UBIQUITOUS PUBLIC SERVICE NETWORK: THE FRAMEWORK AND EVIDENCE FROM RURAL CHINA

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Abstract

As the driving force behind the economic growth of China, Information and Communications Technologies (ICTs) are shaping the ways for both public sector and private sector. Emerging economies like China are powering the growth in their regions. However, very little research was conducted on the ICT adoption and usage in the rural area, especially from the public sector. This research-in-progress paper introduces the Ubiquitous Public Service Network (UPSN) and its application in the rural area of China. This research follows a mixed of quantitative and qualitative research method. A survey with open-ended question interview was developed based on the framework and 727 samples from 52 villages in Ningbo were collected from 2012-2013. Quantitative data from Rural Comprehensive Information Service Station (RCISS) in Ningbo was also collected. This paper proposes a framework of and policy implications for the sustainable IT development of rural China.

Keywords: Ubiquitous Computing, IT for Development, China, e-Government.
1 INTRODUCTION

China's economic growth has been significant for the past 35 years. However, disparities between rural and urban areas have broadened (Kanbur & Zhang, 2005). Rural development is a persistent challenge everywhere, whether in advanced industrial and post-industrial economies or in less developed settings (Malecki, 2003). Recognizing the negative impact of rural-urban diversity on social harmony and China's long-term development, the Chinese government vowed to develop rural areas into the so-called new socialist countryside. For eleven consecutive years after 2004, the Chinese government and the State Council issued eleven priority policy documents on rural development.

This paper considers China in that it fits the generally accepted definition of an emerging economy. It is also part of the powerful set of BRIC countries whose growth is powering that of their neighbours: Brazil Russia, India and China. China’s informatization strategy also has the potential to provide its citizens with better growth opportunities through improvements in telecommunications and information infrastructures, better intellectual property rights and cybercrime legislation (Hanna and Qiang, 2010).

2 LITERATURE REVIEW

2.1 Ubiquitous Computing

The development of information and communications technology is ushering in an era of the ubiquitous network that enables access to a network "at anytime, anywhere and by anything" (Weiser, 1991; Ge et al, 2008). The origin of the "Ubiquitous" concept can be traced to the 1970s (Ge et al, 2008), while it is considered to be systematically articulated by Weiser (Nakamoto & Komeichi, 2006). Based on this, Japan and South Korea put forward Ubiquitous Networking, European Union proposed the environment sensation intelligence (Ubiquitous Network), and North America proposed the general computation (Pervasive Computing).

Although there are a various names of the concept, its core connotation is consistent. It originates from Latin Ubiquitous, also called U-network (Weiser, 1991), referring to the omnipresent network, which takes "omnipresent", "all-embracing", "omnipotent" as the essential features and helps the mankind to realize "4As" (namely in Anytime, Anywhere, Anyone and Anything) correspondence. It was firstly discussed internationally in the World Summit on the Information Society (WSIS) held by the United Nations in December, 2003 in Geneva. And the Ubiquitous Network stepped into the global stage officially and started to influence the world's informatization strategy direction.

2.2 Universal Service

Universal service is an economic, legal and business term used mostly in regulated industries, referring to the practice of providing a baseline level of services to every resident of a country. The concept of Universal Service or Universal Service Obligation initially was a marketing slogan used by Theodor Vail of the Bell System. It evolved in the 1970s to mean either low-priced or subsidized telephone system access. This was part of the campaign of the Bell System to prohibit or inhibit competition in the long-distance market. The campaign failed, but the concept remained. The notion that the last mile of fixed-line access should be subsidized spread beyond the United States, despite well-reasoned arguments and empirical evidence that the policy is a failure (Alleman, 2010). Alleman raised a question: Should wireless or broadband services be included in the universal services definition? The Ubiquitous Network Society is forming. Traditional Universal Service should be enlarged or changed.
2.3 Public Service Network

The Public Services Network is a UK Government program to unify the provision of network infrastructure across the United Kingdom public sector into an interconnected "network of networks" to increase efficiency and reduce overall public expenditure. The PSN is more than a means of lowering network costs and connecting authorities, agencies and departments across government. It offers a platform for innovation, and an opportunity to transform operational capabilities. Through the PSN organisations can improve collaboration, share resources, dramatically reduce costs and accelerate the delivery of a new generation of more efficient and improved frontline services (Mellor and Inns, 2012) There is no doubt that more and more developed countries will meet their inhibits’ demands by providing public services by network. But for most developing or underdeveloped countries, it is still a challenge.

2.4 Development

The concept of Development has its roots in the economics of the firm. Development is defined as “the interruption of the business cycle” according to Schumpeter (1934) and is often used to describe growth in organizations and the regions in which they reside. Development has been considered as an economic phenomenon that leads to better livelihoods. Also, the main purpose of development is to spread freedom and its “thousand charms” to the unfree citizens (Sen, 1999). Development is a concept which is considered both theoretically and politically, and is inherently both complex and ambiguous (Summer and Tribe, 2008). The liberalization of economies replaced the animated development practice in 1950s and 1960s. Willis (2005) refers the ‘Modernity’ to a ‘condition’ if being modern or being like the industrialized counties of Western Europe and North America in particular. The Modernity encompasses industrialization, urbanization, increased use of technology and application of rational thinking (Willis, 2005).

3 A FRAMEWORK OF UBIQUITOUS PUBLIC SERVICE NETWORK

Based on the literature review, a framework of Ubiquitous Public Service Network (UPSN) was developed. UPSN is a network platform by which provides ubiquitous public services for ubiquitous users, especially for those who are in undeveloped or developing areas in China. There are five components in the framework of UPSN: infrastructure, software systems, ubiquitous services, information security assurance, and sustainable development strategy.

3.1 Infrastructure of UPSN

Infrastructure, regarded as “multiplier effect”, is the premise and basis of UPSN. The infrastructure of UPSN includes the engineering facilities for providing ubiquitous public services for the social production and living materials, the equipment for ubiquitous service information collection, processing, transmission, reception and storage. It should be available for any person at any time in any area to access the public service network, accept public services, especially for those migrant workers, farmers who reside in remote areas and rural areas.

3.2 Software Systems of UPSN

The purpose of software systems of UPSN is to provide a platform for ubiquitous information services. The most important thing is to integrate the resources from government, business and community. As a terminal user, he (or she) needs only how he (or she) enjoys the services through the software systems. Generally speaking, public service is not provided by only one sector. It’s some kind of combined service concerning multi-sectors in government, business and community. The key point of the software systems of UPSN is the power of integration. The simplest for users, the highest effect and widest spread will be the UPSN.
3.3 Ubiquitous Service of UPSN

The ultimate goal of UPSN is to provide ubiquitous information services for ubiquitous users. Only the existence of ubiquitous users, can UPSN be improved step by step and become a continuous practically useful platform. To aim at this, the different kinds of users should be taken into consideration. The various types of information, the different ways of information service should be designed to meet the demands of all kind of people.

3.4 Information Security Assurance of UPSN

Information security assurance is the protection layer of UPSN. UPSN provides public information service to the whole society through the network platform, which regards to national security, public safety, and personal security and personal privacy issues, and to the service provider's credit problems as well. Therefore, UPSN security is the key for UPSN’s healthy development. The security guarantee should integrate all levels from security infrastructure, application systems to information security for users’ privacy.

3.5 Sustainable Development Strategy of UPSN

UPSN is a new concept and a new platform. It is necessary to constantly build, improve and update to better improve people's livelihood through UPSN. It will promote harmonious development of economy and society and enhance the image of the government. The development of UPSN needs long-term development strategy to guide, with constant policy to encourage, a flexible approach to construct and operate. Ultimately users can be changed from passive acceptance to putting forward active service requests and then the UPSN will fulfil into a system with service demanding and providing circle automatically and sustainably.

In sum, the framework of UPSN is proposed which includes Infrastructure, software, ubiquitous service, information security assurance, and sustainable development strategy (as shown in Figure 1). The core part of the framework is the software of UPSN, the ubiquitous service of UPSN and the infrastructure. They are supporting each other to finish the main task for the platform. On the other hand, the information security assurance of UPSN and sustainable development strategy will provide additional supporting function for the system.

![Figure 1. The Framework of UPSN](image-url)
4 DATA ANALYSIS

Quantitate data from Rural Comprehensive Information Service Station (RCISS) in Ningbo was collected to evaluate the framework of UPSN. Based on the model, we propose the analysis.

RCISS is a township or village level program designed to provide access to information services via the Internet and other media to meet rural informational needs. It was aiming to “Bridge the digital divide” in “the last one mile.” RCISS includes the following: modern breeding technology, production management, cultural knowledge, information technology, e-commerce business and paid agents of water, electricity, telephone, and television services. Armed with RCISS provided information, farmers can handle relevant business in their own village. RCISS aims to provide farmers in rural areas in China public information service by integrated software platform. It can be regarded as the basic level of UPSN.

Ningbo is a seaport city in the northeast of Zhejiang province, People's Republic of China, holding sub-provincial administrative status and separate state-planning status. As of the 2012 census, the municipality has a population of 7,639,000 inhabitants, 3,663,000 of whom reside in the urban area mainly located in Cixi, Yuyao, Zhenhai, Beilun, Yinzhou, Jiangbei, Fenghua, Ninghai and Xiangshan. It lies south of the Hangzhou Bay, facing the East China Sea to the east. Ningbo borders Shaoxing to the west and Taizhou to the south, and is separated from Zhoushan by a narrow body of water.

<table>
<thead>
<tr>
<th>Sub-area</th>
<th>Towns</th>
<th>RCISS</th>
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<tbody>
<tr>
<td>Yuyao</td>
<td>22</td>
<td>267</td>
</tr>
<tr>
<td>Cixi</td>
<td>19</td>
<td>275</td>
</tr>
<tr>
<td>Fenghua</td>
<td>11</td>
<td>370</td>
</tr>
<tr>
<td>Ninghai</td>
<td>18</td>
<td>368</td>
</tr>
<tr>
<td>Xiangshan</td>
<td>18</td>
<td>494</td>
</tr>
<tr>
<td>Jiangbei</td>
<td>8</td>
<td>107</td>
</tr>
<tr>
<td>Zhenhai</td>
<td>6</td>
<td>63</td>
</tr>
<tr>
<td>Beilun</td>
<td>9</td>
<td>173</td>
</tr>
<tr>
<td>Yinzhou</td>
<td>23</td>
<td>387</td>
</tr>
<tr>
<td>Total</td>
<td>134</td>
<td>2504</td>
</tr>
</tbody>
</table>

Table 1. Nine Sub-areas and the RCISS in Ningbo

In 2009, Ningbo City started construction of RCISS. Till 2010, there had been 2,226 RCISS in Ningbo. In 2011, more than 4,000 people had taken part in the training for use of the RCISS (NBIT, 2013). We choose the nine sub-areas (see Table 1) in Ningbo, China, which include 134 towns and 2,504 RCISS (2012), to illustrate the ubiquitous service of RCISS.

Data was collected from those 9 sub-area, 134 villages, and 2504 RCISS. Data are categorized into four different groups, which are Convenience services, Grassroots government services, Education Service, and Other Services. The application of statistical analysis for the year 2012, 94.1 percent of RCISS daily average frequency of service is less than one time; 98% of the average daily service station usage is no more than twice. Second, the services rendered unitary. Ningbo integrated rural information service station provides four categories of service total 19. According to the statistics of all 19 services in 2012, 29.1% of them provided “0 ” service; 28.3% of them provided only one service for their villages. It indicated that over half of the RCISS only provided once or none service by the RCISS, 18.7% of them provided more than ten services and there was only 0.3% of them provided all the nineteen services for their villages by RCISS. Third, the service frequency fluctuation shows that the RCISS can not provide stable service for inhabitants. According to the monthly service statistic of nine countries in Ningbo, it is always a phenomenon that some RCISS can provide almost
major services in one or two months, especially at the end of a year. So we develop the coefficient of variation (i.e., standard deviation and the mean of the monthly service ratio) to describe the tendency of service fluctuation (as shown in Table 2). Obviously, if the RCISS in an urban country provided little information service, the coefficient of variation would be relatively low, such as Jiangbei and Yinzhou (see Table 2). Fenghua, Ninghai, Cixi and Zhenhai got higher coefficient of variation than the others. It means lots of the RCISS in those urban countries got high service frequency in one or two months. Although Xiangshan provided much more services for their residents, the coefficient of variation kept much lower than other countries. It shows that RCISS located in Xiangshan provided service regularly.

<table>
<thead>
<tr>
<th></th>
<th>Yuyao</th>
<th>Beilun</th>
<th>Fenghua</th>
<th>Ninghai</th>
<th>Cixi</th>
<th>Jiangbei</th>
<th>Xiangshan</th>
<th>Yinzhou</th>
<th>Zhenhai</th>
</tr>
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<tbody>
<tr>
<td>$\mu_t$</td>
<td>1879</td>
<td>742</td>
<td>2710</td>
<td>3699</td>
<td>2908</td>
<td>357</td>
<td>10611</td>
<td>101</td>
<td>964</td>
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<td>$\sigma$</td>
<td>1568</td>
<td>639</td>
<td>4539</td>
<td>7568</td>
<td>5601</td>
<td>145</td>
<td>7206</td>
<td>58</td>
<td>1251</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>0.83</td>
<td>0.86</td>
<td>1.67</td>
<td>2.05</td>
<td>1.93</td>
<td>0.41</td>
<td>0.68</td>
<td>0.58</td>
<td>1.30</td>
</tr>
</tbody>
</table>

Table 2. Coefficient of Variation of the RCISS in Ningbo

5 CONCLUSION

According to UPSN theoretical framework presented in this paper and based on the economic development, information strategies and information technology experience, combined with the status quo of information construction in rural areas and problems from the survey of 52 villages and their 727 farmers in Ningbo, China, the suggestions for UPSN development were presented.

First, the popularization of information technology and network applications in rural areas is to be strengthened, the villagers' information literacy is to be improved. Only when villagers enhance their information literacy, the ubiquitous public service application can be accepted to help farmers. The training on how to use information technologies is suggested to help farmers to accept the UPSN and to change the farmers to be active in using UPSN. Only when farmers can be the users spontaneously, the ubiquitous users of UPSN will be achieved.

Second, investment should be increased on network to rapidly enlarge UPSN’s coverage in rural areas. Infrastructure investment is suggested to focus on building the next-generation information network infrastructure and the next generation of the Internet, the next generation of radio, television and third generation mobile communications network to support the UPSN. Accelerating fibre network’s extension to towns and villages to promote broadband coverage to the government, public service agencies, and community centres is also included in the suggestion.

Third, strengthening the information security infrastructure and management is very important to ensure the healthy development of UPSN. It includes information security infrastructure, legislation and security management of UPSN and so on.

6 FUTURE RESEARCH

As the research-in-progress paper, we propose the initial framework of UPSN. In the future, we will conduct detail qualitative and quantitative research method to further validate the framework and do further research on the farmers’ acceptance of RCISS and how to achieve the ubiquitous information service of UPSN in rural China.

References


