regulatory reform in China while globalization in the aftermath of China's entry of WTO will be further complicating the process (Xia, 2005b). Challenges faced by Chinese government in implementing universal service will become tougher in the future primarily due to ideological uncertainty underlying its political and economic system. Economic transition—from command to market and from focusing on GDP growth to harmonious social development, would undoubtedly entail further revisions in both objectives and administration of the USO. Among all the possible incoming reform efforts in China, ownership reform will have substantial impact on the industry and the universal service regime, particularly when this is accompanied by political uncertainty. Unfortunately, there are no ready experiences elsewhere in this regard that can be borrowed by China, as it would be neither accountable nor practicable for Chinese government to simply copy practices in other countries if the profound differences are considered, although China does have some chance to learn lessons from elsewhere. Originalities are therefore expected from Chinese government in terms of effective organization, extensive public participation, and sustainable support mechanisms where government's roles at both central and local levels need to be explicitly redefined and the current universal service regulatory structure needs to be reframed to lessen agency problems in both policy making and implementing. In the near future, universal service will have to become an integral part of the overall telecom policy in this country, and this is probably one criterion in evaluating the allegedly forthcoming *Telecommunications Act*⁴³.

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⁴³ China initiated its effort on telecommunication legislation in 1984. However, due to unpredictable directions of economic reform and political uncertainty, the process has undergone rise-and-falls for years.

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