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China's Broadband Wireless Industry - A Prospective Approach

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Abstract

The past decade has witnessed a dramatic growth in the number of wireless technologies. In parallel, the liberalisation of telecommunications markets has led to an increasingly complex set of issues to be dealt with by a growing number of actors. A direct consequence has been the added difficulty in forecasting the market evolution of a particular wireless technology and of the wireless industry as a whole.

China's wireless industry has undergone such transformation in a short time and on a large scale. With more than 200m subscribers, or 20% of the world total, the country has become the largest market for mobile telephony. Since the mid-90's China has moved from the status of "follower" to being close to the forefront of wireless markets development. This shift confronts all the wireless industry's actors, from government to manufacturers, with more uncertainty as to the evolution of the industry.

Like in other countries, operators tend to dominate the wireless industry in China. Whether this supremacy is bound to last in light of the industry's continuous transformation is uncertain. Based on interviews we conducted in China, this paper presents a first assessment of the Chinese broadband wireless industry, its main actors, and the major issues they will face in the future. The last section maps out a number of scenarios for the future of the broadband wireless industry in China.

Keywords: Telecommunication, Wireless, Scenario planning

1. Introduction

By the summer of 2001, the size of the subscriber base in China exceeded that of the US for the first time (Steinbock 2003) making, with around 200m subscribers (or 20% of the world total), China the largest market for mobile telephones. The gap between mobile phone users and fixed-line ones has been widened to 5.39 million by the end of 2003, after the former caught up with the latter in October and projections for end of 2004 are around 329 million users¹. Like other markets (Maitland et al. 2002), China's mobile industry is undergoing a rapid transformation of its value chain and industry structures.

Is it possible to assess and forecast the evolution of the wireless industry in China? A large body of literature has been devoted to the field of technological forecasting. Martino classifies the variety of approaches into environmental scanning, models, scenarios, Delphi²,

¹ By January 2004 there were 268.9 million fixed lines vs. 276.8 million mobile subscribers and MII has issued a goal of adding 52 million mobile phone users in 2004 (Ministry of Information Industry, 2004)

² Delphi is used to integrate technology forecasting and assessment for comprehensive understanding of emerging technologies Kameoka, A., Yokoo, Y., and Kuwahara, T. "A challenge of integrating technology

extrapolation, probabilistic forecasts, technology measurement and some chaos-like behaviour in technological data (Martino 2003). Additional approaches such as foresight can be found in Grupp and Linstone (1999). In the field of telecommunications, most forecasting work deals with telecommunication demand. McBurney et al. (2002) divide demand forecasts into exploratory methods and primary market research techniques. Recognising the value of holistic approaches Cracknell et al. (1999) describe an econometric model that retains the traditional strengths of "whole market" models. Some recent work has been devoted to forecasting demand in the mobile industry using models (Kumar et al. 2002).

Prospective is another way to deal with the assessment of possible futures. Scenarios take into account the uncertainties in the driving forces by outlining different possible futures, each resulting from different outcomes for important parameters, economic and social factors, and political and policy actions. As pictures of what the future might look like if different developments come to pass, rather than projections or forecasts, scenarios can be a useful planning tool to guide the actions of individuals and organizations to meet a variety of contingencies (Schwartz 1996).

The goal of this paper is to assess the Chinese wireless industry and to analyze the main issues the stakeholders will face in the medium-term future. The next section is a broad overview of the wireless industry in China. Section 3 scans the Chinese wireless broadband landscape for actors and identifies the principal ones. Based on interviews we conducted with some of those major actors, Section 4 discusses some of the main issues (regulatory, technological and market uncertainty) they perceive as well as their position on those issues. Building on this actor-issue matrix, the conclusion section introduces 3 medium-term scenarios for the development of China's broadband wireless industry.

2. The wireless industry in China

This section presents the market structure, the technological landscape and the policy-making environment of the Chinese wireless industry in 2003.

2.1 Market structure

China's mobile services sector currently operates as an imperfect duopoly with on one side China Mobile (circa 70% of subscribers) and on the other side China Unicom. Despite large-scale investments made by the latter, the market power rests, for the time being, in the hands of China Mobile. Moreover, with China's progressive WTO commitments for market access, sizeable foreign entry into the mobile services market will remain limited for some time. Thus, China's mobile market structure reveals similarities with many other countries: an incumbent (China Mobile) spun off from the fixed-line monopolist who maintained its initial advantage to dominate the market.

One of the notable differences is the linkage that the operators have kept with the government. Although the trend of separation of enterprise and government (*zhengqi fenkai*) is well underway, the organizational boundaries between the operators and the government are much

foresight and assessment in industrial strategy development and policymaking," *Technological Forecasting and Social Change* (71:6), 2004, pp. 579-598. One issue is whether Delphi methods apply well to technology development in developing countries since their application has so far been limited Chakravarti, A. K., Vasanta, B., Krishnan, A. S. A., and Dubash, R. K. "Modified Delphi Methodology for Technology Forecasting Case Study of Electronics and Information Technology in India," *Technological Forecasting and Social Change* (58:1-2), 1998, pp. 155-165..

less clear than in most other markets. A second difference is the lack of service integration. Except for China Unicom and despite the inroads made by China Telecom and China Unicom in wireless telephony via PAS and WLANs, operators were supposed to provide only one type of service. The government has indicated its wish to drive the industry's structure toward integrated operators, i.e. allowing fixed-line operators to enter mobile and vice-versa. But by-and-large, the wireless market structure is not expected to change until the attribution of new mobile licenses at some point in time in 2004.

The landscape for manufacturers looks very different. More than 30 mobile phone producers, domestic and foreign, battle for a share of the market. GSM terminal manufacturers, lead by Motorola, Nokia tend to dominate the market but strong competition has started to emerge from local manufacturers (TCL and Bird). CDMA handsets are mostly produced by Chinese companies, with the exception of Motorola. Companies like Eastcom also emerge with the ability to produce handsets, mobile switching equipment and mobile base stations.

Finally, most of the value-added service providers (VAS) are trying to refine their business models. The current technological uncertainty, coupled with gloomy capital markets, has hindered their development and except for a handful of companies (Sohu and Sina), value-added service provision tends to remain small-scale operations.

2.2 Broadband wireless technological milestones and leapfrogging

The current variety of wireless technologies deployed in China tends to confirm the assertion that the wireless future will include a mix of heterogeneous wireless access technologies (Lehr et al. 2003). Launched in May 2002, 2.5G already created some changes in the competitive position of the two operators in China because of differences in the underlying technology used by each. With the introduction of 3G, competitive positions will probably undergo another shift. However, China Mobile and Unicom are unlikely to be required to launch competing 3G networks until early 2005. This leaves a full two years during which 2.5G will be the main battleground for the operators – probably longer than in other markets.

Personal Access Systems (PAS) have long remained in the regulatory gray area³. Following several policy-making reversals, PAS seems finally to have been officially permitted to operate nationwide⁴. Although it is not offering broadband wireless at the time, PAS technology allows such a migration path. A more important aspect of PAS has been the role it played in “disrupting” the industry albeit on the fringes (as mobile “test-bed” for fixed operators and “troublemaker” for mobile operators). Indeed the success of PAS has initiated a battle between fixed and mobile operators, which has forced the latter to resort to de facto one-way billing to fend off PAS. In addition PAS raises the questions of how further open mobile markets and encourage competition.

Another technology currently operating at the margin is the Wireless Local Access Network (WLAN). With limited market for the time being, WLANs equally have a potential to disrupt the mobile market. From the regulatory perspective, WLANs benefit from the same treatment

³ Personal Access System (PAS) or Xiaolingtong is a wireless technology allowing limited roaming but at the cost of fixed telephony. PAS is essentially derived from PHS technology (Personal Handyphone System) invented in Japan in the early 1990s for densely populated urban areas with restricted mobility.

⁴ In March 2003, PHS business was defined as supplement and extension of fixed-line phone business by China's government. The move means that China's government eventually acknowledges the legitimacy of PHS business (SinoCast "PHS Business Should Stick to Low-price Guideline," 2004b.)

as other parts of the world: it is currently un-regulated. This status can be attributed to the emerging nature of the technology (not yet on the regulator's radar screen) rather than a positive decision from the Chinese regulator to leave WLANs outside of its regulatory scope⁵. Here several questions are raised: is the regulator more interested in content than conduit?

China is still considering which of the new third-generation (3G) technologies it will adopt as the national standard. It is currently studying wideband-code division multiple access (W-CDMA - a GSM development) and CDMA2000 (the US variant), as well as home-grown TS-CDMA, which has been developed by the China Academy of Telecommunications Technology and Siemens. There is lack of decision-making from all the various stakeholders, that is the government through its Ministry of Information Industry (MII) and the major network operators China Mobile and China Unicom. The situation looks like a Catch 22: network operators don't want to roll out 3G networks before the government has announced one or several standard(s), while the government waits for domestic and international equipment manufacturers to complete the testing process. These intense technological dynamics are perturbing the classical liberalization course of fixed telephony markets followed in most national policies and putting governments in front of new regulatory and policy-making challenges (Arnbak 2000).

2.3 Policy-making environment

Most authors (Dai 2002; Fan 1996; Lovelock et al. 2000; Ure 1994) highlight the unicity of China's telecommunication experience (size, scale and speed of network development, location focus and no limitation to traditional telecommunication infrastructure) while concluding that the policy process has been a fairly consistent and interactive one. Drawing on institutional theory and bargaining theory, Zhang (2001) analyzes the policy-making mechanism stressing the important role played by informal institutions in shaping China's telecommunications policy-making. He however concludes that telecommunication policy tends to be inconsistent and uncertain and that policy implementation is accompanied with deflection and inconsistency. Lovelock et al. (2000) offer an alternative to existing studies on Chinese telecommunications that focused on technical/industrial studies, descriptive accounts or prospect for liberalization analyses and largely neglected the process of policy-making, arguing that central control in China telecommunications policy-making has remained impressively consistent. The government's role has indeed remained paramount during the initial phases of industrial development.

Telecommunication reforms has been particularly complex due to several factors, including weak horizontal linkages among ministries, China's keen interest in content regulation and surveillance, and the distribution of regulatory responsibilities among Party and government actors (DeWoskin 2001). Overall, the sector remains one of the least liberalized in Asia and is relatively closed to foreign participation. However, to stimulate consumer demand and sustain levels of private sector investment, the relaxation of controls and establishment of a clear regulatory framework are becoming increasingly unavoidable. Moreover, commitments made as part of China's pledge to join the World Trade Organization (WTO) in 2001 should engender significant revisions of the market, providing benefits for domestic and foreign

⁵ The disruptive nature of WLAN is exemplified by the recent issuing of standards forcing foreign manufacturers to cooperate with domestic companies to produce WLAN equipment (SinoCast "China to Be Determined to Implement Its Own WLAN Standard," Beijing, 2004a.)

interests alike⁶. For Zhang (2001) the extent that the WTO can influence China's telecommunication policy-making and regulatory transition is still uncertain and depends on whether China has an incentive and political will to fully implement the WTO principles. It is very early to judge on the reach of the WTO concessions in telecommunications. However, and despite many hurdles, China seems to have embraced the spirit of WTO-inspired competitive environment and is shifting to global regulation norms in telecommunication. The potential for far-reaching reform should not, however, be over-estimated. WTO reforms may take several years to filter through, while entrenched, conservative elements in the bureaucracy will continue to oppose any reforms that threaten to seriously undermine state control.

3. Actors

Some authors have applied policy networks to telecommunications (Schneider et al. 1991) focusing on actor configurations and institutional arrangements. In such an approach the telecommunication sector is considered as a system of actors – an action domain – where specific economic, technical and political interests are at stake, with resources are mobilized and exchanged and where individual and collective strategies are pursued (Geray 1999). In their work on globalisation of regulation, Braithwaite et al. (2000) focus on the way actors have used mechanisms and principles to determine the shape of international telecommunication regulations. Their analysis identifies five actors: companies, business organizations, states, and organizations of states, NGOs and mass publics, and epistemic communities of actors. Similarly, Pau identifies 7 basic categories: customers, operators, equipment providers, VAS service providers, regulatory bodies and governments (Pau 2002).

In the case of China's telecommunication, the issue of interplay has been addressed at the government level by Lovelock (1999) with a bargaining framework that is employed in lieu of a legislative framework and a mechanism for administrative co-ordination⁷. Further, Mueller et al. use a game theory model to analyse the way four players (the Chinese state, the Ministry of Information Industry/China Telecom, domestic rivals, and foreign strategic investors) interacted over access to foreign capital and technology (Mueller et al. 2000).

3.1 Companies

An analysis of the value chain draws clear distinction between the various players, i.e. equipment manufacturers, network operators and VAS providers. The former tend to fall less under the scrutiny and management of the government. Several reasons explain this: the equipment manufacturing industry has over the years achieved a relative maturity and functions pretty much along the lines of a competitive market. While still falling under production licensing processes and subject to the usual industrial planning guidelines as well as periodic "buy local" campaigns, Chinese telecommunication manufacturers benefit from relatively little direct government protection. Some of the international equipment manufacturers have even started to view them over the past few years as their emerging rivals. On the other side, the two major network operators operate for the time being under an imperfect duopoly, with China Mobile claiming around 70% of the total subscribers. Despite

⁶ Although the WTO accession process is often considered as an important driver in the overall economic reforms and in the opening of particular industries to foreign investment, the power of the Ministry of Information Industry (MII) has somewhat limited the amount of concessions made during the accession.

⁷ The increasing freedom left to market players will probably require to shift the focus from the government to the market.

heavy investments, China Unicom remains at best a challenger. Unless privatization of telecommunication assets takes place, which seems unlikely for the time being despite the partial listing of the two major operators on foreign stock exchanges, their role and salience in the development of the industry will largely be dictated, directly and indirectly, by the government.

3.2 Business associations

Domestic associations are often regarded as being mainly controlled by the government in an attempt to show some public morality and are seen as a middle layer between the Ministry and the State Owned Enterprises (SOEs). In the field of wireless telecommunication many activities previously conducted under MII are now the remit of industry associations but the typical membership roster consists entirely of SOEs that are effectively compelled to join. Thus, the emergence of business associations in China “with a voice of their own” is still something quite nascent. Those associations can be divided in three: vendor-driven groups, broad-based constituencies and foreign organizations. Vendor-driven groups, such as the TD-SCDMA forum seem to be more focused. However, they lack credibility since they have clear vested interests. Broad-based constituencies, such as the China Mobile Communication Association (CMCA) are trying to bridge the various constituencies. However, one question is whether such a bridge is feasible, i.e. whether operators, manufacturers and the regulator can agree on substantial topics given that their interests often go in opposite directions. Finally, foreign organizations, such as the United States Information Technology Office (USITO), the American Chamber of Commerce or the E-commerce Working Group (ECWG) are quite active and carry the lessons from previous experience in other international markets. However, their voice might not always be heard by the decision-makers, despite attempts to take as neutral an approach as possible and including domestic actors.

3.3 The State

Despite appearances, the Chinese State is not a monolith. Important players besides MII are the State Council and the State Development and Reform Commission (SDRC)⁸. The most important regulatory policies must gain support from SDRC and approval from the State Council. Moreover, there are many interest groups with powerful bargaining power which also impose significant influence on telecommunications regulation and policy (Zhang 2001). Lovelock et al. offer a two-tier bargaining model that consists of a co-ordinated approach on part of government and from a macro-policy perspective (Lovelock et al. 2000). In their analysis the government has set forth a strategic initiative to build around facilitating reforms without being bound to a single set strategy (attempt to regulate the process without being restrictive, refusing to define where the boundary lines are) and it has tried to encompass and co-ordinate participation.

In addition to the general policy-making process, one has to note the shift of centers of powers within the State. A major milestone was the re-organisation of the industry in 1998 through the creation of the Ministry of Information Industry (MII). However, as market and political reforms are carried on, there is a redistribution of tasks and functions at the government level.

Until recently, China’s telecommunication industry was largely independent from external “interference”. Since its accession to the WTO in November 2001, specific commitments

⁸ Previously known as the State Development and Planning Commission (SDPC)

have been negotiated leading to a gradual and limited opening of the telecommunication services sector. In a nutshell, China has agreed to open the value-added services to foreign investment through joint-ventures while keeping a firmer grasp on the mobile and fixed services⁹.

3.4 NGOs and mass public

Ma (2002) questions whether autonomy is the most useful theoretical concept in our understanding of what is happening in China and argues that instead of addressing how illegitimate Chinese NGOs are for their lack of autonomy, we should understand how they differ from governmental organizations and from their predecessors. “More and more organizations, and industrial associations in particular, are acting like mediators and interest groups. These associations have been important bridges between government and business. Not only do they assist the former by implementing regulations and supervising proper business behavior, they also furnish their members with information, technology, training and many other services.”

After many decades of neglect, end-users are becoming more and more influential and consumer rights lobbies have become more vocal and effective in mobilizing (for example, the China Consumer Association has brought mobile handsets under the *sanbao* policy¹⁰). While they still lack an in-depth understanding of the technology issues, operators have realized that they have to develop more sophisticated marketing, to adjust strategies to meet customer requirements and that the government can't just make decisions that will go over consumer interests.

4. Issues

The following section presents the issues perceived and the actors' position on those issues. The issues were grouped in three sets: market, technology and regulatory uncertainties.

4.1 Market uncertainty

Intellectual Property Right (IPR) - Historically, the mobile infrastructure technology in China has come from Europe, USA and Japan. China has been a follower in adopting the technology in its country and networks and had not much to say about IPR issues. With the 3G transition, IPR became an inherent part of strategy (Steinbock 2002). In the case of China, technology-agnosticism to bargain the best terms could be a leading driver (Steinbock 2003). The issue is further complicated by the current lack of recognition for IPRs in China. Understandably operators don't seem to care too much of IPR as long as it doesn't slow down the 3G standard decision. Finally, the Chinese government has the natural aim to increase domestic IPR. However, it is faced with the dilemma of letting the market decide and intervening to favour the domestic standard.

Imbalance and alignment of players in value chain - A variety of different factors have to come together uniquely at the same time for something in the wireless broadband space to be successful. As discussed above the dominance of operators, competition of manufacturers and lack of value-added providers is currently stifling the value-chain. Despite heavy

⁹ While the WTO accession remains the major element of outside pressure, China takes part in other multilateral initiatives, such as the International Telecommunication Union (ITU) and APEC TEL working groups.

¹⁰ The three guarantees: one week (return no questions asked), one month (return/trade in for equal value) and one year (maintenance and repair).

investments in China Unicom, the government has failed to create a competitive mobile market for operators and China Mobile's influence on the industry remains enormous.

Shift from voice to data - China is not immune from the worldwide trend of shift from voice to data¹¹. The government is concerned by the shift to data as this will transfer the problem of information "control" from the Internet to the mobile industry. On the other side, and in light of the decreasing ARPU in voice communications, operators are welcoming the additional revenue stream. There is thus little doubt that the Chinese operators will cooperate with the government like ISPs do.

In addition to those issues, actors identify additional issues: the emergence of new actors, the partial listing of Chinese operators on foreign capital markets, the current gloom in capital markets, decreasing ARPUs, and the lack of applications.

4.2 Technology uncertainty

At first, the debate around standardization comes across as pretty straightforward: standardization can overcome many disadvantages related to a too wide variety of products, services or methods. Without standardization, a battle between different technological systems may emerge, and users may get stranded in technologies that will disappear from the market after a while (Bekkers et al. 2002). However, Gandal et al. (2003) argue that whether mandated standards have been more beneficial than standards determined by the market in the case of wireless telecommunications depends upon several factors including whether market competition led to technological improvements in wireless technology, whether compatibility (standardization) matters for the adoption of wireless technologies, as well as other regulatory decisions about factors such as calling party pays, roaming and call termination.

Choice of standard - Backers of both 3G standards, each with strong political support, have been furiously lobbying the Chinese government (which is expected to issue 3G licences in 2004) to bless their particular technology. To complicate matters further, however, a third contender has entered the field: China's home-grown 3G standard, called TD-SCDMA. Despite a relatively strong government backing, TD-SCDMA is expected to play more of a niche role. Thus standards and unique Chinese standards have become the issue. Both operators and manufacturers fear that the government and its agencies are putting out standards in sectors that "aren't well thought out and are very costly since it is not business people doing it but bureaucrats who think they what is good for China". The government is likely to choose the technologies that will generate best prospects for the equipment industry in China. The government is expected to issue licenses based on both W-CDMA and CDMA2000, so that China's manufacturers can leverage the scale of the domestic market to become global players. TD-SCDMA may have a small role, for example in limited franchise areas, for the sake of national pride, but no nation-wide rollout.

Timing of standard - The issuing date of 3G licenses is yet undecided. Because the 3G-oriented multimedia short messages market remains immature experts believe that 3G

¹¹ In January 2004, more than 15 billion SMS were sent (Ministry of Information Industry)

licenses should issue at some point in 2004 but this will depend on the State Council's decision¹².

Locus of decision - Stigler's central thesis was that as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit (Stigler 1971). In the case of wireless broadband a shared view is that the market will see some government "guidance" in deciding which technology operators apply in rolling out their networks.

4.3 Regulatory and policy uncertainty

As analyzed by McCarty (1992), there is a good case to be made that a "feedback loop" between regulatory proceedings, processes, and telecommunication infrastructure can also apply to China. In a broad sense, China's most pressing regulatory issues remain the absence of an official telecommunications law, interconnection regimes to sustain fair competition, the establishment of a Universal Service Obligation (USO) policy and the issuing of 3G mobile licenses.

The confluence of regulated and unregulated markets poses dilemmas in deciding on issues of open access to the new opportunities for competitive providers and/or consumers (Arnbak 2000). Bourreau et al. (2001) point out the duality of regulatory policies: if regulatory authorities cannot respond fast enough to follow the rapid change of the market, many regulatory measures then become either inefficient or obsolete. On the other hand, due to endogenous relationship between technological progress and industry structure, regulatory policies affect the speed of technological change in return.

According to the economic theory of regulation, there is a balancing of interest group strength and weaknesses at the margin, with the outcome determined by the stake that the various groups have in it and the efficiency by which they can influence the regulatory process (Wenders 1988).

As described above, telecommunications policy-making is rather complex in China. Although the Ministry of Information Industry (MII) nominally is in charge of the telecommunications policy-making, there are actually more players involved in the process. On the one hand, the State Council and the National People's Congress¹³ draw and enact formal institutions in the forms of rules, orders, and decisions. These formal institutions are mandatory and binding for MII while formulating the telecommunications policy. On the other hand, the interest parties and public opinion representing the informal institutions also play an influential role of shaping the telecommunications policy, mainly through bargaining with the formal institutions.

Role of government/regulator - Across actors, it is recognized that there is a need for a much more focused role of the regulator, whose task would be to concentrate on the regulations of the telecommunication service market: market regulations, interconnection, universal service obligations (USO), telecommunication resources, licensing and other important issues.

¹² An executive of the Management Bureau of Radio Frequency says the bureau need to allocate the frequency carefully, if the State Government issued 3G licenses in the near future, but up to now, the bureau has not been informed on this issue.

¹³ And to a certain extent the Communist Party

Transparency - Despite notable improvements, the lack of transparency and associated uncertainty remains an issue, at least for foreign operators. Solving the issue of transparency won't be easy. By the nature of the industry, telecommunication companies and operators are not necessarily interested in a consensus action. Efforts by business associations like the American Chamber of Commerce's white paper are important effort but they too often are the result not of the companies themselves but of the experts, consultants and advisors who know the issues just as well and put together the concerns.

In addition general issues of transparency (like licensing processes) are going to be brought through the WTO, instead of the traditional route via the MII. Such forum/regime shifting will probably delay the issue of transparency for international actors since they will have to establish different contact channels. Finally one can mention that while major foreign equipment vendors or operators see the lack of transparency has a major issue, smaller players see it as a god sent: they thrive on this lack of transparency.

Implementation of regulations - Major uncertainty lies in the implementation of regulations. For example, the implementation of regulations for the foreign investment provisions, certainty about the final shape of the major telecommunication assets, the move to a telecommunication law and to see at a practical level some precedents and examples of investments and partnerships that work.

5. Conclusion

Based on the assessment of the broadband wireless industry in China, its main stakeholders, and the issues analyzed during the interviews we conducted, further research has to be done for validating the assumption that the three following scenarios describe possible futures for the wireless industry in China.

5.1 Techno-nationalism and the public good – Regulation rules

In this scenario the government maintains its central role and attempts to dictate the development of the industry to the other actors by various means. To put it differently, “standards and unique Chinese standards are the issue”¹⁴. The recent dispute between the China and the USA on Wireless LAN Authentication and Privacy Infrastructure (WAPI) illustrates the scenario¹⁵. While China has recently agreed to delay indefinitely a plan to impose a security standard for wireless communications, it took a very high-level of intervention between both countries. While the regulators are clearly aware of technological trends and making decisions on standards after watching what has happened in foreign markets¹⁶, a tendency to intervene remains. Increased government involvement, through the Ministry of Information Industry or the Leading Group on Informatisation, entails a diminished room to maneuver both for operators and equipment manufacturers. Except in the case of government-led technological investments, the scenario also implies a reduced incentive to innovate as market-players suffer from regulatory uncertainty.

¹⁴ Interview with author, Beijing. June 10 2002

¹⁵ The Chinese government has clarified that the proposed standard took the “Regulations for the Administration of Commercial Encryption” as its legal basis, which legislation was promulgated by the State Council on 7 October 1999. These regulations prohibit the use of foreign encryption technology in commercial applications in China.

¹⁶ Interview with author, Beijing, September 3 2001

5.2 Level playing field – Market rules

In this scenario, operators and equipment manufacturers take a pro-active stance. Although the influence of various associations remains limited, their existence indicates a desire from the market to take part in the industrial development. In addition, the objective to breed national champions with a capacity to gain global market shares will require the government to leave companies gain a competitive edge at home. The implication for actors is, and for the time being, power with the incumbent operators. Compliance with WTO commitments and further liberalisation of the telecommunication sector may nevertheless re-define the landscape through the emergence of additional operators

5.3 Techno-fetichism – Technology rules

In this scenario, continuous emergence of alternative technologies threatens the government's attempt to regulate and redistribute the strength of players in the value chain. As noted by Lehr et al., WiFi wireless access can emerge in a decentralized, bottom-up fashion (although it is also possible for this to be centrally coordinated and driven by a wireline or mobile service provider). While the prevailing business model for 3G services and infrastructure is vertically integrated, this need not be the case for WiFi (Lehr et al. 2003). The implications for actors are emergence of other/new operators, a diminished role for government and regulators and the creation of new alliances¹⁷. In turn, this might lead to a shift of IPR from manufacturers to content providers. In terms of usage, this scenario implies a diversification of access devices (such as heterogeneous PAS/WLAN devices).

The only certainty is that the future of the industry will be made of a mix between regulations, market and technology forces. Despite their shortcomings the scenarios presented offer a departure point to map the development of China's broadband wireless industry. The approach may be useful both to market players and the government in their efforts to identify the key issues at stake and influence the industry's development.

¹⁷ Korea, Japan and China are said to spend over \$250 Million on 4G technologies and services

References

- Arnbak, J. "Regulation for next-generation technologies and markets," *Telecommunications Policy* (24:6/7), 2000, pp. 477-487.
- Bekkers, R., Verspagen, B., and Smits, J. "Intellectual property rights and standardization: the case of GSM," *Telecommunications Policy* (26:3-4), 2002, pp. 171-188.
- Bourreau, M., and Dogan, P. "Regulation and innovation in the telecommunications industry," *Telecommunications Policy* (25:3), 2001, pp. 167-184.
- Braithwaite, J., and Drahos, P. *Global business regulation*, Cambridge University Press, Cambridge, 2000.
- Chakravarti, A. K., Vasanta, B., Krishnan, A. S. A., and Dubash, R. K. "Modified Delphi Methodology for Technology Forecasting Case Study of Electronics and Information Technology in India," *Technological Forecasting and Social Change* (58:1-2), 1998, pp. 155-165.
- Cracknell, D., and Mason, C. "Forecasting telephony demand against a background of major structural change," in: *The Future of the Telecommunications Industry: Forecasting and Demand Analysis*, D. G. Loomis and L. D. Taylor (eds.), Kluwer Academic, Boston, 1999, pp. 203-215.
- Dai, X. "Towards a Digital Economy with Chinese Characteristics," *New Media & Society* (4:2), 2002, pp. 163-184.
- DeWoskin, K. J. "The WTO and the Telecommunications Sector in China," *The China Quarterly* (167:1), 2001, pp. 630-654.
- Fan, X. "China Telecommunications: Constituencies and Challenges," 879716-36-4 P-96-4, Harvard University, Cambridge, MA, p. 167.
- Gandal, N., Salant, D., and Waverman, L. "Standards in wireless telephone networks," *Telecommunications Policy* (27:5-6), 2003, pp. 325-332.
- Geray, H. "Network policy formation between idealist and strategic models: a political economy perspective from Turkey," *Telecommunications Policy* (23:6), 1999, pp. 495-511.
- Grupp, H., and Linstone, H. A. "National Technology Foresight Activities Around the Globe: Resurrection and New Paradigms," *Technological Forecasting and Social Change* (60:1), 1999, pp. 85-94.
- Kameoka, A., Yokoo, Y., and Kuwahara, T. "A challenge of integrating technology foresight and assessment in industrial strategy development and policymaking," *Technological Forecasting and Social Change* (71:6), 2004, pp. 579-598.
- Kumar, V., Nagpal, A., and Venkatesan, R. "Forecasting category sales and market share for wireless telephone subscribers: a combined approach," *International Journal of Forecasting* (18:4), 2002, pp. 583-603.
- Lehr, W., and McKnight, L. W. "Wireless Internet access: 3G vs. WiFi?," *Telecommunications Policy* (27:5-6), 2003, pp. 351-370.
- Lovelock, P. "The evolution of China's national information infrastructure (NII): a policy-making analysis," University of Hong Kong, 1999, p. 400.
- Lovelock, P., and Ure, J. "Telecommunications Policy-Making in China: A Two-Tier Bargaining Model," *China Quarterly* (submitted), 2000.
- Ma, Q. "Defining Chinese Nongovernmental Organizations," *Voluntas - International Journal of Voluntary and Nonprofit Organisations* (13:2), 2002, pp. 113-130.
- Maitland, C. F., Bauer, J. M., and Westerveld, R. "The European market for mobile data: evolving value chains and industry structures," *Telecommunications Policy* (26:9-10), 2002, pp. 485-504.
- Martino, J. P. "A review of selected recent advances in technological forecasting," *Technological Forecasting and Social Change* (70:8), 2003, pp. 719-733.

- McBurney, P., Parsons, S., and Green, J. "Forecasting market demand for new telecommunications services: an introduction," *Telematics and Informatics* (19:3), 2002, pp. 225-249.
- McCarty, D. W. "Playing the regulatory game: Network modernization," *Telecommunications Policy* (16:7), 1992, pp. 531-537.
- Mueller, M., and Lovelock, P. "The WTO and China's ban on foreign investment in telecommunication services: a game-theoretic analysis," *Telecommunications Policy* (24:8/9), 2000, pp. 731-759.
- Pau, L.-F. "The communications and information economy: issues, tariffs and economics research areas," *Journal of Economic Dynamics and Control* (26:9-10), 2002, pp. 1651-1675.
- Schneider, V., and Werle, R. "Policy Networks in the German Telecommunications Domain," in: *Policy networks: empirical evidence and theoretical considerations*, B. Marin and R. Mayntz (eds.), Campus and Westview Press, Frankfurt am Main and Boulder, CO, 1991, pp. 97-136.
- Schwartz, P. *The Art of the Long View: Planning for the Future in an Uncertain World*, (1st ed.), Doubleday, New York, 1996, p. 258.
- SinoCast "China to Be Determined to Implement Its Own WLAN Standard," Beijing, 2004a.
- SinoCast "PHS Business Should Stick to Low-price Guideline," 2004b.
- Steinbock, D. "Wireless R&D: From domestication to globalization," *Info - The journal of policy, regulation and strategy for telecommunications* (4:6), 2002, pp. 27-49.
- Steinbock, D. "Globalization of wireless value system: from geographic to strategic advantages," *Telecommunications Policy* (27:3-4), 2003, pp. 207-235.
- Stigler, G. "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science* (2:Spring 1971), 1971, pp. 3-21.
- Ure, J. "Telecommunications, with Chinese characteristics," *Telecommunications Policy* (18:3), 1994, pp. 182-194.
- Wenders, J. T. "The economic theory of regulation and the US telecoms industry," *Telecommunications Policy* (12:1), 1988, pp. 16-26.
- Zhang, B. "Assessing the WTO agreements on China's telecommunications regulatory reform and industrial liberalization," *Telecommunications Policy* (25:7), 2001, pp. 461-483.