An Comparative Analysis of the Current Status of Digital Divide in Taiwan

RUEY-GWO CHUNG Department of International Business Management Hsiuping Institute of Technology Address: No.11 Industrial Road Dali City Taichung County Taiwan

CHIH-WEI LI & CHEN-LIAO CHEN

Department of Industrial Education and Technology National Changhua University of Education Bao-Shan Campus, Address: No.2, Shi-Da Road, Changhua City TAIWAN cwkevin@ms21.hinet.net

Abstract: - Information technology and network communications are playing a very important role in today's modern society, and they have a significant influence on the policy-making in the country. In education, their importance is reflected by the sought-after IT courses and information-integrated teaching. "Digital divide" is an issue caused by a delay in the introduction of information technology to different ethnic and social groups, lower availability of information equipment, and different abilities to access the Internet. In order to understand the accessibility of and ability to access information equipment in different regions in Taiwan, the Research, Development, and Evaluation Commission of the Executive Yuan (RDEC) started conducting surveys on domestic digital divide since 2001 and using the findings as references for formulating policies that address the issue. The purpose of this paper is to use secondary data to analyze the latest "2009 Digital Divide Survey" by RDEC and to describe the current status of digital divide in Taiwan. Research indicates that at the moment, digital divide in Taiwan is mainly caused by a lack of the willingness and ability to learn among those with a lower educational background and/or who are older individuals. This is significantly different from the causes of digital divide found in 2002 which included expensive computer equipment and Internet access fees, poor connectivity and bandwidth, and a lack of access in public places. When aiming at reducing digital divide, the government is advised to adjust its strategies accordingly and meet the changes in society.

Key-Words:- digital divide, information technology, technical network, disadvantaged groups, information literacy, information education

1 Introduction

The rising of information technology and the Internet have drastically changed how we live, work, and study, and computers with Internet access have replaced the traditional methods of gathering information. With the arrival of the knowledge-based economy, information has become another important factor of production, following land, labor, and capita. Compared to those lacking information, therefore, those who possess information are more competitive. However, this could also lead to new phenomenon of inequality. However, different factors that affect digital divide, including access to computer and the Internet, local economic development, national telecommunications policies, and social and cultural system, may all result in different phenomenon of digital divide on different level and dimension [12]. Norris proposed that the development of digital divide is multi-dimensional and multi-level, covering three different concepts of global divide, social divide, and democratic divide, while the impact of the structure is mainly top-down, that is, "State \rightarrow Society \rightarrow individual"[15]. In other words, similar to many other social phenomena

under study, digital divide is not entirely determined by personal factors, but factors such as social environment and organizational structure will all affect the individual. In addition, the concept of "Social-Technical Network" proposed by Kling also suggested that the only way to effectively resolve the problem of digital divide is to understand the real impact that information technology has on people by including the working of information technology into the social context and observe how it is used through the ecological view of social relations [17]. In summary, any study on the social impact of information technology and the Internet will require a more comprehensive approach in examining its every aspect in order to gradually get the whole picture as well as the problems likely to occur. In a study of digital divide restricts itself to the analysis on a single level, one will never be able to understand how the interaction between social structure, cultural system, and individual behavior is displayed by the subject of digital divide. Moreover, the majority of previous studies of digital divide on the individual level have continued to use only those relevant individual-level variables for measurement and analysis. Although such an approach can partially describe the phenomenon of digital divide, it lacks the analysis of the overall structure. Therefore, apart from an individual's access to information, information technology skills, and information literacy, present day observations on the development of digital divide believe structural factors such as allocation of resources and learning environment differences, are also key factors that determine the occurrence of digital divide [13].

According to the "World Information Society Report 2007" announced by the International Telecommunication Union (ITU), the "Digital Opportunity Index" (DOI) that indicates the development and pattern of each country's information society is assessed with the three indicators of "infrastructure," "opportunity," and "application." Among the 81 nations included in this evaluation, the ranking of Taiwan was raised to the 7th place in 2007 from the 10th in 2006 [3].

Despite our nation's exceptional performance in the domain of information technology, "digital divide" is still inevitable – an issue shared by other advanced nations and is caused by a delay in the introduction of information technology to different ethnic and social groups, lower availability of information equipment, and different abilities to access the Internet.

To address digital divide in Taiwan and promote equal information and digital capacity among all individuals, RDEC has been holding digital divide surveys since 2001 for the purpose of understanding different demographic groups' digital capacity and learning opportunities with scientific surveys and using the findings to formulate appropriate policies.

The purpose of this study is to use secondary data to analyze the "2009 Digital Divide Survey" announced by RDEC, discuss the current status of information access, information literacy, and information application among those aged 12 or above, and determine the current status of and factors behind digital divide in Taiwan by analyzing the data in the past years.

2 The evolution of the definition and concept of digital divide

Internet originated in 1969 as APARnet and in 1974, the U.S. Department of Defense provided to the world a program of free communication between computer networks. By the 1980s, the U.S. campus network was complete, and in the 1990s, we saw the rise of the World Wide Web that linked the world into a network system of gigantic database, with various kinds of information travelling across time and space in the Internet world. This marked the end of the industrial society and the beginning of the information society for the mankind.

According to the views of Toffler and Naisbitt on the era of information society, information is the fourth factor of economic activities after land, labor, and capital; in addition to promoting the creation and use of added value, unimpeded flow of information helps to allocate the scarce resources more evenly and to utilize the resources more efficiently, in the end it can also enhance the social and national competitiveness and public well-being [19] [18].

The boundlessness of the Internet is undoubtedly the best platform for unimpeded information. For a long time, it is believed that the Internet is a free, open, and autonomous public domain free from authoritative control, and communication via the Internet appears to better address the issue of unfairness and realize more of the social welfare. For example, Internet Society (ISOC) stated very clearly its aim and purpose from the very beginning: the right to use the Internet should not be differentiated based on race, color, language, religion, politics and other positions, national, class, wealth, or other status, that is, to achieve an ideal world of "Internet is for Everyone" [20].

However, the ideals established by this network world quickly developed into a bubble in the real world of today due to the advancement and availability of information communication technologies (ICTs). Moreover, as information communication technology was introduced to various populations at different times, it resulted in the phenomenon of digital difference during the process time of information communication technology proliferation. What digital time difference has produced is, instead of eliminating social injustice, it creates new class antagonism, a phenomenon commonly referred to as the "digital divide" [21] [22] [11].

The concept of "digital divide" was first proposed by the Americans. Katz discovered in his study that the poorer, less educated, African Americans, and Hispanics are less likely to use information technology, and lower likelihood in the use of information technology means greater chance in missing out on opportunities of success [23]. As a result, the phenomenon of digital divide will lead to inequality in the use of social resources that actually widens the gap between social classes in the United States.

The world of the Internet has always been deemed as a public space that is free and open. In the real world, however, not everyone is given equal opportunities to access the information technology. The term "digital divide" is utilized by governments and scholars around the world to describe the gap between different groups in terms of accessing information equipment and the Internet.

But in 1970, Professor Tichenor, Donohue, and Olien from University of Minnesota proposed the "Knowledge Gap Hypothesis" that suggested, information increase may lead to uneven distribution of social information. In other words, even though everyone in society has the opportunity and right to access mass media, the differences between individual's social condition and environment will result in barriers and gaps. Therefore, when more mass media information is fed into the social system, people with higher socioeconomic status will absorb information faster those than with lower socioeconomic status, resulting in gradual widening of knowledge gap between these two groups of people rather than narrowing it. They believed factors such as communication skills, information

storage, and social contacts will cause the knowledge gap to expand [16]. Of these factors, those with a higher educational level have an advantage, which is why Tichenor and others proposed the use of education level as a predictor for above-mentioned socioeconomic status.

In knowledge gap theory, "education level" can predict a person's access to the Internet, because education level is an income index and generally the higher the family income, the higher the education level of the children, and better the chance in access to and use of the Internet. So people with high education level will usually absorb information better and quicker than people with low education level. These people with competitive advantage in socioeconomic status can usually leverage on their education level to consolidate their existing socioeconomic status, therefore one can say that socio-economic status and the ability to use information technology is closely related [14]. Moreover, in terms of the ability to process information, people of higher socio-economic status often have more opportunities to access "critical information", and thus, are more likely to gain more resources. In doing so, it results in a further issue of "relative exploitation of power". People with high socioeconomic status may possess more information and channels in decision-making or execution, while people with lower socio-economic status will lack the necessary knowledge. As a result, the quantity and quality of information distribution are likely to deepen with technological advancement.

With the constant evolution and advancing of technology, the nature of digital divide also changes constantly, and its definition also changes when new introduced. technologies are For example: Previously, digital divide is examined by reviewing "computer ownership and access." With the advancing technologies and Internet, however, the analysis of digital divide now includes the indicator of "Internet access rate." After the Internet access rate reached a certain level in developed nations, the information/communication technology has become a new indicator; for example: The access to online messaging and voice conference programs such as Skype and MSN has also become a new indicator. As a result, the Organization for Economic Co-operation and Development (OECD) further expanded the scope of digital divide and defined it as the gap in the opportunity to access information/community technology (ICTs) and other online activities, including computer hardware/software and Internet access [9].

Judging from the aforementioned concept and its evolution, it is clear that the evaluation of digital

divide not only should include the rate of accessing relevant hardware but also the depth and width of the ability to utilize information equipment. This is the concept of the second level of digital divide proposed by Ezster, stating that digital divide should not only cover different Internet access rates but also the difference in individuals' Internet literacy [7].

In the area of information education in the information age of today, e-learning is growing in popularity [25]. In addition, a research indicated that the intention of this work is to contribute to the discussion on how to obtain quality and credibility in information found in wiki projects. We would like to find out the tools we should be producing. In this perspective, we would attempt to answer the following questions: Who is the best evaluator for information resources? Who is the most trustworthy producer of information resources? We developed an empirical research in order to answer those questions. In this empirical research, we identified not only the best evaluator and producer, but also the best evaluator and producer for specific type of information resource [27]. Today, any development is dependent on access to more and more knowledge and information. It is also based on the generation of knowledge. As a result, it is important to use technology and information more efficiently. In fact, technology will not have existed if there is no innovation. All technologies that we have is the result of someone inventing a better way of doing something, a better tool [26]. The new technology of computing is growing rapidly, cloud with applications in almost every area, including education. E-learning systems usually require many hardware and software resources. Since there are many educational institutions that cannot afford such

investments, cloud computing is the best solution for them [24].

3 Methods and Framework

The purpose of this article is to use secondary data as the sample, which was taken from the 2009 Digital Divide Survey launched by RDEC was entrusted to and conducted by the Survey Department of UDN. Using the Computer-aided Telephone Interview System (CATI), citizens age 12 or above throughout Taiwan (including Kinmen and Lienchiang County) were randomly interviewed over the phone; 16,133 valid surveys were acquired, and the scale and depth of this survey make it one of the rare achievements in its kind in Taiwan (please see RDEC's 2009 Survey for details).

Under the framework of that study, the question items on the questionnaire covered four aspects: personal computers/Internet access, household computer/Internet access, personal information, and information. household The evaluation of individuals' digital divide is divided into three aspects: "information access," "information literacy," and "information application," which not only discuss individuals' access to information equipment but also the depth and width of their ability to access information. Household digital divide is analyzed with the two aspects of "household information environment" and "information literacy of family members [3]." In this present study, not only the aforementioned aspects are explored but the difference between 2009 and 2005 is also analyzed.

Primary dimension	Secondary dimension	Third dimension	Index layer (content of each dimension)	Notes
		Access to computer	 Previous computer experience frequency in use of computer per week 	Evaluate how computers are used and the frequency
Individual's IT literacy	Access to information	Access to the Internet	 Previous Internet experience no. of hours spent on the Internet per day Mobile Internet user or not 	Evaluate how the Internet is used and the frequency
	Information literacy	IT literacy	1. Ability to send and receive email	Evaluate the ability in sending/receiving email and

Table 1. Research framework and major survey items of 2009 digital divide survey on individuals and households[1] [2] [3]

			2.Ability to use word processing software	basic word processing	
		IT security literacy	1.Filter strange emails 2.Set up personal password	Evaluate security awareness and protection in using a computer	
			3.Awareness of Internet copyright		
		Work (education) application	1.Job search or academic research 2.E-learning	Evaluate the use of computer both at work and at school	
			1.Awareness of government's website		
	Information application	Public behavior	2.use of the Internet to search for government notice	Evaluate the use of e-	
			3.previous experience in online application through government's website	government website	
		Daily application	1.Online selling or purchase		
			2.Internet Banking		
			3.Search for general information		
			4.Search for information on travel and food	Evaluate e-commerce and the level of acceptance in online	
			5. daily Online news reading	information collection, communication, and	
			6.Online recreational activities	entertainment	
			7.previous Internet messaging experience (MSN, etc)		
			8.previous Internet call experience		
		WEB2.0	1.Use of blogs		
			2.Use of personal blogs		
			3.Photo and video upload	Evaluate the use of WEB2.0	
			4.Photo and video download		
		Information gathering	1. Ability in reading English websites		
			2. Ability in searching for specific information	Evaluate the ability in information gathering	
Household IT literacy	IT environment	IT equipment	1.Computer ownership in household	Evaluate computer ownership in households	

of household	Network environment	1.Internet connection in household 2.Internet connection method	Evaluate Internet connection in households and their connection methods
Information literacy of family member		 1.percentage of computer user in household 2.Percentage of Internet users in household 	Evaluate the number (%) of IT equipment users and the number (%) of Internet users in households

4 Findings

4.1 Gap in terms of information access

Please, follow our instructions faithfully, otherwise you have to resubmit your full paper. This will enable us to maintain uniformity in the journal. Thank you for your cooperation and contribution.

The findings further suggest that the availability of information equipment is closely correlated to the degree of urbanization. The more urbanized an area is, the more available computers and the Internet are. For example: The computer-access rate and Internet-access rate in remote and aboriginal areas increased from 52% and 48% to 56.2% and 52.2% respectively in 2009. Despite the increase, however, these numbers are still below the average.

Moreover, a large percent of the individuals who are less educated or older still has poor information access. Statistics indicates 92.4% of those age 30 or below access the Internet, yet only 29.2% of those in the 50-60 age group have accessed the Internet, and as low as 7.0% of those age 60 or above have accessed the Internet, which is far below than the U.S. counterpart (around 30%) [4]. In 2009, the value in the 61-64 age group increased to 22.3%, and dropped to 7.7% in the 65-and-above group, indicating that despite the low Internet-access rate among those aged 60 or above, the value increased from 7.0% to 22.3% within just four years and is even approaching the 30% marker in developed nations such as the U.S. As for the influences of educational level, 95.4% of those who were college educated or higher had accessed the Internet in 2005, while less than 15.9% of those who only attended elementary school had done so. Similar results were also found in the 2009 Survey, indicating a positive correlation between educational level and computer access. Since ICTs have mostly been developing in the past 15 years, those who are older and less educated would feel more estranged towards ICTs, while those who are younger and more educated are more accepting [8].

The disadvantage in which people with disabilities are put must also not be ignored. Although it is commonly believed that the information technology makes things easier for those with disabilities, the fact is that the limited cognition, movement, learning, and perception, the threshold for accessing digital technology has also been raised for them as well. A lack of an appropriate interface, equipment, or training only further worsens the issue of digital divide for those with disabilities. For example: Ordinary computers are not designed for those with visual impairments. However, the lives of the visually impaired could be improved if they were trained to access special computers, allowing them to learn about and communicate with the world in the comfort of their own homes. Leaving their homes is often a huge challenge to them due to their disability, yet a specially designed computer may help them undergo important tasks such as communication, learning, and working. The 2005 statistics indicates that only 40.6% and 35.0% of those with disabilities had respectively accessed a computer or the Internet. The 2009 statistics was equally low, yet it indicates that 90% of those who access the Internet have computers, suggesting the access to computers is a threshold. Once those with disabilities learned how to use a computer, it would become an essential part of their lives. Therefore, education is essential, and an important challenge is how to introduce these new communication technologies to those with disabilities.

In short, the 2009 Digital Divide Survey indicates that the issue of digital divide is most significant in those who are 40 or older, less educated, and/or living in areas that are remote and less urbanized. Further, the issue is also significant in minority groups that have poor information access, including those with disabilities or who are mountainside aborigines [6]. These rather information-isolated respondents mostly stated that they did not have the need, the ability, or the time to access information. This indicates that instead of not being able to afford the equipment or access fees, the true reasons behind the current digital divide are the lack of accessing computers or the Internet, the lacking of the realization of the benefits of information-access, and the lacking of the learning ability.

4.2 Status of information literacy and information application among the Internet users in Taiwan

When discussing the issue of digital divide in Taiwan, we must not only understand the rates of computer ownership and Internet access but also individual users' digital literacy and whether it varies with demographic variables.

Findings indicate that the Internet users in Taiwan have already developed certain fundamental skills. As of 2009, 92.2% of the respondents know how to use e-mails, 88.0% know how to search for information, 75.9% have used messengers, 39.4% have used web phones, 75.1% have engaged in online recreations, and as high as 43.2% of those living on offshore islands have used web phones. Compared to the 2005 counterpart, the 2009 numbers have increased by 5% \sim 20%, indicating how the public in Taiwan is influenced and reliant on ICTs.

In terms of e-commerce, the popularity of online finance increased from 18.5% to 28.9% in 2009, and the popularity of shopping/selling online has also increased from 37.2% to 59.3%, indicating that online shopping is prevalent among more than 50% of the respondents and is an important part of our lives. When asked why one does not engage in online e-commerce, the findings indicate that the main factors that deter the public from engaging in e-commerce are the concerns with security and privacy. The latest data also indicates that the public's confidence in online shopping can still be improved by providing them with different payment-methods and security measures. The survey shows that 50.4% of online shoppers prefer to pay at a post

office or a bank, and 36.9% pay with a credit card. Further, 32.9% choose CODs while 25.1% prefer to pay at a convenience store. The significant popularity of these methods of payment and pick-up implies that although the public has concerns with online shopping, they are still willing to shop online when different transaction systems are provided, and the result is the wide popularity of online shopping.

Research on how "bloggers" participate in the era of Web 2.0 indicates that 30.8% of Internet users regularly browse blogs, and 45% occasionally do so; in other words, 76% of Internet users have browsed blogs. In addition, 43% of Internet users have their own blogs. These findings indicate that the online world has become an important space where people can share their thoughts and express themselves [5].

The issue of English skills is still a major problem to the Internet users in Taiwan as 55% of the respondents stated that they lacked the ability to read websites written in English, 38% stated they were somewhat capable, and only 4% stated they could read English with ease. Regarding this issue, we believe that in order for the people in Taiwan to participate and compete in the world, English skills are a crucial factor. No matter how sophisticated the equipment and technology are, the lack of English skills will surely pose as a major obstacle that hinders Taiwan's international participation.

A cross analysis shows that those who are younger, more educated, and/or working in professional domains do not only engage in online activities but more diverse their information literacy is also better than those who are older, less educated, and/or working in other domains. As for the differences between employing departments, the level of digitization in those working in governmental agencies is significantly higher than that in those working at private companies or who are self-employed. We believe a reason behind this is that the local governments have introduced the "one-stop window service." In addition, the government has long been criticized for its inefficiency, thus digitization has been actively promoted among governmental agencies in order to address this issue. Further, it is difficult to ensure digitization in all private companies in Taiwan when most of them are small and medium enterprises.

4.3 Information environment in Taiwanese families

Besides observing information access. information application, and information literacy, the quality of the household information environment is also an important aspect that allows us to determine the scale of digital divide. Findings indicate that from 2005 to 2009 the rate of household computer ownership in Taiwan increased from 79.5% to 84.1%, and the Internet-access rate also jumped to 78.1%, indicating Taiwan's information environment is significantly better than that in Europe or the U.S., and a possible reason behind this is that Taiwan is a key manufacturing nation of computers and related hardware. Taiwan's Acer is one of the top computer manufactures and owns as much as 70% of the European market, and OEMs in Taiwan are also the manufacturers of computers sold under major brands. "Netbooks" that became very popular in these two years were also first introduced by a Taiwanese computer manufacturer; costing around 300 USD per unit, a netbook may even come free if a consumer signs a contract with a mobile phone carrier. These factors all influence and improve the rate of household computer access in Taiwan.

However, difference the in learning opportunities due to different levels of household income is also a major concern. Computer ownership is 95% in families whose providers work as managers, professionals, technicians, or office workers, and is dropped to 60% when the providers work in agriculture, forestry, fishery, or other non-technical, labororiented positions. Judging from the monthly family income, for those households with a monthly income less than 17,280 NTD, the computer ownership rate is only 27.3%; for those households with a monthly income of 20,000-30,000 NTD, the computer ownership rate increases substantially to 72.3%, which, however, is still far lower than the national average of 84%.Computer-ownership rate in households with foreign spouses is significantly

lower than the that in households without (75.0%: 84.6%); the difference in household information environment is limited between households with people who are with disabilities and those without (83.1%: 84.9%), and Internetaccess rate in the latter is 78.1%. As seen above, the level of income significantly affects information access, which is much higher in the wealthier families. We believe the fact that information-access is lower in families with foreign spouses is correlated to the structure of these families. A significant number of such families in Taiwan are of the minority group, and many males with disabilities or have low income marry "mail-order brides" from less developed Southeast Asian countries. With the poor financial status, the rate of computer access is low as a result [10].

To summarize the above, minority families are still lagging behind in the information age and need assistant from the government as well as the entire society.

4.4 Changes of digital divide in Taiwan

Besides understanding the level of digitization among the public in Taiwan, it is also important for us to examine the changes of digital divide in the past years as the results may serve as valuable references for the government to formulate appropriate policies and solutions.

Years[1] [2] [3]						
	2005	2006	2007	2008	2009	
Number of valid samples	26,622	26,702	15,007	16,131	16.133	

70.1

64 4

71.1

65.6

73.4

68.5

72.6

67.7

68.8

62.7

Table 2. Comparison of Information Access in
Internet Population Age 12 or Above over the
Years[1] [2] [3]

The rates of computer-access in 2008 and
2009 are respectively 73.4% and 72.6%; despite
the changes, the variation is within the range of
sampling error. The rates of Internet access
among those age 12 or above in 2008 and 2009
are respectively 68.5% and 67.7%; again, though

Computer Access

Rate

Internet Access

Rate

the variation may seem like regression, it is still within the range of sampling error. This indicates that there has been no major improvement with information access in Taiwan in the past year and a bottleneck in the promotion of Internet/computer access.

Table 3. Comparison of Internet Access in Internet Population Age 12 or Above over the Years[1][2][3]

	2005	2006	2007	2008	2009
E-mail Access	85.7	88.2	88.9	86.4	75.1
Online Recreation	67.4	68.0	70.1	68.4	75.1
Life-information Inquiry	88.1	86.7	89.8	86.0	88.0
Online Messaging	67.6	73.0	76.4	74.3	75.9
Online Banking	18.5	22.6	27.8	26.1	28.9
Online Shopping	37.2	44.7	49.7	49.5	59.3

The 2009 Survey indicates that the popularity of e-mails, online recreation, and online shopping continue to rise, suggesting that e-mails have become an important way for us to communicate with one another, blogs and other online channels have become an important space where the public engage in recreational activities or chatting, and online shopping that has increased to 59.3% has also become a popular way to shop.

5 Conclusion

In their initial effort to reduce digital divide, nations around the world focused on improving their Internet infrastructure. In this regard, the Taiwanese government has been promoting the availability of Internet hardware through market competition. With governmental intervention, Internet access became cheaper and more popular. and an evaluation system and resource-allocation appropriate have successfully resulted in public information access. Taiwan's Internet infrastructure was ranked second in 2007, and ranked 7th in terms of digital opportunity.

Not only Taiwan's digital infrastructure is leading the world, its household information

environment is also second to none. However, personal Internet-access rate is lower, and we believe this is due to the fact that Taiwan's digital divide is worse than that in the U.S., Japan, or Korea.

In other words, with the development of the Internet infrastructure in Taiwan, the main causes of the current digital divide in Taiwan are low education levels and the older age groups' lack of willingness or ability to learn. This is significantly different from the 2005 findings which suggested that the main causes of low computer/Internet access were the expensive computer and access cost and poor bandwidth. The changes imply that the government must find ways to increase the willingness and the need to learn among those who are less educated and/or older, introduce user-friendly interfaces, and encourage older individuals to try high-tech products.

addition, In information access varies significantly with educational level, age. occupation, and industry, and digital divide exists between different counties and cities. indicating much room for improvement on the government's part. The issue of digital divide, however, cannot be solved overnight. With limited governmental resources, it is advised that the government should focus on social justice and national competitiveness by encouraging or helping the minorities such as low-income students, those with disabilities, and the aboriginals to participate in the digital world, improving the public's Internet literacy, providing affordable Internet access, and reducing the threshold of entering the online world in order to promote equal opportunities and national competitiveness.

References:

- [1] RDEC of the Executive Yuan, Survey on Digital Divide in Taiwan, 2004.
- [2] RDEC of the Executive Yuan, Analysis and Report of Digital Divide, 2005.
- [3] RDEC of the Executive Yuan, Analysis and Report of Digital Divide, 2009.
- [4] Lin, H., <u>FCC: Number of households enjoying</u> broadband raised by 15% to 32.5 million households in USA in 2004, Taipei: Website of

"Foreseeing Innovative New Digiservices," <u>http://www.find.org.tw/0105 news friendly</u> print.asp?news id=3643, 2004.

- [5] Tseng, H., A study of digital divide in Taiwan, Taipei: *RDEC of the Executive Yuan, 2002.*
- [6] Jian, W., An analysis of the current digital divide in Taiwan. *RDEC Bimonthly*, v. 30, No.1,2005.
- [7] Ezster, H., Second-Level Digital Divide: Difference in People's Online Skill. First Monday, 7(4). Retrieved on March, 12, 2005, from://firstmonday.org/issue/issue74/hargittai/, 2002.
- [8] Loges, W.-E., & June, J.-Y., Exploring the digital divide: Internet connectedness and age. Internet connectedness and age. *Communication Research*, 28(4),563-562, 2001.
- [9] O.C.E.D. 'Understanding the Digital Divide' O.C.E.D. Retrieved on March, 1,2005, from Http://www.oecd.org/dataoecd/38/57/1888451.p df,2001.
- [10] Lin, S.-L., Social Segregation and the Health Care of Female Immigrants in Taiwan, The *journal of nursing*, Vol.54, No.4, 2007.
- [11] ChiuWei, S.-Z., & Chen, J.-j., "Phenomenon of Digital Divide – A Comparative Analysis between Countries." *Communication Management and Research*, No.93 : 1, 2004, pp. 1-29.
- [12] Tseng, S.-f., "2002 Digital Divide Survey in the Area of Taiwan." *a research report commissioned by Research, Development and Evaluation Commission, Executive Yuan*, 2003.
- [13] Chen, W.-Z., "A Study on IT Education and Digital Divide in Taiwan", *Information Society Studies*, NO.13, 2007, pp. 193-228.
- [14] Chen, P.-l., "The Issue of Internet "Access." *Library and Journal of Informatics*, NO.20, 1997, pp. 1-12.
- [15] Norris, P., "Digital Divide: Civic Engagement, Information Poverty, and The Internet Worldwide", Cambridge University Press, 2001.
- [16] Tichenor, P.J., & Donohue, G.A., & Olien, C.N., Mass Media Flow and Differential Growth in Knowledge, *Public Opinion Quarterly 34:* Colombia University Press. 1970.

- [17] Kling R., "Learning about Information Technologies and Social Change: The Contribution of Social Informatics.", *The Information Society*, Vol.16, No.3, 2000, pp271-232.
- [18] Naisbitt, J., Megatrends: Ten New Directions Transforming Our Lives, 1st Ed. Warner Books, Ltd., New York, NY.1984.
- [19] Toffler, A., *The Third Wave*. Bantam Books, New York, NY. 1980.
- [20] ISCO, Taiwan. Retrived March, 12, 2005, from <u>http://www.isco.oeg.tw</u>, 2005.
- [21] Light, J.-S., Rethinking the digital divide. *Harvard Educational Review*, Vol.71, No.4, 2001, pp. 709-733.
- [22] Graham, G., Bridging urban digital? Urban polarization and information and communication technologies(ICTs). Urban Studies, 2002, Vol.39, No.1, 2002, pp.33-56.
- [23] Katz, J., Social Consequences of Internet use: Access, Involvement, and Interaction. MIT Press, 2002.
- [24] Paul, P., Felician, A., Marius, V., Using Cloud Computing for E-learning Systems, 8th WSEAS International Conference on data networks, communications, computers. Morgan State University, Baltimore, USA. 7-9November, 2009, pp. 54-55.
- [25] Chen, C.-C., Shih, D.-H., & Lee, C.-J., Web 2.0 Trends based on e-learning for Troops Training Process improvement (TTPi), 8th WSEAS International Conference on data networks, communications, computers. Morgan State University, Baltimore, USA. 7-9November, 2009, pp. 240-245.
- [26] Adrian, V., Lorena, B., & Catalin, B., Quality Model for M-Learning Applications, 8th WSEAS International Conference on data networks, communications, computers. Morgan State University, Baltimore, USA. 7-9November, 2009, pp. 60-66.
- [27] Carlos, J. C., & Manuela, A., Wiki: How to Improve Information Quality?, 9th WSEAS International Conference on Applied Computer Science, University of Genova, Genova, Italy. 7-19October, 2009, pp. 224-228.