
Digital Television Switchover: China Goes Its Own Way

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Abstract

Switching to digital television has become an established global trend. With all the major TV markets in developed countries now set to switch – or having already done so – China too has a strategy to replace its analogue television transmissions with digital technology across all TV platforms. However, except in Hong Kong, its approach is very different from that of most other countries. Elsewhere the priority has been to switch off analogue terrestrial transmissions to make more efficient use of spectrum, often against a background of satellite and cable growing in importance and diminishing the role of terrestrial reception. In China, however, converting analogue cable systems to digital has been the primary switchover activity. Progress in implementing digital terrestrial television has been slowed by China's decision to develop its own technical standards, and regulatory restrictions apply to direct satellite reception. This article explores why the Chinese route to switchover is different. Economic and political factors make a market-led policy difficult to design or apply. Moreover, China's motivation is different: rather than pushing to re-use analogue terrestrial spectrum, the government aims to support the interests of the TV receiver manufacturing industry and, especially, to improve the managed communication of information to the Chinese people.

Published material on this subject, other than official documents, has been limited but the new *International Journal of Digital Television* (1:1, 2010) carries two articles by Chinese academics from the Communication University of China and a short introductory article of my own; these, together with interviews I conducted in China in 2008, provide the main sources for this longer article (see endnote).

The Goal of Digital Switchover

In the late 1990s a small number of brave countries embarked, somewhat uncertainly, on the public policy of switching their television systems wholly to digital transmission – with the specific aim of switching off traditional analogue terrestrial transmissions. After a period of policy trial and error, punctuated by a series of commercial crises and legal controversies, they concluded that the goal was feasible. Berlin pioneered the process in 2003; the first national switch-offs of

analogue terrestrial television came in 2006 in the Netherlands and Luxembourg. Finland and Sweden followed in 2007; then Switzerland and Germany. Several European countries, including the UK, have started to switch off on a region-by-region basis. The United States completed full analogue terrestrial switch-off in June 2009.

Digital switchover is now an established international trend among virtually all the advanced economies of the world, with switchover scheduled for 2011 in Japan and by 2012 for much of western Europe.

At the heart of digital switchover policy in most countries lie issues of spectrum efficiency. Digital television transmission involves coding and then compressing the signal. The main benefits are increased robustness, facilitating improved technical quality, and increased capacity, giving the option of many more programme services. Such is the (continually improving) effectiveness of the compression process that, in addition to creating more television programme services, it becomes possible to reclaim parts of the old analogue broadcasting spectrum and auction it, or reallocate it, for alternative uses.

Digital technology can be applied to all the main means of transmitting and distributing television signals – satellite, cable, terrestrial (hill-top transmitter to roof-top aerial), and the newcomer, broadband. The convergence with digitalized telecommunications services facilitates various hybrid and interactive services, so the consumer appeal of the digital proposition might be some combination of high-definition television (HDTV), an expanded number of channels, interactive features and on-demand content.

Satellite operators generally find the switch to digital commercially convincing, because of the extra capacity and increased efficiency it offers them. Cable industry perspectives are more complex. Large highly capitalized companies generally judge the investment worthwhile, especially if they face satellite competition in the pay-TV market, but for decentralized local operations essentially in the relay business the investment in new cable systems and new set-top boxes for their subscribers can be daunting.

The main public policy issues, however, tend to surround terrestrial television, since the spectrum efficiency benefits and reallocation opportunities can normally only be realized by a coordinated switch-off of analogue terrestrial television – raising questions about the feasibility and desirability of assisting incumbent analogue terrestrial broadcasters to switch their transmissions and of persuading, or even subsidizing, their analogue terrestrial viewers to acquire new reception equipment. Where, as in many countries, analogue terrestrial transmission has

historically provided the backbone of public service or state-owned television services, there are political risks and often public finance implications.

International Pattern

While the desire to make efficient use of spectrum has been a common factor, different countries have formulated their digital switchover policies with their own national balance of motives and, in some cases, the motives have varied over time. In the United States, what began as an industrial policy initiative to counter a perceived threat from Japan's consumer electronics giants ended as a federal government bid for the revenue it could secure by auctioning released analogue spectrum (Galperin, 2004). In the UK a major driving force, at the outset anyway, was the desire of the main analogue terrestrial broadcasters to be able to compete with satellite and cable in the field of multi-channel TV. In Germany a key consideration was an acute shortage of spectrum and the realization of how much was being used for a very small number of terrestrial TV households.

Differences between countries arise also from different balances between transmission platforms. Direct satellite to the home (DTH) has made major inroads into traditional patterns of terrestrial reception in many countries and, in advanced economies generally, these services are now digital. The extent of cable penetration varies greatly. In countries where it is widespread and coupled with satellite, such as the Netherlands and Switzerland, terrestrial viewers form very small minorities. Elsewhere, for example in southern Europe, terrestrial reception is dominant and switchover is taking much longer to achieve there.

Nonetheless, given the focus on ending analogue terrestrial transmissions in order to reclaim spectrum, a pattern has emerged. It is to create a public policy framework within which market forces can provide the main driving force behind the consumers' switch to digital receivers, so that the element of political compulsion – and the element of public expenditure – can be minimized. Governments or regulators offer the incumbent analogue terrestrial broadcasters new digital terrestrial spectrum, either for free or on advantageous terms, on which they can simulcast (duplicate) their services, and afford to provide something extra (new channels, HDTV, or both), so that their viewers have an incentive to buy digital receivers during a transition period. The switch to digital television can involve increasing the number of programme channels by a factor of five or more, providing the viewer with a supermarket of choice. When enough consumers have switched, a compulsory timetable can be set for analogue terrestrial transmissions to be switched off. The limited public expenditure necessary, and the political risk of introducing a compulsory timetable, are warranted by the spectrum efficiency benefits (with the option of public revenue from spectrum auction).

So, implementing a politically designed system of digital terrestrial television is normally an early and central part of any digital switchover strategy. Meanwhile, the market can normally be relied upon to switch satellite services to digital. In the case of cable national approaches have varied. A key point is that, from the point of view of switching off analogue terrestrial transmissions, it does not matter whether satellite and cable systems are digital or analogue, provided they carry versions of the analogue terrestrial services due to be switched off. Thus, while the Netherlands was in the vanguard in switching off analogue terrestrial transmissions, it retained an extensive system of analogue cable which will only gradually be converted to digital. Finland, however, as a major player in the telecommunications industry, wished to be at the leading edge of all digital technology and imposed a firm timetable for completing cable digitization.

China's Approach

China's approach to digital switchover stands in contrast to this emergent pattern of focusing on analogue terrestrial switch-off for spectrum efficiency reasons. Digital terrestrial television, other than in Hong Kong, is in its infancy, and has been subject to delays arising from the decision to develop specifically Chinese technical standards for this development. Direct satellite to the home is subject to strict political regulation, variably enforced. China has made the conversion of its 140 million or so analogue cable households (around one-third of China's total TV households) its priority. It has now completed the switch for over one-third of these cable homes, but not without difficulty. After a period of experimentation involving different pilot schemes, the quest for a market-led switchover policy was replaced by a government-driven approach involving significant public subsidy and soft loans. The following sections of this article describe China's approach and progress to date more fully; the main factors which explain it are then analysed.

Characteristics of Television Broadcasting in China

China accounts for one-third of the world's total television viewers, with some 500 million TV sets. It has more than 2500 TV broadcasting stations and around 18,000 television transmitters and relays (Zhou Yan, 2010). Its population of 1.3 billion occupies over 3.6 million square miles of land, with both mountainous and desert terrain.

The broadcasting organizations are all state-owned and come under the supervision of the State Administration of Radio, Film and Television (SARFT). Programme production companies also need to be licensed by SARFT. Watching over the work of SARFT is the Propaganda Department of the Chinese Communist Party's Central Committee, which in turn receives guidance from an

informal Central Leading Group for Propaganda and Ideological Work at the apex of the system (Scharping, 2007).

The practicalities of officially managed content have eased substantially from the highly restrictive era when imported programmes were a rarity and had to be authorized at national level. While restrictions remain on broadcasting foreign dramas and animations in peak-time, their primary purpose is to protect and foster domestic production. There are regulations relating to sexually explicit or violent content. The use of standard Mandarin is also enjoined, with regulations forbidding the imitation of Taiwanese accents or the ‘unnecessary’ use of foreign language (Kender et al., 2007). The area of greatest sensitivity is political journalism, where news censorship and self-censorship have underpinned one-party rule and reflected a culture keen to avoid any embarrassing ‘loss of face’, but where internationally reported events – infectious diseases, accidents, anti-government protests in Xinjiang and Tibet, and the 2008 Sichuan earthquake – provide a growing pressure to be more open and frank.

Satellite technology is extensively used for distributing services to cable head-ends and terrestrial transmitters, but direct-to-home satellite reception is limited in scope. DTH services began to be beamed into China from abroad in the 1990s, when News Corporation’s STAR TV, based in Hong Kong, launched its pan-Asian services. Direct transmissions into the home by foreign broadcasters threatened China’s state control of television content and China’s response in 1993 was to introduce regulations banning the ownership of DTH reception satellite dishes without a special licence – and licences were in practice largely restricted to hotels and foreign compounds.

Cable reception of satellite services, however, provided a filter between the broadcaster and the viewer where control could be exercised. So when Phoenix Television, also Hong Kong based and partly owned by STAR, launched a range of Mandarin services in 1996, it was able to reach agreement for these to be received via cable in Guangdong province.

Cable TV has burgeoned in China and is now standard in most Chinese cities. Growth has been rapid since 2002. By the second quarter of 2009 digital cable subscribers in China exceeded 50 million (Wang Wei, 2010). Elsewhere in China, among the rural households which account for the majority of the population, terrestrial transmitters and small local relay systems fed by satellite distribution (plus some DTH satellite) provide the means of reception. TV coverage extends to 96.6 percent of the population, but that still leaves around 40 million people in small villages, including different ethnic groups especially in border regions, without access to television at all.

While the state owns all the television stations, at national, provincial and local level, nearly all of their funding is commercial, with revenue primarily from advertising, plus basic subscriptions in the cabled cities.

In terms of ownership, media in China are still state-owned organizations, not companies. But in the sense of financing sources, they are more financially supported by advertising rather than subsidies from government. Therefore ratings and circulations are becoming unprecedented critical factors for all media in China, just as important as those in the commercial media system. (Hu Zhengrong, 2005, 3)

Thus, outside the cabled cities, analogue television is provided free-to-view to the great majority of the Chinese people – largely independently of government finance.

Digital Terrestrial Television

China started digital terrestrial television trials back in the 1990s. A fundamental decision taken then was to develop a specifically Chinese set of technical standards for digital terrestrial TV. The international context for this is the absence of any common global standards for digital television. Instead three rival technologies have been developed by the United States, Europe and Japan, partly from motives of market protection.

The American ATSC system (Advanced Television Systems Committee) is specifically for digital terrestrial TV. Europe's DVB (Digital Video Broadcasting Project) and Japan's ISDB (Integrated Services Digital Broadcasting) standards both encompass digital satellite and digital cable (and mobile TV) as well. Salesmen for these three rival systems have toured the globe, signing up royalty-paying customers in other countries, with results largely, but not exclusively, reflecting different analogue legacy systems (i.e. the adoption of ATSC by countries with the American NTSC analogue system and of DVB by countries whose analogue TV was based on the German PAL or the French SECAM system).

China's analogue TV is based on a variant of the PAL system. For digital satellite and cable, China chose standards based on Europe's DVB system, with some modifications. For digital terrestrial television, however, which is not just a set-top box business but impacts on TV set manufacturing, China decided to design its own set of standards.

The motive for doing so is commercial. As well as deterring rivals from seeking to enter China's enormous TV receiver market, it reduces the need to buy intellectual property from foreign companies. This is consistent with China's approach in

other fields, for example 3G mobile telephony, and part of a broader technology strategy:

Like any government in a developing country, China wants to reduce its dependence on foreign companies and cultivate its own technology industries – moving its economy from low-tech commodities to high-tech products, based on a growing element of its own intellectual property, hopefully to fetch a premium in the global market-place. As the world's leading producer of consumer electronics, Chinese companies would like also to reduce their royalty payments to foreign vendors. As prices at the consumer level continue to decline, royalty payments are an increasingly high percentage of total product cost. (Deloitte, 2004: 2)

The Chinese standard for digital terrestrial television is known as DMB-T (Digital Media Broadcasting Terrestrial), but in practice it incorporates two different, currently incompatible, systems developed respectively by Qinghua University in Beijing and Jiaotong University in Shanghai. The technical difference between them is not trivial. The Qinghua design resembles the European DVB's OFDM (Orthogonal Frequency Division Multiplexing) multi-carrier system and the Jiaotong one is similar to the American single carrier vestigial sideband system. Receiver manufacturers have been expected to be able to handle either or both variants, with broadcasters making the practical choice of which system to use. This academic – and political – competition initially inhibited commercial development.

Digital terrestrial television was planned for several of the major cities due to host the 2008 Olympics, with HDTV as an ingredient. The first service began in Beijing in January 2008, with six standard-definition services and one new high-definition channel to showcase the 'High Definition Games'. However, the multiplex was managed by SARFT and its status, as for digital terrestrial TV in a few other cities, was that of a trial. No digital terrestrial receivers went on sale in the shops (Starks, 2010).

The period of the Olympics was very different in Hong Kong. There, for historical reasons, terrestrial television is more important than in the major cities on the mainland, accounting for the majority of the 2.3 million households. The Hong Kong government decided to adopt Beijing's Qinghua variant of the Chinese standard and digital terrestrial transmissions began at the end of 2007. The two main terrestrial broadcasters, TVB and ATV, started simulcasting their analogue services and added new digital-only channels, including HDTV. Coverage of 75 percent was swiftly achieved. The services were free-to-view. Two types of set-top box were marketed with no subsidy: the cheaper version offered standard definition and the more expensive could display high definition on an HDTV-ready flat-screen TV set. Take-up was driven by the Olympics and rose from 9

percent to 20 percent over the summer of 2008 (Author interview, Radio Television Hong Kong official, 2008).

The pattern in Hong Kong therefore is similar to European models of digital switchover, with the introduction of digital terrestrial and the simulcasting of analogue services central to a digital switchover transition period. The role planned for digital terrestrial in mainland China's switchover has yet to be fully scoped. However, policy decisions and investment have now started to be made on the basis that digital terrestrial will be free-to-view:

In 2008, with the state financial support of 2.5 billion RMB, the development plan of terrestrial digital TV is to cover 100 cities including capital cities and municipalities specifically designated in the State Plan, and furthermore to launch two new digital terrestrial TV channels. (Zhou Yan, 2010)

Direct-to-home Digital Satellite

The use of DTH satellite is also in its infancy. It has been recognized as an appropriate technology for rural areas without television reception. A state-owned DTH digital satellite company has been set up, offering a service of 30 channels, which excludes foreign stations, and providing set-top boxes free, for remote areas.

The initiative suffered an early technical setback. China's first DTH satellite, SINOSAT-2, which it had designed and developed itself, was launched in October 2006 (*Space Daily*, 2006). However, its solar panels and communications antennae failed and the satellite had to be declared inoperable. In 2008 a successor, Chinasat-9, made in France, was launched and became operational. The scheme to serve remote areas has been underpinned by substantial investment and is designed to provide television, radio and information services to people in rural areas on a free-to-view basis (Zhou Yan, 2010).

The 1993 regulation banning the unlicensed ownership of DTH reception satellite dishes (Decree 129) is still in place. The desire to restrict the viewing of foreign broadcasts remains, so an open market in DTH services, dishes and receivers is unlikely to be legalized. So the initial DTH service constitutes a closed system, focused on rural areas and restricted to the services and receivers of a state-owned provider.

However, now that the state-owned satellite broadcasting and reception system has been established, initially for remote areas without adequate reception, it is clearly capable of taking on a more extended role in supporting digital switchover. At present, Chinasat-9 is only using a fraction of its potential transponder capacity to

deliver 48 standard-definition TV channels, plus radio, data and downloadable information services, all available on a free-to-view basis. How it expands and whether its expansion will involve any subscription business has yet to be decided (Zhou Yan, 2010).

Digital Cable Television

The drive to digitize China's extensive analogue cable systems began with a number of local pilots, complemented by the availability of digital pay-TV services from CCTV (China Central Television) and other providers, to test various business models.

An early experiment in 2000–2 demonstrated that the market would not work on its own: cable customers were not willing to buy expensive new digital set-top boxes on the strength of the limited new content on offer. Analogue cable systems in major cities may already carry around 40 TV channels, including satellite channels from provinces right across the country as well as the national broadcaster's (CCTV) multi-channel services. Developing attractive new content for a range of new digital channels has proved difficult. The relaying of foreign channels is restricted and the production of new home-grown material is economically constrained.

In China it is not surprising to see that after dinner a viewer living in a metropolitan city like Beijing switches on the TV and zaps the remote control, hopping between the surfeit of channels. The viewer will soon discover that the programs which one can choose to watch are very limited. One can either choose to watch episode four of a drama series on the Hunan Satellite Channel or episode 10 of the same drama series on the Anhui Satellite Channel. (Chin Yik-Chan, 2007)

Pay-TV services have proved of limited popularity, primarily because the content potentially most attractive for a premium pay tier, sport and movies, remained part of the basic subscription service. The government had no desire to remove popular sport from Chinese households and the film industry had no system of rights management that would allow feature films to be aired sequentially on premium and basic channels (Starks, 2010). Moreover, once a film is released, it becomes widely available on pirate DVDs. China Home Cinema, a pay channel run by CCTV-6, began by offering much the same range of films as CCTV-6 had shown a few weeks earlier (Kender et al., 2007).

In 2003, the coastal city of Qingdao in the north-east offered its customers a basic 50 digital channels (in place of the 30 previously available on analogue), with a free digital set-top box but a 10 RMB (£1 or so) increase in the monthly subscription. The investment in cable infrastructure and free set-top boxes was funded by a loan

from the government-controlled China Development Bank, which the extra subscription income would theoretically be able to pay off. Consumer interest proved modest. In the richer city of Hangzhou in central China another model was then tried, with a fuller service offering new interactive services including video-on-demand. However, this business model required more expensive interactive set-top boxes and therefore a higher subscription and was judged unsuitable for less opulent cities (Starks, 2010).

Following these and other early initiatives, an ambitious national timetable was set. The business model could be varied to reflect the relative wealth of the area and local policies, and organizational reform was encouraged to consolidate diverse groups of broadcasters into city and provincial monopolies with greater capital. The major cities, including all the provincial capitals and all the cities in the east, were given a switchover deadline of 2005. Counties in the east, and the cities and most of the counties in the central region, as well as some cities in the west, were expected to switch by 2008. The target for the remaining counties in the central region and most of the counties in the west was 2010, with 2015 as the date for completion in the remaining counties in the west.

Slippage soon began. Teething problems included conflicts between the national providers of pay-TV channels and the local cable companies over conditional access. The encryption systems used by pay-TV operators in delivering their services to the cable head-end proved incompatible with the 'hodge-podge of systems' used by the cable distributors (Kender et al., 2007).

More serious was lukewarm consumer interest due to the shortage of differentiated programme content. The 40 basic analogue channels lacked fresh material and the extension to 50, 60 or more basic digital channels added very limited value. The new digital pay-TV channels had very low take-up. They offered a wide range of 'niche' content – including cars, fashion, travel, pets, the stock market, European football, golf, tennis and Chinese chess. Among the 5 percent or so of digital households who chose to subscribe to them, the fishing channel was one of the most popular (Author interview, official at Top TV, 2008).

The 2005 target was missed and the government response was to begin making digital switchover compulsory, starting in small cities. Instead of being sold a new service package, consumers were informed that their systems would be modernized with a modest increase in the charge. The basic idea was to install one new digital set-top box per household for free and to control subscription increases strictly to guard against any significant consumer revolt. Cable companies were offered the regulatory carrot of a subsidy or soft loan and urged to invest, with a hint that the alternative could be an end to their monopoly status (Starks, 2010).

By 2007 SARFT claimed that 25 cities had achieved full (defined as 95 percent) switchover to digital cable, but a survey by *Screen Digest* commented that on closer inspection:

The 95 per cent benchmark is typically for the central area of the city, leaving the suburbs and counties aside.... Most of the 25 cities that claim full switchover are small, with less than a million subscribers. Big municipalities like Beijing and Shanghai lag behind considerably. Three years on from the original complete migration target, major cities in the country have turned into the bottleneck of digital plans. (*Screen Digest*, 2007)

To speed up the conversion rate in the major conurbations, different approaches developed in different places. In Guangzhou and the surrounding province of Guangdong, for example, investment in digital infrastructure and digital set-top boxes was financed by state loans. Guangdong began converting subscribers on the basis of a free cable set-top box, an increase to 55 channels, no new basic content but new data services and pay-TV options, and a compulsory subscription increase from 17 RMB to 25 or 26 RMB per month. Retaining the old analogue service was no longer an option, though poor households, for whom the cost increase was a real issue, could downgrade to a reduced service of six channels only for 5 RMB per month. Most households, not surprisingly, accepted the digital upgrade.

In Beijing, the government provided a direct subsidy of 100 RMB to the Gehua cable company for every digital set-top box it gave its customers, but required the company to hold the digital subscription to the same 18 RMB per month which it charged for analogue. Gehua's sources of new revenue were therefore limited to pay-TV subscriptions and income from a variety of sponsorship, product placement and merchandising deals.

Instead of a major expansion of programme content, digital cable viewers are offered new data and information channels, including practical daily life services such as job vacancies, property, health and transport information, as well as government information services (Wang Wei, 2010). The most sophisticated digital cable information services offer two-way interactive services, supporting transactions in shopping, banking and making travel or entertainment reservations and, while this costly technology is at present limited to cities like Hangzhou, Shanghai and Shenzhen, the aim is to develop digital cable in this direction (Wang Wei, 2010).

Most cable organizations are now part-way through the digital conversion of their customer base. In late 2008 Gehua reckoned to have converted about 50 percent

of its customers. The national picture is therefore complex, and changing, with some cities claiming to have completed and others still in the early stages, but overall about a third of cable households have been switched.

Difficulties Surrounding a Market-led Policy

Even in the relatively well-to-do cabled cities, China has found it difficult to design and apply a market-led policy for achieving full digitization. Consumer demand has proved limited, partly because of the multiplicity of programme channels already provided on analogue cable and partly because of the lack of attractive new content for new digital channels. The virtuous circle of attractive new digital services persuading consumers to spend their own money on acquiring new digital receivers has not materialized and state subsidy and loans have had to provide a substantial part of the funding.

Economic factors form part of the explanation. While the Chinese economy grew at an annual rate of the order of 10 percent for over a quarter of a century, the global economic crisis of 2008–9 has had an impact. Moreover, the market forces providing much of the drive behind economic growth have often increased inequalities, so while per capita income has risen dramatically as a national statistic, levels of consumer spending-power vary greatly, as does the market for television advertising revenue.

Political considerations have also constrained the range of potential new digital programme material, most obviously through the continuing restrictions on the relaying of foreign channels. While Maoist doctrines and whims lie back in history, the Communist Party's grip on strategically important institutions and businesses remains strong, as it strives to perpetuate its role and safeguard the national integrity of an increasingly diverse population against the kind of centrifugal forces which broke up the Soviet Union.

If market-led policies have proved difficult to develop for the cabled cities, they are even more unlikely to provide the basis for digital switchover in rural areas, where consumer spending-power is generally much lower. As investment in digital terrestrial and digital satellite technology becomes committed, a strategy to map out the role of each platform – and its obligations in respect of free public access – is emerging (Zhou Yan, 2010). However, it is not clear whether all existing analogue terrestrial homes will be converted to digital terrestrial or whether the cost and complexity of implementing this over large areas of rugged terrain will lead to a regulatory change which would allow direct satellite reception a greater role.

The big, as yet unanswered, policy question is who will pay for new digital receivers for the millions of rural households outside the cable systems who currently receive free-to-view analogue television through terrestrial aerials or via some form of legal or illegal satellite reception. These 240 million or so homes, spread over an enormous geographical area, account for over 60 percent of China's TV households. If new digital receivers were sold at an unsubsidized price, then many householders would be unable to afford them – so take-up would have to remain voluntary, poorer families in particular would be excluded from the benefits of digital, and legacy analogue television would have to be left in place. If new digital set-top boxes were given away free on the basis of one-per-household, as in the cabled cities, then the cost to the state would be huge. Means-testing and levying some modest monthly subscription would be possibilities, but the administrative implications are formidable, enforcement might prove impractical and an effective compulsory scheme could spark resistance.

So the various policy options are fraught with different risks. Given China's other ambitions for rural economic and social development, some very strong justification for completing switchover on a comprehensive basis would need to underpin the cost to the state of fully digitizing the rural areas.

China's Main Switchover Motivation

Other countries have prioritized analogue terrestrial switch-off in order to reclaim and re-use scarce spectrum, but this has not yet been a significant driving-force in China. While spectrum is an ever-growing requirement for mobile telecommunications, China does not feel the major pressures to be found in smaller countries with close neighbours whose conflicting claims on frequencies need to be accommodated. Moreover, broadcasting spectrum is not financially valued and priced in the same way as in, say, the USA where the federal government's potential revenue from auctioning released spectrum justified the cost of vouchers to subsidize set-top box purchases by analogue terrestrial households (Starks, 2010).

So why would China choose to formulate a digital switchover policy? Part of the answer lies in China's wider agenda of modernizing the country and acquiring new competences in the high-tech field. This is the country which in 2008 put men into space. State support for the modernization of the broadcasting and consumer electronics industries helps fulfil China's ambition to transform itself from a low-cost factory producing goods from other nations' designs with other nations' equipment to a nation in the vanguard of economic and technological progress.

China has long been the world's largest manufacturer of TV sets. Since it joined the World Trade Organization, its very competitively priced consumer electronic

goods have played a major role in its export boom. The global switch to digital transmission is now transforming this business (Starks, 2010). The world market for digital terrestrial receivers (TV sets and set-top boxes) has been predicted to grow from 65 million units in 2007 to more than 350 million units in 2013 (ABI Research, 2008). In its early phases digital terrestrial TV, like digital cable and satellite, has been based largely on set-top boxes used to convert analogue TV sets, but then the analogue terrestrial tuners integrated into TV sets are replaced by digital terrestrial tuners. In the advanced economies of the world analogue TV sets are becoming obsolete.

China's major players in the industry cannot afford to fall behind. They are already shifting from cathode ray tube to flatscreen technology and the next step is to make HD-ready flatscreen digital TVs, incorporating the relevant technical standards for their major export markets. Remaining with analogue technology for the long term would mean being tied to a shrinking market, at any rate in the advanced economies. Digital switchover represents a beckoning export opportunity, especially as countries which are making digital switchover mandatory are keen to keep down the compulsory cost to their consumers and look to China as a prime source of low-cost mass production.

In the changed global market conditions of 2008–9, the economic balance in China may shift somewhat from exports towards increased production for domestic consumption. With a domestic market comprising 20 percent of the world's population, digital switchover within China represents a major business opportunity for Chinese consumer electronics manufacturers with their own distinctive Chinese technical standards.

However, information policy is probably more of a driver than industrial policy. China has a political desire to increase, and also to control, the dissemination of information in the interests of creating and guiding a 'harmonious society'. The Communist Party leadership appreciates that a policy of withholding information from China's huge population of increasingly well-educated citizens could never work, yet it has set its face against the conflict and discord which it associates with an open market in information and opinion (Starks, 2010). So the aim is to manage the public communication process – and the creation of new digital information channels is well-suited to the purpose.

The new digital cable services now include a locally relevant government data channel providing public service information – covering topics like transport, health and social services – within what, in another context, has been termed 'a walled garden'. Services to rural areas, using push Video-on-demand (VOD), include practical information relevant to farmers:

In 2008 the cable television network in Liaoning Province was the first to experiment with push VOD technology in the implementation of the Cultural Information Resources Sharing Project. Set-top boxes with 160G hard disks were installed in rural households to record downloaded material. The cable television network operator can push a variety of video e-books to their set-top boxes during off-peak hours, so that the farmers can watch when they wish and learn agricultural knowledge. (Wang Wei, 2010)

China's digital television switchover is, in theory at least, part of an integrated approach encompassing the convergence of broadcasting, telecommunications and computer technologies. Different government departments have had their own, often overlapping, responsibilities for the historically separate broadcasting and telecommunications industries, and SARFT and the recently renamed Ministry of Industry and Information Technology have had a history of rivalry, which at one point involved rival systems of mobile TV. However, a 2008 announcement declared that six ministries had collaborated in compiling a document entitled *Several Policies on Encouraging the Development of the Digital Television Industry*, with a pledge to work more closely together (ChinaTechNews.com, 2008).

So, in parallel with the process of digital switchover, China has been developing mobile TV and IPTV (Internet Protocol TV) and, of course, has seen a major expansion in access to, and use of, the Internet, albeit in the controlled editorial environment created by the 'Great Firewall of China'. By February 2008 around 16 percent of the population were estimated to be online (*The Times*, 2008). Internet access in every Chinese home is, however, unlikely to be feasible and advocates of an information policy based on the Internet have yielded to those favouring the use of new digital television services, since the penetration of television is so much higher and due to remain so (Zhou Yan, 2010).

In Conclusion

For reasons of industrial policy and, more importantly, information policy, China is therefore likely to pursue the goal of full digital switchover in the long term, although the spectrum re-use drive underlying the policy in most other countries is not a major consideration at this stage and although a market-led model does not look feasible. However, for economic and political reasons, including the potentially very high costs of state funding, implementation is likely to take many years. China initially aspired to complete full digital switchover by 2015, but the only firm commitment to meet this target now relates specifically to switching cable television households (Author interview, SARFT officials, 2008).

Note: Research for this paper was facilitated by the University of Westminster's China Media Centre. - Author interviews were carried out in October 2008,

with officials from SARFT, Radio Television Hong Kong (RTHK), and Top TV.

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