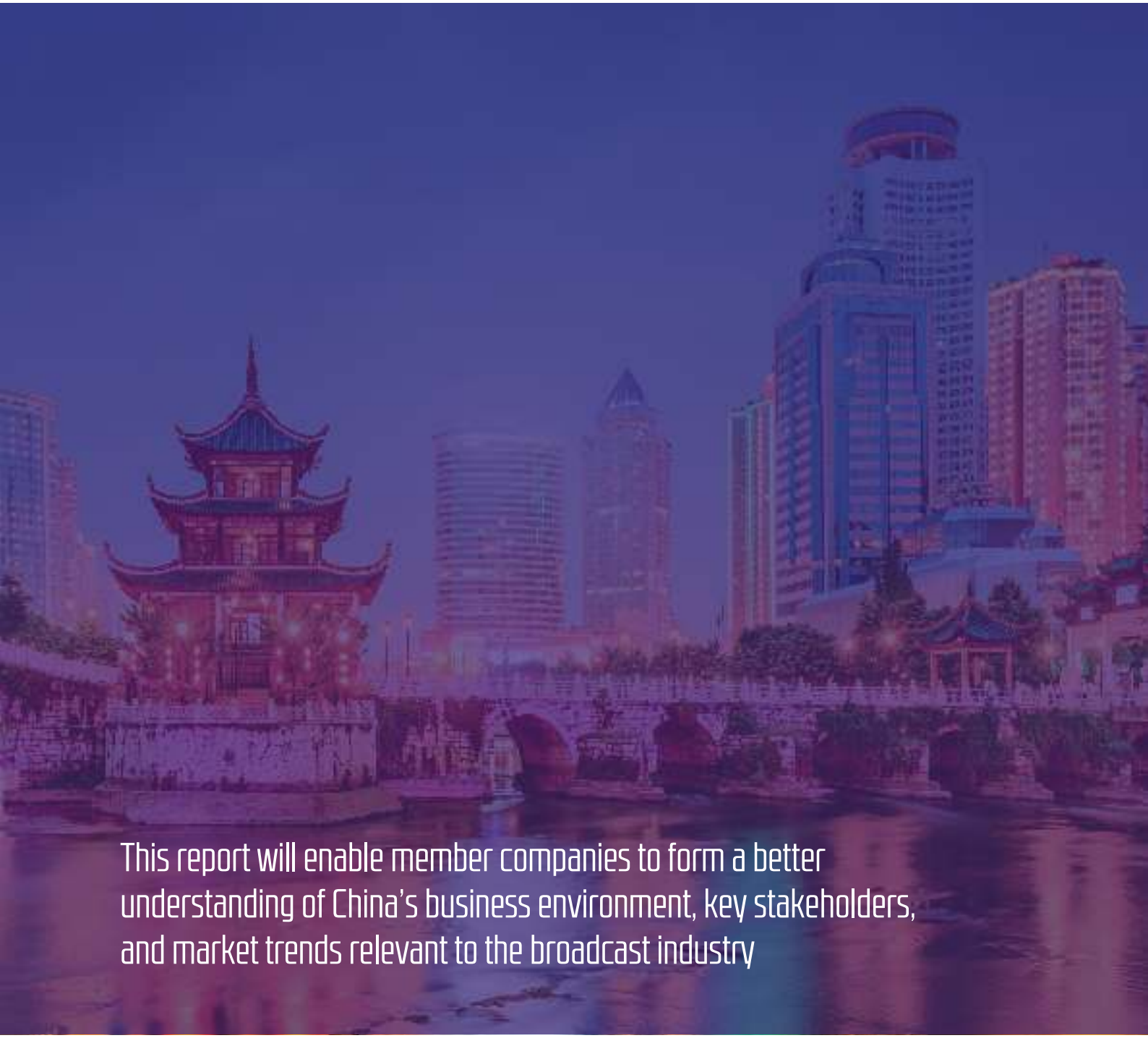
IABM BUSINESS INTELLIGENCE
China Market Entry Study

JULY 2019



This report will enable member companies to form a better understanding of China's business environment, key stakeholders, and market trends relevant to the broadcast industry

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Representing vendors globally across the digital media and entertainment industry

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Introduction

The IABM Business Intelligence (BI) China Market Entry Study provides IABM members with a varied range of business information about the broadcast and media industry in China. The purpose of this report is to enable member companies to form a better understanding of China's business environment, key stakeholders, market trends in our industry by presenting otherwise scattered information in an orderly and relevant manner. Moreover, our study aims at providing general information about different forms of market entry to China as well as insights about operational business practices based on a wide range of expert interviews conducted for this study during the first half of 2019.

Report Contents and Structure

The analysis is undertaken by our Head of Insight and Analysis, Lorenzo Zanni, Principal Analyst, Riikka Koponen and Research Analyst, Chiara Raucci. Our study consists of two parts; 1) Market environment in China and 2) Market Entry to China, which discuss the following topics:

- **Market landscape**
- **Broadcast and media technology industry in China**
- **Future outlook – Broadcast and media technology trends**
- **Industry buying groups and sales practices in China**
- **Market entry strategies and preparation**

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Executive Summary

Market Landscape

- In 2018, out of the total population of 1,39 billion, over 800 million people (representing 58% of the total) lived in China's cities – the largest urban population in the world.
- Since opening up to foreign trade and investment in 1979, China has been among the world's fastest-growing economies, and in 2010 it overtook Japan as the world's second largest economy. On average, China has doubled its GDP every eight years and lifted an estimated 800 million people out of poverty since opening up its economy.
- Even though China alone accounted for one-third of global economic growth in 2018, China's real GDP growth has slowed significantly over the past decade, from 14.2% in 2007 to 6.6% in 2018. According to the IMF's estimate, China's GDP growth could fall to 5.6% by 2023, as the country's economy continues to transition away from investment – and export-led growth toward services – and consumption-driven growth.
- Recently, China has been a target of the Trump administration's trade policy. At the beginning of 2018, president Trump announced that the government would impose tariffs on imported steel (25%) and aluminum (10%). During 2018, the US administration raised tariffs on about US$ 300 billion of imported goods, mostly from China.

Broadcast and media technology industry in China

- China is the biggest TV market in the world – it accounts for one third of the world's total TV households. According to the latest government statistics, the percentage of households in China that owned a TV set was 99% in 2017, being equivalent to about 440 million households (average household size 3.1).
- Broadcasting organizations are all state-owned and directly under control of a new State Council agency called the National Radio and Television Administration (NRTA), which replaced the State Administration of Press, Publications, Radio, Film and Television (SAPPRFT) in a reform in March 2018.
- There are over 2,600 TV and radio stations in China, which are all owned by the state at national, provincial and local level. Nearly all of the TV stations' funding is commercial, with revenue primarily coming from advertising and basic subscriptions.
- The principal network provider is the public service broadcaster China Central Television (CCTV). CCTV has the largest number of FTA channels offered by a single operator in the country, at 16.

China has been among the world's fastest-growing economies, and in 2010 it overtook Japan as the world's second largest economy. On average, China has doubled its GDP every eight years and lifted an estimated 800 million people out of poverty since opening up its economy.

- Over the past few years, China's TV stations – at the national and local level – have experienced a significant decrease in their traditional TV advertising revenues due to the emergence of OTT platforms and IPTV.
- China is currently in the midst of its "2020 Analog Switch Off Plan" (ASO), officially aiming to switch off the analog signal in big cities by the end of 2018 and in the whole country by 2020.
- Cable connection remains the dominant distribution platform with its 221 million TV households, followed by FTA satellite TV households, the number of which exceeded 136 million as of August 2018.
- China is the largest Pay-TV market in the world by subscriber base; it has a third of the world's Pay-TV subscribers. The estimated size of China's Pay-TV market across all technologies at the end of 2017 was 325 million subscribers equating to about 65% household penetration.
- According to the Chinese Internet Network Information Center (CNNIC), the number of internet users in China rose by 30 million in the first half of 2018 reaching 802 million, representing 57.7% of the total population. By comparison, the US has an estimated 300 million internet users. 778 million Chinese (98.3%) internet users used mobile phones to access the internet.
- According to Asia Video Industry Association (AVIA), China's online video market size by number of active users was estimated to be 596 million at the end of June 2017, representing about 76% of the online population.
- In 2019, China's telecom industry will be driven by commercial trials and launches of 5G networks, which should be officially launched in 2020.

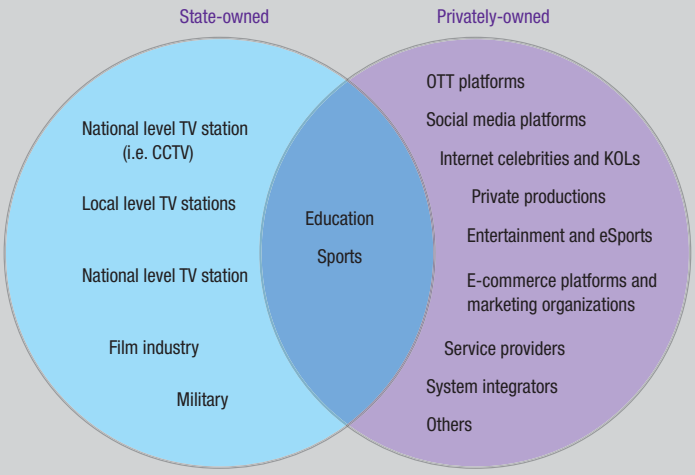
Future outlook – Broadcast and media technology trends

- The number of paid subscribers to China's online video platforms was 230 million at the end of 2018 and is expected to surpass 300 million during 2019.
- According to the industry experts interviewed for this study, China's sports sector offers a significant market opportunity for broadcast and media technology vendors in the coming years. Rapid growth of the sports sector will translate into a sizable need for live production and especially remote production using mobile video production solutions.
- China continues to dominate the 4K Ultra-High-Definition (UHD) market globally. According to IHS Markit, 42% of all TVs shipped in China in 2017 had 4K panels, and by 2020 China's 4K TV shipments are expected to reach 44 million units – equaling the same as North America and Western Europe combined.
- Chinese telecommunication companies (telcos) have also started to expand their footprint and role in TV content distribution in China. Recently, China's biggest telcos – China Mobile, China Telecom and China Unicom – have started to work toward 4K TV content and 5G applications. This move is greatly supported by the existing infrastructure managed by these three major telecom operators.

Industry buying groups and sales practices in China

- In China, buying groups can be divided into state-owned end customers procuring through public biddings and project tenders or private end customers buying through private sales channels.
- CCTV is the biggest single end-customer in the whole broadcast and media industry in China and it also has a huge indirect influence on local TV stations, which often choose the same solution as CCTV.

Major industry buying groups in China and the involvement of Chinese state-owned enterprise (SOEs)



Source: IABM

- CCTV's decision making is based on a points system, where CCTV's procurement team, consisting of a range of different professionals in various departments, gives a score on the vendor organization's departments and their solution.

Market entry strategies and preparation

- There are several options for entering the Chinese market depending on;
  1) the technology vendor's business and offering targeted to the Chinese market,
  2) its resources allocated to the market entry and
  3) its actual addressable market in China.
- Even though there are theoretically several ways to enter the China market, in practice there are only two viable entry modes;
  1) export (directly or indirectly) or
  2) investment (i.e. establishment of a legal entity in China).
- Investment entry mode refers to establishing some form of a legal entity in mainland China for the purpose of expanding operations, and it can technically mean setting up a Representative Office (RO), a Foreign Invested Partnership (FIP), a Wholly Foreign-Owned Enterprise (WFOE) or a Joint Venture (JV).
- It is important to note that a JV is the only type of company that allows foreign investors to engage in restricted industries in China such as telecoms.
- The Chinese currency Chinese yuan (CNY) is not fully convertible. Hence, it is important for foreign companies to incorporate a profit repatriation strategy into their set-up planning of a subsidiary in China to ensure its ability to access the profits earned and to achieve cost savings.
- The choice of location is very important when entering the Chinese market. Many technology vendors interviewed for this study, who primarily serve traditional broadcasters, said that they preferred to set up a presence first in Beijing, where CCTV and the majority of key decision makers of the broadcast industry are located.
- Our study illustrated that finding a local Chinese partner – either a distributor, an agent or other business partner – was considered as the most critical aspect when entering the Chinese broadcast and media technology market.

The number of paid subscribers to China's online video platforms was 230 million at the end of 2018 and is expected to surpass 300 million during 2019.

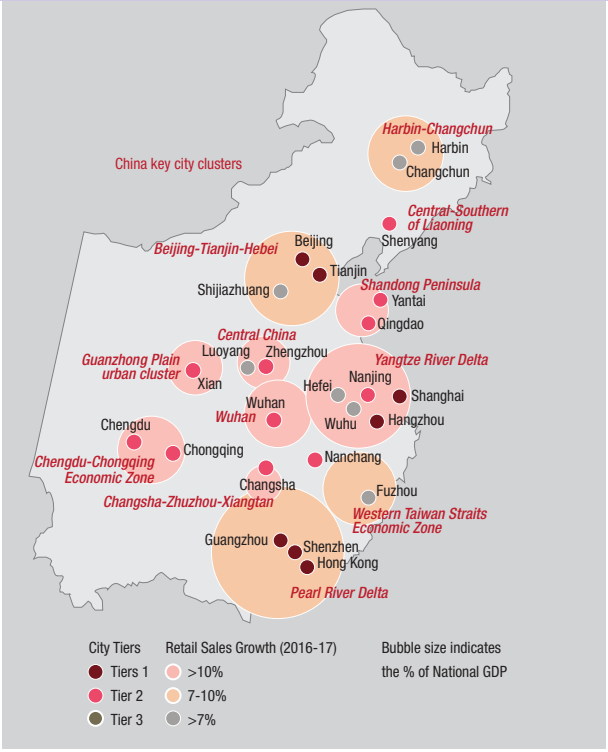
Part I:
MARKET LANDSCAPE

IABM – July 2019

Market landscape

Population and economy

In 2018, out of the total population of 1.39 billion, over 800 million people (representing 58% of the total) lived in China's cities – the largest urban population in the world. According to McKinsey, China's urban population will reach 65% by 2030. Over the past decade, China's largest cities and municipalities such as Beijing, Shanghai and Chongqing (i.e. Tier 1 cities) as well as provincial capitals such as Wuhan and Qingdao (i.e. Tier 2 cities) have experienced a dramatic increase in urban residents. For example, Beijing's population increased by 27% between 2010 and 2015, while Chongqing's urban population also grew by 27% over the same period. The smaller cities (e.g. Tier 3 and 4) are growing too – as of May 2018, a total of 89 Chinese cities had an urban population of more than 1 million people. The map on the right illustrates China's key city clusters and their retail sales growth reflecting the biggest consumer clusters.



Source: National Bureau of Statistics of China

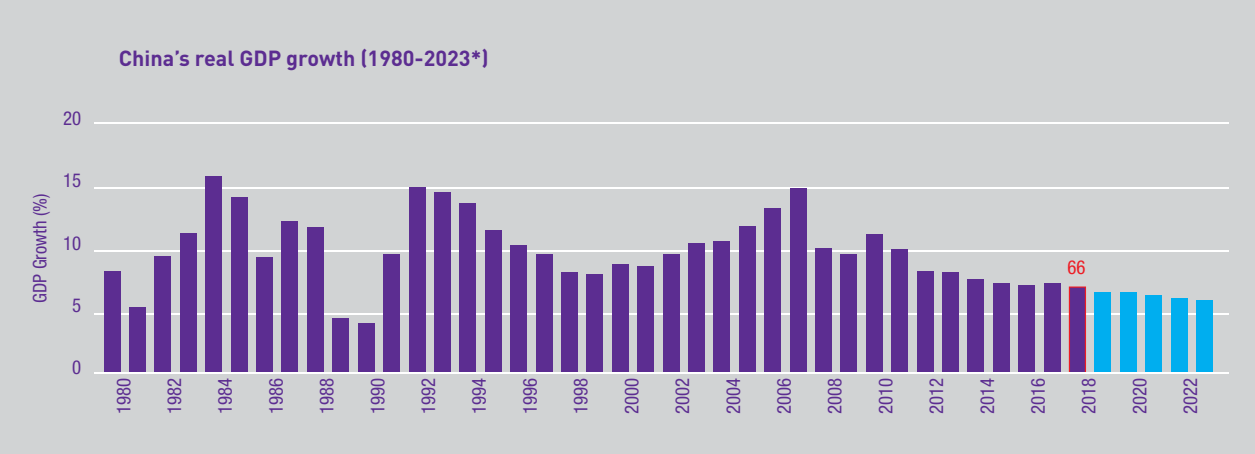
Since opening up to foreign trade and investment in 1979, China has been among the world's fastest-growing economies, and in 2010 it overtook Japan as the world's second largest economy. On average, China has doubled its GDP every eight years and lifted an estimated 800 million people out of poverty since opening up its economy. According to the World Bank, based on the international standard poverty line of US$1.9 per day, China's extreme poverty rate fell from 88.3% in 1981 to 1.9% in 2013. The Chinese government has set an official target to eradicate poverty by 2020; at the end of 2018 there were 16.6 million people living in extreme poverty (i.e. with an annual income less than RMB 2,300) in China, according to the National Bureau of Statistics of China.

Even though China alone accounted for one-third of global economic growth in 2018, China's real GDP growth has slowed significantly over the past decade, from 14.2% in 2007 to 6.6% in 2018. According to the IMF's estimate, China's GDP growth could fall to 5.6% by 2023, as the country's economy continues to transition away from investment- and export-led growth toward services- and consumption-driven growth.

Recently, China has been a target of the Trump administration's trade policy. At the beginning of 2018, president Trump announced that the government would impose tariffs on imported steel (25%) and aluminum (10%). During 2018, the US administration raised tariffs on about US$300 billion of imports, mostly from China. In total, new tariffs have been raised on about 12% of US goods imports. China responded with retaliatory tariffs of 5-25% on US$110 billion worth of US goods, nearly 70% of its total US imports. Due to this heightened economic uncertainty, the slowdown of China's economic growth is expected to continue in 2019, as exports will likely decline further. Responding to the slowdown, the Chinese government has announced support measures, including monetary easing, large tax cuts and an expansion of infrastructure investment.

The chart opposite shows China's real GDP growth between 1980-2018 as well as providing a growth estimate until 2023.

Source: CNN



Source: IMF 2018

Acknowledging the need to diversify the economy and find new sources of growth, the Chinese government has named slower economic growth as the 'new normal' and introduced reforms to accelerate a new growth model relying less on fixed investment and exports, and instead boosting private consumption, services and innovation. The latter has become a top priority of the Chinese government, and it has announced a wide range of innovation initiatives such as 'Made in China 2025', which aims at modernizing China's manufacturing in 10 key sectors. These reforms to rebalance the economy are crucially important, as China's fixed investment has generally been the largest contributor to China's real GDP growth.

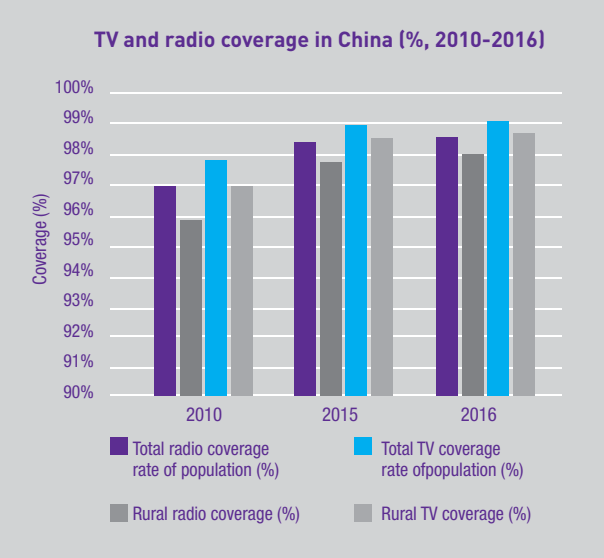
Whereas in the past China's economic modernization and growth strategy was to attract foreign direct investment (FDI) into China to help boost the development of domestic firms, the Chinese authorities initiated a new 'go global' strategy in 2000 to encourage Chinese firms, particularly state-owned enterprises (SOEs), to invest overseas. As a result, China has become the world's second-largest source of FDI outflows after the US – for the first time in 2016 China's FDI outflows (US$183 billion) exceeded its FDI inflows (US$134 billion). By using FDI, China gains access to intellectual property rights (IPR), new technology and innovations, know-how and famous brands, which help Chinese firms to move up the value-added chain in manufacturing and services as well as to boost domestic innovation. By acquiring or investing in foreign firms, Chinese firms are becoming more globally competitive.

In terms of demographic development, China has a sizable aging population – an estimated 324 million people (22% of the total population) will be over 60 years of age by 2027. This puts pressure on the Chinese government to improve social benefits, while the working-age labor pool will decrease. Over the same period, China's younger, digitalized generations will form the new key consumer group, which not only consumes at a higher rate, but also is less price sensitive than previous generations. According to Bain & Company, those born in the 1990s will make up of 15% of the population, and those born in the 2000s will represent 21% of China's population, in 2027. These young, digitally savvy consumers will have higher standards for convenience, quality and variety.

Broadcast and media technology industry in China

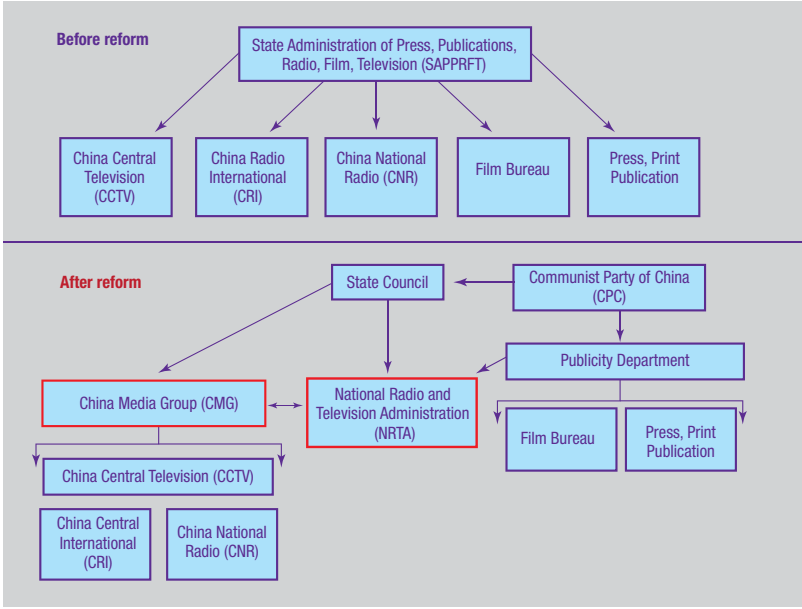
Distribution network and administrative structure

China is the biggest TV market in the world – it accounts for one third of the world's total TV households. According to the latest government statistics, the percentage of households in China that owned a TV set was 99% in 2017, being equivalent to about 440 million households (average household size 3.1). Out of this, about 350 million households had a digital television, representing 79% of the total number of households owning a TV set. As shown in the chart below, both radio and TV coverage of the total population and rural population in China exceeded 98% in 2016. Thanks to their wide reach, China's broadcast television and radio have continued to play an important role as a medium for entertainment, news, live sports and education over the past decade.



Source: National Bureau of Statistics of China

In 2016, China had about 2,600 TV broadcasting channels (including FTA and Pay-TV stations) and over 18,000 television transmitters and relays, according to China's National Bureau of Statistics. Broadcasting organizations are all state-owned and directly under the control of a new State Council agency called the National Radio and Television Administration (NRTA), which replaced the State Administration of Press, Publications, Radio, Film and Television (SAPPRFT) in a reform in March 2018. At the same time, the regulation of film was also moved under the control of the central Publicity Department of the Communist Party of China (CPC) Central Committee. In the reform, a new state-media conglomerate, unifying three state-run broadcasters – China Central Television (CCTV), China Radio International (CRI) and China National Radio (CNR) – was set up and named as China Media Group (CMG) (i.e. 'Voice of China'). This new authority is directly managed by the Publicity Department of the Communist Party of China (CPC) and its main responsibility is to "strengthen international communication, tell China's story well and increase China's soft power", according Shen Haixiong, the head of the new China Media Group and former director of CCTV. The chart below illustrates the new administrative structure of China's TV and radio sector.



Source: China Media Group

There are over 2,600 TV and radio stations in China, which are all owned by the state at national, provincial and local level. Nearly all of the TV stations' funding is commercial, with revenue primarily coming from advertising and basic subscriptions. Cable TV networks are the second largest source of income for many TV stations – most households where cable is available pay a small maintenance fee for their television service. This fee is separate from the Pay-TV option.

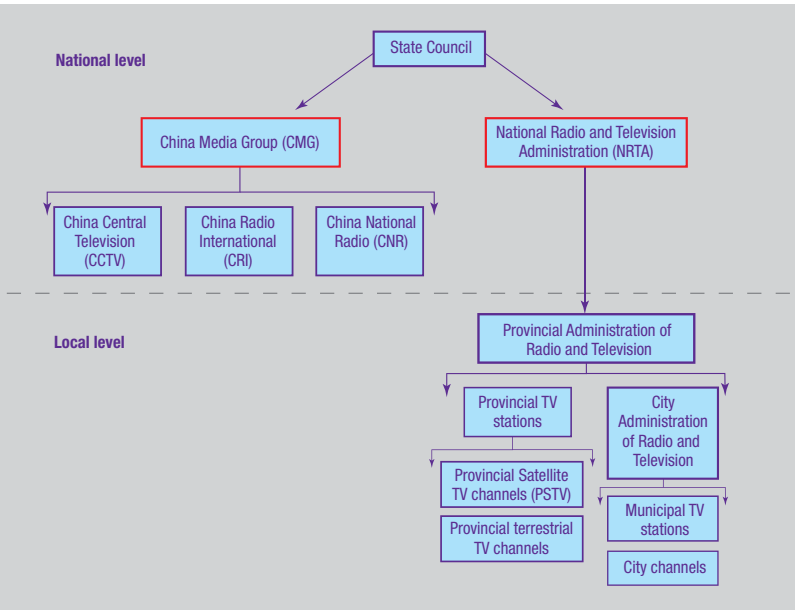
According to a publication by IGI Global, *Internet Mercenaries and Viral Marketing – The case of China's Social Media*, the TV channels carried through the cable television system can be divided into four types:

1. CCTV channels, which have a national and international audience
2. provincial satellite TV (PSTV) channels, which are carried via satellite to a national audience
3. provincial non-satellite TV channels, which concentrate on territory-based local markets, and
4. overseas channels, which have received approval from the Chinese authorities.

The principal network provider is the public service broadcaster China Central Television (CCTV). CCTV has the largest number of FTA channels offered by a single operator in the country, at 16. Moreover, CCTV has 18 pay channels and three overseas channels, of which some are broadcast in foreign languages like English, Spanish, Russian and Arabic. CCTV 1 is the flagship channel of CCTV and a general channel, which is almost always at the top of TV ratings list in the country.

Provincial satellite television (PSTV) channels refer to TV channels that are run by provincial TV stations, which are transmitted via satellite to the national audience. These stations are owned by provincial governments. Each provincial station is permitted to have one satellite TV channel that can be carried by local cable TV systems and hence have a national reach. Compared to terrestrial channels, PSTV channel coverage is wider and is no longer confined to the specific province in which it is located. In total, there are 31 provincial satellite TV channels, of which the most popular stations include Hunan Satellite TV (HNTV), Jiangsu Satellite TV (JSTV), Beijing Satellite TV (BJTV), Zhejiang Satellite TV (ZJTV) and Dragon TV (Shanghai). Hunan Satellite TV (HNTV) is the most famous PSTV channel in China and often ranking in the top 10 in the annual nation-wide rating and advertising revenue comparison after CCTV's channels.

Provincial non-satellite TV channels refer to provincial terrestrial TV channels, which cannot operate at the national level, and their mandate is to only broadcast to their own province. These channels also include the 'lower tier' TV stations of municipalities (e.g. Shanghai, Guangzhou, Chongqing), ethnic autonomous regions, cities and counties (towns). These local stations cover local issues, which cannot be adequately addressed by CCTV as well as providing local programs with local dialect. The chart below describes the administrative structure of China's national and provincial TV stations.



Source: Marianne Friese Consulting, IABM

Consistent with most countries, over the past few years, China's TV stations – at the national and local level – have experienced a significant decrease in their traditional TV advertising revenues, as advertisers' expenditure continues to shift further toward content marketing, digital advertising on OTT platforms and brand placement in variety shows and dramas. Due to the emergence of OTT and internet TV accessible through multiple devices, viewership of traditional, linear TV has decreased dramatically – particularly among the younger generations. As a result, some local TV stations have had to merge with bigger stations or close down. Chinese broadcasters and linear TV providers have responded to the harshening competition from the OTT sector by investing heavily in original content and programming – in 2017, their program spend equaled US$6.4 billion, according to IHS Markit. However, as the number of Chinese OTT players and the new media sector continue to grow, Chinese TV stations are expected to face increasing financial pressure in the future.

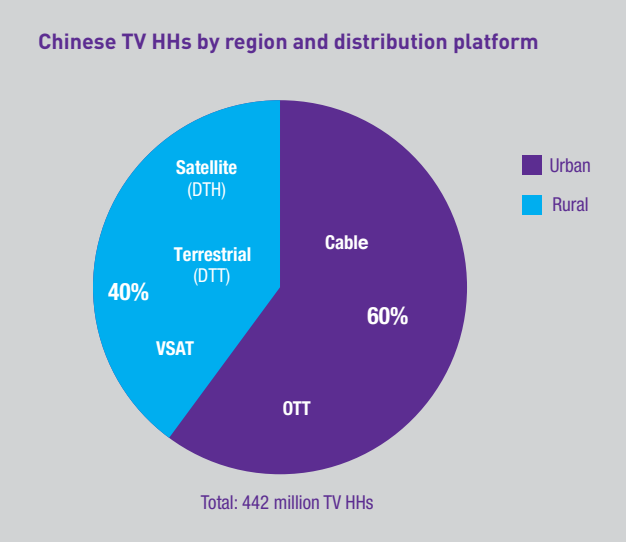
Broadcast technology infrastructure and transmission systems

According to National Engineering Research Center of Digital Television (NERC-DTV), China's public broadcast service is characterized by a dual structure, which segregates urban and rural households. Urban households, which account for nearly 60% of all households, are serviced through cable and over-the-top (OTT) connections, while rural households receive encrypted national and provincial programs via satellite (DTH) as well as local programs through free-to-air (FTA) terrestrial transmission.

Since 1993, individual satellite reception has been illegal in China, but the government has granted special licenses for direct-to-home DTH reception satellite dishes for hotels and foreign compounds. The government has also allowed a few thousand satellite dishes in rural, remote areas to improve TV penetration. These satellite TV connections in rural areas are FTA. Moreover, in rural areas hundreds of Very Small Aperture Terminal (VSAT) user stations are used for voice, data and image transmission. After the devastating earthquake in Sichuan in 2008, telecom operators started to utilize satellite communications as a backup system to the fiber network through a project called 'super base station' managed by China Mobile and over 1000 VSAT sites were built throughout China. With support from the Chinese government, Chinese telecom operators have been implementing a project 'to cover every village' by using the VSAT satellite communications system to complement the fiber network system. So far, this project has resulted in a built-up of over 3000 VSAT sites for voice, data and image transmission in rural areas of China.

While DTH satellite reception is limited in scope, satellite technology is extensively used for distributing services to cable head-ends and terrestrial transmitters in China. As of October 2013, there were three central earth stations located in Beijing, Shanghai and Guangzhou and 31 provincial stations. The Beijing gateway is the largest earth station in China. Private networks using VSATs complement the public networks. Banks, petroleum corporations, water firms, power and coal companies,

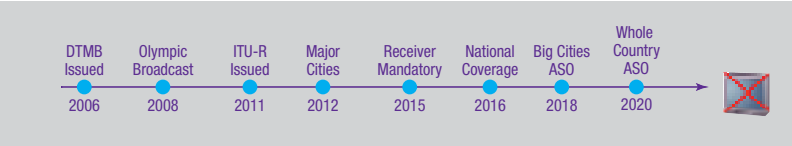
meteorological institutions, customs, railway and transportation departments, aerospace and civil aviation institutions, broadcasting and television, news agencies, earthquake administration, health departments and education organizations have their own private networks for the purposes of remote education, medical care, information broadcast, internet access, data acquisition, internal networks and emergency communications. The chart below illustrates China's broadcast technology and distribution infrastructure.



Source: NERC-DTV

Transition to digital broadcasting

When it comes to the transition from analog to digital television transmission, China is currently in the midst of its '2020 Analog Switch Off Plan' (ASO), the official targets of which are to switch off the analog signal in big cities by the end of 2018 and in the whole country by 2020. As of April 2019, there were no official statistics available about the status of analog switch-off in the biggest cities of China to measure this against China's official Analog Switch Off Plan. However, national coverage of digital transmission was accomplished in 2016 as a result of an investment of US$800 million between 2014 and 2016, which expanded digital TV coverage to 70% of the total population. The timeline below shows the official targets of China's Analog Switch Off Plan.

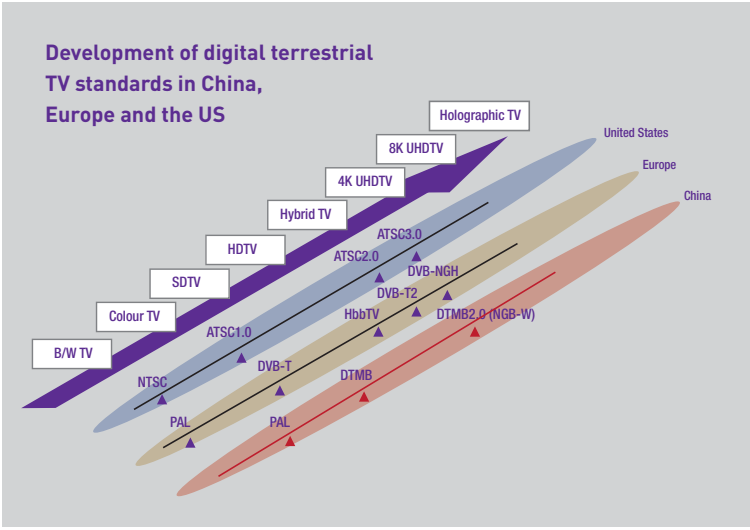


Source: NERC-DTV

China's analog 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 certain modifications. For digital terrestrial television (DTT), which impacts on TV set manufacturing, China designed its own set of standards. By designing its own standard, China was not only able to protect its enormous TV receiver market from foreign competition, but also it did not need to buy intellectual property from foreign companies. This helped Chinese manufacturers to reduce their royalty payments to foreign vendors, which accounted for a high percentage of total product cost, making Chinese companies more competitive in the context of the declining prices of consumer electronics.

The Chinese standard for digital terrestrial television (DTT) is known as DMB-T (Digital Media Broadcasting Terrestrial), which practically incorporated two different systems developed by Qinghua University in Beijing and Jiaotong University in Shanghai. The Qinghua design resembles the European DVB's OFDM (Orthogonal Frequency Division Multiplexing) multi-carrier system and the Jiaotong design is similar to the American single carrier vestigial sideband system. Receiver manufacturers in China have been expected to be able to handle either or both variants, with broadcasters making the practical choice of which system to use.

According to the National Engineering Research Center (NERC-DTV), the next step in China's digital transition will be the adoption of next generation DTT standard, the DTMB 2.0 / NGB-W System, which is a more flexible and interactive, IP-based open system and has much higher and more robust spectrum efficiency than the current DTMB standard. The figure below provides a benchmark against the development of digital terrestrial TV standards in the US and in Europe.



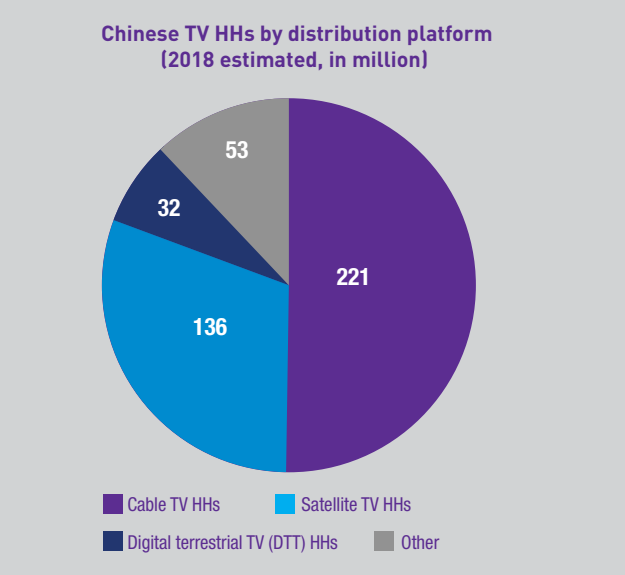
Source: NERC-DTV

In April 2018, Pakistan National Television (PTV) adopted China's DTMB high-definition terrestrial digital TV standard, with the support of ZTE – China's largest listed communications equipment supplier – providing all design planning solutions and a complete set of equipment to Pakistan National Television.

Distribution platforms and digital infrastructure of Chinese households

When looking at China's traditional TV distribution network, cable connection remains the dominant distribution platform with its 221 million TV households, followed by FTA satellite TV households, which number had exceeded 136 million as of August 2018. Historically, the Chinese government has limited access to direct-to-home (DTH) satellite signals, with the exception of unencrypted state-affiliated channels via the CBTV platform. Currently, its free-to-air (FTA) DTH satellite service is

available extensively via the 'Huhutong Project' – launched by SAPPRFT (now replaced by NRTA), and aimed at bringing TV and radio access to millions of residents living in rural and mountainous areas not covered by cable or terrestrial signals. Households receiving free-to-air digital terrestrial TV (DTT) signal – accounting for about 30 million – are primarily located in more remote areas of China. The chart below illustrates the composition of China's traditional linear TV distribution by platform type.



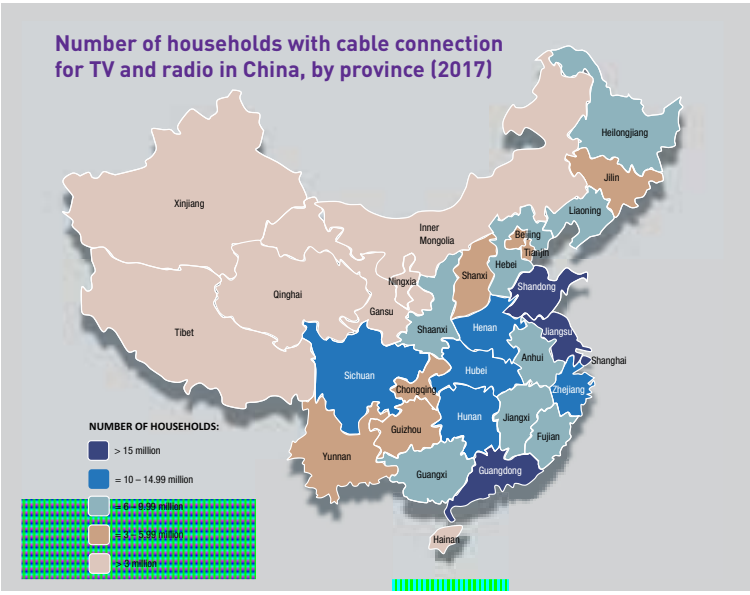
Source: Asia Video Industry Association (AVIA)

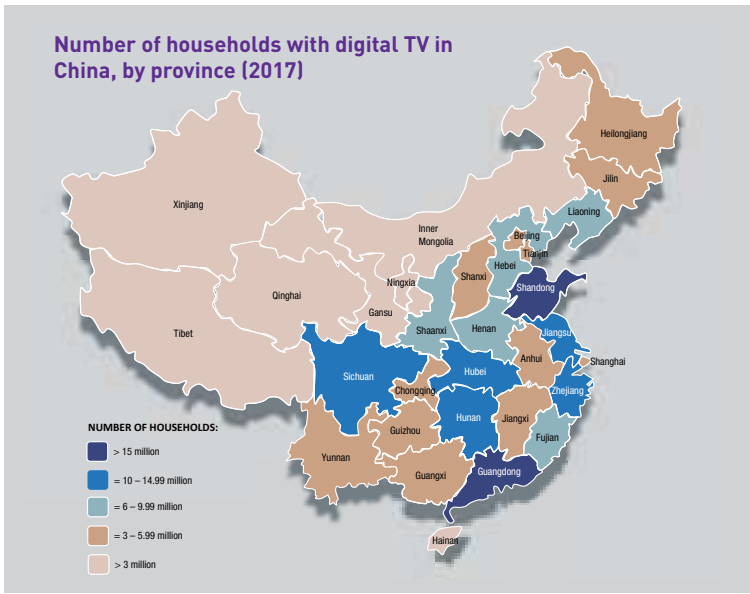
Cable TV

As the largest TV platform in China, cable households account for about 50% of all TV households. In China, cable TV is seen more as a utility rather than as a Pay-TV service, and the market is relatively fragmented, as each region and major city has its own cable TV provided by a single regional operator. China's cable operators are funded and controlled by governments at the provincial, city and county levels. Hence, subject to the regulations of the National Radio and Television Administration (NRTA), China's cable operators are local monopolies controlled by local governments at various levels, which earn revenues mainly from two sources: fees for digital TV access and fees for value-added services. Due to their monopolistic position, many cable operators lack the market experience and resources necessary to upgrade their cable networks from mono-directional to bidirectional networks and to compete in value-added video services such as video-on-demand (VOD) against the new media players.

Over the past decade, the Chinese government has put a lot of effort into developing and modernizing China's cable network. In fact, cable TV has dominated China's official transition to digital TV after the State Administration of Radio, Film and Television (now replaced by NRTA) implemented a policy giving priority to digitalization of cable TV. The government's 'Uniform Transition' policy as well as its 'Cable First' strategy accelerated the digitalization of China's cable infrastructure, and the government subsidized the purchase of cable set-top boxes to speed up the national digitalization process. Due to the large size of audiences prior to the digital transition, Chinese cable operators had a tremendous installed base of digital subscribers, enabling these operators to quickly scale-up to value-added video services or even triple-play services. Accordingly, at the end of 2014, over 80% of cable TV households had been digitalized, and nearly 85% of China's TV households were receiving digital TV broadcasts.

Formerly, in the analog era, China's cable operators acted as a pipeline of content, as they neither understood nor controlled audience demand, as set-top-boxes (STB) were not introduced into the market before the digital switchover. With the digital transition, these cable operators have now extended their role from a content distributor to a smart intermediary and a proactive platform between content and service providers and audiences, as they can use digital technologies to interact with customers and store detailed information about their demand in STBs. Moreover, STBs enable cable operators to precisely control which customers have access to which services limiting the free-ride behavior of consumers, which was usual in the analog era. The two maps below illustrate the distribution of China's cable TV households as well as digital TV households by province as of 2017.





Source: SARFT (now NRTA), IABM

Even though cable operators have globally raised prices for TV access and increased the share of value-added services of their total revenues after the transition from analog TV to digital TV, China's cable operators still rely heavily on access fees. For example, the largest cable company in China, Jiangsu Cable's access fees to digital cable TV accounted for 71.1% of its revenue from individual customers in 2016, while its broadband service accounted for 16.9% and value-added services 12%. Given the intensifying competition in China's broadcast and media industry, Chinese cable operators will need to improve their competitiveness and become more efficient in monetizing their offerings. According to Asia Video Industry Association (AVIA), China's cable average revenue per user (ARPU) level remains low at US$2.53 per month, even though China is the largest cable TV economy in the Asia Pacific region with a total subscription revenue of US$6.8 billion in 2017. Comparably, Australia's cable TV service ARPU was about US$66.11 per month in 2017.

Similar to other major markets like the US, China has recently witnessed a significant drop in the number of digital cable subscribers (i.e. cord cutters) due to the emergence of IPTV and OTT services. Between 2015 and 2017, the number of digital cable TV subscribers in China declined from 174.7 to 159.9 million households. In sharp contrast to the rapid decline of cable subscribers, the number of IPTV users in China has grown rapidly – in 2017, there were already over 122 million IPTV subscribers in China accounting for more than 80% of all IPTV subscribers in the Asia Pacific region.

Satellite TV

China is a restrictive market for satellite services. Chinese satellite operators receive preferential treatment over foreign satellite operators that are required to obtain government approval or enter into a contract with a 'qualified domestic entity' in order to provide services in China. Foreign satellite operators are prohibited from leasing transponder capacity directly to end-users in the country, without the prior approval of the Ministry of Information and Industry (MII).

While satellite technology is extensively used for distributing services to cable head-ends (e.g. AsiaSat) and terrestrial transmitters, individual direct-to-home (DTH) satellite reception is limited in scope and subject to regulation, which was introduced in 1993 (Decree 129) banning unlicensed ownership of DTH reception satellite dishes. In the past, special licenses were largely restricted to hotels and foreign compounds, but recently a free-to-air (FTA) DTH service has become available extensively via SAPPRFT's 'Huhutong Project', which aims to bring TV and radio access to millions of residents living in rural or mountainous areas not covered by cable or terrestrial signal. As of August 2018, the number of FTA satellite TV households had exceeded 136 million (3.1 people per household) in China, according to Asia Video Industry Association (AVIA). This makes satellite the second largest TV platform after cable TV in China.

There are also a number of unlicensed satellite TVs in the market, which receive channel signals officially being targeted at Taiwan, Hong Kong or foreign countries like Thailand. Thus, the content on these channels is not censored by regulators and fees for the content do not get distributed to the rightful IP holders. Also, some consumers from a lower socio-economic class (e.g. migrant workers) have been incentivized to purchase illegal satellite dishes for use in the cities to avoid paying the maintenance fee of a cable network.

Digital Terrestrial Television (DTT)

China began digital terrestrial television (DTT) trials in the 1990s, and has been planning the digital transition since early 2000. In 2004, the country developed its own digital terrestrial broadcasting standard called DTBM (Digital Media Broadcasting Terrestrial), which became an official DTT standard in China in 2006. Initially, digital terrestrial television was planned for several of the major cities due to host the 2008 Olympics, and the first service began in Beijing in January 2008, with 6 standard-definition (SD) services and one new high-definition (HD) channel to showcase the 'High Definition Games'. However, this multiplex was managed by SARFT and digital terrestrial TV in a few other cities was purely a trial. No digital terrestrial receivers were yet on sale in the shops at that time.

The second part of the digital transition plan saw CCTV embark on converting more than 18,000 transmitter towers from analog to digital. By comparison, the UK converted 1,154 transmitter sites to DTT during its digital transition process. However, the digitalization of the terrestrial platform, the only other TV distribution platform apart from cable that is still broadcasting an analog signal, has been progressing at a slower pace and is still unable to cover 100% of the Chinese population. Because the government has prioritized the digitalization of the cable platform, only a handful channels are available in the analog terrestrial platform in rural and remote areas in China, and currently households receiving a free-to-air digital terrestrial TV (DTT) signal equate to about 30 million. As a result, the government has revised the plan so that about 10% of the population will be served by a satellite service in a similar way to FreeSat in the UK or Tivusat in Italy.

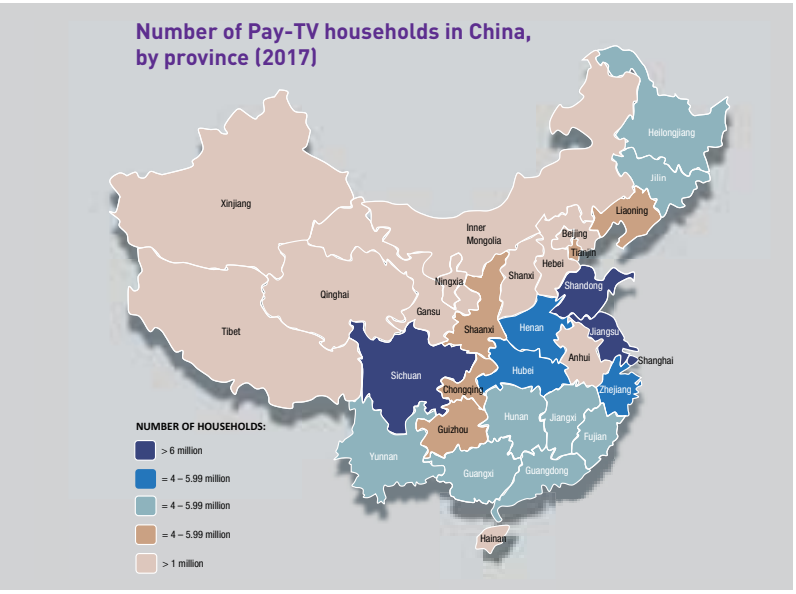
Pay-TV

China is the largest Pay-TV market in the world by subscriber base; it has a third of the world's Pay-TV subscribers. Household penetration of any form of Pay-TV reaches over 90% in China. According to Asia Video Industry Association (AVIA), the estimated size of China's Pay-TV market across all technologies at the end of 2017 was 325 million subscribers equating to about 65% household penetration – up 3.8% from 313 million households in 2016. For comparison, India has about 150 million Pay-TV subscribers. Cable TV is the most widely adopted Pay-TV distribution technology in China. As of June 2017, there were about 160 million Chinese households which subscribed to cable Pay-TV services, representing a household penetration rate of 35%. Again, India ranked second after China with 90 million cable TV subscribers. By 2022, China's Pay-TV market is expected to grow to 353 million subscribers, representing a CAGR of 2.4%. In terms of revenue, China will gain nearly US$1 billion in Pay-TV revenue between 2017 and 2023 increasing its total Pay-TV revenue to US$13 billion. Advertising on Pay-TV platforms generated revenues of US$5 billion in 2016 being equivalent to 29% of total TV advertising in that year in China.

The chart below illustrates the estimated increase in the number of Pay-TV subscribers in China.

Source: All View Cloud, AVIA

At the end of 2017, China Radio & TV was the world's largest Pay-TV operator with its 220 million subscribers. Nevertheless, the figure is expected to fall to 201 million subscribers by 2023, as it will lose subscribers to IPTV and OTT. The map below shows the number of Pay-TV households by province as of 2017.



Source: SARFT, IABM

Internet Protocol Television (IPTV)

China opened IPTV (Internet Protocol Television) business under a restrictive supervision policy of SARFT (now NRTA) in 2004. The first license went to Shanghai Media Group (SMG) in May 2005. From then on, telecom operators had to seek collaboration with SMG in the field of IPTV, via its wholly owned subsidiary BesTV, which was established to operate the IPTV business. Under such collaborations, telecom operators provided set-top boxes that were often bundled with broadband service and no extra charge to push adoption, while content was largely sourced from broadcasters. This resulted in conflicting interests between the broadcast and telecom sectors as well as regulatory authorities SARFT and MIIT, and China's IPTV market appeared stagnant for years due to regulatory uncertainties. However, demand for IPTV services has grown significantly in China over the past few years thanks to the increase in the mobile and fixed-line broadband subscriber base. By the end of 2017, the total number of IPTV subscribers in China exceeded 120 million, according to iResearch.

Today, all licensed IPTV providers in China need to obtain an "Information Network Audio-visual Program Broadcast Permit", which requires the IPTV provider to have a private ecosystem, which is not in any way linked to websites on the public internet. The new regulatory body granting IPTV licenses is the National Radio and Television Administration (NRTA), which simultaneously governs and maintains the monopoly of traditional cable services in the country. NRTA has adopted a province-to-province management approach for approving and issuing IPTV transmission service licenses for IPTV businesses. In practice, this means that a telecom operator can only provide an IPTV service for those subscribers who are customers of its regional branch in the province, which has been granted an IPTV license. For example, China Mobile – the country's biggest telecom provider – got its first IPTV license only in June 2018 for Guangdong province, which means that only China Mobile's regional branch, Guangdong Mobile, can deliver the IPTV service.

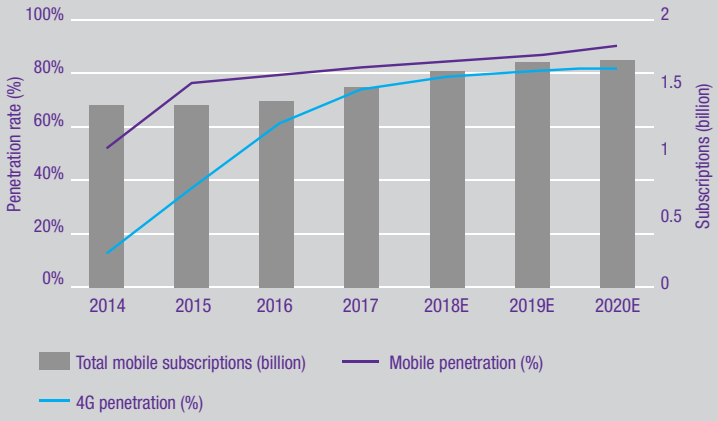
China's IPTV market is largely saturated, and there are three major operators in IPTV field; China Telecom, China Unicom and China Mobile. At the end of 2017, China Telecom (China's third largest telecom provider) was leading the IPTV market with 92 million subscribers followed by China Unicom (the second largest telecom provider) with 28 million subscribers. China Mobile's newly granted IPTV license for Guangdong province is expected to be applied to other regions in China soon, which will enable the operator to generate new revenue not only from its current 14 million mobile broadband subscriber base and those of China Unicom and China Telecom, but also it will directly compete with China's traditional cable TV services. After years of pilot programs with IPTV, telecoms providers have become a threat to China's cable operators, which have enjoyed a monopolistic position in TV distribution.

According to iResearch, the majority of China's cable TV operators are lagging behind in innovation (e.g. HD and 4K), and cable's picture quality is generally poor. As a result, the relatively high fees of cable TV are not competitive with the low-cost or even free IPTV services offered by major telecoms providers. For example, China Telecom has put forward a 'strategy of firmly upholding IPTV and broadband' allowing each broadband subscriber to be also an IPTV user (e.g. 4G + fiber + IPTV package). Moreover, for all three major telecoms operators, IPTV is a key factor when it comes to smart home solutions, as they hope IPTV services will persuade users also to keep using their other products. Hence, China Mobile is well positioned with its existing 127 million fixed-line broadband subscribers to win more market share in China's emerging smart home sector through its newly granted IPTV license.

Telecoms industry and broadband infrastructure

Over the past five years, China's mobile penetration rate has increased dramatically thanks to the construction of an extensive 4G network and heavy promotion of 4G compatible handsets. According to Asia Video Industry Association (AVIA), China's mobile penetration rate increased from 48% in 2014 to 73% in 2015, representing annual growth of nearly 52%. At the end of 2017, the mobile penetration rate was already 78%, and the figure is expected to grow to 86% of the total population by 2020. As of June 2018, 74% of mobile subscribers were estimated to be on a 4G network.

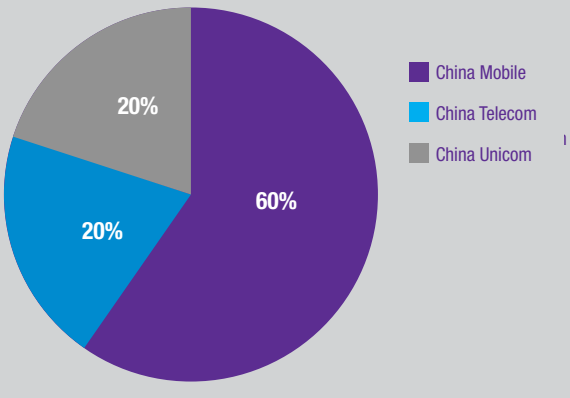
Penetration of mobile phones and 4G in China (2014-2020E)



Source: GSMA, DBS

In terms of market players in China's telecoms industry, there are three major telecoms operators; China Mobile, China Telecom and China Unicom. As of June 2018, China Mobile had a dominant market share of 60% with 906 million subscribers (of which 677 million were 4G), followed by China Unicom with a market share of 20% (302 million subscribers, of which 203 million were 4G) and China Telecom with 19% (282 million subscribers, of which 217 million were 4G). According to the Development Bank of Singapore (DBS), the growth of China's mobile subscriber base will increase by 5% in 2019, partly driven by the second SIM slot market. However, the cancellation of the mobile data 'roaming tariff' on July 1st 2018 by the Chinese government led the mobile average revenue per user (ARPU) to decline. All three major telecoms providers also suffered from the cut of long-distance charges imposed by the government. In 2018, China Mobile, China Unicom and China Telecom were ordered to slash the cost of mobile data by 30%, as well as cancel data roaming charges for users when they travel between China's provinces. The measures are part of a push to advance the digital economy, which the government sees as the major driver of growth.

Mobile subscribers in China – Market shares (Q4/2018)



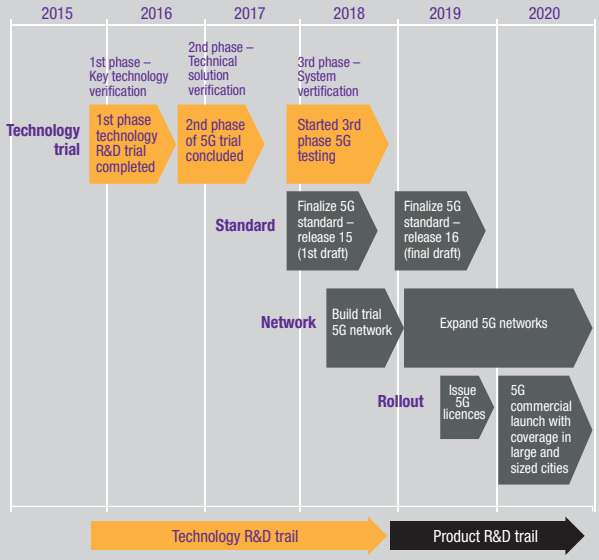
Source: DBS

Over the past year, the Chinese government has pushed the opening-up of China's telecoms industry to overseas capital and investors. By the end of 2018, 121 overseas companies had been approved to engage in businesses including running data centers, telecom and information processing services in China, marking a year-on-year growth of 39%. According to the China Academy of Information and Communications Technology, overseas investments in China's telecoms industry will focus on online data processing, transaction processing, information services and domestic call center businesses. More overseas investors are also likely to head to Tier 2 and Tier 3 cities to explore business opportunities, now the telecoms network covers almost every village in China. However, currently these overseas investors can only apply to resell telecom services as own-brand mobile phone services in China and thus they do not threaten the dominant market position of three large state-owned enterprises. While the growth of traditional mobile services is slowing down due to increased penetration, new businesses such as IPTV, IDC (Internet Data Center), Cloud and IoT have emerged to support service revenue growth of China Mobile, China Telecom and China Unicom – new and emerging business areas saw an increase of 18-39% in terms of service revenue for telecoms operators in the first half of 2018.

In 2019, China's telecoms industry will be driven by commercial trials and launches of 5G networks, which should be officially launched in 2020. By the end of 2018, the number of 5G base stations built by all telecoms operators was around 3,000. In May 2019, China Telecom and the Shanghai Municipal Government signed a strategic collaboration agreement to accelerate 5G infrastructure construction in Shanghai.

According to the Economic Observer Online, the agreement permits China Telecom to build more than 3,000 5G base stations in Shanghai in 2019 and more than 10,000 5G base stations by the end of 2021. China Unicom revealed that it has invested RMB 400-500 million in 17 cities to test 5G applications, and other operators are estimated to have spent a similar amount on 5G testing in 2018. Hence, the focus of China's telecoms industry is on the number of 5G licenses issued by MIIT. In December 2018, China Mobile was approved to utilize 5G test frequency spectrum in the 2515-2675MHz and 4800-4900MHz bands. China Telecom was permitted to utilize frequency spectrum in the 3400-3500MHz band, and China Unicom 3500-3600MHz. Interestingly, at the same time, MIIT gave also its approval for China Broadcast Network (CBN) to build its own 5G network. This will bring more competition to China's 5G network space in the coming years.

Timetable for China's 5G development

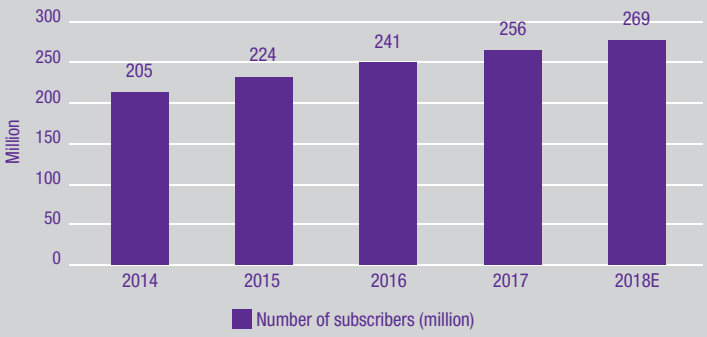


Source: MIIT, SCMP, China Daily

China's fixed-line broadband penetration has grown strongly over the past five years. The growth has been driven by a national strategic initiative known as 'Broadband China', which was launched in 2013 through an initial investment of US$204 billion. The initiative aims at reaching 70% of households with fixed-line broadband speeds in cities and rural areas of 50 Mbps and 12 Mbps respectively by 2020. Other targets of 'Broadband China' include covering 85% of China's population with 3G/LTE subscriptions and that 98% of administrative villages would have a fixed-line broadband connection by 2020.

According to HSBC, the number of China's fixed broadband subscribers grew 9% from 185 million to 241 million between 2013 and 2016. By the end of 2018, fixed broadband subscribers were estimated to have reached 269 million reflecting an annual growth rate of 6% since 2016.

Total fixed-line broadband subscribers in China (2013-2018E)

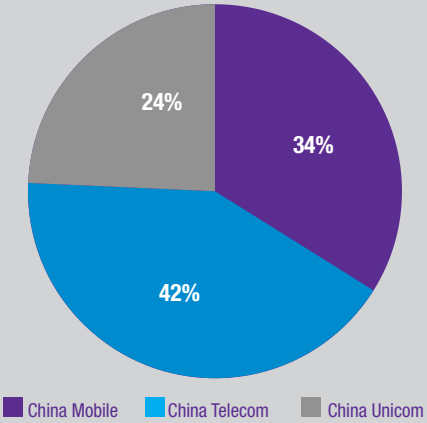


Source: HSBC

Fiber broadband continues to be the fastest growing fixed broadband segment, as DSL and cable modem access continue to decline as customers migrate away from these platforms in favor of fiber broadband. At the end of 2018, fiber-to-the-home (FTTH) penetration reached 90% of urban households in China. However, the FTTH penetration in rural areas and remote villages is estimated to be much lower. Chinese telecoms operators are also expanding their investments in optical fiber networks for 5G network backhaul as well as increasing their fixed-line network capacity to 10G passive optical network (PON).

Competition in China's fixed-line broadband market has been fierce due to the aggressive entry of China Mobile to the fixed-line market. As of October 2018, China Telecom was leading the market with a share of 42%, followed by China Mobile (34%) and China Unicom (24%). The fixed-line broadband market and residential broadband business have become increasingly important for telecoms operators that are targeting China's booming smart home sector with new services such as IPTV and smart home devices.

Broadband subscribers in China – Market shares (Q4/2018)

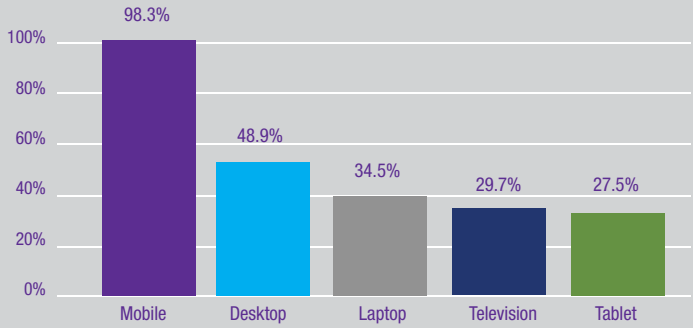


Source: DBS

Mobile internet and OTT

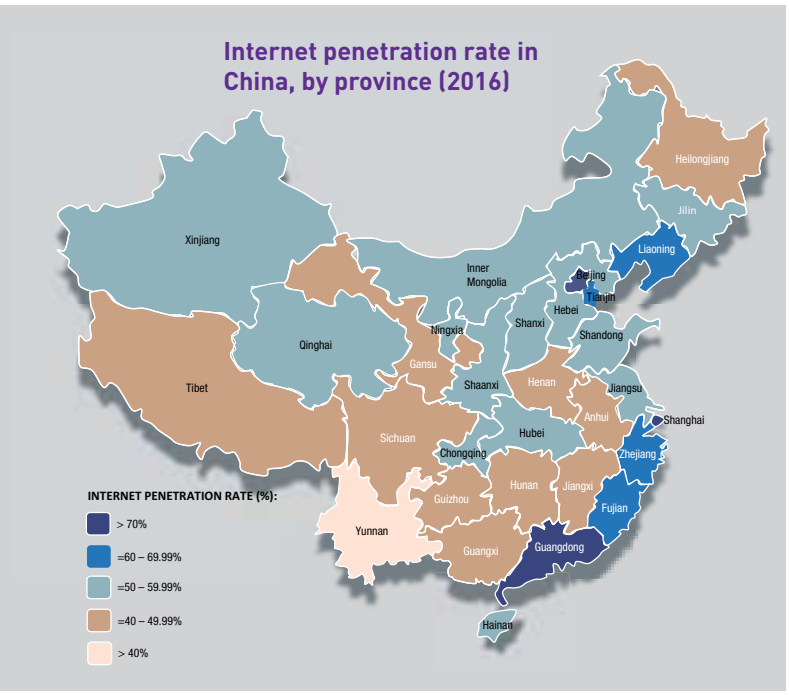
According to the Chinese Internet Network Information Center (CNNIC), the number of internet users in China rose by 30 million in the first half of 2018 reaching 802 million, representing 57.7% of the total population. By comparison, the US has an estimated 300 million internet users. 778 million Chinese (98.3%) internet users used mobile phone to access the internet, followed by desktop (48.9%) and laptop (34.5%). Over the past few years, purchases of desktop PCs and laptops as well as their usage to access the internet have decreased in China.

Share of internet users by device in China (as of June 2018)



Source: CNNIC

In terms of geographic location, 74% of internet users live in urban areas, the remaining 26% being rural residents. Many consumers, particularly those in rural China, leapfrogged the fixed-line era of desktop computers and went straight to surfing the internet on their phones. The map below illustrates China's internet penetration rate by province, with highest penetration focusing on coastal provinces in South, East and North China.



Source: CNNIC, IABM

In June 2018, cumulative mobile internet traffic reached 26.6 billion GB reflecting an annual increase of 199.6%, according to CNNIC statistics. As mobile internet access has become more affordable, data-intensive services such as online video streaming, live streaming and online music have dramatically increased their popularity thanks to millennials who dominate the Chinese internet – three-quarters of internet users are under the age of 40. Abundant video content has also attracted audiences from traditional media to OTT service providers. This is largely due to the fact that OTT service providers have so far been subject to less content regulation than TV stations, and hence they have been able to collect a more diverse and appealing content offering. Compared to cable operators enjoying local monopoly and national fragmentation, the market of China's OTT service providers is more concentrated. As China's OTT players must compete with one another for a nationwide audience, fierce competition has eliminated a large share of China's OTT service providers.

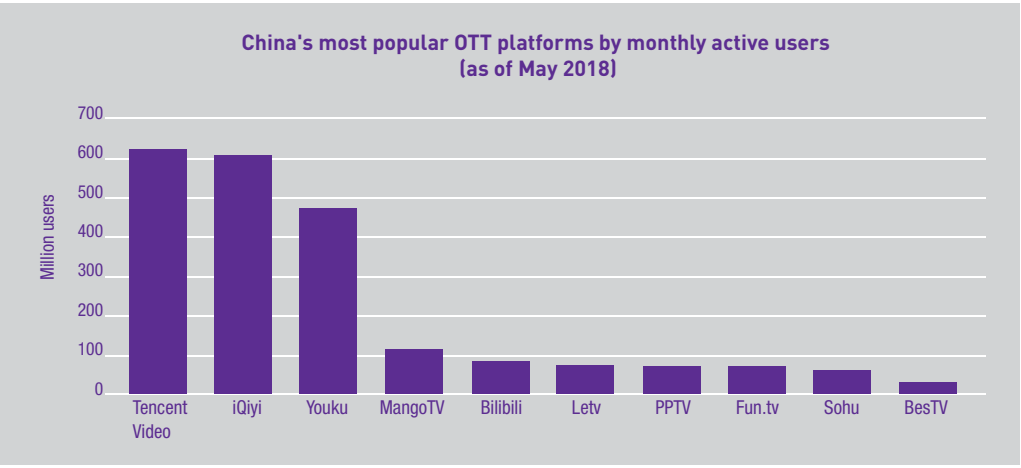
Despite the rapid growth of China's online video industry, most OTT service providers have had difficulties in making profits due to their high costs and limited sources of revenue. China's OTT service providers have to pay much higher prices for bandwidth than their western counterparts, while they still rely heavily on advertising revenue. According to iResearch, advertising revenues accounted for 55.2% of total revenues of OTT service providers in the second quarter of 2016, while subscription fees reached 18.2% and other sources, including copyrights distribution and derivatives, accounted for 26.6%. The table below compares China's cable operators and OTT service providers.

	Cable Operators	OTT Service Providers
Orientation	Both administrative and market orientation	Market orientation
Ownership and control right	State owned and controlled by local governments	Most OTT service providers privately owned
Market structure	Fragmented in cities and counties, with disconnected networks	Dozens of OTT service providers; less than 20 with national influence
Content-related business	Content transmission, aggregation and value-added content services like VOD	Online content production, aggregation and broadcasting
Major source of revenues	Subscription fees and revenues from value-added digital TV services	Advertising revenues

Source: Xing W, Jing C. et al. 2017

According to Asia Video Industry Association (AVIA), China's online video market size by number of active users was estimated to be 596 million at the end of June 2017, representing about 76% of the online population. Over the last three years, revenues for the online video sector have grown from RMB 10 billion in June 2014 to an estimated RMB 50 billion in June 2017. China's online video market has experienced a transition from services characterized by piracy to legitimate services driven by advertising and subscription-based services. At the end of 2017, there were an estimated 74 million paying video users (about 12% of the entire online video base), up from only 8 million in 2014 (2% of the entire online video base). An average one-month subscription to an online service in China ranges from RMB 20 to RMB 40 depending on the platform and type of package selected, according to AVIA.

In terms of competition, China's online video space is made up of over 200 players, of which only three players – Youku, iQiyi and Tencent Video – dominate the premium long-form content space. Youku, streaming mainly hit shows and dramas, was launched in 2006 and acquired by Alibaba in 2015, and it later merged with Tudou, which focuses on user-generated content (UGC). iQiyi was launched in 2010 by Baidu and produces a wide range of original programming ranging from short dramas, movies and animation to live streaming and reality shows. The current market leader, Tencent Video (Tencent owns WeChat) with over 600 million monthly active users was launched in 2011. China's online video platforms have traditionally relied on ad revenue and their paying subscriber bases have been relatively modest. For example, as of February 2018 Tencent Video and iQiyi had 63 and 60 million paying subscribers respectively. The following chart lists China's most popular OTT platforms.



Source: iResearch, Tencent, Baidu, Nasdaq

According to AVIA, there are three major emerging trends in China's online video space: live streaming, eSports and short-form video. In 2016 alone, China's live streaming user base grew by 60% from 194 million to 310 million. Nevertheless, due to a stricter regulatory environment, the growth forecast for the next three years has dropped to 12%. Over the past few years, eSports has become a huge phenomenon in China – the number of eSports viewers and gamers grew by 181% from 87 million in 2015 to 285 million in 2017, and the number is estimated to reach 351 million by 2019. Industry revenues for eSports have also increased by 198% per annum from RMB 5.2 billion in 2014 to RMB 46.2 billion in 2017.

Thanks to the large number of viewers watching content on their mobile phones, especially when away from home, short-form videos – typically lasting between 15 seconds to a few minutes – have become one of the fastest-growing trends in China. According to QuestMobile, the number of monthly active users (MAU) of dedicated short-form video platforms doubled from 203 million in December 2016 to 414 million at the end of 2017. As of March 2018, there were nearly 600 million users of short-form video platforms. Launched in 2011, Tencent-owned Kuaishou is the current leader in short-form video apps with an estimated market share of 50% (230 million users), followed by Douyin/TikTok (124 million users), which was launched only in September 2017, but already became the most downloaded iOS app (45 million downloads) in the first quarter of 2018 globally beating WhatsApp, YouTube and Facebook. The picture below exemplifies different interactive features of Douyin/Tik Tok short-form video app.

Source: Medium Corporation

Regulatory environment

When it comes to the key stakeholders in TV regulation, there are three major government organizations – State Council, National Radio and Television Administration (NRTA) and Cyberspace Administration of China, which oversee and control broadcast content in China. Historically, content censorship was primarily overseen by State Administration of Publication, Press, Radio, Film and Television (SAPPRFT), which is now replaced by NRTA. Particularly, oversight of TV content is vital for the Chinese government, as it reaches the entire nation and hence it is tightly regulated. General regulations for Pay-TV state that retransmission of foreign channels on Pay-TV networks is generally prohibited, even though exemptions can be sought from NRTA. Advertisements are generally prohibited on domestic premium TV channels (i.e. channels requiring a subscription), and otherwise only 12 minutes out of 1 hour can be ads. Foreign content must not exceed 30% of daily programming on a domestic Pay-TV channel. In principle, TV channels should use standard Mandarin Chinese, and NRTA approval is required for other languages to be used.

Professionally produced online content, in turn, has had less comprehensive censorship guidelines, but over the last two years the Chinese government has taken a more active approach to enforcement of online video content as well. OTT regulation is split into two categories: content delivered via internet to televisions and via private managed networks to other devices (OTT Type 1); and content delivered via internet to devices other than television (OTT Type 2). OTT providers must obtain a license for 'Spreading Audio-visual Programs via Internet Networks' (AVSP), which is – in practice – only available to state-owned enterprises. OTT Type 1 content aggregators are subject to the same restrictions as cable TV (e.g. all imported programs subject to censorship and NRTA approval). OTT Type 2 providers must obtain an AVSP license as well as commit to an annual cap of 30% for foreign films and television plays on a single website. Permits for all foreign and TV dramas per title must be obtained before they are transmitted via internet. In order to obtain approval for a serialized show, applicants must submit the full season to the regulator for review. As a result, the release date of legitimate content significantly lags the release date in the country of origin leading to a higher incidence of piracy. Moreover, online video platforms must import foreign films and television dramas for use on their own websites and not exclusively to resell to others. In September 2016, SAPPRFT (now NRTA) issued the notice 'Strengthening the Management of Live Services of Internet Audio-Visual Program Services' to tighten control over the live streaming industry. This resulted in 19 articles specifying the regulations for operating a live streaming platform in China – designed to restrict live streaming content that violates desired social values. In May 2017, the Ministry of Culture launched inspections of live streaming sites which were operating without a license or

allowing restricted content to be streamed on their platforms. As a result, 10 live streaming platforms were closed, and 48 live streaming operators were punished. A month later, the Ministry of Culture reviewed 10,562 mobile live broadcast applications and forced another 12 of these to be closed down permanently.

Regulation on short-form video content is also getting stricter than before. In April 2018, China's media regulators ordered short-form news aggregator Jinri Toutiao and Kuaishou to clean up content on their platforms, while Douyin was criticized by the internet authorities in July 2018 after one of its advertisements was interpreted as disrespecting a famous wartime martyr. In January 2019, Chinese authorities introduced detailed regulations for China's short-form video industry, signaling out 100 categories of banned content. The China Netcasting Services Association, one of the largest internet associations in China, released two sets of management rules for the industry sector, of which the first rule states that all video content (including the title, introduction and viewer comments) need to be reviewed before broadcast. Secondly, all companies involved in the short video business also need to set up a content reviewing team with a strong political sense.

When it comes to copyright, the law grants protection in respect of copyright, but online content piracy is widespread, and China is a hub for the streaming of intercepted international programming supported by a thriving market for illicit streaming devices (ISDs). It is anticipated that initiatives to improve copyright protection will be introduced in the next few years, along with regulatory reform to facilitate the convergence of the telecoms network, the cable TV network and the internet. This reform will be prepared and implemented by MIIT and NRTA, but no official deadline has been announced.

Video content piracy in China

According to Asia Video Industry Association's estimate, revenue losses from TV episodes and films (excluding sports) due to video piracy will increase from US$5.5 billion in 2016 to US$9.8 billion in 2022, accounting for roughly 19% of the estimated global cost of piracy. For comparison, revenues losses caused by piracy in the US equated to US$8.9 billion in 2016 and are expected to reach US$11.6 by 2022, according to Statista. This makes China the world's second biggest market for pirated content after the US (in terms of revenue loss). In China, the most frequently used sources of pirated content are cloud site downloads, unauthorized streaming sites and torrents. Based on interviews conducted by AVIA, people aged 18-24 are more likely to watch pirated content than other age segments in China and their primary reasons for watching pirated content were difficulties in finding legitimate versions of western films and shows, and the ease of finding and using pirated content in search listings - and that the pirated content is free.

Chinese regulators have gradually started to intervene in the immense piracy issue. In 2016, an anti-piracy campaign known as the *Jiangwang Operation* resulted in a seizure of 1.5 million pirated publications, shutdown of 1,655 websites and removal of 274,800 pirated links. Moreover, in May 2017, the Beijing court awarded US$1 million, one of the highest fines ever issued, for a case of copyright infringement against an online platform.

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Part II:
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Future outlook – Broadcast and media technology trends

From TV stations to private productions and OTT

According to McKinsey, young people (aged below 35) will account for 35% of China's media and entertainment customer base by 2020. This will continue to disrupt viewership of traditional, linear TV in China, as the majority of young millennials convert to IPTV and OTT services. Also, the way the young people obtain news and information is changing – at the end of 2017s, Tencent's WeChat surpassed television as the primary source of information among Chinese youth. According to the Chinese authorities, 84% of young people in China used WeChat, and only less than 50% watched TV at the end of 2017. For younger generations, a TV screen is increasingly used for gaming consoles as well as movies accessed through an OTT service.

As discussed in previous chapters, the emergence of new OTT and IPTV services has already hit Chinese TV stations, which have faced a significant decline in revenues, particularly advertising revenue. According to several industry experts, there was a dramatic change in TV stations' annual budgets between 2016 and 2017, and since then their revenues have continued to decline. This sudden decline in revenues is estimated to stem from several factors:

1) a significant drop in sales of new cable sets (and thus cable fees), as the younger generation does not watch TV anymore similarly as their parents' generation,
2) a massive drop in advertising revenues, as advertisers are increasingly switching to digital advertising on OTT platforms and
3) a decrease in local TV stations' (i.e. provincial, city and county level TV stations) budgets, as the financial support from the central government has been reallocated to new growth sectors such as sports and online entertainment.

So, even though the central government's budget allocated to different provincial governments still varies from year to year, regular annual budgets – on which local TV stations have typically relied – have generally diminished. This concerns all local TV stations in Tier 2 and smaller cities, while the financial situation is reported to be the most difficult in the smallest TV stations at the city and county levels. As a result, some stations at these levels have merged with others or closed down their operations over the past few years. However, as a local TV station remains a key channel of communication for the local community and has an important symbolic value for a local government in each province, the number of shutdowns is estimated to remain relatively limited.

According to industry experts interviewed for this study, Chinese TV stations vary significantly in terms of technology infrastructure and their mindset toward development and modernization. Some local TV stations are very conservative and unwilling to change, while some are still finalizing their upgrade from SD to HD. Some more advanced provincial TV stations would be eager to transform and upgrade their equipment, but they cannot afford all the technology required to keep up with the intensifying competition due to budget constraints. Moreover, as China's cable TV system is fully independent of the internet (i.e. allowing only cable distribution), traditional TV stations have to rely on IT TV cable systems and changing them takes time. This has resulted in a leakage of highly skilled human resources; many key employees, who used to work for CCTV or local TV stations, have now changed to a job in China's booming OTT sector.

In order to remain competitive, the majority of traditional TV players have launched an OTT option or a website to provide access their program content online. However, these extended online content offerings by traditional TV stations have had relatively low viewership, as the content on their online platform is primarily the same as on their cable TV channel, which younger audiences would likely not watch anyways. At the same time, the big OTT players are offering so wide a range of appealing content in a highly sophisticated manner that it is very difficult for traditional TV stations to compete with the professional OTT platforms. Eventually, for just the price of an internet connection at home, an end consumer gets much more content as well as flexibility compared to a cable TV license fee. For example, in Shanghai an internet connection of 500 MB at home costs approximately RMB 2,000 per year or RMB 200 per month, whereas a cable TV license costs about RMB 1,000 per year. With continuously improving network speeds, Chinese end consumers increasingly prefer to pay only for an internet connection.

Over the past year, the elevated trade tensions between China and the US have also impacted the demand in China's broadcast and media technology market. Several stakeholders in the broadcast and media technology industry interviewed for this study reported that they have received much fewer inquiries since the introduction of the trade tariffs by the Trump administration at the beginning of 2018. In China's broadcast technology sector, the first quarter of each fiscal year has typically been relatively quiet, while the third and fourth quarters have usually been the best periods for sales, because the remaining budget of a local TV station has preferably been used prior to the year-end. Now several technology vendors have reported a decrease in the number of inquiries as well as delays in payments even after having won a tender. If such circumstances continue, Chinese industry experts are anticipating that the market conditions could continue to weaken in 2019.

Typically, international companies such as Sony, Grass Valley and Panasonic have had most success in projects where hardware solutions have been supplied. However, in the context of shifting consumer demand away from traditional TV toward OTT platforms as well as increasing

technology vendors that used to primarily rely on hardware business are now gradually converting their core business to a more diverse range of solutions and software integration. This is due to the fact that pure hardware business in China's broadcast and media technology market is getting much more difficult. Moreover, an increasing number of local TV stations are asking for turnkey solutions, as their annual budgets are tight and should be preferably spent cost-effectively. Accordingly, many technology vendors are increasingly working with third parties, teaming up with software companies as well as developing their own solutions to merge with certain software.

As China's TV stations continue to struggle and the OTT sector booms, a new market segment consisting of smaller private productions has started to grow rapidly over the past few years. These small, privately-owned professional productions have hired lots of people from the traditional TV stations and are primarily serving China's booming film industry as well as the OTT sector with online content and videos designed for social media. According to local industry experts, there are already about 100,000 small private corporate productions, which buy the same kind of equipment as TV stations, even though they are not allowed to produce the full range of content that TV stations do. Compared to about 2,600 TV stations in China, these private productions form an interesting new end customer segment for technology vendors. The emergence of private productions illustrates that there are several new customer segments with increasing demand for content:

1) OTT platforms,
2) film industry
3) sports and esports and
4) gaming.

Small private productions are agile and fast in producing customized content and also can sell their copyrights at lower price compared to bigger production houses. In addition, they are closely connected to the user interface of their content, as many of the private productions focus on user-generated content (UGC) and short-form video production. They also work closely with internet celebrities and other key opinion leaders (KOLs) such as famous actors and artists, who have a very strong influence on Chinese audiences. Some internet celebrities have even their own production teams selling their self-produced content to OTT platforms or publishing it directly to followers on the internet.

Boom in China's film industry

China's booming film industry is also fueling the growth of private productions. Over the past decade, China has witnessed a massive increase in the number of cinema screens nationwide, now equating to about 55,000 screens. In 2017, China's cinema market accounted for a total of US$7.9 billion in revenue (i.e. box office ticket sales), already relatively close to that of the US and Canada combined, equaling US$11.1 billion. This rapid growth has also translated into a significant improvement in quality, technological capability as well as creative input among Chinese production entities. Even though China's foreign film quota still stands at 34 releases per year, a foreign film often reaches larger audiences in China than in its home country. Those Hollywood films that have been granted approval in China have been hugely popular among Chinese audiences and thus they have influenced the style of Chinese-produced big budget films. Moreover, despite the strict approval procedure to which foreign films are subject, partnerships and co-productions between foreign and Chinese film studios are increasingly common. Whereas between 2002 and 2012 a total of 37 films were produced as co-productions, in 2013 alone five films were made through co-production. For example, in 2018, FOX Networks Group Asia partnered with mm2 Entertainment to co-produce six Chinese language films, and it also signed a multi-year partnership with Endeavor China to develop and produce films, TV series and short-form productions. FOX also acquired the rights to Youku's hit reality TV program Dunk of China and Huanyu Film's The Legend of Hao Lan in 2018.

Today, there are four major film studios, which produce the vast majority of all movies in China. These studios are the China Film Group Corporation, Huayi Brothers, PolyBona Film Distribution Company and Shanghai Film Group. The biggest of these corporations was established in 1999 under the name of China Film Group Corporation (CFG), which is a conglomerate governed by the state. It has the most complete industry chain and thus dominates the Chinese film industry. Currently, the CFG produces over 30% of China's total film output and owns China's only movie channel, CCTV-6. The CFG conglomerate also includes a share-owned theater, whose circuit accounts for about 40% of the total domestic box-office. Since 2004, the CFG has had a joint-venture with Warner Bros. The second largest film studio, Huayi Brothers, was established in 1997 and was one of the first private film corporations in China. Today, Huayi Brothers engages in both film production and distribution, and has an estimated market share of 30-40%. The third major player, Shanghai Film Group, has about 25% market share of the total domestic box-office. Shanghai Film Group also owns a movie channel called Oriental Movie Channel as well as China's largest theater chain, Shanghai Lianhe Cinema Circuit. Finally, PolyBona Film Distribution Company is the largest shareholding distribution company managing about 120 domestic and foreign films over the last five years, and it has an approximate market share of 20% of the overall film market. Recently, it has been shifting its focus from distribution to film production.

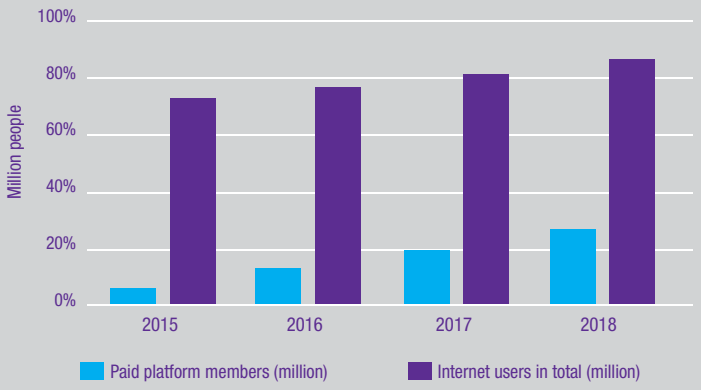
Even though the production of big budget films is concentrated in the four biggest studios, there are also 20 smaller state-owned studios as well as over 300 private film corporations operating independently. These smaller film studios focus on production of art movies – often in partnership with Hong Kong or Taiwanese studios – aimed at overseas niche markets or they end up producing 'main melody' (patriotic-style) films financed by the government.

OTT subscriptions on the rise

The film industry has also greatly benefited from the OTT sector boom, as outside of the cinema OTT has created an entirely new space for China's film market to grow. As

Chinese films have become accessible via OTT platforms and the content quality continues to improve, the number of Chinese viewers willing to pay a monthly subscription or on a pay-per-view-basis for content has increased rapidly over the past few years. In addition to a pay-per-view payment model, Chinese viewers favor a platform membership, which enables viewers to control the subscription amount in relation to the frequency of their access to content and move between different 'membership classes' within the platform. According to the Chinese consulting firm Entgroup, the number of paid members subscribing to China's online video platforms was 230 million at the end of 2018 and is expected to surpass 300 million during 2019. An average subscription (i.e. an average video membership fee) in China ranged from US$26-35 per year, according to data from Baidu's iQiyi and Tencent Video platforms. The chart below illustrates the rapid growth of China's SVOD segment.

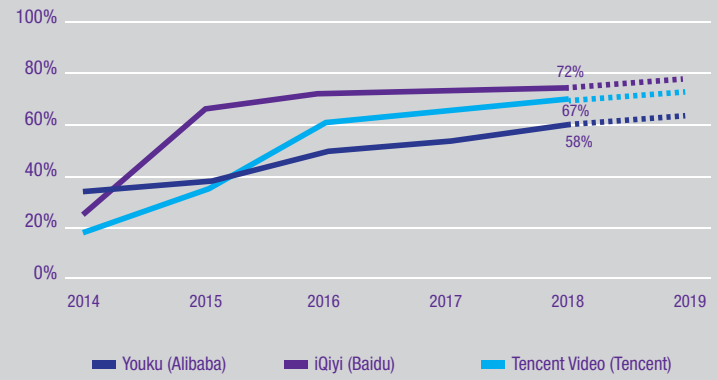
Number of SVOD subscribers to OTT platforms vs. total internet users in China 2015-2018 (in million)



Source: CINNIC, Entgroup

Thanks to investment in homegrown content, the growth of China's SVOD market is predicted to remain steady. The dominant players of China's overall OTT market – iQiyi, Youku and Tencent Video – are also the key driving forces in the country's SVOD segment, as these OTT giants continue to invest in their own original content as well as provide a distribution space for China's film industry. For example, iQiyi's Story of Yanxi Palace, a blockbuster drama and the most searched TV series on Google in 2018, contributed greatly to the growth of the company's paid memberships. Although iQiyi is currently leading the SVOD segment, the gap between the three leading OTT platforms is expected to narrow as investment in content continues and their content strategies evolve. Recently, these platforms created a new user-oriented business model by implementing a revenue-sharing model for the production of content. The new model provides an incentive for production studios to produce best-quality content, while it reduces costs for the platforms. The chart below describes the growth of SVOD users' penetration in China.

SVOD OTT user penetration in China by provider in 2014-2019 (% of SVOD users out of total)



Source: eMarketer

In China's entertainment market, where historically advertisement-based video-on-demand (AVOD) OTT services have been the mainstream way to monetize content, paid content has increasingly become a driving force led by the biggest, top-tier OTT platforms producing their own content.

According to IHS Markit, China became the world's second largest market in terms of spending on TV programming in 2017 with its US$10.9 billion after the US (US$58.3 billion). Out of the total US$10.9 billion, Chinese TV broadcasters accounted for US$6.4 billion and OTT platforms US$4.5 billion. The growth of China's TV programming spending was largely due to aggressive content investment by the three biggest OTT platforms (i.e. iQiyi, Youku and Tencent Video), which not only aim at increasing their paid subscriber base, but also to expand merchandising, mobile game development and other new revenue streams. According to IHS Market, TV programming spending of iQiyi was US$3.2 billion, followed by Youku and Tencent Video, with US$2.2 and US$1.7 billion respectively.

In terms of programming spending type, original programming accounted for 49% of all Chinese programming in 2017, followed by acquired programming (46%) and sports programming (5%). This split is expected to remain relatively consistent during the next five years.

Chinese government promoting sports

According to the industry experts interviewed for this study, China's sports sector offers a significant market opportunity for broadcast and media technology vendors in the coming years. The rapid growth of the sports sector will translate into a sizable need for live production and especially remote production using mobile video production solutions. The major driver for the sector's growth will be the Chinese government's strong promotion and support for the sports industry. In December 2018, the State Council announced a plan to speed up development of the competitive sports industry – by 2025, China's sports industry should reach RMB 5 trillion (over US$700 billion). According to the plan, a number of cities and clusters will be built for sporting events and performances and 100 influential sports events will be organized, including the Beijing Winter Olympics in

2022. A particular emphasis will be on football, basketball, volleyball, table tennis, badminton and ice hockey. Winter sports will also be promoted, according to the plan. The Chinese government also wants to strengthen the role of sports in high schools and universities nationwide.

When it comes to the most popular sports in terms of viewership and content investment, NBA was the most popular sports league with its 640 million Chinese viewers over the course of 2017-2018. On average, CCTV drew 25 million viewers per game during the NBA Finals in 2018. The biggest OTT platforms have also entered the sports market competing now with CCTV. For example, for Game 7 of the Western Conference Finals between Golden State and Houston, 29.4 million people watched the match on CCTV and another 10 million people on Tencent Video. For regular season games the average number of viewers was about four million on CCTV and three million on Tencent Video. The involvement of social media, which in China is fully integrated to OTT platforms, is also huge – the NBA league estimates that it has 180 million social media followers in China. Moreover, the league's flagship weekly show, NBA Primetime, has had on average 28 million Chinese viewers per episode over the last three years.

Chinese OTT and social media platforms have started to play an important role as distributors of sports content. For example, the NBA All Star weekend organized in the US in March 2019 was covered not only by traditional TV stations (i.e. CCTV, Guangdong TV, Best TV), but also a wide range of OTT platforms (i.e. Tencent Video) and social media platforms focusing on short-form videos (i.e. Weibo, Douyin, ByteDance). Over the last few years, Tencent has made a massive investment in NBA content by recruiting more people devoted to the NBA in China than the NBA League itself has. Also, the company has recently invested US$20 million in its own production studio in Beijing, which combines traditional game broadcasts with some of its own VR and AR technology used for eSports and gaming productions. ByteDance, the parent company of Douyin focusing on short-videos, recently made a media deal with the NBA League, as sports is becoming an increasingly important content genre for the platform. For example, one 10-second video depicting Detroit Piston's player Andre Drummond in his daily practice got 33 million views on Douyin in 2018.

China's OTT players are aggressively expanding their market position in the field of live sports as well. In August 2018, iQiyi founded a joint venture with Super Sports Media, which holds broadcasting rights in China for the English Premier League and UEFA Nations League soccer as well as the Australian Open, ATP Tour and WTA Tour tennis events. Tencent Video has acquired rights for the NBA League, English Premier League, UEFA Champions League and Bundesliga, while Youku is focusing on the Chinese Basketball Association (CBA League), La Liga and Serie A soccer. OTT platforms are also increasingly charging their platform membership subscribers on a pay-per-view basis as well as offering different premium membership classes, allowing viewers to navigate based on their interest within the membership scheme.

Sports' huge popularity in China has contributed to the dramatic growth of China's eSports market. According to CCTV's report, the Chinese eSports market is expected to grow from US$1.25 billion in 2018 to US$ 3 billion by 2020. In February 2019, the Chinese government officially recognized eSports as a profession, which is expected to boost the sector's growth significantly. According to CCTV's estimates, eSports already employs 50,000 people in China, with the number expected to surpass 250,000 by 2020. Also, the number of Chinese eSports leagues has risen from less than 10 in 2016 to over 100 in 2018.

4K UHD video industry continues to boom

China continues to dominate the 4K Ultra-High-Definition (UHD) market globally. According to IHS Markit, 42% of all TVs shipped in China in 2017 had 4K panels, and by 2020 China's 4K TV shipments are expected to reach 44 million units – equaling the same as North America and Western Europe combined. The growth of China's 4K UHD market – about RMB 4 trillion in size – stems from the Chinese government's support for Chinese manufacturers, who have quickly transitioned to 4K technology and thus been able to bring relatively high quality 4K TV sets at lower price to the Chinese market. In March 2019, China Media Group (the new parent organization of CCTV), the Ministry of Industry and Information Technology and the National Radio and Television Administration (NRTA) launched a 4-year action plan to develop China's 4K UHD video industry. The plan states that China will make breakthroughs in key technologies such as UHD imaging, 3D sound capture, high-precision optical lenses and the manufacture of 4K display panels. Moreover, the plan promises to support production of UHD content as well as development of a new distribution network for 4K UHD video using 5G technology. By supporting 4K UHD TV manufacturers as well as Chinese TV stations, the government helps traditional TV stations and media companies to stay in business, while the OTT sector continues to boom.

At the end of 2018, both Guangdong TV and China Media Group (including CCTV) launched their first 4K UHD channels. China Media Group has also announced that it will upgrade its production and broadcasting systems to fully support 4K UHD, with the rollout happening in stages between 2019 and 2021. In December 2018, China Media Group, China Mobile and Huawei launched the first national-level 5G new media platform and later in January 2019 the companies carried out their first test of 4K UHD video transmission using a 5G-based network in Shenzhen, while the actual 4K UHD live broadcasting took place at Beijing's 2019 New Year's Gala. OTT players such as iQiyi are offering 4K content for paid subscriber members, but currently the share of these viewers is very low.

While it is becoming difficult to buy a large screen TV without 4K in China, aggressive competition in the LCD display industry is already fueling the development of 8K resolution. Driven by affordable pricing, China is expected also to dominate 8K shipments in the coming years, as its early-adopting consumers are willing to discover new features. However, currently 8K technology is mainly discussed among the industry stakeholders but actual deployments of 8K remain rare.

The technology vendors interviewed for this study expect that during the next five years 4K UHD will be the new mainstream technology front in China, as capabilities, computing systems, AI and 5G technologies improve. Even though the majority of TV sets in Chinese homes are still HD supporting HD and SD content, technology vendors see that Chinese consumers want bigger screens, particularly as the younger generation uses TV sets increasingly only for movies and console games. Esports will also deploy 4K UHD in the future. Hence, demand for 4K UHD production equipment will increase, and production companies (including OTT platforms with their own production studios) and gaming companies will also want to secure their ability to undertake high-end productions. According to technology vendors interviewed for this study, CCTV has also started to officially announce 4K business in its tender requirements from time to time. Remote production will be one of the key drivers for the purchase of 4K UHD production equipment. The vendors also forecast that every OB truck studio in China will use 4K in the coming five years, because all top 10 TV stations have started to study 4K production in a systematic way due to the central government's push. However, some local TV stations are still upgrading their equipment from SD to HD and this process will be going on for the next few years, meaning that they will not adopt 4K before having completed the transition to HD.

Many technology vendors interviewed point out that CCTV has experimented with producing 4K UHD special effects. For example, during the 2019 New Year's Gala, CCTV showcased several 4K UHD special effects, but as the whole value chain is not yet in place and the majority of viewers do not have compatible infrastructure, the effects were not very visible during the live show. Thus, many TV stations put the recorded 4K video on their website after the event.

China's 4K UHD market development is closely intertwined with the adoption of IP. Currently, China's IP infrastructure is not fast enough to transfer large video files, but the central government has started to promote the transition to IP for all TV stations. Vendors interviewed expect that IP adoption will increase in the coming years due to the growth in live production as well as online streaming. Accordingly, vendors anticipate that all live video production will need IP for real-time public broadcasting, especially mobile video production systems. Whereas CCTV will lead the IP adoption, local TV stations, particularly smaller city and county level stations, will likely be reluctant to shift to IP due to its high cost and the difficulty in squaring the costs with the benefits. Also, the majority of local TV stations still use SDI and may be too conservative to shift their whole thinking toward an IP ecosystem until the cost of IP-based production decreases.

By contrast, CCTV is investing heavily in IP technology as it sees IP workflows to enable a smooth upgrade to 4K. In February 2018, CCTV bought NewTek's bi-directional IP technology, NewTek NDI, for transport of video, audio, metadata and communications over standard networks. CCTV reports that the solution enabled a reduction of cabling and complicated configurations across various environments such as OB vans, small studios and broadcast control rooms. It also reports that NewTek's NDI solution allowed for new media to be used in the multi-angle camera live production. As CCTV still uses baseband alongside an IP workflow, the NC1 Studio

I/O Module was used in the project to take the signal from the IP system, convert it into an NDI signal and distribute it as a low latency signal. This allowed real-time, high-quality switching as well as transmission of live broadcast signals. In 2019, NewTek anticipates that show producers will be looking at setting up new positions using PTZ cameras and further simplifying the workflow by using less network cabling.

In December 2018, CCTV chose Grass Valley as its technology partner to deliver an end-to-end 4K UHD IP-equipped studio that supports production and playout for its wide range of FTA and paid channels. The project encompassed four LDX 86N 4K/UHD cameras, a 3M/E Karrera production switcher with GV K-Frame X engine, two GV Node IP routing and processing nodes, two GV Convergent IP/SDI router control and configuration systems and 39 IPG-3901 plug-and-play IP/SDI modules. According to CCTV, the priority of the project was to ensure that the transition to 4K/UHD is as smooth as possible with minimal disruption to their service.

Some local TV stations have also started their transition to IP. In February 2018, Sony delivered an IP Remote Production (REMI) studio capable of 4K HDR production to Shandong TV, a provincial TV station in North East China. A large, 1200 square meter studio equipped with eight HDC-4300 system cameras and six HDC-2570 HD system cameras are already in use for on-air production. In August 2018, Sony delivered two 4K/IP OB Vans, each equipped with 24 HDC-4300, 4K/HD HDR-capable system cameras, to a production house in Beijing called Touch Video Live Broadcast China (TVLB). According to Sony, both OB vans delivered can broadcast a maximum of 48 cameras for 4K HDR production and are ideal for big sports and entertainment events.

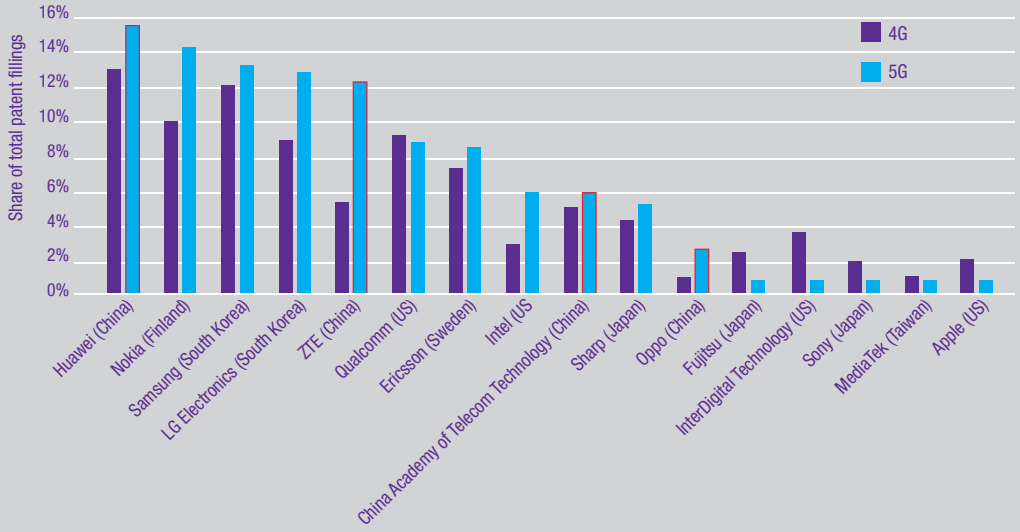
When it comes virtual and augmented reality (VR/AR), technology vendors anticipate that demand for these technologies to produce special effects is growing, but at a much slower pace than 4K UHD due to the very high cost of VR and AR productions. Technology vendors say that many end customers want VR features and effects, but they often withdraw when faced with the high price. Some customers want to buy VR solutions despite the cost, because these technologies make their audiences excited and engaged.

Strengthening role of telcos and 5G in content distribution

The Chinese government views 5G as crucial new growth driver for China's technology sector and the whole economy. In the central government's 13th Five-Year Plan, 5G is named as a 'strategic emerging industry' and 'new area of growth'. Also, in its 'Made in China 2025' plan, China has outlined that its goal is to become a global leader in the manufacture of 5G mobile communication technology. According to a study from the China Academy of Information and Communications Technology, the 5G market could account for RMB 1.1 trillion (US$166 billion) or 3.2% of mainland China's entire GDP in 2025, adding RMB 2.9 trillion in economic value by 2030.

Recently, the former chairman of China Mobile, Jianzhou Wang, said in a TV interview that the development of China's mobile industry from 1G to 5G is "a process of from nothing to something, from small to big and from weak to strong". Accordingly, under the government's direction, Chinese companies began conducting research on 5G in 2013 and held technical trials of related technologies in 2016. Accordingly, Chinese companies started increasing their filings of 5G-related patents in 2016. As of March 2019, China had filed for 34% of 'standard essential patents' (SEPs) for 5G communications systems, being over 50% more than its 4G patents, according to the German patent database, IPlytics. This is a clear change compared to the launches of 3G and 4G, which were dominated by companies from the US and Europe holding the key SEPs, while Chinese companies had to pay large royalty fees to Western companies. As commercial 5G services start, companies building 5G base stations or making 5G-compatible handsets will have to pay royalties to the holders of the essential patents. Currently, Huawei Technologies has the largest share of filings for 5G-related SEPs (15%), while other top filers in China include ZTE and the China Academy of Telecommunications Technology. The chart below illustrates the distribution of key patents holders for 4G and 4G technologies.

Key patent holders for 4G and 5G technologies globally (% of total filings)



Source: IPlytics

Chinese telecommunication companies (i.e. telcos) have also started to expand their footprint and role in TV content distribution in China. Compared to Chinese cable operators, who have enjoyed a monopolistic position for several decades, Chinese telcos are more market oriented, efficient and already know their individual end-consumers' needs and habits relatively well. Recently, China's biggest telcos – China Mobile, China Telecom and China Unicom – have started to work toward 4K TV content and 5G applications. This move is greatly

supported by the existing infrastructure managed by these three major telecom operators. Hence, China's existing strengths in connectivity will be a key factor in enabling the Chinese telcos to diversify from manufacturing technology to developing and executing new digital business models.

Fiber-based broadband, including fiber-to-the-cabinet (FTTC), has been the prerequisite for the mainstream adoption of video on demand around the world over the past decade. The introduction of 4G helped the growth of live streaming from smartphones via services such as Periscope and Facebook Live (launched in 2015) and services such as TikTok and Douyin in China. At the enterprise-level globally, all cloud computing-based services rely on high-quality connections. In January 2019, China was estimated to have over 330 million full-fiber connections, representing about 70% of the world's total, according to Deloitte. Today, such fiber-to-the-premise (FTTP) infrastructure enables gigabit-speed links to premises and by 2024 even multi-gigabit speeds should be possible. Secondly, China's 4G network is already the world's largest with almost 5 million 3G/4G base stations and 1.2 billion 4G subscribers – representing a third of the world's total. In early 2018, China had almost 2 million cell sites, whereas the US had about 200,000. Moreover, China has 5.3 sites for every 10 square miles (i.e. for every 26 km), while the US has only 0.4. The existing density of the 4G network in China should reduce the incremental cost of rolling out 5G. According to Deloitte's forecast, China could reach 430 million 5G subscribers by 2025, and within two to three years, hyperfast speeds of 500 megabits per second (Mbps) over the mobile network should become widely available in cities thanks to 5G rollout. A series of massive build-outs led by China Mobile are expected to improve China's broadband monumentally over the next few years, with the 2022 Winter Olympics in Beijing as a target event to showcase 5G technology.

China's Belt and Road Initiative (BRI) is a key financial tool to push forward China's ambitious deployment of fiber-optic and 5G projects along the BRI route map. According to Rethink Research, China is planning to deploy fiber-optic connections to 80% of its households in the coming years. A crucial element of China's 5G network is that it will give wireless companies the ability to monetize their services more effectively. For carriers or network providers, a great advantage of 5G is 'network slicing', which will allow carriers to create – on the fly – multiple customized virtual private networks for particular customers and applications. In practice, this will enable each 5G carrier to define its network from moment to moment, charge effectively for service differentiation and act as a gatekeeper for applications seeking entry.

China's giant end-consumer market enables Chinese 5G technology manufacturers to test and iterate their new high-capacity services quickly, which provides a significant competitive advantage for China compared to the US for instance. In order to start testing 5G, China has been actively developing appropriate consumer devices to support 5G rollout. In October 2017, China introduced the first 5G reference smartphone design, while 5G-compatible smartphones supporting multiple sub-6GHz, millimeter wave (mmWave) frequencies and 4K or 8K screens will be available by the first half of 2019.

China is also been expanding its influence on the 5G standard-setting process. In 2013, the Ministry of Industry and Information Technology (MIIT), with the National Development and Reform Commission (NDRC) and the Ministry of Science and Technology (MOST), jointly founded the IMT-2020 (5G) Promotion Group to accelerate the formulation of 5G standard in cooperative mechanism with the EU, the US, Japan and Korea. Operators and technology vendors both domestically and internationally participate in the group providing important inputs to the 3rd Generation Partnership Project (3GPP) to support the development of a global unified 5G standard. The development of a 5G standard was further catalyzed in late 2016, when Chinese telecoms operators led the 5G System Architecture project, which determined the structure of 5G networks globally. This move happened shortly after polar coding, which is a technology backed by Chinese telecoms equipment makers, was approved as part of the global standard for 5G.

In December 2018, the central government awarded China Mobile, China Unicom and China Telecom with 5G spectrum licenses, enabling them to conduct final trials for the new mobile system before its wide commercial rollout from 2020. According to the Ministry of Industry and Information Technology (MIIT), the trials should ensure the compatibility of the various types of radio frequency spectrum ahead of the launch of 5G mobile services. China Unicom and China Telecom were allocated 100 megahertz each of spectrum in the 3.5-gigahertz to 3.6GHz bands and 3.4GHz to 3.5GHz bands, respectively, for their trial 5G networks, according to separate filings to the Hong Kong stock exchange. China Mobile announced that it had been allocated 160 MHz of spectrum at 2.6GHz for its 5G trial.

As a response to these 5G trials by the three state-owned telecom carriers, China's cable operators have asked for support from the central government in order to take advantage of the country's 5G development, which obviously threatens the existing monopolistic market position of Chinese cable operators. In November 2018, China Broadcasting Network Corp, the largest cable network operator in the country already holding a license to operate internet and telecom services, received approval to build 5G networks. This move allowed China's 5G market to transform into a four-player battleground. Later in March 2019, China Broadcasting announced strategic partnerships with CITIC Group and Alibaba to speed up efforts to upgrade its existing cable networks as well as to compete with the three major telcos. Through a joint venture formed with CITIC Group called China Broadcasting Network Mobile, China Broadcasting is now preparing to launch a mobile network using the 700MHz spectrum band, which is currently used for domestic analogue television broadcasting. As the low-band 700MHz spectrum can have better network coverage compared with other frequency bands, the joint venture will be in a favorable position to provide better coverage for high speed mobile internet using 5G technology. At the end of April 2019, China Unicom, in turn, announced that it will move up its commercial 5G rollout to May 2019, accelerating the start of consumer 5G services in China.

According to industry experts interviewed for this study, the existing 'race to 5G' among the 5G license holders is likely to

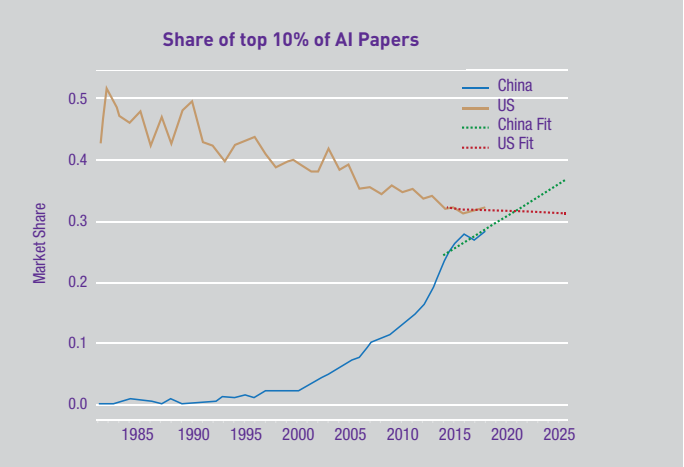
drive down the cost of 5G by the end of 2020. Currently, the estimated cost of a live 5G show connection to studio with delay of only one second is about RMB 200 per 30 minutes.

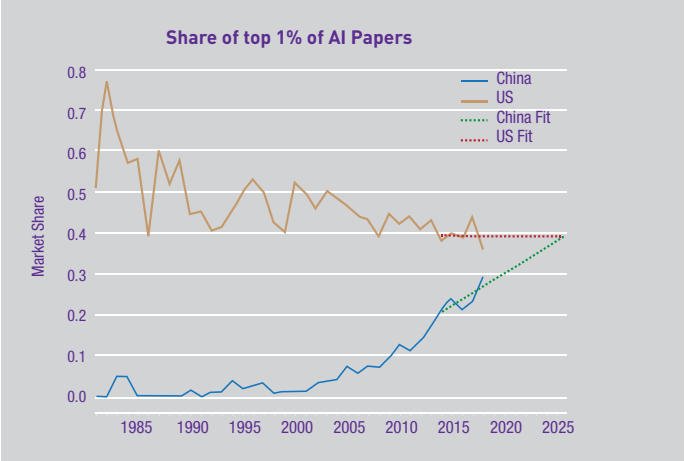
AI applications booming in China's media sector

China's strength in connectivity should also catalyze the development of AI-based applications. With its 1.2 billion 4G subscriptions, over 800 million internet users and 600 million mobile payment users, China's data sets are unparalleled in size. The Chinese government is strongly supporting the development of China's AI sector. In July 2017, China's State Council issued the 'New Generation Artificial Intelligence Development Plan' (AIDP), which forms the core of China's AI strategy together with 'Made in China 2025' plan. These documents aim at creating an AI industry to China worth US$150 billion by 2030.

One Chinese state alone has announced that it will spend US$5 billion to develop AI technologies and businesses, while the city of Beijing has committed to spend US$2 billion to develop an AI-focused industrial park. Moreover, a major Chinese port in Tianjin plans to invest US$16 billion in its local AI industry. These government programs will support major projects, academic research on AI as well as AI-related startups. In fact, the government's latest capital fund is expected to invest over US$30 billion in AI and related technologies within state-owned firms. Already in 2017, Chinese startups received 48% of the total US$12.5 billion funding allocated for AI startups globally. However, currently the development of AI is led by the three big internet companies – Alibaba, Baidu and Tencent (BAT) – of which each has its own focus area. While Tencent focuses on computer vision for medical diagnosis, Baidu is specializing in autonomous driving. Alibaba's cloud computing division is working on a project called 'city brains' referring to a set of AI solutions to improve urban life and smart transport. According to MIT Technology Review, the BAT accounted for 53% of China's 190 major AI companies. The fourth key player in the field of AI is a Shenzhen-listed company called iFlytek, which is a dominant player in voice recognition with augmented intelligence.

An interesting way to evaluate China's rapid catch-up in the field of AI is to look at the country's significant leap forward when it comes to academic research and the quality of published research papers. According to a study by the Seattle-based Allen Institute for Artificial Intelligence, not only the number of high-quality papers by Chinese researchers, but also the frequency of these papers being cited have risen dramatically over the past five years. After analyzing over 2 million AI papers published up until the end of 2018, the Allen Institute came to the conclusion that China is 'poised to overtake the US in the most-cited 50% of papers in 2019, in the most-cited 10% in 2020 and in the 1% of most-cited papers by 2025'. As shown in the graphic below, the researchers found that America's share of the most-cited 10% of papers declined from a high of 47% in 1982 to a low of 29% in 2018. At the same time, China's share rose to a high of 26.5% in 2018.





Source: The Allen Institute

When it comes to most relevant use cases of AI deployment in China's broadcast and media sector, China's state news agency Xinhua News unveiled China's first AI news anchor in November 2018. According to Xinhua, an AI system is used to synthesize the presenters' voices, lip movements and expressions based on those of real Xinhua presenters. By working 24 hours a day on Xinhua's website and social media channels, the news agency claims that it can reduce news production costs significantly in the future.

Source: Medium.com

In February 2019, Xinhua announced that it had created the world's first female AI news anchor in collaboration with the Chinese search engine Sogou. The anchor made her debut during the 'Two Sessions' political meetings at the beginning of March. Moreover, Xinhua and Sogou announced that they had developed an improved male anchor, who is also able to stand up and gesticulate with more natural mouth movements. According to Xinhua, its 'AI employees'

have already produced 3,400 reports totaling over 10,000 minutes in length since November 2018.

AI is also widely used in China's social media. For example, Tencent's WeChat, which has over 1 billion daily users, uses AI to both create ads and target users to eliminate the need for designers and copywriters to be involved. The AI engine builds ads catered to each user's known preferences, and as privacy restrictions are less strict in China compared to Western markets, social media platforms deploying AI have access to a single database of hundreds of millions of users translating into faster learning and smarter algorithms. Tencent began its AI experiments in 2016, when the company opened an AI lab in Shenzhen with a vision to 'make AI everywhere'. Since then, Tencent has focused on research in machine learning, speech recognition, natural language processing and computer vision. In addition, it has focused on developing practical AI applications for business in the areas of content, online games, social and cloud services. According to industry experts' estimates, Tencent's AI team consists of about 50 research scientists and over 200 engineers in China and the US. In terms of video applications using AI, Tencent's YouTu Lab specializes in image, face and audio analysis. It recently opened another similar lab in Seattle, which primarily focuses on natural language processing and speech recognition systems. The lab's work will aim at further developing WeChat's voice-to-text feature and software for smart homes, according to the company.

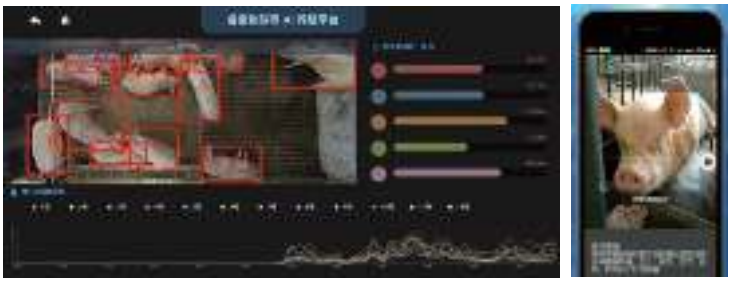
Another Chinese technology company focusing on video-related AI applications is ByteDance, which owns a machine-learning enabled short-form video platform Douyin (i.e. TikTok). Douyin uses AI to make creating and sharing 15-second videos easy for its users. Douyin does not allow advertising on its platform and instead encourages brands to create branded content, which is in line with the material that its users create – by using AI.

Alibaba also has its own AI lab. In 2018, Alibaba introduced an AI-based graphic design tool, Luban, already in use by e-commerce platforms such as Tmall and Taobao through Alibaba Cloud. During the 2018 Alibaba Double 11 Shopping Festival (i.e. 'Singles' day') on November 11th, Luban cumulatively designed about 6 million banners for 200,000 merchants during 24 hours. On average, Luban is able to design 8,000 ads per second. The picture below illustrates the AI-driven ad design process of Luban.

Source: Alibaba

Other major uses cases deploying AI include facial recognition systems, which are currently being tested in major train stations like Wuhan. In Shenzhen, AI-firm Intellifusion works with local police to display faces of pedestrians on large LED screens at intersections. The company is also collaborating with local mobile phone carriers as well as WeChat to develop a system which automatically sends personal text messages to pedestrians who an AI engine has identified as having violated traffic rules.

JD.com and Alibaba have also recently come up with AI-enriched applications in agriculture and farming. In June 2018, Alibaba launched a new agricultural AI platform, ET Agricultural Brain, to allow farmers to better monitor, understand and react to the needs of their livestock and crops. For example in Shenzhen, ET Agricultural Brain uses AI to raise pigs by using a digital ID for each pig, which helps in tracking vital signs such as sleeping, eating, sickness and pregnancy through visual recognition, voice recognition and real-time environmental monitoring. As a result, the pig farms testing Alibaba's video monitoring system have been able to raise more newborn pigs, reduce death rates and increase farms' income by 10%, according to Abacus.



Source: New York Times

In September 2017, an AI-powered robot dentist joint-developed by the Fourth Military Medical University's Stomatological Hospital and Beijing Beihang University carried out the first successful autonomous implant surgery by fitting two new 3D-printed teeth into a patient's mouth without any human involvement. The operation took one hour, and the implants were fitted within a margin of error of 0.2-0.3mm, reaching the required standard. The application is targeted at China's domestic dental care market, which is estimated to consist of about 400 million patients urgently needing new teeth, while currently only one million implants are carried out across the country each year due to limited number of accredited dentists in China.

Industry buying groups and sales practices in China

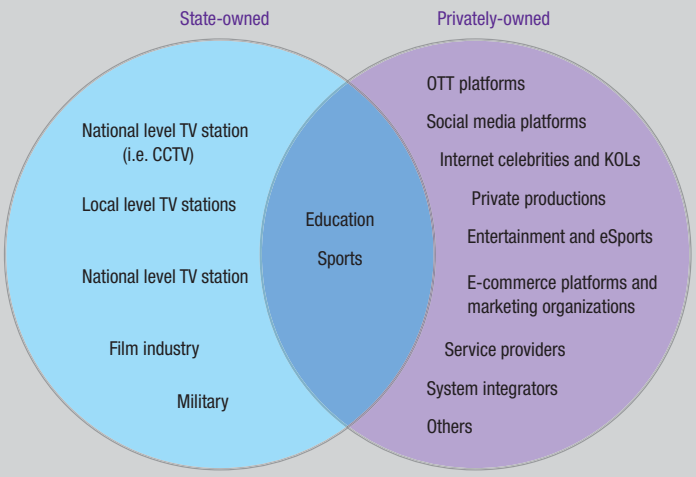
Categorization of end customers and buying groups

Key industry buying groups in China's broadcast and media sector consist of the following categories;

1. **Traditional broadcasters**
   a. **National level TV station;** CCTV, which is the largest and the most influential single end-customer in China's broadcast industry
   b. **Local level TV stations;** Provincial, city and county level TV stations, whose annual budgets vary from year to year
   c. **National and local radio stations:** China Radio International (CRI) and China National Radio (CNR) are the largest single end-customers in radio broadcasting
2. **Convergence media (i.e. new media)**
   a. **OTT platforms:** iQiyi (Alibaba), Youku (Baidu) and Tencent Video, which dominate the whole OTT segment and buy to certain extent the same production equipment as TV stations
   b. **Social media platforms for user-generated content (UGC):** Douyin (ByteDance) and Toutiao (ByteDance), which focus on 15-second short-form videos created by users
   c. **Internet celebrities and key opinion leaders' (KOLs) own productions:** A rapidly growing and influential new buying group for professional production equipment and turnkey solutions
3. **Production and post-production:**
   a. **Film industry:** China Film Group Corporation, Huayi Brothers, PolyBona Film Distribution Company and Shanghai Film Group, which produce the vast majority of all movies in China
   b. **Private productions (also defined as 'corporate' in China):** Smaller scale private production companies, which primarily serve the film industry and OTT segment
   c. **Education:** Universities and academia, high schools and professional training institutions supported by provincial governments buying equipment for e-learning content
   d. **Sports:** A diverse range of buyers including TV stations, OTT platforms, private productions and streaming platforms buying equipment particularly for remote production (e.g. OB trucks) and live streaming
   e. **Other:** A diverse range of content producers focusing on specific, niche content such as wildlife
4. **Entertainment and eSports: Gaming companies**, streaming platforms, OTT platforms, social media platforms producing mobile and video games and other entertainment content
5. **E-commerce/Marketing:** The biggest e-commerce platforms such as Tmall (Alibaba), Taobao (Alibaba) and JD.com as well as social media platforms buying equipment and solutions for advertising
6. **Military:** Army, public security organizations procuring surveillance solutions. However, this segment is not directly addressable by foreign technology vendors.
7. **Service providers:** A diverse range of professional service providers such as private OB truck service providers, consultancies and other service agents
8. **System integrators (SIs):** A gradually diminishing group of companies, as the system integration business becomes increasingly difficult. Many system integrators operating in mainland China originate from Hong Kong, but because domestic Chinese manufacturers have caught up in quality and technological capability and can now sell their own turnkey solutions, system integrators have been losing their market share and margins over the past five years.

Some of these industry buying group categories can overlap and they can be involved in several businesses. However, when it comes to actual sales procedures, the buying groups can be divided into state-owned end customers procuring through public biddings and project tenders or private end customers buying through private sales channels. The chart below illustrates the division of industry buying groups into state-owned and privately-owned company categories, which defines how they typically buy products and services from technology vendors.

Major industry buying groups in China and the involvement of Chinese state-owned enterprise (SOEs)



Source: IABM

When it comes to the state-owned company category, procurement of new broadcast and media technology happens through public bidding or tender, if the total value

of the project exceeds US$50,000. Usually, manufacturers' sales representatives (e.g. distributors, agents) do the actually bidding and attend the tender on behalf of the manufacturer, whose products or services they represent. In smaller projects, which are not subject to a public bidding procedure, state-owned companies typically purchase a desired solution directly from a manufacturer or manufacturers' sales representatives based on the end user's specifications. As the Chinese government does not allow TV stations to buy any transmission equipment from overseas, foreign manufacturers must physically assemble their transmission-related solutions somewhere in China by a legal Chinese entity in order to sell them to the Chinese market. From an assembly factory, a manufacturer can then sell the products directly or ask distributors to procure them in their own territories.

It is important to note that – in practice – international companies mostly can only address Tier 1 and 2 level local TV stations in China, because smaller city level stations are very price sensitive and thus mainly addressed by local companies.

Sales procedure for CCTV – the trend setter

CCTV is the biggest single end-customer in the whole broadcast and media industry in China and it also has a huge indirect influence on local TV stations, which often choose the same solution as CCTV. Hence, a project sold to CCTV provides a crucial reference for a technology vendor, as it becomes much easier to convince lower tier TV stations to buy the same solution as CCTV. According to the industry experts interviewed for this study, a great majority of local TV stations choose the same solution as CCTV, even though provincial and city level TV stations are independent of the national level TV station. Occasionally, it is difficult for some big TV stations like Shanghai TV (which was China's first live TV station), Beijing TV and Hunan TV to choose the same solution as CCTV, because their content differs from that of CCTV. Naturally, the choice of solution is also dependent on the annual government budget allocated to local TV stations. Compared to local TV stations, CCTV's budget is not limited to any specific, pre-defined budget and thus it can choose any high-end technology it prefers. According to local industry experts, the cheapest solution usually does not win in CCTV's tender process, which usually takes on average two months. As CCTV has to follow a very strict set of government broadcast delivery rules, safety of automation and top security are the most important purchase priorities defining the choice of technology and brand. After CCTV has chosen which technology and brand it considers the most secure and safe, all other TV stations follow CCTV's security decisions. Sometimes, a technical institute acts as a third party consultant or sends its own chief engineer to evaluate different vendors' products. Some vendors prefer to send their equipment to CCTV's studio for a field comparison, because it gives CCTV firsthand information and experience about the solution.

CCTV's decision making is based on a points system, where CCTV's procurement team, consisting of a range of different professionals in various departments, gives a score on the vendor organization's departments and their solution. Based on the final score, the technology vendor is then invited to do a test at CCTV's premises or on site. In the testing process, which lasts about one month, there are two areas of evaluation:

1) the technology itself (i.e. engineering) and
2) the financial aspect, of which engineering is the most important, though financial aspects carry some weight too. As CCTV and local TV stations' priorities are strictly related to safety, they all end up buying master and backup systems in order to prevent any technical issues during broadcasts. According to a local technology vendor interviewed for this study, the safety issue in production is particularly important for live events and news (e.g. CCTV 7:00PM and 9:00PM live news), and if anything goes wrong for 15 seconds during these broadcasts, the operator is fired immediately. Thus, it does not matter if the solution has less functions and is significantly more expensive as long as it maximizes the safety of automation. According to experts interviewed for this study, CCTV also occasionally launches tenders in which only foreign products are accepted.

Tender process with local TV stations

For local TV stations, which are more price sensitive, the key purchasing criteria are a strong brand and a reasonable price. Key decision makers in local TV stations still rely on senior management to make the final decision about the solution to be purchased. Compared to the past, when there were only few key people making all decisions, local TV stations' decision-making teams have grown in size over the past years and they nowadays often consist of people from engineering, technical and administrative departments. For a technology vendor this means that it has to convince more people that its solution is the best one. Relationships of trust play an important role in the process and thus many technology vendors rely on their local distributor's teams to communicate with the end customer in each territory. The majority of technology vendors interviewed for this study said that they have divided their sales network into specific territories or regions, of which local resellers, distributors or agents are then exclusively in charge, as they have their own personal relationships with end customers in each region. Organizing the sales network based on geography (i.e. distributors by region) is particularly common among technology vendors who are primarily selling and targeting the traditional broadcast sector, because public tenders are often province-specific. Local distributors also do marketing locally as well as act as an important information channel between the manufacturer and the end user in different territories. In addition to a strong brand and a reasonable price, a service package and after sales service capability are very important for majority of end customers in the traditional broadcast segment.

In general, a sales process with a state-owned end customer – excluding CCTV – follows a pattern, where the end customer sends a project description to potential vendors, who make a proposal that meets the stated need and then bid for the project with the lowest possible price. Usually, a minimum of three vendors get to take part in the actual tender. While competing vendors are not aware of their competitors' bid prices, they nonetheless often share information with each

other depending on the project. Usually, the end customer gives a direct indication about the project's budget or an indirect hint about the right pricing to win the tender – particularly if the personal relationship between the end customer and the vendor's team (e.g. the distributor doing the actual bidding) is good. Many vendors interviewed for this study said that they try to quote the lowest price, which they might adjust based on the communication with other vendors and the end customer during the tender process. Typically, a tender process for large projects requested by local TV stations takes on average two to three months, but if the end customer uses agents, these agents might ask for a quote with a very tight schedule like two to three days before the tender's closing date. However, this depends on the project and the technical evaluation can also take up to three months before the tender is released.

Even though the vendors selected to tender exchange information about the project with each other, the competition among vendors may limit their willingness to share information in some cases. Big technology vendors such as Shanghai Media Group (SMG) naturally have an advantage in big projects as they can set their quoted price very low as they often have their own sizable in-house resources, crews and systems. Big technology vendors and their sales directors might also have ambitious annual sales targets compelling them to get a certain number of projects sold each year even at a lower price. Hence, their quotations might be so low that smaller technology vendors cannot compete with them. Accordingly, many smaller vendors focus on smaller projects and events, where they can offer customized one-to-one solutions more flexibly than bigger players. However, smaller vendors might often work with a major system integrator (SI) to complete a big system and thus such collaboration can make them more competitive in larger projects.

In terms of quality, there are more and more Chinese companies whose technology is good enough (i.e. 'fit-for-purpose') to compete with foreign technology vendors in many projects in the traditional broadcast segment. This is particularly the case for the education and private production buying group segments, where even small Chinese technology vendors can sell at a low margin. Chinese technology vendors and their distributors have a relative advantage in creating personal relationships with end customers compared to foreign vendors and thus they might get invited to the actual tenders even with lower quality solutions that might not fulfil the initial tender requirements.

Sales practices with privately-owned end customers

When it comes to the sales practices of the privately-owned company category, the biggest buyers are OTT platforms such as iQiyi and Tencent Video, who are expanding their original content production capabilities. These internet giants not only buy the highest-end technology available on the market, but also attract in-house talent from TV stations to their own production teams. The major OTT platforms are buying large turnkey equipment as well as the most exclusive rights such as those of English Champions League. The leading OTT players already have their own production studios in Beijing, Shanghai, Shenzhen and Nanjing and they plan to expand their in-house production facilities to lower tier cities in order to localize their content further. Some OTT platforms are concentrating their purchases in specific business areas such as sports. For example, China Sport Media's offering of live Football League coverage is growing very fast and it recently bought an OB truck for OTT TV streaming. Private productions form another new, major buying group in the privately-owned company category, because the film industry has a strong demand for their content. Private productions typically buy the same equipment as TV stations and prefer turnkey solutions, even though they are not allowed to produce everything.

The sales process in the privately-owned company category is slightly more straightforward compared to public tenders, and technology vendors sell either directly or through a distributor to private end customers. The sales network might be divided either by region or by product segment. For example, some distributors might represent only the OB business. According to technology vendors interviewed for this study, some of them are also selling solutions together with other technology vendors or third parties to provide a turnkey solution. This is particularly the case for many hardware vendors, who have started to work more with software companies in order to ensure that their hardware can be integrated and merged with certain software preferred by the end customer. Some hardware vendors said that they have set up their own R&D labs to improve their ability to integrate different software with their existing hardware solutions.

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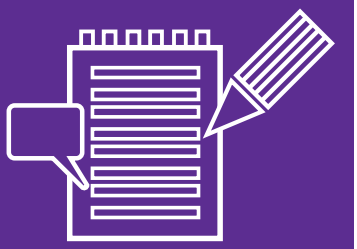

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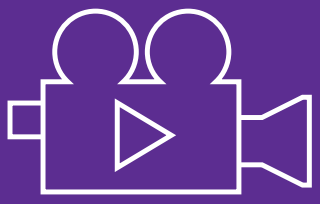

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Market entry strategies and preparation

Different forms of market entry to China

When it comes to different ways and alternative formats to enter the Chinese market, there are several options depending on:

1) the technology vendor's business and offering targeted at the Chinese market,
2) its resources allocated to the market entry and
3) its actual addressable market in China.

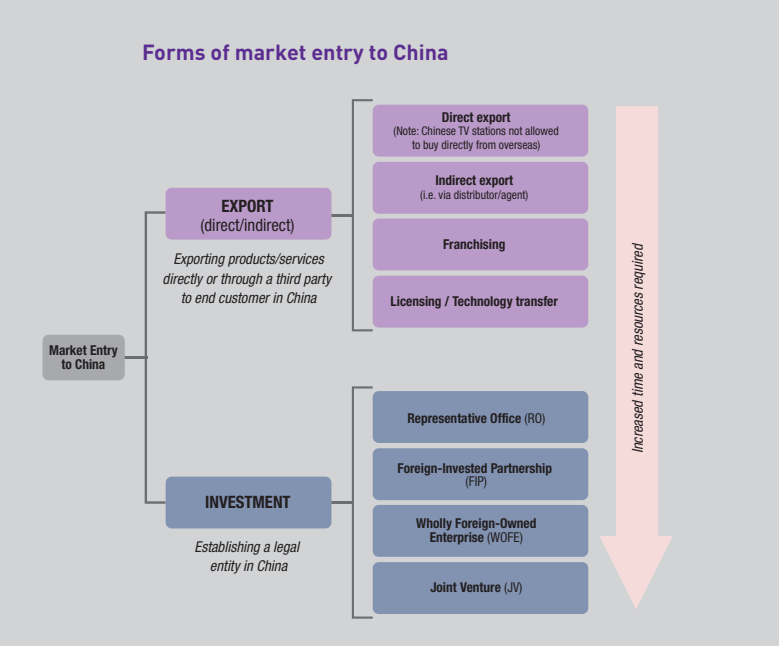
After having identified these key determinants, a technology vendor can discard those forms of entry which do not fit the framework of its plan and focus on studying the remaining alternatives in a detailed manner. Naturally, the company's offering, resource needs and target market segments might change in the course of the entry process and after having set up its first operation in China, but it is important to have a relatively clear, realistic and concrete vision of the desired form of presence at the start of the planning stage of the market entry. In order to get an indication about the amount of required resources and suitable product offering, a technology vendor should first identify where its addressable market in China actually is and which types of end customers, competitors and administrative bodies it consists of. The best way to gain a clearer view on the addressable market size, its dynamics and key stakeholders is to conduct a profound market study either internally or by consulting with a local market research firm or other professional third party service providers familiar with the Chinese market and the context of market entry. The market research should ideally include a wide range of expert interviews with Chinese authorities and regulative bodies, local distributors and foreign companies operating in the same industry segment in China. Understanding the regulative environment and latest policies is especially important for a company planning an entry to China's broadcast and media industry, because the policies change frequently, and the end customer base is dominated by Chinese state-owned companies.

After having quantified the addressable market size, the end customer types, their needs and physical location (e.g. Beijing, Shanghai, Shenzhen) through market research, the technology vendor can prepare a feasible product strategy (i.e. which products to register in China) and a rough entry budget. It is important to note that the Chinese government does not allow Chinese TV stations to buy solutions directly from overseas. Moreover, the market research should have provided information about potential import duties, which may also affect the choice of setting up an assembly factory in mainland China.

Even though there are several ways to enter China, fundamentally there are only two different entry modes:

1) export (directly or indirectly) or
2) investment (i.e. establishment of a legal entity in China).

As mentioned above, exporting directly is not possible for vendors who plan to sell into the state-owned broadcast segment, but exporting indirectly through an intermediary such as a local distributor to the end customer is possibly the most common pattern among foreign manufacturers to enter the Chinese market. Export mode of entry can also refer to franchising, technology transfer and licensing, but these are less common options due to China's relative complexity of regulations and registration procedures as well as concerns about intellectual property (IP) violations. The chart below illustrates different market entry modes to China.



Source: The Swedish Trade and Investment Council, IABM

In general, direct and indirect export models do not require a legal establishment in China, but a direct export model requires a registered Chinese company with an import license as counterpart (i.e. importer). A direct export model might suit those foreign companies who sell unique products in smaller quantities and operate in a segment where a well developed distribution network is not that important. The advantages of a direct export model are greater potential profit margin and a higher level of control over the business. In addition, with a direct export model, a foreign company gets to know precisely who its end customers are and can exchange information directly with them. This can translate into a better understanding of the overall market environment. A direct export model also provides foreign companies with better protection of trademarks, patent and copyrights, when the control over all transactions stays with the foreign vendor. However, this model requires lots of internal resources to develop and maintain customer relationships and responding to customers' needs quickly can be more difficult than when having a local agent. Given the crucial importance of personal relationships and a local business partner, a great majority of

foreign technology vendors prefer to export indirectly though local partners, who know the local market and have direct contacts with end customers.

In an indirect export model, a local agent or a distributor is the technology vendor's direct representative selling its products in China, and technically a distributor first buys the products from the technology vendor prior to reselling them either directly or through a third party to the end customer. The difference between an agent and distributor is that an agent is the technology vendor's direct representative in China and is usually paid a monthly management fee through a service contract, whereas a distributor buys the products first from the vendor before reselling them. The distributor's income is thus the difference between their buying and selling price. An agent's commission is typically lower than the distributor's profit margin, but a major advantage of using distributors is that the technology vendor passes a greater degree of risk to the distributor compared to an agent. Naturally, selling indirectly either through an agent or a distributor means a certain loss of control over business activities as well as dependency on a third party to submit crucial market information to the vendor.

A franchising model means that the technology vendor lends its trademark and business system to a franchisee who pays a royalty for the right to use the brand and the system in China. In contrast, licensing means the technology vendor gives permission to another party to use its company's intellectual property rights (IPR) on agreed terms, while a technology transfer is a process of transferring know-how through either selling or licensing the technology. Foreign vendors should ensure that their IPR is registered in both the home country and China before engaging in any form of franchising or licensing in China.

Investment entry mode, in turn, refers to establishing some form of legal entity in mainland China for the purpose of expanding operations, and it can technically mean setting up a Representative Office (RO), a Foreign Invested Partnership (FIP), a Wholly Foreign-Owned Enterprise (WFOE) or a Joint Venture (JV). A Representative Office is not defined as an actual legal entity, but a liaison office for the technology vendor's headquarters' in its home country. A RO is prohibited from engaging in profit-making activities (even though it is taxed) and hence it is traditionally used as a first step to gain a foothold in China. A liaison office (i.e. RO) is allowed to do market research, promote products and conduct business activities on behalf of its headquarters in the company's home country as long as the headcount of a RO does not exceed four staff members in China. Key advantages of an RO are that it is less expensive as it has no minimum capital requirement, it is relatively easy and quick to set up within a couple of months, it does not require a Chinese partner and it is not subject to any restrictions on type of business or industry. Moreover, an RO can act as a coordinator for the vendor's activities in China such as managing a wide range of local distributors. For example, a UK-headquartered technology supplier, The Vitec Group, has a Representative Office in Beijing and all of its business is done through local distributors, dealers and partners.

A Foreign-Invested Partnership (FIP), in turn, is a contractual arrangement between two or more parties to do business in China together under a common name. There are no minimum requirements on registered capital and an FIP does not have to pay income tax. However, an FIP is not permitted for 'prohibited industries' nor industries 'restricted to joint ventures' and setting up an FIP always requires an approval from the provincial industry and commerce departments.

A Wholly Foreign-Owned Enterprise (WOFE) is a limited liability company owned by a foreign entity. The WOFE's business scope determines the type of activities allowed such as manufacturing and sales, retail, services and trading. Technically, there are three typical types of WOFEs:

1) a consultancy service WOFE which means that a foreign company only has intellectual properties, but no physical properties,
2) a manufacturing WOFE which allows a foreign company to manufacture in China for sales in China or export to foreign markets and
3) a trading WOFE which typically specializes in trading, distribution, brand franchising or retail in China.

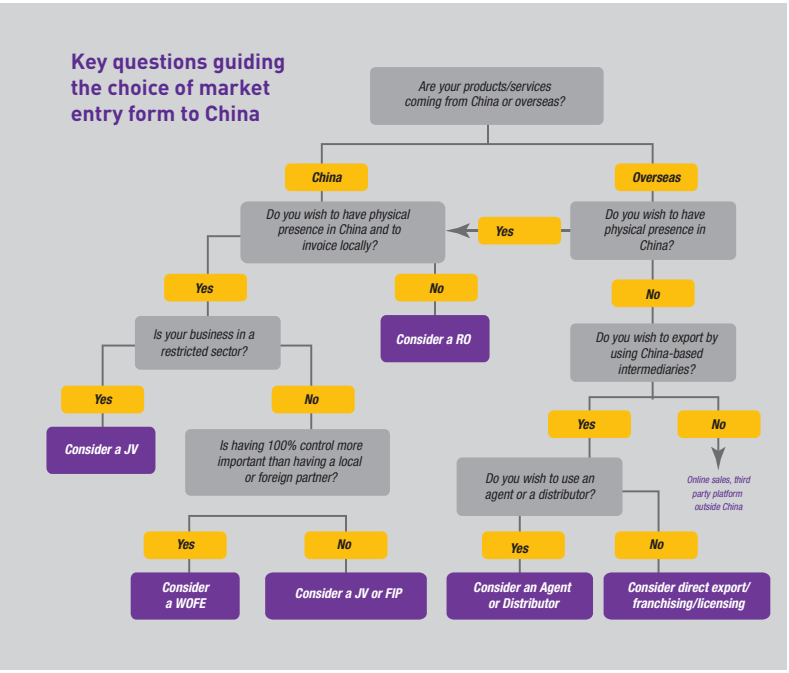
   In general, a WOFE can send and receive local invoices and revenue in RMB, and it does not require a Chinese partner.

However, a WOFE cannot be set up in restricted industries and it needs to be granted a WOFE business license, the application process for which is complicated and usually takes from three to four months. A WOFE is also subject to 25% corporate income tax (CIT).

A Joint Venture (JV) refers to a legal entity created jointly by Chinese and foreign partners either with joint operations and ownership or shared interest and operation on a contractual basis. It is important to note that a JV is the only type of company that allows foreign investors to engage in restricted industries in China such as telecoms. In China, a JV has two types:

1) Equity Joint Venture (EJV) which is a legal entity created by Chinese and foreign partners with joint ownership and operations and
2) Contractual Joint Venture (CJV) which is a partnership based on an incorporated arrangement or a contractual cooperation agreement.

   A great advantage of a JV is that it enables a foreign vendor access to an already developed network of distributors and local partners – and restricted industries. In a JV, the partners share operational costs and there is also certain flexibility in terms of negotiating profit sharing, capital investments and management structure. On the other hand, a JV requires registered capital, of which at least 25% must come from a foreign investor. Moreover, as foreign and Chinese JV partners must share intellectual property (IP), there is always a risk of IPR violations. The chart below summarizes the key questions regarding the choice of a market entry mode to China through a decision tree.



Source: The Swedish Trade and Investment Council, IABM

The Chinese currency Chinese yuan (CNY) is not fully convertible. Chinese buyers can purchase foreign currency freely on current account items, but it must be supported by real transactions, which are documented. In China, foreign exchange is under the supervision of the State Administration of Foreign Exchange (SAFE), which has designed a policy on the requirements that must be fulfilled before conversion or remittance of foreign currency can be done. Having a registered bank account in a Chinese bank is a requirement for any foreign company setting up operations in mainland China, and thus any cross-border transactions are subject to the rules laid out by SAFE, which all Chinese banks must follow. Accordingly, Chinese banks must review all the required supporting documents like invoices, tax clearance or exemption certificates and contracts before converting CNY into the appropriate foreign currency for a settlement of overseas invoices. SAFE might also require an additional approval for special types of payments. It is important for foreign companies to incorporate a profit repatriation strategy into their set-up planning of a subsidiary in China to ensure its ability to access the profits earned and to achieve cost savings.

Several foreign and local banks nowadays have a license to handle import and export business. However, when selling from a foreign company to a Chinese company when the goods are produced in China, there is no possibility to effect overseas payment due to Chinses foreign exchange control. Without import documents (i.e. Custom clearance documents) the buyer cannot make payments overseas. Accordingly, many foreign companies with production as well as sale in China establish a WOFE or FIP, which enable transactions made between the subsidiary and the Chinese buyer. The subsidiary can transfer overseas payments to the mother company abroad. One of the most common ways to repatriate profit from China is that a China-based entity (i.e. WOFE or FIP) pays dividends directly to its foreign parent company. However, only profits that have gone through annual audit can be repatriated meaning that the gross profit will be subject to 25% Corporate Income Tax (CIT). Dividends are subject to a further 10% withholding of CIT when distributed to foreign investors. Moreover, a foreign-invested enterprise can only distribute dividends out of its accumulated profits meaning that its prior accumulated losses must be more than offset by its profits in other years. Due to these restrictions, many multinational companies have adopted certain implicit policies, such as minimizing their profits in China in a legitimate manner via intercompany payments.

In July 2009, the Chinese currency authorities lifted restrictions on RMB trade settlement between China and Hong Kong, which was the first time RMB settlements were permitted outside mainland China. This resulted in the development of offshore RMB markets (e.g. Hong Kong, Singapore etc). These exist alongside the RMB market on mainland China (onshore RMB market), where buying and selling restrictions still apply. Hence, today there are two RMB markets, which differ according to regulations or market participants and each market has its own exchange rate. RMB that circulates outside mainland China is denoted as CNH, and its exchange rate floats freely. A foreign company can make payments in China Offshore Spot (CNH), which is allowed for the export/import of goods and services. However, services and details related to transactions in CNH may vary between different Chinese banks and thus must be discussed and agreed separately.

At the beginning of 2018, the central People's Bank of China (PBoC) said that it was planning to encourage cross-border and overseas use of the RMB to settle accounts and boost investment. The PBoC also expressed that it recognized Chinese banks had been looking to trade in offshore RMB and that there was a growing need for foreign-funded companies in China to be able to transfer investment revenue overseas. Accordingly, the Chinese government has since been encouraging RMB inflow and justifiable outbound investment, which means that real trades with supporting documentation will generally be approved.

Choice of location

The choice of location is very important when entering the Chinese market. Given that the broadcast and media business in China is strongly related to the government, many technology vendors interviewed for this study, who primarily serve traditional broadcasters, said that they preferred to set up presence first in Beijing, where CCTV and majority of key decision makers in the broadcast industry are located. Also, they found that it was important to be present in Beijing in order to build personal relationships with end customers, authorities and well-connected distributors, which play a crucial role in the actual sales process. In addition, technology vendors said that they received important information through their contact network in Beijing as well as having a wider selection of potential partners there compared to other cities. In addition, Beijing has also become the home of the second-largest number of valuable technology startups in the world after Silicon Valley over the past decade. Baidu's headquarters is also located in Beijing.

Shanghai, in turn, was described as being more suitable for those technology vendors who target the OTT, gaming and entertainment segments, because Shanghai is currently the hub for eSports and entertainment. Alibaba's headquarters is also located in Hangzhou, close to Shanghai, and thus there is a sizable pool of Chinese companies working in the same e-commerce and entertainment ecosystem around Shanghai. Some interviewees also said that Shanghai had a more liberal, entrepreneurial atmosphere compared to Beijing thanks to Shanghai's long-held legacy of being China's financial and business hub of international trade since the 19th century. Shanghai also has China's first Pilot Free Trade Zone, through which many foreign companies have decided to enter the Chinese market over the past few years.

Shenzhen, a technology hub located in South of China has enjoyed relatively open policies since 1980, when it was the first city designated to be a Special Economic Zone. Consequently, manufacturing activities from Hong Kong and Taiwan relocated and expanded in Shenzhen resulting in that the city quickly becoming China's key hub for original equipment manufacturers (OEMs) of all kinds of consumer and technology products, particularly consumer electronics. Thanks to the central government's approval of a strong private sector-led economy in Shenzhen, the city has been able to create a vibrant entrepreneurial ecosystem that is now housing a massive number of technology companies and hardware related startups focusing on AI, 4K/UHD and robotics. Tencent, Huawei and IBM China all have their headquarters in Shenzhen.

Naturally, other major cities in mainland China such as Tianjin, Guangzhou, Chongqing, Chengdu as well as lower tier cities like Wuhan, Qingdao, Fujian and Jinan are relevant locations for foreign technology vendors, especially when targeting the traditional broadcast segment as each province has its own provincial TV station as well as several city and county level TV stations. The industry experts interviewed for this study also pointed out that many technology vendors setting up sales and services offices in smaller cities greatly support their distributors and resellers to make sales locally as each office usually has a local team taking care of local marketing and after sales support. Also, presence in smaller cities helps to build personal relationships with local end users, according to experts interviewed.

Given the particular importance of personal relationships when doing business in China, hiring local Chinese employees provides a wide range of advantages for a foreign company; a local team speaks the language, knows the local culture and operational practices. Often, local staff also have a profound understanding of legal framework as well as relevant information sources. Local sales teams have precious knowledge and experience in dealing with the local customer base and its needs. All industry experts interviewed for this study said that having local staff was either 'important' or 'very important'.

In our study, Hong Kong was identified as a less desirable location – especially if the technology vendor plans to target the broadcast and media market in mainland China. According to industry experts interviewed, systems integrators are one of the largest end customer groups in Hong Kong, while there are very few TV stations in the city. The experts said that the quality requirements in Hong Kong are strict and that end customers use very high-end products and turnkey solutions, which mainly come from Japan, Europe, the US and Canada. Some technology vendors interviewed said that they had set up sales and service offices for local customers in Hong Kong, and that they also served other markets in South East Asia through their Hong Kong offices. However, setting up a presence in Hong Kong was not found the most efficient way to address mainland China's broadcast and media industry due to relatively long physical and social distance to the key markets in Beijing. Still, many Chinese companies choose to list on the Hong Kong Stock Exchange. Also, large international system integrators such as NDT and CSS might be based outside mainland China (i.e. in Hong Kong), even though their main work happens in China.

Overall, a great majority of industry experts interviewed for this study said that finding a local Chinese partner – either a distributor, an agent or other business partner – is critical when entering the Chinese broadcast and media technology market. As personal relationships are still of key importance in the industry, a foreign vendor is unlikely to succeed without a well-connected Chinese partner, who understands what local end customers need. Also, dealing with state-owned end customers and government authorities requires local knowledge and profound understanding of the dynamics in China's broadcast and media industry. A Chinese partner will also be able to provide information about 'real' market trends as well as practical aspects characteristic to the Chinese business culture. To find the right business partner, a foreign technology vendor should do an extensive partner search study in China, preferably with an external, local third party service provider. A foreign vendor should invest enough time and financial resources in the partner search process and see it as one of the most important strategic phases during the whole market entry procedure. In the partner search process, a foreign vendor should carefully verify the background of each partner candidate and avoid choosing the first candidate through the door. Moreover, it is important for a foreign company to ask for and examine references from previous projects completed by a potential Chinese partner candidate to get a reliable overview about its business.

Business culture and localization

Business culture in China significantly differs from the Western business context. The best way to face the cultural differences is to avoid the attitude and assumption that things will be somewhat similar in China to how they are in the Western countries, because they simply are not. Changing attitudes also means accepting that the different way of doing things in China can be equally good in the Chinese context as the way things are done in the Western markets in the Western context. Appreciating the Chinese way of doing things requires humbleness to adapt to a new social environment. For example, the conception of time (i.e. a general tempo of doing things) in China differs from that in the Western markets, as things may happen very quickly in China, preferably immediately. At the level of practice, this means

responding to emails and social media messages (e.g. WeChat) as quickly as possible and following up on business topics very frequently. At the same time, Chinese business culture favors a certain spontaneity and meeting schedules might change several times per day.

In order to succeed in China, a foreign vendor needs to localize itself and its offering. Localization must start from evaluating the initial business model in the light of existing regulations, local end customers' needs and preferences. The best way to localize a foreign vendor's business is to find a Chinese partner who knows the end customers' needs and the actual channels to market. Localization also requires recruiting local Chinese employees who are native Mandarin Chinese speakers and are familiar with Chinese business culture. Moreover, having Chinese staff is crucial when building up local marketing, after sales and service capabilities. Localizing a foreign brand might also require developing a Chinese brand name together with a Chinese partner.

Sources of support

When it comes to major sources of support in China's broadcast and media technology industry, it is important to gain visibility and firsthand experience about the Chinese market by attending major exhibitions such as BIRTV and CCBN – both arranged annually in Beijing. Those technology vendors who target more China's OTT, entertainment and private productions should consider attending the NAB Shanghai Show. As marketing is often done locally by local sales and service teams, a technology vendor should pay attention to the existing sales and service resources when choosing a Chinese partner, whose personal relationships and sales network play a critical role in winning projects in China's broadcast and media industry. Technology vendors interviewed for this study also said that they do relatively active online advertising, attend tradeshows and organize events frequently in different provinces of China. Some vendors also said they have started to attend education shows to boost their business with end customers involved in the education segment such as universities, high schools and professional training institutions. They also pointed out that the broadcast and media technology industry in China is also a relatively small niche segment and thus people tend to know each other as well as what connections, information and experience they have. Social media – particularly WeChat – applications are not directly used for marketing and business-to-business (B2B) activities, but they are very important in developing personal relationships in the broadcast and media industry.

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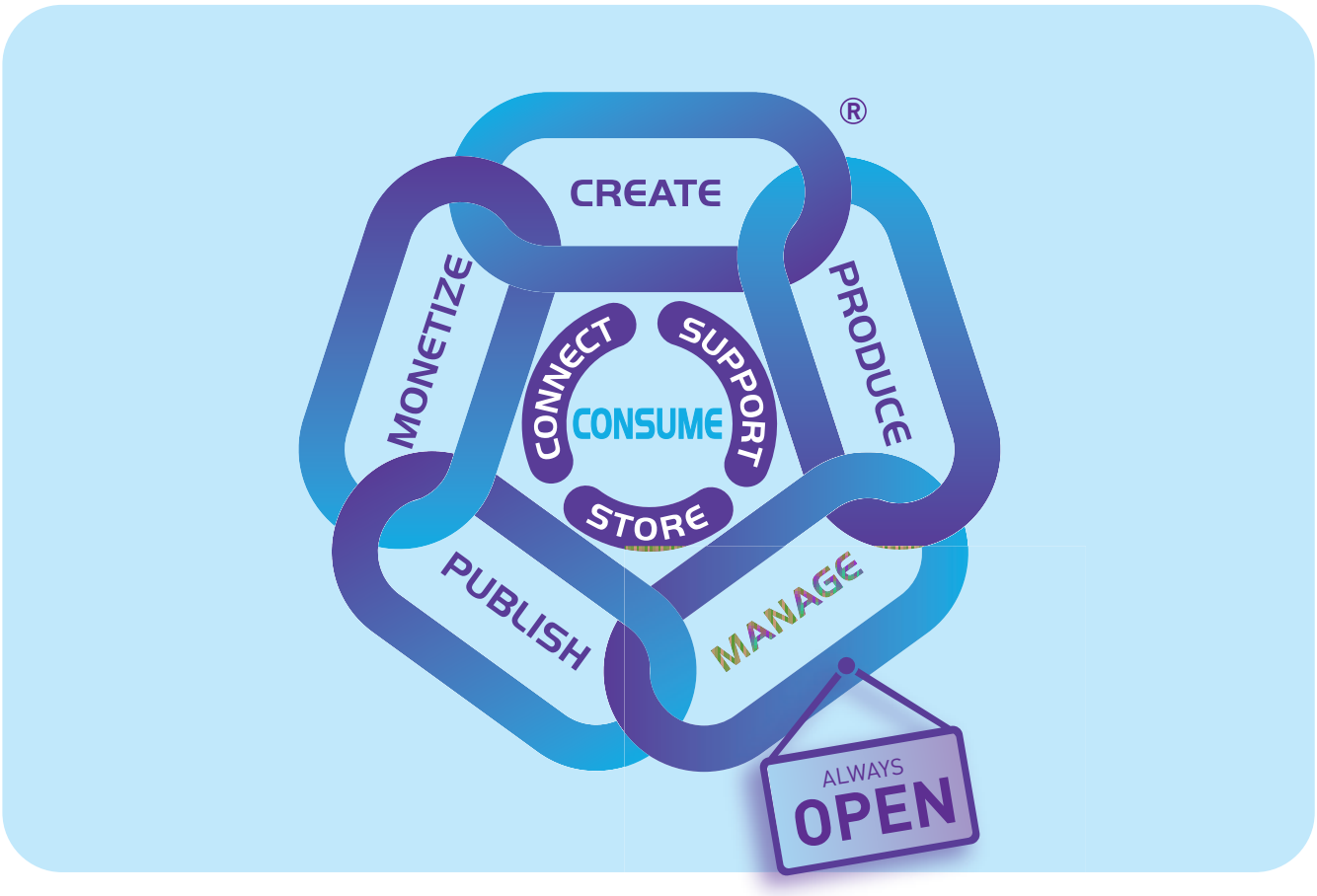

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