

## **A CASE STUDY OF PATENT DEVELOPMENT OF CHUNGHWA TELECOM IN THE DIGITAL CONVERGENCE ERA**

Po-Ching Lee\*

Assistant Professor

Graduate Institute of Intellectual Property Right,  
Shih Hsin University (Taiwan)

### **ABSTRACT**

This study investigates Chunghwa Telecom for its patent activities in Taiwan, China and the U.S. and explains its patent development with the business strategy in the digital convergence era. After the privatization of Chunghwa Telecom in 2005, facing the competition in the telecommunications market, three factors are considered by Chunghwa Telecom in patent filing strategy for innovation: 1) whether to remain as trade secrets, 2) commercialization of the technology, and 3) the scale of the commercialization, especially in the decision for foreign filings. The patent portfolios are established in the fields of data switching networks, secure communication, positioning, ticketing, and digital TV. The filing strategy is directionally aligned with the business development of Chunghwa Telecom in the vision of “multiple screens and a cloud” in digital convergence. Given the advantages in telecommunications technology, this study recommends that the patent portfolio of Chunghwa Telecom can be enhanced with more innovations in interactive services cross devices in the digital convergence era.

Keywords: Digital convergence, telecom, patent, Chunghwa Telecom

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## I. Introduction

Digital convergence, in its simplest form, means the union of the functions of the computer, telephone and television, thus representing a massive reorganization of businesses with a value of a trillion dollars.<sup>1</sup> A unification of such scale alters the positioning and core innovation for corporations in the media and communications industries.<sup>2</sup> The development of digital convergence has caused structure changes in the media and communications markets in Taiwan.<sup>3</sup> For example, the UDN Group, one of the top news groups, has become a cross-channel and cross-device content service provider; the Want Want China Times Group has stepped from news business and TV programs into the operation of cable TV system.<sup>4</sup> On the other hand, Taiwanese telecom groups have also developed their strategies for digital convergence. For example, Chunghwa Telecom,<sup>5</sup> the largest telecom company in Taiwan, has expanded its services from telecommunications into interactive multimedia.

Since patents are a critical factor in the technological and industrial development process as well as corporate competitiveness,<sup>6</sup> through patent

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<sup>1</sup> David B. Yoffie, *CHESS and Competing in the Aging of Digital Convergence*, in *COMPETING IN THE AGE OF DIGITAL CONVERGENCE* 1, 3-4 (David B. Yoffie ed. 1997).

<sup>2</sup> Po-Ching Lee, *Empirical Study on the Digital Convergence Strategy and Patent Activity of Taiwanese Media Groups*, 1 NTUT J. of INTELL. PROP. L. & MGMT. 121 (2012).

<sup>3</sup> See *id.* See also Mei-Ching Chen & Niann-Chung Tsai, *The Study of the Transition of Taiwan Media Group's Value Net under Digital Media Convergence*, in *CONVERGENCE IN MEDIA MARKETS*, INTERNATIONAL TELECOMMUNICATIONS SOCIETY ASIA-PACIFIC REGIONAL CONFERENCE, Taipei (International Telecommunications Society 2011).

<sup>4</sup> See Lee, *supra* note 3.

<sup>5</sup> See Chunghwa Telecom Co., Ltd., <http://www.cht.com.tw/en/> (last visited Dec. 10, 2012).

<sup>6</sup> See e.g., Zvi Griliches, *Patent Statistics as Economic Indicators: A Survey*, 8 JOURNAL OF ECONOMIC LITERATURE 1661, 1661-707 (1990), available at <http://www.nber.org/chapters/c8351>; Zhen Deng, Baruch Lev & Francis Narin, *Science & Technology as Predictors of Stock Performance*, 55(3) FINANCIAL ANALYSTS JOURNAL 20, 20-32 (1999); Holer Ernst, *Patent Information for Strategic Technology Management*, 25 WORLD PATENT INFORMATION 233, 233-242 (2003); Po-Ching Lee & Roger Kang, *Cong IC Zhi Zao Ye Zhi Zhuan Li Zhi Biao Tan Qi Ye Chuang Xin Jing Zheng Li* [從 IC 製造業之專利指標談企業創新競爭力], 208 ACCOUNTING RESEARCH MONTHLY 67, 67-72 (2003) (in Chinese); Po-Ching Lee & Roger Kang, *Ru He Yun Yong Zui You Xiao Lu De Zhi Hui Jin Kuang-Liao Jie Zhuan Li Jia Zhi Chuang Zao Qi Ye Li Ji* [如何運用最有效率的智慧金礦-瞭解專利價值創造企業利基], 204 ACCOUNTING RESEARCH MONTHLY 85, 85-92 (2002) (in Chinese); Chun-Chieh Wang, Dar-Zen Chen & Mu-Hsuan Huang, *Technological Innovative Capacity of Taiwan and South Korea from 1987-2006-A Perspective of Patents*, 5(2) NCCU INTELLECTUAL PROPERTY REVIEW 31, 31-51 (2007) (in Chinese); Mu-Jun Wang [王睦鈞], *Tou Shi Tai Wan Zi Tong Xun Ji Shu Guo Jia Jing Zheng Li* [透視臺灣資訊技術國家競爭力], 32(7) TAIWAN ECONOMIC RESEARCH MONTHLY 43 43-52 (2009) (in Chinese).

analysis, this study investigates how Chunghwa Telecom has committed in innovation. Relying on empirical inquiries, including in-depth interviews with high-level managers<sup>7</sup> and patent analysis,<sup>8</sup> this study also intends to explain the patent activity in relation to the business strategy of Chunghwa Telecom in its vision of digital convergence.

## **II. Business Development of Chunghwa Telecom**

### **A. From Voice/Data Transmission to Video Service**

The history of Chunghwa Telecom is inextricably bound to the telecommunications development of Taiwan. The Directorate General of Telecommunications (DGT), Ministry of Transportation and Communications, has been responsible for the provision of telecommunications services and administrative oversight since it was established in 1943. In 1996, according to the new laws and regulations,<sup>9</sup> the DGT was divided into two separate entities: one, the DGT, supervises administrative activities; and the other, namely Chunghwa Telecom, owned by the government, provides telecommunications services. In 2005, Chunghwa Telecom privatised by decreasing government's shares to less than 50%.

Refer to Figure 1, illustrating the positioning change and value network of Chunghwa Telecom in digital convergence.<sup>10</sup> Chunghwa Telecom originally provided data and voice services via fixed phone-line infrastructure. HiNet Internet service officially started in 1995; since then it remains as the number one ISP (Internet service provider).<sup>11</sup> Following the liberalization of telecommunications, Chunghwa Telecom also obtained the licenses related to mobile telecommunication network. Therefore, the telecommunications services of Chunghwa Telecom can be provided over

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<sup>7</sup> The research team of this project interviewed with Jia-Yng Guo [郭嘉陽], Assistant Engineer of Interactive Multimedia, Multimedia Department, Chunghwa Telecom, Taipei (Jan. 1, 2011) (in Chinese). The author interviewed with Jing-Ming Chen [陳鏡明], Managing Director of Multimedia Department, Chunghwa Telecom, Taipei (May 4, 2012) (in Chinese).

<sup>8</sup> See Lee, *supra* note 3, for detailed methodology.

<sup>9</sup> See Telecommunications Act § 30 (1996), Organizational of the Directorate General of Telecommunications, Ministry of Transportation and Communications Act (1996), abolished on July, 4, 2007, and Chunghwa Telecom Co., Ltd. Act (1996).

<sup>10</sup> This study uses a four-horizontal-segments model, 1) Content, 2) Platform, 3) Transmission, and 4) Terminal, for the value structure of the converged media environment suggested by Lee, *supra* note 3, to analyze the market expansion, positioning change, and value network for the telecom group in the digital convergence era.

<sup>11</sup> See HiNet Internet Service, *Company Profile*, [http://www.hinet.net/footer\\_aboutus.htm](http://www.hinet.net/footer_aboutus.htm) (last visited Dec. 10, 2012) (in Mandarin Chinese).

fixed-line and mobile telecommunications networks to the phones, computers and mobile phones of customers, as illustrated in Figure 1. In 2002, Taiwan government permitted fixed-line network service providers to offer IPTV (Internet protocol television). With the advantage of last-mile access to households, “MOD” (multimedia on demand) of Chunghwa Telecom was officially launched in 2004 to provide IP TV service and VOD (videos on demand) to household subscribers. Besides, to facilitate media services for MOD, Chunghwa Telecom was once a shareholder of ELTA,<sup>12</sup> a media provider, until 2003 when Chunghwa Telecom was forced to sell off its shares in ELTA because there was a campaign to drive government influence out of the media.<sup>13</sup> However, Chunghwa Telecom still maintains friendly relations with ELTA.

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<sup>12</sup> ELTA Technology Co., Ltd. was founded in 2000 and launched the first broadband media portal of HiNet, the Internet service provider under Chunghwa Telecom. *See* ELTA Technology Co., Ltd., *About Us*, [http://www.elta.com.tw/eng/about\\_1.php](http://www.elta.com.tw/eng/about_1.php) (last visited Dec. 10, 2012).

<sup>13</sup> There have been campaigns for political powers out of media in Taiwan. The legislative landmark was made on December 9, 2003; the Legislative Yuan passed amendments to the Broadcasting and Television Act, Cable Television Act, and Satellite Broadcasting Act, to prohibit the government, political parties, party affair personnel, appointed government officials, and elected public officials from investing in the broadcasting and television industries. *See* Public Television Service Foundation, *About PTS*, <http://web.pts.org.tw/~web02/ptsenglish/history.html> (last visited Dec. 10, 2012).

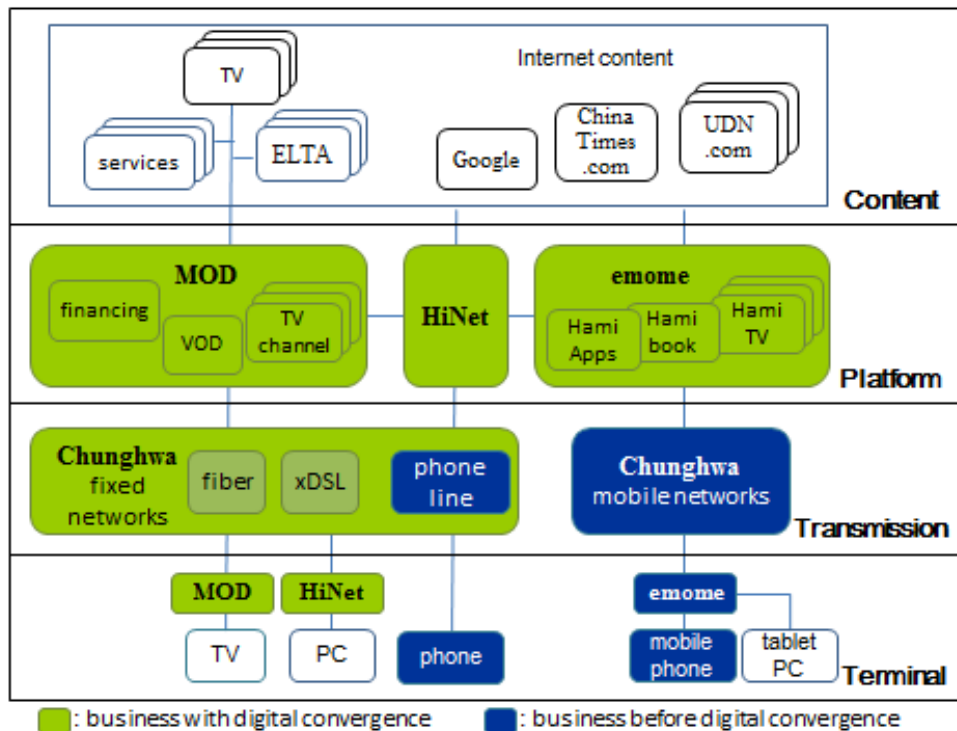


Figure 1: Positioning change and value network of Chunghwa Telecom in digital convergence.

The business of Chunghwa Telecom covers three main segments: 1) fixed network, 2) mobile communication, and 3) data communication services, for providing voice, private wire circuit, wireless, broadband access, intelligent network, virtual network, e-commerce, enterprises integration services, and other value-added services.<sup>14</sup> Furthermore, Chunghwa Telecom Laboratories,<sup>15</sup> a research and development institution of Chunghwa Telecom, focuses on the creation of innovative products and advanced information and communications technologies to meet the demands of the constantly evolving communications market.

## B. Converged and Interactive Content Services

Broadband and data streaming technologies enable the transmission of digital and interactive content through a bilateral network, xDSL or FTTx, the infrastructure owned by Chunghwa Telecom, as illustrated in Figure 1. Chunghwa Telecom's MOD aggregates television channels, VOD and other applications, e.g. karaoke, TV-based e-commerce, teletext, and financial

<sup>14</sup> See Chunghwa Telecom, <http://www.cht.com.tw>.

<sup>15</sup> See Chunghwa Telecom Laboratories, <http://www.chttl.com.tw>.

services, to appear on users' television via the MOD set-top box<sup>16</sup>.

MOD is a new media. We started testing this system in 2000 and officially get the permit on March 3, 2004. Since then, we have been defined MOD as a platform. Moreover, it is an open platform and welcome domestic [content] providers to get on this platform.....We tried to manifest the interactive characteristic of this multimedia.<sup>17</sup>

As described above, MOD is a converged content platform; MOD subscribers can enjoy broadcast TV channels, cablecast TV channels, and many other types of on-demand programs anytime. MOD household users can also pay their utility bills via MOD financial services. Following the advance of smart phones and increase of smart phone users, Chunghwa Telecom has expanded its content business of MOD on to the mobile services platform, namely “emome”, while rolling out Hami value-added services which target smartphone users, as illustrated in Figure 1. For example, Hami Bookstore offers an e-book service; Hami Apps enable subscribers to download a variety of applications and games; and Hami TV allows subscribers to watch TV programs on their mobile phones anytime and anywhere.<sup>18</sup>

### C. Challenge and Vision of “Multiple Screens and a Cloud”

If Chunghwa Telecom remains a content provider with a single platform, it will be hard pressed to compete for consumers' attention given all of the competition from domestic and foreign media in Taiwan's content market, such as Want-Want Media Group,<sup>19</sup> Fubon, Apple and Google. In the era of digital convergence, Chunghwa Telecom's core vision is to arrange their businesses according to the concept of “multiple screens and a cloud”, allowing customers to link to their computers, televisions or mobile phones through the communication cloud. The front-end of the converged content services is represented by an integrated platform, for example, the household users can receive services via MOD and the smart phone users can receive services via “emome” platform.

We look forward to making a breakthrough with a more agile business strategy and expanding our platform beyond TV to different devices to reach a broader customer base that can not only

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<sup>16</sup> See Chunghwa Telecom MOD, <http://mod.cht.com.tw/>.

<sup>17</sup> Interview with Chen, *supra* note 8.

<sup>18</sup> See Chunghwa Telecom emome, <http://hamiweb.emome.net/>.

<sup>19</sup> See Lee, *supra* note 3.

enjoy the content on TV offered by our platform but also through different devices.....Chunghwa Telecom will provide a very competitive cross-device platform, rather than just a product to replace cable TV.<sup>20</sup>

Actually, we spend a great deal of time thinking about what the environment will be like with multi-screens. Do consumers really need to see the exact same content on a TV, cell phone and PC? What kind of content will be so attractive that consumers will demand to see it across several devices? Or, do we need to develop different designs to fill the gap and what is the gap?<sup>21</sup>

With the vision of “multiple screens and a cloud”, there are many challenges in the digital content convergence and services integration of Chunghwa Telecom that must be overcome. For example, how to incorporate on-line content like YouTube into MOD? The first step is a license to obtain the desired content. The second step is the introduction of a revolutionary new platform to resolve technical issues, so that the users just need to upload the new platform and restart the set-top box without needing a replacement box, just like updating a new OS for a mobile phone. Third, the content being viewed via MOD also involves complicated legal regulations. Furthermore, faced with the dilemma of a growing complexity of services and interface limitations, how to develop a user-friendly interface for MOD is a problem pressing for a solution.

Chunghwa Telecom is committed to a strategy of supplying differentiated content ... Content will come from a wide range of providers, enabling Chunghwa Telecom to become a strong brand which channels all types of content to consumers.<sup>22</sup>

The MOD user environment and interface cannot be compared to the PC, since many functions must be integrated into a remote controller which is much more complicated than the simple control of TV volume and channel. There is a learning curve, since some time is needed to become familiar with the device, but we work very hard to streamline the user interface to reduce the number of clicks a user must make to reach the selected content.<sup>23</sup>

We have developed an application for an interface, so users can

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<sup>20</sup> Interview with Guo, *supra* note 8.

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> *Id.*

operate MOD through their iPhone or iPad. The user only needs to download a free application to turn their iPhone or iPad into an MOD remote control. All of the remote control functions are represented by an icon with a theme which makes it an intuitive interface for the end user.<sup>24</sup>

### III Patent Analysis

#### A. Patent Development beyond an Emerging Stage

Chunghwa Telecom has granted 896 patents in Taiwan, China and the United States till May, 2012, as shown in Table 1.<sup>25</sup> In addition, it has many patent applications still pending (data not shown in tables). Figure 2, 3, and 4 show the distributions of Chunghwa Telecom's patents in Taiwan, China, and the United States, respectively, each year by their filing years and issue years.<sup>26</sup> Chunghwa Telecom was granted its first patent in Taiwan in 1987. Nearly twelve years later, Chunghwa Telecom started filing patents in China, and the filling activity was growing from 1998 to 2004, but at low in the period between 2005 and 2006. The filing activity in the Unites States slightly increased from 2000 to 2004, but dropped in 2005 and 2006.

Table 1: The number of patents of Chunghwa Telecom issued in Taiwan, China and the United States (till May, 2012).

Patent Type	Taiwan patent	China patent	U.S. patent
<b>Invention</b>	498	44	24
<b>Utility model</b>	293	3	-
<b>Design</b>	34	0	0
<b>Total</b>	<b>825</b>	<b>47</b>	<b>24</b>

In Figure 2, by observing the number of patent granted each year, there are two trough periods in the overall increasing trend: one is the years between 1997 and 1999; the other is the years between 2006 and 2009. These may be traced back to two downward trends by observing the number of patents representing by their filing years: one is around 1996; the other is around 2005 and 2006. The year of 1996 was the time that Chunghwa Telecom split from the DGT to become a business entity; it may be explained

<sup>24</sup> *Id.*

<sup>25</sup> This research did not intend to include all of Chunghwa Telecom's patents granted in different countries. Chunghwa Telecom's patents granted in China and the Unites States were analyzed to study its foreign filing strategy.

<sup>26</sup> Those patent applications eventually not allowed are not included in Figures 1-3. Nevertheless, the filing trend of the granted patents may still indicate the trend of overall filing activities.

that most of resources and management attentions have been paid to the transition of the company.

The second downward trend of filing patents is around 2005 and 2006, the time that Chunghwa Telecom further transformed from a government-owned to private-owned company. There are two causes likely resulting in declining in patent filing activities in that period of time. First, as Taiwan liberate the telecom market since 1997 and then Chunghwa Telecom was not the solo telecom player in the market, given other career opportunities in the industry, in the transition period from government-owned to private-owned company there were some talents switching to other companies. The second cause, and the main one, is that since Chunghwa Telecom becomes private-owned, facing the competition in the telecommunications market, it adopted different guidelines in its patent management system to file patents. Therefore, an unstable growth of patent activities is resulted in the years around 2005 and 2006. These two reasons also contributed to the decrease in filing activities in China and the United States in the period between 2005 and 2006, shown in Figures 3 and 4.

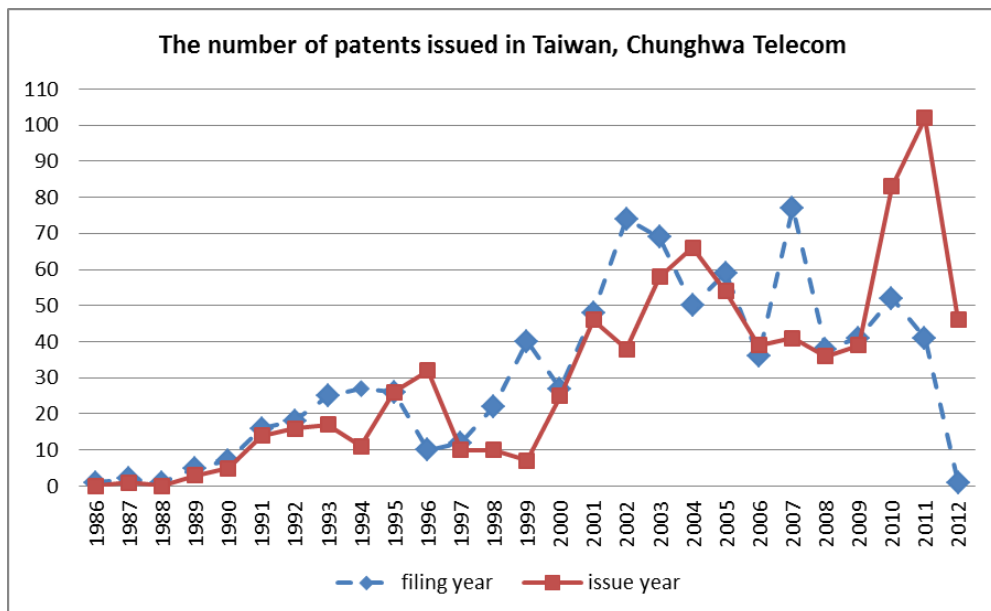


Figure 2: The distribution of Chunghwa Telecom's patents issued in Taiwan, analyzing and presenting by filing dates and issue dates (till May, 2012).

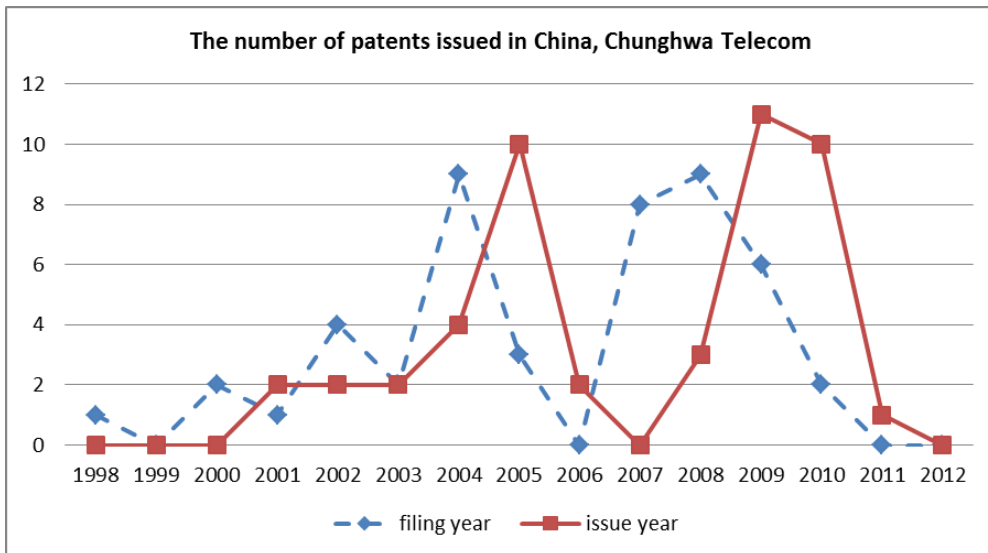


Figure 3: The distribution of Chunghwa Telecom's patents issued in China, analyzing and presenting by filing dates and issue dates (till May, 2012).

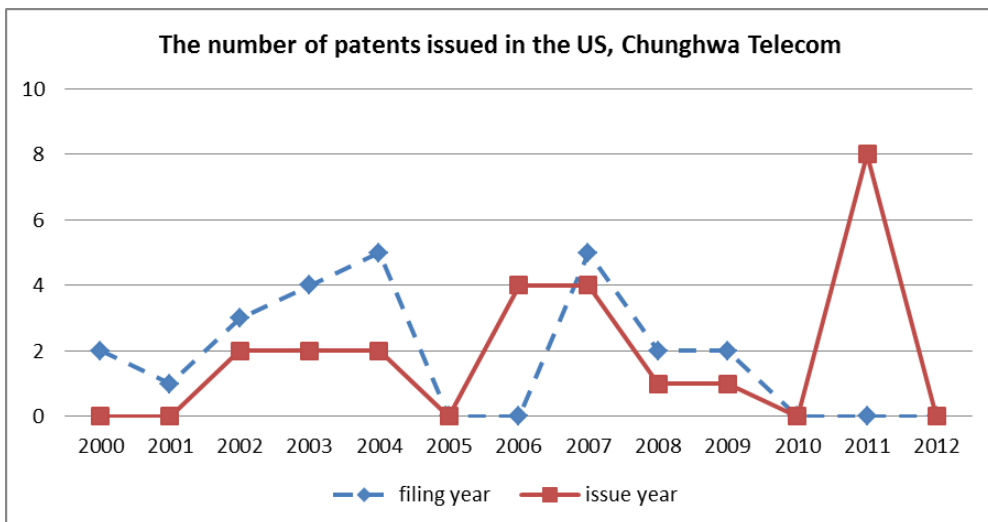


Figure 4: The distribution of Chunghwa Telecom's patents issued in the Unites States, analyzing and presenting by filing dates and issue dates (till May, 2012).

Many of Chunghwa Telecom's patents are co-owned with Chunghwa Telecom Laboratories. Since Chunghwa Telecom has become private-owned, Chunghwa Telecom Laboratories focuses on advanced technologies to empower Chunghwa Telecom staying in a leading role in the market. With

nearly 3.2 billion NT dollars of R&D investments each year,<sup>27</sup> it does not reflect in a rapid growth of patents in recent years. That is because many R&D achievements remain trade secrets, other than filing patents to disclose technological details.<sup>28</sup> In addition, only those R&D achievements with considerable business opportunities may be qualified to apply for patents.<sup>29</sup>

More than 80% of Chunghwa Telecom Laboratories' resources are contributed to the development and business of Chunghwa Telecom .... In early years, Chunghwa Telecom Laboratories seemed more emphasis on "research"; that was the role it should be. However, it is now part of the real-life business. For those [technologies] preferred being kept as trade secrets, it is better not to disclose to the public. Therefore, technologies will be evaluated to decide whether it is appropriate to file patents.<sup>30</sup>

Overall, the filing activity and the numbers of patent granted in Taiwan show increasing trends except the low around years 2005 and 2006. Chunghwa Telecom also has more than ten years experiences in foreign filings, although the quantity of patents is less than that in Taiwan. Considering the quantity of patent assets, increasing trend of patent activities and evaluation guidelines for patent filings, the patent development of Chunghwa Telecom have grown beyond the emerging stage.

## **B. Increasing Patent Activities in Data Switch, e-Commerce, Secure Communication, and Digital TV**

The International Patent Classification (IPC) of each patents<sup>31</sup> were analysed in order to investigate the trend as well as specific focus of Chunghwa Telecom's innovation. Figure 5 shows the important IPCs of Chunghwa Telecom's patents issued in Taiwan. To study the development of innovative activities of Chunghwa Telecom, IPCs at the third level of two groups of patents in Taiwan are analyzed by taking the year 2000 as a dividing line; one group are patents issued before 2000 and the other group are patents issued in and after 2000. Before 2000, the top three IPCs were:

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<sup>27</sup> See Chunghwa Telecom Laboratories, *About CHTTL*, [http://www.chttl.com.tw/web/ch/aboutus/aboutus\\_01.html](http://www.chttl.com.tw/web/ch/aboutus/aboutus_01.html) (last visited Dec. 10. 2012).

<sup>28</sup> Interview with Chen, *supra* note 8.

<sup>29</sup> *Id.*

<sup>30</sup> *Id.*

<sup>31</sup> Patents are systematically classified according to the areas of technology to which they pertain. The most common system is the International Patent Classification (IPC). See World Intellectual Property Organization [WIPO], International Patent Classification (IPC), <http://www.wipo.int/classifications/ipc/en/> (last visited Dec. 10. 2012).

H04L (transmission of digital information, e.g. telegraphic communication), H04M (telephonic communication), and G06F (electric digital data processing). Patent activities focused in telegraphic and telephonic communications before 2000 is in consistent with the positioning and business Chunghwa Telecom as a telecommunication carrier.

After 2000, the top three classifications mentioned above still maintained important. In addition, there are two noticeable IPCs, which were less important before: G06Q (data processing systems or methods, specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes; systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes, not otherwise provided for), and G07B (ticket-issuing apparatus; fare-registering apparatus; franking apparatus). G06Q is an IPC relating to data processing for doing business and e-commerce, is a so-called business method or e-commerce patent. G07B relates to the application apparatus or system for ticketing and fares. That is to say, in recent years, Chunghwa Telecom's research not only focuses on telegraphic and telephonic communications and digital data processing, but also extends to the fields of e-commerce and apparatus for specific application.

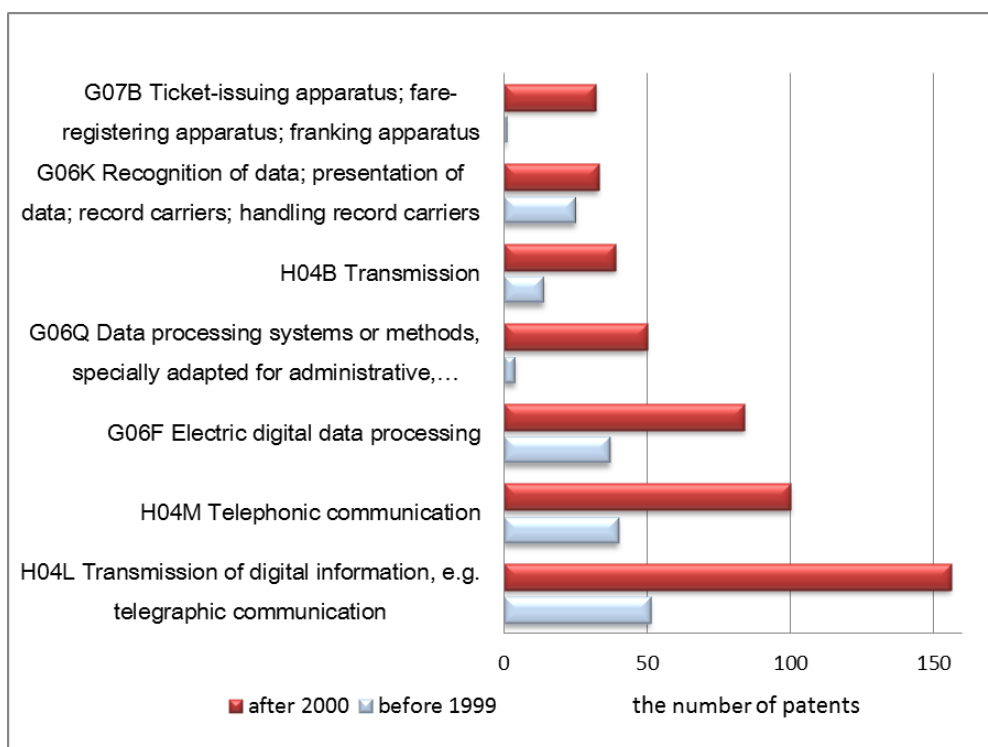


Figure 5: The important IPCs at the third level of Chunghwa Telecom's patents in Taiwan in different periods, representing the trend of innovation (till May, 2012).

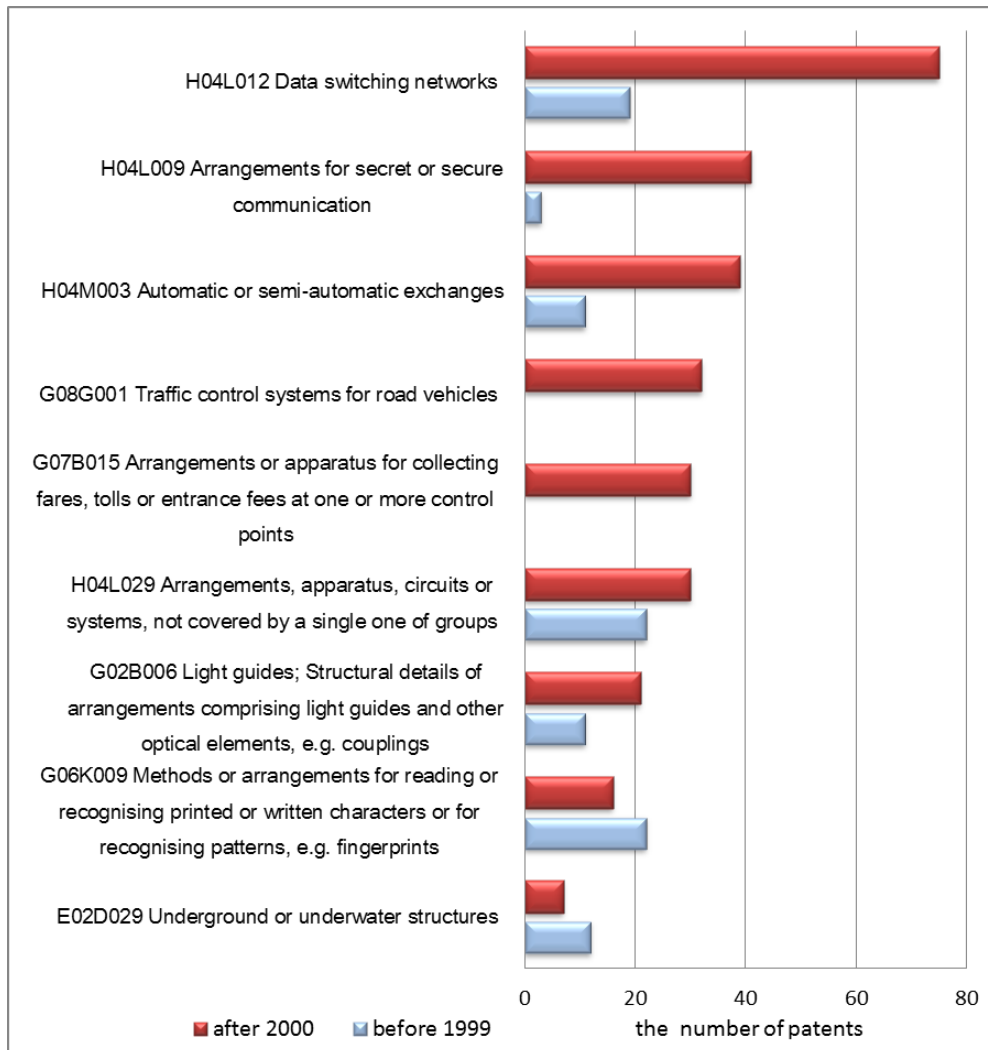


Figure 6: The important IPCs at the fourth level of Chunghwa Telecom's patents in Taiwan in different periods, representing the specific technology of innovation (till May, 2012).

More specifically, Figure 6 shows the top IPCs at the fourth level of two groups of patents; one group are patents issued before 2000 and the other group are patents issued in and after 2000. As demonstrated in Figure 6, the most important subclass after the year of 2000 is IPC H04L012 (data switch network), which also ranks the third IPC before 2000. It reveals that Chunghwa Telecom, as a telecommunications company, is strong in the technology of data switch network. A noticeable increase after 2000 is H04L009 (arrangements for secret or secure communication). Since Chunghwa Telecom's services become more interactive and diversified,

security and personal identification system hence become more important; patent portfolios in these areas therefore are established.

The other noticeable IPCs are G08G001 (traffic control systems for road vehicle) and G07B015 (arrangements or apparatus for collecting fares, tolls or entrance fees at one or more control points), both subclasses not shown in the top IPCs during the period before 2000. The above two subclasses reveal Chunghwa Telecom's recent research and development in the apparatus and application system applying communications technologies in positioning, identification, as well as ticketing. Specifically, some of these patents are related to e-motor vehicle and driver system and ticketing system, services provided by HiNet internet service by Chunghwa Telecom.

In addition, Table 2 lists 27 Taiwan patents related to digital TV and video transmission, highlighting the innovation and technological achievements of Chunghwa Telecom in set-up boxes and MOD systems. It is worthwhile to mention that the first digital-TV-related patent was filed in 1992<sup>32</sup> and then slowly built up the patent portfolio. In other words, Chunghwa Telecom started innovation in the field of digital-TV-related technology in 1990s, much earlier than the launch of MOD in 2003. Recent technological developments include set-up boxes resulting in many utility model patents after the year of 2006. The increased number of utility model patents in recent years also implies that Chunghwa Telecom intends to accumulate patent assets in a relatively shorter period of time after it became a private-owned company.<sup>33</sup>

Table 2: Taiwan patents of Chunghwa Telecom related to digital TV (till May, 2012)

	Patent No.	Title	IPC	Filing Date Issue Date
1	191908	Image communicating system	H04M011/00 H04N007/00	1992/06/30 1992/10/01
2	240837	Testing apparatus for video signal	H04N007/24 H04N017/00 G06T001/00	1993/04/21 1995/02/11
3	243035	Interactive video-on-demand device on telecommunications network	H04N007/10 H04L012/28	1994/04/20 1995/03/11

<sup>32</sup> Taiwan Patent No. 191908 (Image communicating system).

<sup>33</sup> Utility model does not require the substantive examination, therefore the prosecution time is shorter than that of the utility patent application and the allowing rate is higher.

4	231829	Optical distribution network architecture for distributed Video supplier	H04N007/10	1994/04/29 1994/10/01
5	292469	SBS noise reduction by spontaneous oscillation single-mode laser	H04N005/21	1995/07/26 1996/12/01
6	370332	Simulated multi-channel digital TV signal	H04N007/169	1998/06/22 1999/09/11
7	451590	Digital image law-enforcement monitoring system primarily using digital watermark to avoid editing and distorting	H04N007/16	1999/08/07 2001/08/21
8	451583	Automatic monitoring method and device of fiber cable TV transceiver	H04N017/00 H04N005/14	1999/10/05 2001/08/21
9	I220634	Wireless projection gateway system	H04N005/38	2003/03/24 2004/08/21
10	I286027	Integrated image-registration multiple lane free flow vehicle law enforcement system	H04N005/225	2003/09/10 2007/08/21
11	M24468 4	AV signal converting device applied in integrating image telephone and image monitoring system	H04N005/232 H04N007/18	2003/11/03 2004/09/21
12	I246321	Remote video-on-demand digital monitor system	H04N005/225	2004/01/28 2005/12/21
13	I242380	Digital image monitoring system for motion detection	H04N007/18 G06T007/20	2004/08/12 2005/10/21
14	I248310	Continuous image compression method	H04N007/24	2004/11/12 2006/01/21
15	I295539	Method for color	H04N007/26	2005/05/26

		image data compression and decompression		2008/04/01
16	I317584	Time measurement method for multimedia streaming packet	H04L012/26 H04L012/24 H04N007/24	2006/07/06 2009/11/21
17	M38267 4	Image monitoring system of integrated mobile communication device	H04N005/225	2006/09/28 2010/06/11
18	I346507	Interactive video on demand service	H04N007/173	2007/09/14 2011/08/01
19	I348294	System for providing and installing image monitoring	H04L012/26 H04N005/232	2008/02/25 2011/09/01
20	M37994 6	Internet protocol TV (IPTV) interactive advertising apparatus	H04N005/76	2009/08/31 2010/05/01
21	M38267 5	Video camera control device based on gesture recognition	H04N005/232	2010/02/09 2010/06/11
22	M39062 5	Device for changing boot-up screen of internet TV terminal device	H04N007/16	2010/04/23 2010/10/11
23	M39062 6	Media sharing device constructed under Internet Protocol television environment	H04N007/16	2010/04/26 2010/10/11
24	M41552 7	IPTV Interactive watching behavior Recording device	H04N007/00	2011/04/01 2011/11/01
25	M41628 3	Entrance machine image/video transmission system	H04N005/91 H04L012/56	2011/07/13 2011/11/11
26	M42454 9	Monitoring and recording system for road security checkpoint	G06K019/00 H04N005/232	2011/10/18 2012/03/11
27	M42860 8	Personal video recorder human interface on	H04N007/00	2011/12/29 2012/05/01

		IPTV platform		
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### **C. Foreign Patent Filings with Different Strategies**

Chunghwa Telecom's 47 patents in China relate to 27 IPCs at third level. 43% patents are classified under H04L (transmission of digital information, e.g. telegraphic communication). Other important IPCs include G06K (recognition of data; presentation of data; record carriers; handling record carriers), H04N (pictorial communication, e.g. television), G06F (electric digital data processing), and H01L (semiconductor devices). Chunghwa Telecom's patents in China are not limited to technology related to telegraph communication and data processing, but also include image communication technology.

Although starting relatively late in the United States, Chunghwa Telecom has 24 U.S. patents, related to 22 IPCs at third level. 30% patents are classified under H03F (amplifiers). Other important IPCs include H01S (devices using stimulated emission), and G05B (control or regulating systems in general; functional elements of such systems; monitoring or testing arrangements for such systems or elements).

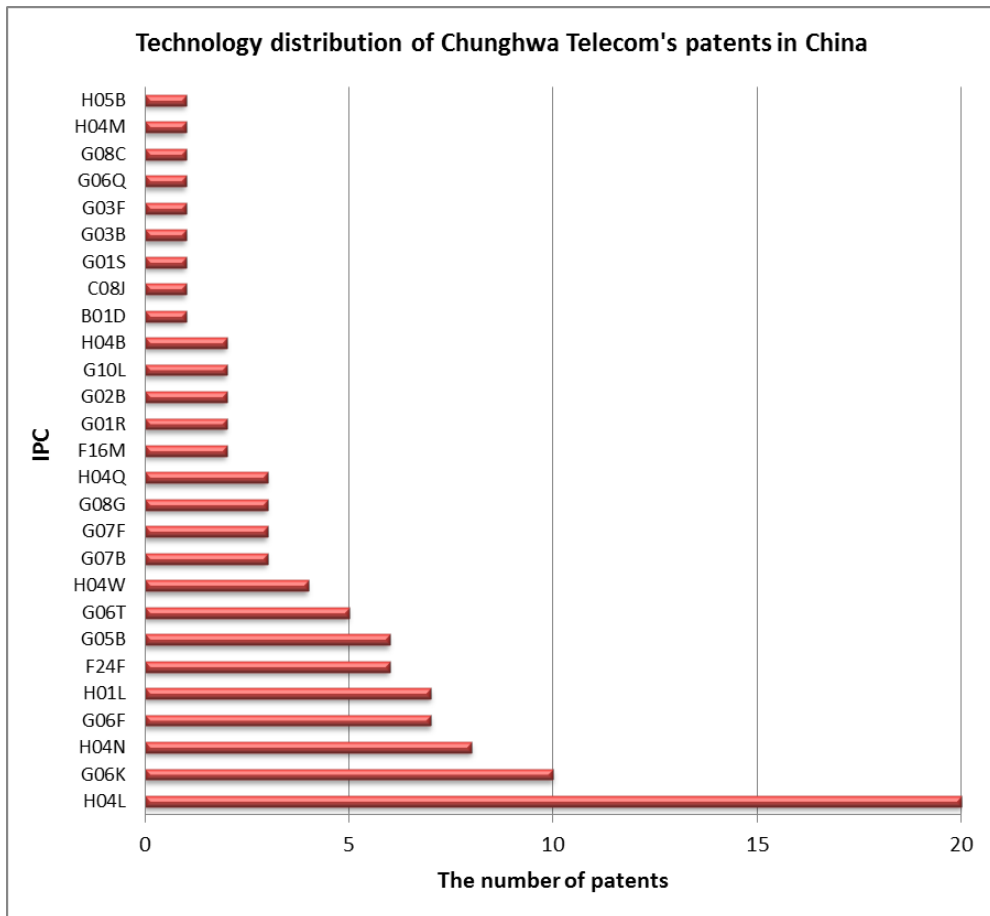


Figure 7: The technology distribution Chunghwa Telecom's patents in China according to the IPC at the third level (till May, 2012).

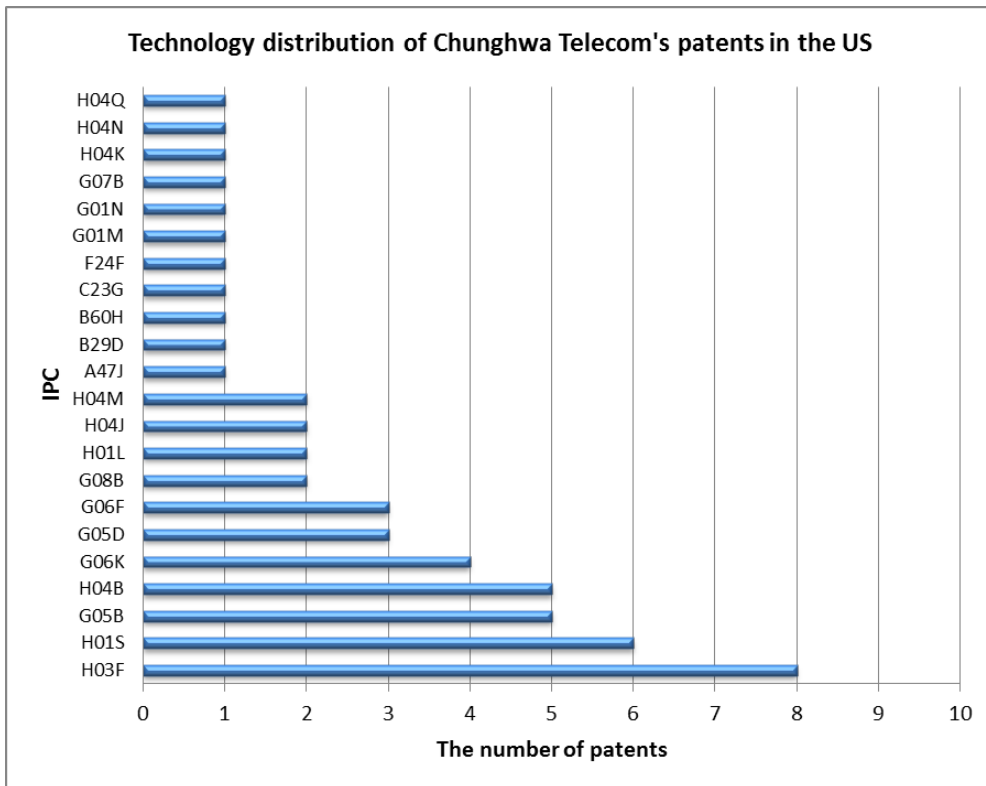


Figure 8: The technology distribution Chunghwa Telecom's patents in the United States according to the IPC at the third level (till May, 2012).

Compared with the technology distribution of Taiwanese patent activities after the year of 2000 (Figure 5), patent activities of Chunghwa Telecom in China (Figure 7) show two important IPCs which are the same as the top IPCs in Taiwan: H04L and G06F. Such similarity is not observed in comparing Taiwanese and U.S. patents. The patent portfolios in China and the United States are different. With a small quantity of patents, Chunghwa Telecom has expanded their U.S. patent portfolio into a diverse range of fields with no specific focus on application apparatuses or systems. It implies that taking market demand into account, the U.S. is not the focus market of Chunghwa Telecom. Chunghwa Telecom seems view U.S. patents as an indicator of R&D. On one hand, the application of fundamental or innovative research for patent is more important in the United States, since such technologies may have broader scope of utilities. On the other hand, those technologies with less effort in localization may be applied for patents in foreign countries.

#### IV. Conclusion

It is fair to say that the historical development of telecommunications in Taiwan makes Chunghwa Telecom a leading role in the market; MOD allows Chunghwa Telecom to step from the telecommunications into interactive multimedia service and to further realize digital convergence. In the integrated strategy of Chunghwa Telecom, the concept of “multiple screens and a cloud” is executed by providing MOD service on mobile phones, televisions, and computers for subscribers.

Since the telecommunications industry was a government monopoly in the past, Chunghwa Telecom viewed their patent portfolio as an indicator of performance or a defensive strategy. With Chunghwa Telecom laboratories, patent activities of Chunghwa Telecom grow steadily since 1986, except the transit period from the DGT to Chunghwa Telecom in 1996. After the privatization of Chunghwa Telecom in 2005, the patent filing strategy with the technological and business strategies can be summarized: First, facing the competition in the telecommunications market, the R&D focuses on the creation of innovative products and applications of telecommunications technology. Second, for these innovations, there are 3 factors to consider in patent filing strategy for innovation: 1) whether remaining as trade secrets a better option, 2) commercialization of the technology, and 3) the possible scale of the commercialization, especially in the decision for foreign filings.

Chunghwa Telecom has been granted a considerable number of patents with patent activities in China and the United States during the past ten years. Chunghwa Telecom's patent portfolios seem more specific focused in China than in the United States; it reveals the business priority of Chunghwa Telecom in the China market over the U.S. market. The majority of Chunghwa Telecom's patents relate to the technologies of telegraphic and telephonic communications, digital data processing, and data switching networks. The patent portfolios have been established in the fields of secure communication, positioning, ticketing, and digital TV, especially innovative apparatus and devices. These are directionally aligned with the business development of Chunghwa Telecom in the vision of “multiple screens and a cloud” in recent years. Given the number of e-commerce patents, the efforts toward service-type innovation are also observed. Considering the increasing trend in patent activities, the number of patents accumulated and the patent filing strategy with business consideration, the patent development of Chunghwa Telecom has grown beyond the emerging stage and gradually reached the growth stage.

It is recommended that the company with technical advantages in communications may employ their foundation in communications and data processing techniques to reinforce the patent portfolio in the area of service-type innovation, which will enable the company to carve out a niche in new markets and new services with the tide of digital convergence.

[2012] Vol. 1 NTUT J. of Intell. Prop. L. & Mgmt.

Chunghwa Telecom has great strengths in telecommunications technology and related patents. Given these advantages, the patent portfolio of Chunghwa Telecom can be enhanced with more innovations in interactive services cross devices to further develop cross-strait markets in the era of digital convergence.

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