

BROADBAND DEMAND, COMPETITION, AND RELEVANT POLICY IN TAIWAN

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Abstract: Taiwan has been making great efforts to promote the fulfillment of its National Information Infrastructure, with broadband network technology and its application having rapidly developed in recent years. In relation to the two major forms of broadband network technology, i.e. cable modem and ADSL, two MSOs, namely, Eastern Multimedia Company and Hoshin GigaMedia Center, Inc., provide broadband network via cable modem, and HiNet and Seednet are the major ADSL service providers. Three new fixed networks have offered ADSL services as well since they began their operations. There are 3.51 million households (HH), or 54.4% of the household population in Taiwan, using the Internet, and 2.5 million households, or 38.9% of the HH population, using broadband (TWNIC 2003).

This paper analyzes the demand for broadband, the competition among providers of broadband, and relevant policies in Taiwan. The research methods adopted include a literature review, in-depth interviews, and a follow-up analysis of previous surveys conducted via the World Wide Web and by telephone.

According to a Point-Topic report conducted in March 2003, Taiwan has the second highest DSL penetration in the world, being surpassed only by South Korea (Johnson and Butt 2003). In May, 2002, the ROC government announced its "Challenge 2008" Six-year National Development Plan to transform itself into a high-tech service island. The six-year plan involves a budget of NT\$2.6 trillion (approximately US\$75 billion). One of the objectives of this plan is to develop a "Digital Taiwan." To this end, there are five goals that have been set for achieving this, with one of the most important aspects of the plan being to install broadband Internet in every household, with a view to reaching six million households by 2008 (CEPD 2002).

The four fixed networks will invest a total of NT\$364.4 billion (US\$10.5 billion) in broadband deployment between 2002 and 2007. The Directorate General of Telecommunications (DGT) has been asked to play an active role in opening up the telecommunications market, deregulating the unnecessary rules and controls, lowering the entry barriers, maintaining market order, providing a stable and competitive environment, and removing the obstacles to the broadband infrastructure. However, there exist doubts about whether the goals can be achieved, since it may be impossible to reach 93% of the 6.45 million households in Taiwan, in view of the fact that some of the households might not consider it necessary to subscribe to broadband.

The purpose of this paper is to (1) describe the development and current status of broadband in Taiwan; (2) analyze broadband adoption and user demand; (3) analyze broadband

strategies among providers; (4) analyze the government's broadband policy; (5) discuss the obstacles to the deployment of broadband; and (6) propose solutions to facilitate a more rapid deployment of broadband. While broadband includes ADSL, cable modems, wireless LANs and Direct PCs, etc., this paper focuses on ADSL and cable modems.

The Development and Current Status of Broadband

In Taiwan, the two major forms of broadband network technology are the cable modem and ADSL, with broadband services having been in operation since the end of 1998. Cable modem services started earlier than the DSL services. Before the government opened up the fixed networks, Chunghwa Telecom (CHT) monopolized the telecommunications market and hesitated to promote an ADSL service, fearing that the new broadband service might hurt T1 revenues from the business sector. When the government opened up the fixed networks in 2000, CHT realized that it could not postpone the ADSL service any longer. After ADSL came on the market, it grew very fast. By the end of 2000, ADSL penetration surpassed that of cable modem. There were four main reasons for this: (1) The NII established a penetration goal in July 2000 to reach three million users in three years; (2) the government opened up three fixed networks in March 2000, all of which subsequently provided ADSL service; (3) the residential demand for broadband steadily increased; and (4) many ISPs started to provide ADSL services.

Since the competition within the broadband market has become increasingly fierce, the cable modem providers have hesitated to invest more money to upgrade their one-way

infrastructure to a two-way infrastructure. The situation resembles that of the chicken and the egg. If the cable modem providers do not upgrade their infrastructure, the subscribers will lose patience and might convert to ADSL services. A one-way cable modem is not only slow but also costs more, because the subscribers still have to pay the circuit fees. GigaMedia (owned by one of the MSOs) decided to provide ADSL service in addition to cable modem service in March 2001.

At present, Eastern Multimedia Co., Ltd. (EMC) under the Eastern Multimedia Group (EMG) and GigaMedia under the Koos' Group are the two MSOs providing broadband network services via cable modem. EMC has 170,000 cable modem subscribers, while GigaMedia has 80,000 cable modem subscribers. EMC has transferred all of its cable modem business to Eastern Broadband Telecom (EBT). It rents its hybrid fiber coaxial (HFC) circuit to EBT.

The incumbent CHT's HiNet has the largest share of the ADSL market (84.2%), with Seednet being number two in terms of ADSL service providers (5.5%). The three new fixed networks together have only a 3% share of the ADSL market (TWNIC 2003).

In July 2003, there were 3.51 million households using the Internet, representing a 54.4% penetration, and 2.5 million households using broadband, or 38.9% of the HH population (TWNIC 2003). 2.2 million households subscribe to ADSL, while 250,000 subscribe to cable modem services (FIND 2003). The DSL penetration in Taiwan is now the second highest in the world, being surpassed only by South Korea (Johnson and Butt 2003).

Table 1. Top Ten Countries in terms of DSL Penetration

	March 2003		June 2002		January 2002	
	rank	%	rank	%	rank	%
South Korea	1	14.1	1	12.1	1	11.0
Taiwan	2	9.7	2	6.3	3	4.8
Hong Kong	3	8.7	3	5.7	2	5.6
Denmark	4	N/A	4	4.4	5	2.9
Canada	5	N/A	5	4.3	4	3.7
Japan	6	N/A	9	2.6	-	1.2
Belgium	7	N/A	6	3.9	6	2.8
Sweden	8	N/A	8	3.0	8	2.2
Finland	9	N/A	10	2.3	9	1.7
Germany	10	N/A	7	3.1	7	2.2

(Source: Johnson and Butt 2003)

Key Factors Contributing to Broadband Deployment

When DSL penetration in South Korea became the highest in the world, a great number of policy-makers, industrialists and scholars wanted to find out what the key success factors were. Now that DSL penetration in Taiwan has become the second highest in the world, is it also possible to summarize the key success factors? Strictly speaking, Taiwan cannot be considered to have been successful, for it still has some barriers to broadband deployment. Nevertheless, we can at this moment identify the factors that contributed to the rapid deployment of broadband in Taiwan, namely, the broadband policy, market competition, and consumers' demand.

Broadband Policy in Taiwan

With regard to broadband policy, six measures are regarded as having helped promote the deployment of the broadband network (Chien 2003; Kao 2003), as follows:

1. Telecommunications Liberalization. The process of telecommunications liberalization in Taiwan can be shown to consist of four stages (Chien 2003; Hsieh 2003):

(a) First stage (1987-1995): Opening up customer premises equipment (CPE) and value-added services.

(b) Second stage (1996-1998): Revising the Telecommunications Law and making DGT solely a governing agency and CHT a company that is heading toward privatization, and opening up the mobile and satellite communications markets.

(c) Third stage (1999-2000): Opening up fixed networks and international cable leasing.

(d) Fourth stage (July 2001-2003): Opening up international simple resale (ISR) and the 3G mobile phone market.

The ROC government propagated two major Telecommunications Liberalization White Papers to liberalize the telecommunications industry (Kao 2003). The first one was released in 1987, and was aimed at providing a fair and competitive environment, promoting technological progress, improving industrial efficiency, providing high-quality, diverse, and cheaper telecommunications services, and triggering economic development. The second Telecommunications Liberalization White Paper was propagated in 2002, and was aimed at constructing an international telecommunications environment, promoting universal service, improving the digital divide, promoting competition, providing creative and high-quality

telecommunications services, and helping the development of the telecommunications industry (Chien 2002; Hsieh 2003).

2. Revising the Telecommunications Law. The Telecommunications Law was first introduced in 1958, and was later revised in 1977, 1996, 1998, and 1999. The significance of the 1996 version was that it separated the DGT from the CHT, meaning that the DGT would become a pure governing agency and would not manage CHT anymore. CHT has since been ordered to become privatized. In 1999, the law was revised significantly to cope with the new telecommunications environment. For example, the foreign ownership restrictions were relaxed in order to encourage foreign investment. For Type I service, the direct foreign ownership ceiling was raised from 20% to 49%; while the indirect foreign ownership ceiling was raised to 60%.

In addition, network interconnections constituted an important measure that was stipulated in the 1999 law. The revised Telecommunications Law asked the dominant player CHT to rent its local loop to its competitors so that the consumers would have the chance to choose the new fixed networks.

3. Encouraging competition. The Telecommunications Liberalization White Paper and the Revised Telecommunications Law emphasized competition by opening up the telecommunications market and applying asymmetrical regulations such as network interconnections and unbundling that were imposed on the dominant player CHT.

4. Public land and buildings. The government also gave public land and buildings priority in order to establish the needed conduit infrastructure. It revised the rules regarding the installation of telecommunications facilities both inside and outside residential buildings in December 2001. It assured consumers that they had the right to choose a local telephone company. If Type I telecommunication services needed to pass through public or private land or buildings, or cable needed to be placed underground, the central and local governments were required to provide assistance. The application process was also shortened.

5. Assistance in providing access to the right of way. The new fixed networks still have problems when it comes to applying for the right of way from local governments. Therefore, the central government has formulated regulations regarding conduit sharing that the local government should adopt.

6. Set deployment goal. The "Challenge 2008" National Development Plan released in 2002 lists ten projects. One of them involves setting a broadband deployment goal, whereby there are to be six million broadband household subscribers by the end of 2007. The "e-Taiwan" project launched at the end of 2001 has also been incorporated into it. Other goals included (1) 50% of the population using the Internet; (2) 70% of Internet subscribers using broadband; (3) a national backbone capacity of 1,250 Gbps; (4) an international backbone capacity of 250 Gbps; (5) fiber-to-the-curb (FTTC) penetration reaching 95%; (6) striving for next-generation broadband networks such as IPv6 and wireless LAN; and (7) allocating a NT\$10.7 billion (US\$0.3 billion) budget over six years to develop digital content industries (CEPD 2002).

Market Competition and Broadband Strategies

CHT is the dominant fixed network in Taiwan. Although the government has been trying to privatize CHT, it is not yet completely privatized. Its subsidiary HiNet provides ADSL service to both residents and the business sector, and dominates the DSL market because of a last-mile benefit and its former chairman Mao Chih-Kuo's management agenda. Before Mao Chih-Kuo came to CHT, he was the Deputy Minister of the Ministry of Transportation and Communications (MOTC). In that capacity, he had the opportunity to become well acquainted with the practices of the telecommunications industry. Realizing that the average revenue per user (ARPU) in the case of ADSL was higher than that in the case of local phone calls, he asked CHT's management team to focus more on HiNet's ADSL deployment and marketing. He set a goal to reach one million ADSL subscribers in 2001 and two million in 2002. He almost reached his goal (Chen, Y. 2003), for there were over 2 million ADSL subscribers in January 2003. CHT's strategy has been to focus on branding and reliability, and so their ADSL price is higher than that of the ISPs.

Although HiNet dominates the local loop, there are many other broadband providers such as the new fixed networks, ISPs, and cable modem providers. The broadband strategies they adopt include promotion, bundling, advertisements, and price competition, etc. They often use price competition and promotion strategies in tandem. Seednet is an ISP whose strategy is to focus on good service and lower prices.

EBT is a new fixed network that also has a family affiliation with the cable MSO EMC. It provides both ADSL and cable modem services, has acquired an ISP named Asia Pacific Online (APOL) and is now the second largest provider in the

Taiwanese broadband market. It has 80,000 ADSL subscribers and 170,000 cable modem subscribers. It was the first company to provide 3 G mobile phone services, because it did not have 2 G mobile phone services, and it wanted to be in the 3 G market earlier than other providers. Its broadband strategy is to attract subscribers with its broadband content by offering on-line games and cheaper rates (Jeng 2003).

GigaMedia not only provides cable modem service but also provides ADSL service. Because it hesitated to invest in upgrading to two-way cable in 2001-2002, it lost some of its one-way cable modem subscribers. As of August 2003, it had only 80,000 cable modem subscribers. Perceiving the drawbacks of one-way cable modem service, it no longer promotes one-way cable. In relation to its cable modem service, it provides a wide variety of cheap packages such as 512 k-64k, 1.5-128K, and 6M-256K; for ADSL service, it provides 512 k-64k, and 1.5-384K. It provides DSL (512 k-512k) service as well (Chiang 2003).

Other new fixed networks, such as Taiwan Fixed Network (TFN) and SPARQ (New Century InfoCom Tech Co., Ltd.), have only 80,000 and 40,000 subscribers, respectively, because they are new entrants and they still have problems regarding access to the last mile. They prefer to promote broadband to small and medium businesses and also Hi-building. Other ISPs such as Seednet and SoNet also promote ADSL actively. For instance, SoNet encouraged HiNet subscribers to switch to its service with gifts such as computers or digital cameras.

A survey conducted in July 2003 indicated that the reasons for choosing broadband include fast speed (26.73%), cheaper price (20.03%), and safety and stability (18.61%) (TWNIC 2003). In fact, most households subscribe to 512K-64K speed, their main considerations being price and stability. Younger people tend to give more consideration to price than older people. The broadband providers know how to target different people by providing different packages and bundling strategies (Liu and Chen 2002).

In summation, the ADSL service area covers the whole country, while cable modem providers have designated service areas and thus have limited coverage. Additionally, people have more choices among ADSL providers. They can choose from four fixed networks as well as other ISPs. If people want to subscribe to cable modem, their choices are very limited however, because there are only one or two cable TV operators in most cable TV designated service areas. Since CHT used to be the only telecommunications company providing local and long distance phone calls, people are more familiar with CHT

than with the cable operators. Although CHT used to monopolize the telecommunications market, people had fewer complaints regarding telephone companies than the cable operators. There are only two cable modem providers, and some of their service areas are not fully two-way deployed. One-way cable modem subscribers have to pay the circuit fee. These subscribers are both time-sensitive and price-sensitive. When they cannot accept their phone bills, they tend to quickly switch to ADSL service. It is obvious that the fixed networks have more financial resources, but interconnection for the new entrants takes time.

Table 2. Comparison of Cable Modem and ADSL Services

Cable modem	ADSL
Designated service area, limited coverage	Nationwide service area
Less choice	More choices
Not fully two-way	Chunghwa Telecom (HiNet) dominates last mile.
One-way cable modem subscribers have to pay for the circuit fee	Interconnection takes time
Negative image	Better image
Less financial resources	More financial resources
	HiNet's top agenda: network effect

Consumer Demand

The following discussion is based mainly on two surveys conducted in 2002 and 2003. One was conducted via the Internet by the author between March 12 and 25, 2002 (Liu and Chen 2002). Eighteen websites helped put the questionnaires on their websites. A total of 3,110 replied as cable modem users, and 12,229 replied as ADSL users. The other survey was conducted via telephone by TWNIC in July 2003. There were a total of 2,366 broadband respondents (TWNIC 2003).

The Broadband Demographic Profile

According to the surveys, men (53%) use broadband more than women (46%), and those people between the ages of 16-20 and 21-25 tend to use broadband more than people of other ages (TWNIC 2003). The broadband users' educational level is high. More than 37% already have a college degree and more than 6% have been to graduate school. Almost half of the users are from middle class families. As for occupation, more than 30% are students, followed by information industry workers and manufacturing industry workers (Liu and Chen 2002). ADSL users tend to have more years of experience on the

Internet than Cable modem users. More than 92% of the users have dial-up experience. In other words, 7-8% broadband users are new users of the Internet (Liu and Chen 2002).

Broadband Users' Demand

Why do people in Taiwan subscribe to broadband? What is the consumer's demand for broadband? The broadband users replied that the reasons why they subscribed to cable modem or ADSL included the providers' speed, promotion, and price. Cable modem users were also influenced by having cable systems at home. ADSL users also considered the stable connection of ADSL.

In Taiwan, the local phone fee does not consist of a flat rate, and people are charged for the time they use. Therefore, it is very expensive to use dial-up or one-way cable modem for a long period of time. One-way cable modem subscribers are time-sensitive and price-sensitive. When they no longer appreciate the speed of dial-up, they will be easily attracted by the promotion of broadband.

Table 3. Reasons for Subscribing to Cable Modem or ADSL

	Cable Modem N=3,110	%	ADSL N=12,229	%
1	Fast Speed	68.0	Fast Speed	73.2
2	Promotion	46.7	Promotion	44.4
3	Price	37.7	Stable Connection	36.0
4	Has Cable TV	29.2	Price	30.0

Source: Liu et al. (2003)

What do people do with broadband? Their main purposes for using broadband are as follows:

Table 4. The Main Purposes for using Broadband

Purpose	N=15,339	%
E-mail		82.9
Search for information		50.3
Download software		39.1
On-line games		21.5
Download audio and video files		15.2

Source: Liu et al. (2003)

It is important to realize that the broadband users do not utilize the characteristics of broadband very well, because they do not emphasize the use of on-line games and download audio and video files. The broadband users replied that

broadband was very helpful for downloading data (73.7%), for e-mail (45.1%), and for searching for information (27.3%). Downloading data was the most obvious one.

The websites that Taiwanese broadband users visited the most were portals (74.9%), software downloads (30.6%), and search engines (20.6%). As a matter of fact, most of the portals today provide the functions of search engines. That is why so many users visit portal sites.

Problems Encountered by Broadband Users

The broadband users still confronted some problems. The problems they encountered most were traffic congestion during peak hours, with slow speeds, and web security. Because cable modem users have to share the cable modem capacity in the same hub with other users, the chances of their being faced with traffic congestion and slower speeds are higher than for ADSL users. Theoretically speaking, the ADSL infrastructure is more secure than that of the cable modem. However, it seems that ADSL users are more worried about web security than cable modem users.

Table 5. Problems Encountered by Broadband Users

	Cable Modem N=3,110	%	ADSL N=12,229	%
1	Traffic Congestion during peak hours	46	Traffic Congestion during peak hours	39.2
2	Speed slows down	32	Speed slows down	29.0
3	Web security	23	Web security	25.2

Source: Liu et al. (2003)

As for the reasons why some dial-up users have not adopted broadband, the answers are: no demand (39.76%), no time to use it (29.63%), and it costs too much (21.47%) (TWNIC 2003).

Broadband Content

During the first stage of broadband deployment, fast speed was important to the wide deployment of broadband. At that time, the broadband operators provided many promotions regarding speed and lowered their prices to attract users. During the first quarter of 2003, the growth of broadband slowed significantly, and therefore the content of broadband was considered to be the next important driving force.

Hi-channel is a popular content aggregator. Owned by CHT and Elta, its media data base acts as a platform for all of the contents. It has 160 channels and 86 partners, including terrestrial channels, cable channels, and other movie channels. Its business model is to split the revenues with the content

providers on the basis of a 3:2:5 ratio (CHT, Elta, content providers). CHT is responsible for the video server, storage, bandwidth, and billing; Elta is responsible for aggregating the content and digitizing the content; and the ICP is required to provide the content with the copyright. Hi-channel has started to break even since January 2003 (Chen, S. 2003).

The fixed networks and the cable modem operators each have their own websites. They all provide content, but are not as attractive as Hi-channel. Hi-channel is an open platform and has the advantage of CHT's last mile and branding. Thus, many content providers are willing to come to this platform because of the network effect.

Although CHT owns half of the shares of Hi-channel, it would also like to operate a content platform by itself. It previously made plans to provide Multimedia on Demand (MOD), which was to provide content to subscribers via their own lines by adding a set-up box. However, the cable operators were afraid of the competition that would follow, so they complained to the DGT and the Government Information Office (GIO). They argued that if cable operators wanted to provide telecommunications services, they needed to apply for a license from the DGT. They questioned why CHT did not have to apply for a cable franchise from the GIO if they wanted to provide MOD service.

In order to encourage new forms of entertainment, the Technology & Information Committee of the Legislative Yuan instructed the GIO to examine CHT's MOD proposal within two months. However, if CHT's MOD wanted to operate on an experimental basis, its scope of operation had to be limited. It was restricted to 60,000 households and could only operate north of Hsinchu. Seeing the potential threat from the MOD, the GIO is now considering allowing the cable operators to expand their service areas. This means that the fifty-one designated service areas might be merged to become sixteen or even four areas. As of August 2003, the CHT's MOD application was still pending. The GIO has not yet approved the application (Yen 2003).

Obstacles to Broadband Development

The DSL providers are often confronted with two major problems: (1) lack of the last mile; and (2) local government attitudes. CHT's HiNet accounts for more than 80% of the DSL market share, while the other three fixed networks only have 3% of the DSL market (TWNIC 2003). The major reason for this is that the new fixed networks lack the last mile. There have been many disputes between CHT and the new fixed

networks. Even though the revised Telecommunications Law stipulates that the dominant CHT has to provide "network interconnection" and to lease its last mile to the new fixed networks, CHT has been trying to postpone renting its local loop. CHT's excuse is that it has to buy new equipment and upgrade its facilities in order to provide network interconnection (Chen, Y. 2003). Although CHT is to be privatized, it is still state-owned, and its budget has to be approved by the Legislative Yuan. For this reason, it takes time to upgrade its facilities. The governing agency (DGT) has been making a lot of efforts to arbitrate between CHT and the new fixed networks, but the contract disputes over rental fees, termination terms and maintenance responsibility have not yet been resolved (Jeng 2003). Therefore, the three fixed networks have less than 1% of the local phone service. Most of the new fixed networks still have to use the HiNet local loop when they provide ADSL service.

The second obstacle is that local governments often ask the new fixed networks to help the local interests if they want to deploy lines and engage in construction locally. The new fixed networks need to apply for licenses or documents from the local government if they wish to dig roads or deploy lines either on the ground or underground. If they do not "contribute" something to the local government, or local interests, they might be confronted with difficulties. Seeing this obstacle, the central government has instructed the local governments to help the new fixed networks deploy faster.

The cable modem providers are often confronted with four major problems: (1) the economies of scale are too small; (2) the service area is restricted to its franchise area; (3) upgrading to 2-way cable modems is expensive; and (4) the industry's image is more negative. First, the designated service areas for cable television in Taiwan consist of 51 areas. Each cable operator is limited to operating in its franchise area. Since Taiwan covers only 36,000 square kilometers and the population is only 22.5 million, the economies of scale to be achieved in cable television are very small. The same applies to the cable modem operators.

Second, the cable modem service is provided by its MSO. Since the cable television service area is restricted to its franchise area, these service providers will usually not serve cable modem to the people who do not subscribe to their cable systems, because they will be confronted with too many difficulties related to monopoly, efficiency, interconnection, etc. (Chiang 2003). Third, upgrading to a 2-way cable modem is expensive. Since GigaMedia hesitated to invest money in

order to upgrade to a 2-way cable modem, some of its one-way cable modem subscribers switched to other services. Therefore, it is very difficult to keep the one-way cable modem subscribers. Fourth, cable operators used to have a negative image, because they started to operate before the government granted them franchises. They were regarded as illegal operators before 1993 when the Cable Television Law was passed. In addition, there were many disputes between cable operators and cable channels regarding the program loyalty fees. The subscribers do not feel very secure in subscribing to cable modem because of the negative past records of cable operators.

Solutions Proposed by the Government and the Broadband Industry

The biggest obstacle to broadband deployment is that the new fixed networks do not have enough time or budget to build the local loop throughout the whole country. Eighty-five percent of the local loop of the new fixed networks is rented from HiNet. In order to solve the problems arising from lacking a local loop, the government has held many meetings with industry representatives. They finally came up with an idea which was to allocate NT\$60 billion (US\$1.71 billion) to build the local loop and to allow the local governments to maintain the facilities and rent them to the private fixed networks. In this case, the local government can collect rents and have more incentives to help the fixed networks. Furthermore, the new fixed networks will not have to wait to negotiate with CHT to get the local loop, for they can rent it from the local government directly (Jeng 2003). They think that this is a more effective means of encouraging competition. However, the above proposal is only a suggestion; it is not mature yet. In order to fulfill the plan, the Executive Yuan has to draft a law and lobby the legislators to pass the law. Otherwise, it remains only an idea as opposed to being a policy.

Believing that "content is king," the government has also propagated its digital content policy. It developed a sequence of digital content training programs to train the content specialists. In addition, in April 2003, the Executive Yuan decided to establish a special office to promote and direct the digital content industry. The office has six divisions including software, telecommunications application, digital learning, video, animation, and games. The government and the broadband industry hope that the content providers can develop more killer applications of broadband content, which can act as an impetus for additional broadband subscription and deployment.

CONCLUSION

There are many factors behind the rapid broadband deployment in Taiwan, including government policy, industry promotion and competition, and the demands of consumers. The consumers are interested in fast speeds and more bandwidth, but are also very concerned about the price. If the prices of broadband services offered by the different providers do not differ too much, the consumers will be more concerned about the branding and stability of the providers. Since the dominant CHT enjoys 80% of the local loop, the new fixed networks and other ISPs cannot compete with CHT's HiNet in the broadband market on an equal footing. Therefore, the DGT should be very firm with regard to executing the interconnection policy stipulated in the Telecommunications Law. To have six million household broadband subscribers by the end of 2007 is only a dream, because it is impossible to achieve a 93% household broadband penetration. The most practical and effective way to solve the interconnection problem is to force CHT to rent its local loop to the new fixed networks or else ask the government to build the local loop and rent it to the new fixed networks. Meanwhile, it is also important to develop digital and broadband content. This might serve as a driving force for broadband penetration. However, most surveys indicate that the consumers are not ready to pay for the broadband content (Liu and Chen 2002; TWNIC 2003). There are two main reasons for this, the first being that the bandwidth is not broad enough to support the broadband content, and the second that the broadband content is not sufficiently appealing. Therefore, there is much scope for improvement on the part of the broadband providers, namely, through their providing more bandwidth to the broadband subscribers and developing more killer applications of the broadband content.

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