

Synergies between Physical and Electronic Developments: A Case Study of Taipei City

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Abstract—It is claimed that a new style of urban planning and policy intertwined with ICT is emerging and urban planning and ICT policy are no longer considered as separate disciplines. The interactions between electronic spaces and urban spaces are so complex and uncertain that confront urban planners and policy makers with great challenges. However, the assumption about the relationship between ICT and urban planning is mainly based on North American and European experiences. In the light of empirical evidence from Taipei City, this paper shows that this new type of urban planning and policy intertwined with ICT has existed in Asian city for a decade as well. Based on these results, this paper further reviews how the Taipei City government implements this new type of urban ICT planning and the validity and realism of its underlying assumptions. Finally, it also explores the extent to which urban ICT planning could promote positive synergies between physical and electronic developments.

Keywords—ICT, Taipei City, Urban ICT Planning.

I. INTRODUCTION

SINCE the third industrial revolution in the mid-1970s, information and communication technology (ICT) has been rapidly applied in many ways. These applications have transformed the modes of industrial production, daily life, and the pattern of spatial behavior, and have redefined our understanding of space, changing from the former concept of “space of places” to the newer concept of “spaces of flows” [1]. Graham and Marvin also identified four key aspects—“physical and developmental synergies,” “substitution effects,” “generation effects,” and “enhancement effects”—to explain the complex and recursive interactions between cities and ICT [2]. Consequently, the conceptual shift and recursive interactions have confronted urban planners and policy makers with great challenges.

Since the mid-1990's, under the growing pressure of global urban competition and the constant evolution of ICTs, many developed countries have started to integrate ICT strategies into urban developments—such as the “TeleVillage” in the US, the Electronic Villiage Halls in the UK, and the “Telecities” network in the EU—in order to enhance urban competitiveness, solve existing urban issues, and offer better public services. Therefore, Graham and Marvin argued “new information technologies actually resonate with, and are bound up within, the active construction of urban places, rather than making them somehow redundant” and claimed that urban planning and ICT

policy are no longer considered as entirely separate disciplines [3].

Thus, a new style of urban planning and policy intertwined with ICT is emerging from which three main types can be identified: integrated transport and telecommunications strategies, city-level new media strategies, and information districts. The integrated transport and telecommunications strategies attempt “to shape and manage the relationships between physical movement and mobility through the applications of new media.” The city-level new media strategies utilize ICT, including physical infrastructure and electronic applications, to enhance community networking, local economic development, and public service delivery at the citywide level. The information districts are particular urban districts where “media infrastructure and services can be designed and managed, geared to sustaining and feeding back” [3].

However, the assumption about the relationship between ICT and urban planning is mainly based on North American and European experiences, so it is necessary to offer empirical evidence from Asian cities to verify it at worldwide scale. Especially in Asia, some developed countries have established a comprehensive framework of ICT applications at national level, such as iN2015 Singapore, u-JAPEN, u-KOREA, and U-Taiwan. They have further applied ICT to diverse areas, from commercial affairs to citizens' daily lives, and building experimental districts or cities where ICT would be utilized ubiquitously.

Among those advanced countries in terms of ICT development in Asia, Taiwan ranks among the top five Asian countries in the Networked Readiness Index 2007-2008 according to the Global Information Technology Report.¹ Not only is Taipei City the capital city of Taiwan, but since 1999 the Taipei City Government (TCG) has been a pioneer in putting together urban and ICT policies, initiating the Taipei CyberCity plan. The idea behind it was to complement the traditional geographical approach to urban policy and to govern Taipei City also with reference to innovative ideas about cyberspace. Its effort has been supported by several international institutes, including the Wireless Internet Institute (W2i), the Intelligent Community Forum (ICF), and the JiWire². Building on the

¹The Global Information Technology Report published by World Economic Forum to examine national ICT strengths and weaknesses and to evaluate progress.

²In 2006, Taipei City both won the e-Government Applications of Wireless Communities Best Practices Awards from W2i and the most Intelligent Community from the ICF. The Wi-Fi hotspot authority, JiWire, also announced Taipei City is the largest municipal Wi-Fi network in the world.

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groundwork of the Taipei CyberCity plan, the TCG is moving towards a new urban ICT plan, the UI-Taipei Plan. This new plan focuses on establishing an intelligent city which can offer comprehensive and ubiquitous public services through ICT applications, so it is a good time to review the outcomes of the first urban ICT plan.

In the light of empirical evidence from Taipei City, this paper demonstrates whether this new type of urban planning and policy intertwined with ICT claimed by Graham and Marvin actually exists in the Asian city as well. Then, based on these two arguments—the recursive interactions between cities and ICT, and the emerging integration of urban planning and ICT technologies—this paper reviews how urban planners and policy makers in Taipei City implement this new type of urban ICT planning and the validity and realism of its underlying assumptions. Further, it also explores the extent to which urban ICT planning could promote positive synergies between physical and electronic developments.

Hence, this paper is organized in three parts. The first part demonstrates the integration of ICT strategies and urban planning in Taipei City and tries to identify the emerging styles of urban ICT planning and to review the recursive interactions between ICT and city based on the arguments of Graham and Marvin. According to the result of the first part, the second part discusses some emerging issues that might need to be considered by the TCG when it moves toward the next urban ICT plan. The final part suggests possible ways to promote synergies between physical and electronic developments while integrating ICT into urban planning practices and strategies. Some potential directions of further study are also proposed in the end.

II. THE EMERGING STYLES OF URBAN ICT PLANNING

Castells noticed “the structure of the global economy is produced by the dynamics of competition between economic agents and between the locales” and indicated that the new industrial system is neither global nor local but “a new articulation of global and local dynamics” [1]. In this global context, some developed countries, particularly in Asia, have proposed comprehensive frameworks for integrating ICT into citizens’ daily lives in order to increase their global competitiveness and enhance their positions in the global economic network.

For example, in 2005 the Infocomm Development Authority of Singapore proposed a ten-year master plan, Intelligent Nation 2015 (iN2015), “enrich lives, enhance economic competitiveness and increase the growth of the infocomm industry” [4]. At the same time, the Ministry of Information and Communication of Korea established the “u-KOREA strategic planning group” to draw up a u-KOREA master plan, which has been published in 2006. The vision of the master plan is “transforming Korea into an advanced country by realizing world’s first u-Society based on world’s best u-Infrastructure” in five areas. That is: “Friendly Government”, “Intelligent Land”, “Regeneration Economy”, “Secure & Safe Social Environment”,

and “Tailored u-Life Services” [5].

However, Castells also addressed that “the global economy emerging from informational-based production and competition is characterized by its interdependence, its asymmetry, its regionalization, the increasing diversification within each region,” so it is clear that this competition does not have to be limited at national level due to open and networked characteristics of “network society” [1]. For decades, the idea of competitiveness has been applied to national, regional, and urban development frameworks, a trend that will continue.

Under the pressure of global urban competitiveness and the trend of informational city development, in 1999 the TCG decided to initiate the Taipei CyberCity plan which mainly focused on improving government service through integrating ICT strategies into urban governance and constructing ICT infrastructure to connect to the global networks. Its objectives are 1) making Internet services equally accessible to all; 2) making the Internet services a public utility; 3) building ubiquitous networks; 4) and synchronizing with the world through the networks [5].

On the other hand, under the concept of “milieu of innovation” [1], the TCG started to build the Neihu Technology Park and the Nangang Software Park in the end of the 1990s with the support of central government. Following the construction of metro system, the idea of integrating ICT and transportation into urban planning has developed, and thus the Taipei technology corridor plan has been held.

According to the classification of urban ICT planning from Graham and Marvin, three planning styles from the city to local scale are identified in Taipei City: telecommunications transport strategies, city-level new media strategies, and information districts [3]. Obviously, since the end of 1990s a new style of urban planning and policy intertwined with ICT has been emerging in Taipei City, as Graham and Marvin claimed that “it is no longer to consider policies for cities and those for telecommunications and new media entirely separately” [3].

Nevertheless, the impacts of this new style of urban planning and policy on urban development remain uncertain. Based on the three planning styles, the recursive interactions between ICT and city are reviewed below.

A. Integrated transport and telecommunications strategies—AITS

One of the main actions of Taipei CyberCity plan is to establish an Advanced Intelligent Transportation System (AITS). The AITS in Taipei City includes an E-parking system and an E-bus system. The E-parking system provides real-time parking information and the E-bus system offers the real-time location and arriving time of those buses through the E-bus station, metro station, Internet or telephone (see Fig.1 and Fig.2). By 2005, the TCG had set up a fixed location information system at 500 metro transit buses.

From 2005 to 2007, the passenger numbers of the Taipei metro and the Taipei City bus have risen by respectively 15.38% and 2.03%, and the growth rate of motor vehicles in each year has decreased from 1.72% to 0.7% [7]. This marked

increase in metro passenger numbers and decrease in motor vehicles amount imply that telecommunications transport strategies could really help local government to offer a better public transportation services and encourage citizens to use these services.

Despite the statistical outcomes, the effects of AITS on mobility and its impacts on spaces, places, environment, economy, and their interactions in Taipei City still require a rigorous study. According to Rooij [8] there are six intertwined effects of ICT on mobility need to be considered when studying urban mobility, including substitution of physical trips, complementation, generation, operational efficiency, long-term spatial planning, and supplementation.



Fig.1 Information signboard in E-bus and metro station

Source: www.itma.org.tw/docs/Itma_980111.ppt (2009.03)

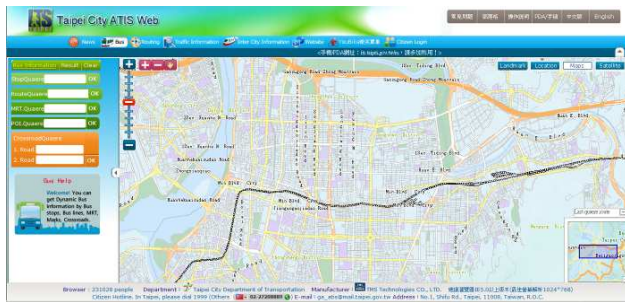


Fig.2 Taipei City ATIS Web

Source: <http://its.taipei.gov.tw/> (2009.03)

B. City-level New Media Strategies—WiFly Taipei

The WiFly Taipei, wireless networks infrastructure development project, is one of the main strategies of the Taipei CyberCity Plan. Because of the uncertainty, in the beginning this project did not gain a lot of support inside the TCG until they decided to invite the private sector to invest in a nine-year build & operate (BO) franchise approach. Through this public-private partnership approach, the TCG did not invest any money but provided public facilities such as traffic signals, streetlamps, metro stations, civil hospital, civil library, and other cultural facilities—while the private sector was in charge to set up the wireless access points (AP). The TCG considered this project as an urban competitiveness plan and stated that “it was risky, but we would regret it if we never tried it” [6].

In order to attract private sector investment, the TCG promised that 1) it would provide public resources and coordinate local administrations to help the private sector get the best places to set up the applications; 2) it would not charge for the usage of public facilities, including 1,800 traffic signals,

90,000 streetlamps, metro stations, and civil facilities; 3) the government would not allow any other wireless development project during this nine-year period; and 4) the government would offer the private sector the flexibility to adjust the fee ratio of the wireless network. The government also established the Wireless Broadband Connection Commission to evaluate and set the fee's upper limit [6].

In May 2004, the TCG selected Hewlett-Packard Development Company, L.P. (HPDC) as technical consultant for organizing the public tenders, helping to select the best applicant to execute the project, and then supervising the construction process. In August 2004, Q-Ware Corporation was selected the best candidate to build and operate this wireless infrastructure. Since the Q-Ware Corporation belongs to the Uni-President Enterprises Corporation, which also owns 7-11³ and Starbucks Coffee chain stores in Taiwan, they could combine their chain stores to maximize the coverage of wireless sensor network. This was a main reason for choosing the Q-Ware as the best proposal.

In the very beginning, the TCG wanted universal coverage of the wireless sensing field in Taipei City, but they soon figured out that would need more than 12,000 access points to accomplish this. This was so extravagantly high that they had to adjust this goal. According to former project manager of WiFly Taipei in the TCG, Shih-Hsing Liang⁴, in order to serve the largest population in the most economical way they finally decided to deploy Wi-Fi access points based on three factors:

- 1) the distribution of registered population,
- 2) the distribution of traffic trips, and
- 3) the distribution of peak-hour population concentration.

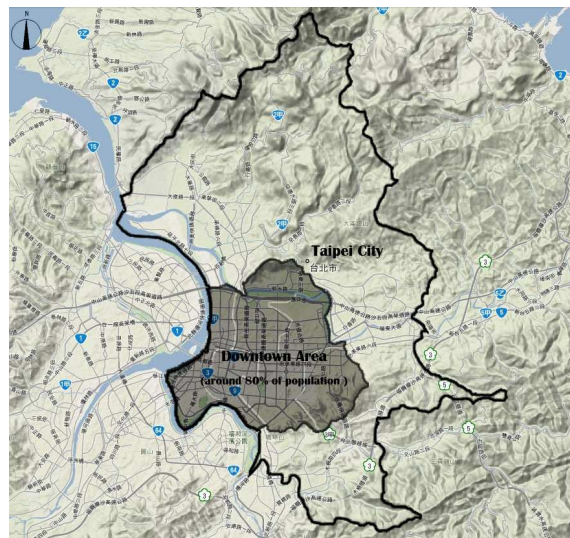


Fig. 3 Downtown area in Taipei City

³ The 7-11 chain is the biggest retailer in Taiwan. In 2006, there were 826 franchise stores in Taipei City, nearly one 7-11 store for every 300 m² built area.

⁴ On 11 March 2009, author interviewed Shih-Hsing Liang to clarify the principle of Wi-Fi AP deployment.

Nearly 80% of the registered population in Taipei City was located in an area of 10 km by 13 km (see Fig. 3). As a result, the TCG chose 30 main streets to be the first area for deploying the APs of Wi-Fi sensor networks, setting up two major conditions for Q-Ware: 1) the wireless signal has to be received in all the open space of the 30 main streets; 2) the coverage has to be extended to reach 90% of population in two years.

Following the suggestion of HPDC, the construction of Wi-Fi sensor networks was divided into 3 stages (see Table I and Fig. 4). In September 2006, the construction was completely finished and had set up more than 4,000 APs in Taipei City, covering nearly 50% of municipal area and reaching 90% of 2.36 million population according to the conditions set by TCG [6]. Nevertheless, considering the returns of its investment, Q-Ware provides higher density of Wi-Fi sensor networks in only 7 main commercial areas (see Fig. 5).

TABLE I
THE CONSTRUCTION TIMELINE OF WiFLY TAIPEI

Stage	Period	Construction Area	Coverage Ratio of Population	Amount of AP
I	2004.09-2005.01	30 Metro stations and their surrounding area (within 150m)	20% (around 0.52 million people)	507
II	2005.02-2005.12	The rest of the 30 Metro stations and downtown area (around 28.2 km ²)	50% (around 1.30 million people)	2,020
III	2006.01-2006.07	Other high density area (around 134 km ²)	90% (around 2.36 million people)	4,000

Source: 100 Questions about Wireless Taipei, 2007 [6]

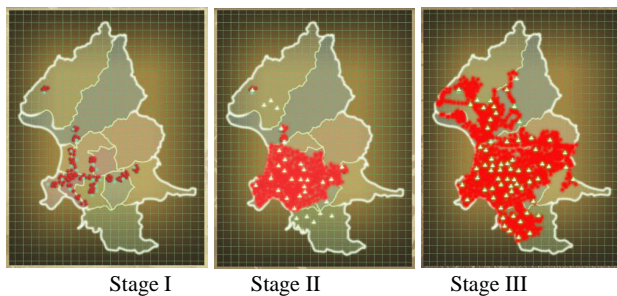


Fig. 4 The AP deployment of Taipei City in different stage
Source: http://www.tca.org.tw/taipei_gov/2005/taipeiwireless.htm (2009.03)

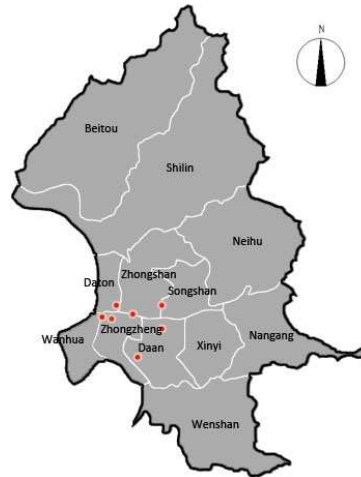


Fig. 5 The distribution of wireless hot-spot in Taipei City
Source: <http://www.wifly.com.tw/> (2009.03)

The tension between the local government interest and private investment is obvious in the WiFly Taipei project. In order to attract private investment successfully, the TCG had to compromise its goal of universal coverage towards 30 main streets as bottom line to deploy the Wi-Fi APs. Although the private sector is more eager to provide access to profitable areas, the wireless network coverage still reached 90% of population. This project demonstrates that if the local government ensures the benefit of most citizens from a spatial perspective, and concentrates on economic initiatives within its capacity, the polarization of ICT development in urban spaces might be mitigated and a better synergy between physical and electronic developments might be achieved.

However, the TCG utilized valuable public facilities as an economic initiative to attract private investment still remains something to discuss, because in those public places, such as libraries or other cultural facilities, citizens do have to pay for the wireless access, a strategy might increase the privatization of urban public space.

C. Information Districts—Taipei Technology Corridor

There are three major technology parks in Taipei City: the Neihu Technology Park, the Nangang Software Park, and the Beitou-Shilin Technology Park. The TCG is trying to link those three technology parks to establish a technology corridor along Taipei Metro networks (see Fig. 6). This corridor plan mainly focuses on creating an attractive investment environment for the development of ICT industries by offering public subsidies, favorable land deals, infrastructural assistance, credits, and a high quality living environment. The TCG expects that this plan will promote a cluster effect and will be a catalyst to make Taipei City become an important ICT hub at global level. The Beitou-Shilin Technology Park is still under planning.

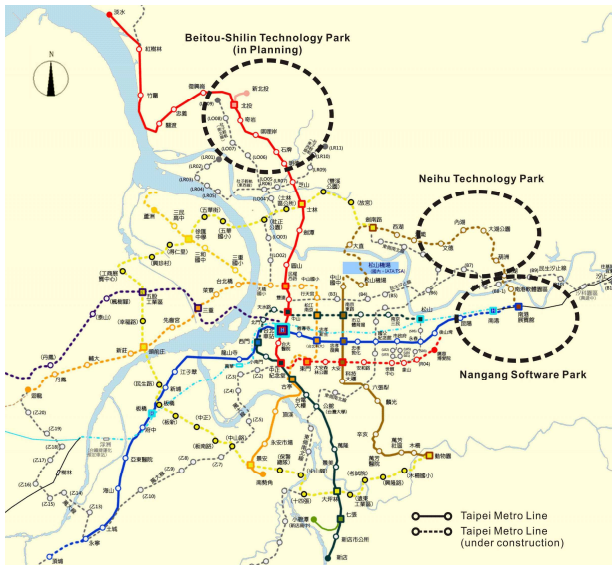


Fig. 6 Taipei Technology Corridor Networks

Source:

<http://en.invest.taipei.gov.tw/IndustrialDevelopment.html> (2009.03)

The other two were built at the end of 1990s and have become focal points for the high tech companies in Taipei area. By the end of 2006, the annual income of Neihu Technology Park and Nankang Software Park were respectively US\$70.0 billion and US\$4.5 billion⁵.

In terms of social and spatial perspectives, from 2000 to 2008, the population growth rate in Neihu district reached 6.9%, the highest growth rate in Taipei, while the average growth rate of Taipei City was -0.7%. Simultaneously, the population in Wanhua district and Daton district, which are the oldest urban area and have the highest percentage of low-income household in Taipei City, declined respectively -8.46% and -6.63% (see Fig.7). From 2000 to 2008, the growth rate of land value in Nangan district and Neihu district raised respectively 27.54% and 21.28%, the first and third ranking position of Taipei City (see Fig. 8). These tendencies indicate the reconfiguration of urban spaces and society in Taipei City. Yet the interactions between the social changes and the Technology Park developments still need a further investigation to clarify the impacts on the society and urban spaces in Taipei City.

The Taipei technology corridor plan shows us the strategy of integration of ICT and urban development embedded in transportation networks, as Castells noticed “a milieu of innovation is its capacity to generate synergy, that is the added value resulting not from the cumulative effect of the elements present in the milieu but from their interaction” [1]. Apparently, urban planners and policy makers in Taiwan already have awareness of the synergy between ICT, transportation and urban planning and start to construct and connect urban spaces with

broader and more complex urban ICT networks in a more sophisticated and integrative way, a tendency that certainly increases the uncertainty of urban development.

Further, as Graham and Marvin stated that with enormous real estate interests, urban planner and policy makers have to be more cautious with the way they configure urban telecommunications strategies in order to avoid perpetuating and reinforcing social and spatial polarization in urban area [3]. It is getting more and more important for urban planners and policy makers to understand the recursive interactions between ICT, transportation and urban planning. This understanding may help them to anticipate the impacts on city not only in economic perspective but in cultural and social perspectives. Especially, the reconfiguration of urban spaces and society in Taipei City is gradually manifest.

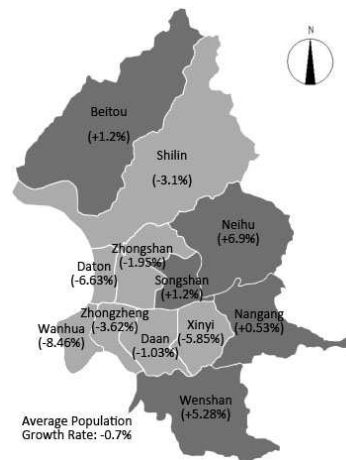


Fig. 7 From 2000 to 2008 the population growth rate in Taipei City

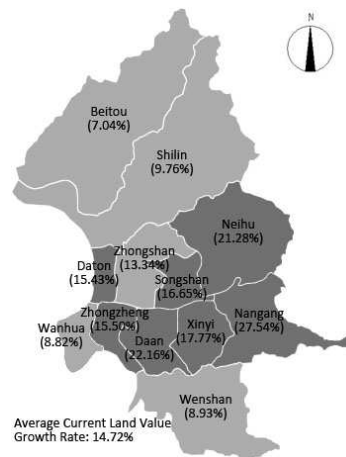
Source: <http://www.dbas.taipei.gov.tw/> (2009.03)

Fig. 8 From 2000 to 2008 the current land use growth rate in Taipei City

Source: <http://www.land.taipei.gov.tw/> (2009.03)

⁵ This data is according to the introduction of the Department of Economic Development of Taipei City Government. Available: <http://en.invest.taipei.gov.tw/IndustrialDevelopment.html>

III. TOWARD AN INTELLIGENT CITY

Based on the result of last section, the trend of integrating ICT and transportation into urban planning and policy making is obvious in Taipei City. However, the urban ICT planning is a very new approach and only has emerged for a decade in Taipei City, so it is certainly a process of learning by doing for the TCG. Through observing its implementations, there are five issues need to be addressed and further considered by the TCG when it moves towards the next urban ICT plan. The issues include deliberation on technological trends, avoidance of technological determinism, improvement in digital divides, role of public space, and demand-oriented spatial design.

A. Deliberation on Technological Trends

In February 2007, the WiFly was taken over by the Far EasTone Telecommunications Co., Ltd (FET), the second-biggest mobile service provider in Taiwan, through purchasing 51% stock of the Q-Ware which originally belonged to the Uni-President Enterprises Corporation (UPEC). The UPEC believes this transaction and partnership could bring in new technology and knowledge of managing a wireless business. On the other hand, the FET thinks this transaction and partnership could fulfill their Fixed-mobile convergence service, a seamless connectivity between fixed and wireless telecommunications networks, and thus enhance their competitiveness.

In fact, this transaction and partnership not only implies that two of the global technological trends—mobile communication and digital convergence—also happen in Taiwan, but reminds the TCG to take global technological trends into account when implementing urban ICT planning and strategies. If the TCG can understand the technological trends in the beginning of WiFly project, they may not select the Q-ware, a system integration provider, but a telecommunication company with broadband backbone networks support as the best candidate to build and operate the wireless infrastructure. Thus, the WiFly project might not always struggle with the boost of subscribers. In short, the WiFly project clearly demonstrates how those technological trends directly influence the feasibility of an urban ICT planning or strategy, so the ICT trends have to be considered in the very beginning.

B. Avoidance of Technological Determinism

As Graham and Marvin reminded that “new technologies can somehow be rolled out as technical “quick fix” solutions to complex urban problems” [3], and thus leading to careless one-direction predictions, such as “technological determinism” or “utopianism-futurism” [9].

Despite the warning, the TCG proposed that the core idea of the Taipei CyberCity plan was “frequent the net and free up the roads [6]” without considering the possible “generation effects [2]” of ICT on traffic. Moreover, in the WiFly Taipei project the TCG believed that if they could provide universal digital access through wireless technology, citizens would spontaneously use these services, which would trigger a wave of experimentation in the field of ICTs, and thus promote the innovation and

development of ICTs industries in Taipei City. But the reality is that by the end of September 2008, the subscribers to WiFly were 435,624⁶, only around 16.61% of the population in Taipei City, much lower than the expectations of the TCG⁷.

Those two examples clearly show us the danger of technological determinism or utopianism-futurism when initiating an urban ICT planning or strategy. Therefore, while moving toward the next urban ICT plan, the TCG may need to “look more critically at the role of technology” in order to “develop more nuanced and sophisticated concepts of the potential roles of telecommunications” [3].

C. Improvement in Digital Divides

One of the main objects of the Taipei CyberCity plan is to bridge the digital divide in Taipei City. Since 2003 the TCG has cooperated with the Taipei Computer Association in offering 350 brand new computers each year to low-income household in Taipei City. In 2006 the TCG drew up a budget from itself, central government, and private sectors’ donations for providing 750 brand new computers for elementary school and junior high school students who were low-income household. It seems that through providing computer to low-income household and disadvantage school students, the TCG has improved the percentage of household internet facilities in some disadvantage districts of Taipei City. For example, in 2003 and 2007 the percentages of household internet facilities of Datong district and Wanhua district, which are the lowest ranking position of Taipei City, have respectively increased from 49.79% and 56.21% to 71.94% and 72.29% when the general averages in Taipei City are 63.94% and 76.60% (see Fig. 9).

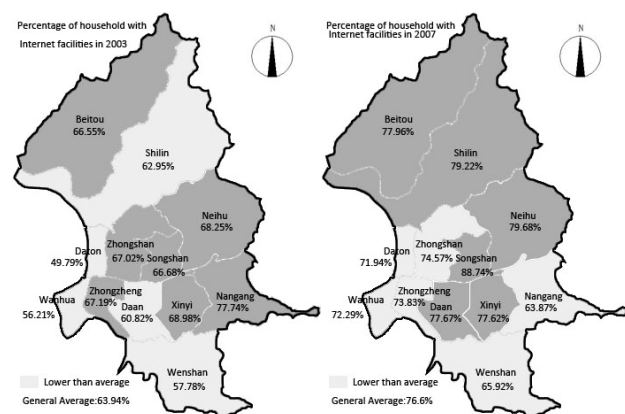


Fig. 9 In 2003 and 2007 the percentage of household internet facilities in Taipei City

Source: <http://www.dbas.taipei.gov.tw/> (2009.03)

⁶ This data is according to a press released by the Department of Information Technology of Taipei City Government on 24 October 2008. Available: http://www.doit.taipei.gov.tw/cgi-bin/Message/MM_msg_control?mode=vie&news&ts=4901c0f9:12c7

⁷ According to Taipei City Council Communiqué Vol. 75(18), this project planned to have 1,100,000 subscribers by the end of 2006. Available: <http://tckm.tcc.gov.tw/tccgazFront/gazatte/readByGaz.jsp?vol=075&no=18&startPage=3845&endPage=3912>

However, as Graham stated there are two core debates of urban digital divides: “uneven access to the Internet” and “software-sorted access to essential urban spaces and services” [10]. The first debate focuses on “the importance of providing universal access to the key ICT infrastructure, of teaching the skills one needs to use it and of ensuring that the technology can provide information and communication possibilities which are useful to all people” [11]. The second debate stresses the use of software sorting “structures urban access and exclusion in subtle but powerful ways” [10]. In other words, there are at least five factors which directly influence the level of digital divides: distribution of ICT infrastructures, characteristics of ICT carriers, basic skill of using ICT, content of electronic services, and prioritization of software sorting. The later three factors are so invisible and immeasurable that urban planners and policy makers are easy to ignore.

Therefore, except chasing universal access to ICT infrastructure and providing Internet facilities for disadvantage groups, the TCG need to consider interface and content design of public electronic services. Furthermore, existing analysis data of ICT are too general and lack the consideration of demographic segmentation and spatial concept, so the development of geo-demographics information system (GDIS) is important and urgent as well. The GDIS could help urban planners and policy makers to clarify and understand the invisible impacts of ICT accessibility on digital divides from spatial point of view, and thus more appropriate ICT planning and strategies could be created.

D. Role of Public Space

Castells noticed that in the network society “a redefinition of the notion of public sphere moving from institutions to the public space” is required, because public space is the “communicative device of our society” which can keep urban interactions and reinforce the social cohesion and social exchange [12]. Graham and Marvin also stated that increasing face-to-face contact in informational networks is supported by “rich, dense and interdependent combinations of meeting places and public spaces” [3]. Thus, the role of public space now is getting more and more important.

However, the boundaries between public and private space is getting blurred, because private-public spaces—such as shopping malls, tourist areas, and new housing estates—are proliferating and eventually producing cut off spaces around cities. Graham and Marvin argued that electronic space may have similar tendency towards privatization as “telecommunication corporations attempt to “package” electronic spaces for the purpose of electronic consumption” [2]. This tendency could be seen in the WiFly Taipei project as well. After the FET took over the WiFly in 2007, the homepage of WiFly showed a commercially oriented interface design. Not only does the FET enlarge the advertisement space, but also adds e-commerce space combining with other ICT service companies which are under its corporation. Moreover, the FET even removed the links of public services on the home page of

the WiFly [13].

Additionally, reflecting the definition of public space from Lynch [14], there are another two questionable points in the WiFly Taipei project. First, while the TCG released public resources to private investor for the deployment of Wi-Fi APs without charges for nine years, citizens do have to pay for wireless access, even in public places such as libraries or other cultural facilities. Second, 93% of wireless network users in Taiwan use laptops to access the Web [15]. Hence, while the TCG expected that Q-ware would have used their chain stores to maximize the Wi-Fi coverage, citizens not only need to pay for the wireless access but also to consume in the chain stores in order to put their laptops on the table to access the Web in the stores. This conflict also points out that public-private partnerships create concerns about whether these spaces belong to private sectors or the public [16].

Briefly, when the TCG constantly put efforts on urban ICT planning and developments without realizing the role and importance of urban public places and being more cautious about the privatization of physically and electronically public space, they may not only lose the opportunity to reinforce the social cohesion but increase social disparity.

E. Demand-oriented Spatial Design

According to the definition of space from Castells, “space is a material product, in relationship to other material products—including people—who engage in (historically) determined social relationships that provide space with a form, a function, and a social meaning.” Under the impacts of ICT, our understanding of space has changed from the former concept of “space of places” to the newer concept of “spaces of flows” [1]. This redefinition implies that our perception of space now contain physical and electronic form.

Thus, two correlated concepts of spatial design are emerging. First, the design of ICT public applications now actually is part of public space design. Second, public space design now has to consider physical space, electronic space, and their interface. Therefore, considering broad dimension of successful public spaces stated by Francis, successful ICT public applications are supposed to be “ones that are responsive to the needs of their users; are democratic in their accessibility; and are meaningful for the larger community and society” [16]. However, through reviewing the outcomes of the WiFly project, it is obvious that the TCG somehow ignored the underlying design concept of public ICT applications: demand-oriented spatial design.

On the one hand, in terms of the physical space design in the WiFly project, the metro station in Taipei City is one of the major public spaces for deploying the Wi-Fi AP, but the TCG merely provides two stand tables at an inconspicuous corner as the wireless service zone in each station without considering users behavior and technical needs (see Fig. 10). In addition to the consideration of users’ needs, this outcome addresses that



Fig. 10 The WiFly wireless service zone in Metro station

urban designers may need to understand that the physical interface design of public ICT applications is becoming one of the main design elements, so cannot be separate from development or redevelopment of public spaces and its design.

On the other hand, since the construction of the WiFly project, the TCG has proposed more than 60 public applications according to the suggestions of the technical consultant, but most of the applications failed to proceed because they hardly fit the local needs. This outcome may originate from a myth that due to the overwhelming potential of ICT, urban planners and policy makers easily believe that “the articulations between urban spaces and new media technologies are open to innovative, local, and planned interventions which can bring benefits” [3]. Yet many ICT applications are a “technological push” that run ahead of demand and do not fit the real social needs and demands of users. This is the “a classic solution looking for a problem” [2].

In short, it is fundamental that an urban ICT planning and its spatial design, either physically or electronically, have to base on a clear understanding and careful consideration of different users’ groups—whether classified by age, gender, job, or other social conditions. As Graham and Marvin suggested, those applications and their spatial design “need to begin with social, geographical and institutional issues and policy needs and move onto how new technologies might meet these needs—rather than the other way round” [3].

IV. CONCLUSION

In the light of the evidence presented in second section, a trend of integrating ICT and transportation into urban planning and policy making is obvious in Taipei City. Some successful implementations, such as AITS and Taipei technology corridor, show a possibility of promoting positive synergies between physical and electronic developments through interdisciplinary and comprehensive urban ICT planning and strategies making. Nevertheless, through reviewing how the TCG implemented this new type of urban ICT planning, five correlative issues appeared: deliberation on technological trends, avoidance of

technological determinism, improvement in digital divides, role of public space, and demand-oriented spatial design.

The characteristics of these issues are so invisible and subtle that they are ignored within urban planning and policy debates. This dangerous situation further makes these issues play a decisive part in determining the feasibility of promoting positive synergies between physical and electronic urban developments. Therefore, it is urgent to put these issues on the public agenda, making ICT urban planning and strategies work “in more egalitarian, democratic and transparent ways” [10]. These two actions might further promote and ensure positive synergies between physical and electronic developments.

Evolving ICT has subtle relationships with human social, economic and cultural life that cannot be assessed separately [17]. In fact, the indirect effects of the subtle relationships on spaces might be stronger than direct influence of ICT on spaces. Hence, it is important that while more cities try to integrate ICT policy into urban planning, the impacts of the urban ICT planning on urban society, economy, culture, and spaces certainly require constant evaluation and monitoring in order to revise and appropriately improve the planning. Additionally, a critical concept of urban ICT planning might be needed addressing that “urban media “Master plans” will be impossible: what is needed are strategic frameworks” [3].

This new style of urban planning and policy intertwined with ICT is at its early stage and is still an experimental process. The recursive interactions between urban ICT planning and urban spaces have been shown to some degree in recent research, but still need a further and rigorous investigation to clarify the direct and indirect impacts on urban society, culture, economy, and spaces. Therefore, the situation might point out the core of future urban ICT research, when urban planners and policy makers are attempting to find better approaches and are eager to learn from experiences in other cities.

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