Barriers of Implementing Applicable Remote Health Care System In China

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Abstract—***Remote Health Care has been a hot research topic during the past few years in both academic and industry world, nonetheless services or products with true applicability are rarely seen at current market in China. What are the reasons behind this? This paper illustrates the key barriers in economical, technical, political and ethical aspects. It contributes as a reflection study for CHI-FIN UBI-SERV project. This research project utilizes user-centric approach to design ubiquitous welfare and safety services and supporting technologies for China and Finland.***

Keywords— **remote health care, user-centric design, user-acceptance study, business evaluation model**

I. Introduction

By the year of 2050, the world will count 2 billion people over the age of 60. In China, the proportion of Chinese aged over 50 will increase from 22% to 29%. Urbanization, aging and changes of globalized lifestyle result in higher amount of chronically illness and non-communication diseases, including depression, diabetes, cardiovascular disease and cancers [1]. Those factors bring serious challenge to traditional health care, like shortage of beds and high cost of doctors and nurses. Not only China, but also the rest of world is facing this problem. Additionally, realization of consumerism is growing dramatically in the field of health care, which means patients are demanding more decision making power during the treatment, and diversity of services. In order to satisfy consumerism, patient-centric care is required, with patients and their service providers sharing the access to personalized and contextual health information and treatment [2]. Furthermore, especially in China, elderly people always prefer to receive care from family or relatives, rather than from nursing houses.

Remote Health Care technology could be one of the promising solution for the challenges mentioned above. This concept is widely accepted and intensively researched by universities, companies and governments. Remote Health Care (or telecare, telemedicine, tele-wellbeing, telehealth, and connected personal health) is also regarded as a fundament block in future ambient intelligence or pervasive computing system. From the last year solely, Chinese central government has allocated funds as much as 466 million RMB (equivalent to 55 million Euros) for developing remote health care technologies, infrastructures and related regulations [3]. On contrast to the heat, or even over-heated attitude from research institutions, companies and governments towards remote health care, major stakeholders in this system, for example hospitals, nursing houses, patients, and aging population, have not shown significant interest. This paper will analyze the respective reasons through a business evaluation model, which contains four criteria, e.g. economy, technology, politic, ethic. The interrelations will also be discussed.

II. Economical Aspect

Generally speaking, economical value of remote health care technologies has been poorly realized. The target audience like caretakers, chronically ill and senior citizens, do not get sufficient information about benefits and potential positive impacts brought by this new technology. Industry often also fails to construct right business models which concern reimbursement and limited out-of-pocket co-payments [4]. However, concepts as pricing models and social-economic links are important to maintain a fluent business operation, particularly in the practical scenario of long-term care.

The present status of business market of remote health care services in China is very tragic. The business bubble formed during the year of 2007. Until now, most players just vanished from the horizon, such as Kanghua Technology Development Ltd. and Beijing Business Network Ltd.. The very few survivors [3] have transformed their business into offering unified communication or dedicated enterprise-level VPN (Virtual Private Network) services.

III. Technical Aspect

Technologies supporting remote health care are already there, such as wireless LANs, femto-cells, wireless sensor networks, RFIDs, memory tags, etc. Hence, firstly, the challenge from technical point of view is not the single technology itself, rather than the proper integration of the available techniques [2]. Currently, no such organization or company has successfully established world or national wide interoperable connectivity standard amongst equipment or service providers. Although there are groups like Continua Heal Alliance, they are trying to standardize the architecture of personal telehealth ecosystem including service modeling, and specify the interfaces for connecting devices and networks. Actual specifications from them are still not finalized. Device connectivity to the service provider side is proprietary-based. Moreover, the situation is going to maintain for the next two or three years. Consequently, large scale adoption of remote health care system is far more than difficult at this time instant.

Secondly, the cost of technology has not been reduced to a reasonable price. To illustrate this point, the cost of a conventional tele-operation monitoring system will be cited and calculated as an example.

Table1 - Equipment Cost of Tele-operation Monitoring System [3]

Item	Price/RMB	Amount	Sum/RMB	
Operating Table Front-end HD Camera	10k	6	60K	60
Data Interface for Microscope	7k	5	35K	35
Data Interface for Microcirculation Detector	8k	5	40K	40
Work Station	10k	5	50K	50
Transport Network (offers 10 to 20 simutanenous connectivity)	150k	1	150K	150
The Whole System			335K	335

According to the table above, in total, only the equipment cost of the whole system goes as high as 300k RMB to 400k RMB (equivalent to 35k – 47kEuros). After setting up the system, technician should be hired to maintain and administrate the system. This adds extra operation expenditure to initiate the service as well. The cost impact can be neglected in the western world, since comparing to high labor price, the equipment cost is relatively low. In China, the situation differs. Basically due to vast amount of population, the labor price is much lower. Most entrepreneurs or hospital manager would choose to use that money to hire more skilled doctors directly or expand and upgrade facilities, build up branch offices, etc. This happens rather than spending money on constructing cryptic and unreliable remote health care systems. And this is really the case now in China. The pioneer institutions like Peking Union Medical College Hospital (associate to Peking University Health Science Center) and Shanghai Huashang Hospital (associate to Fudan University), have the resources to fully implement the system. Nevertheless, these applications have been limited to educational purposes and emergency diagnose support only. [5]

Thirdly, there is a lack of underlying network infrastructure to support remote health care services in rural areas. According to the fifth national census from nation bureau of statistics of China [6], there are 807,39 million people which is 63.91 percent of the whole population, living in the rural areas. This group of people are the ones who can benefit the most from this technology. However, the poor or even absence of network infrastructure becomes the bottleneck for the implementation. Without any doubt, lousy audio or video quality, inconsistent data transfer and possible connection drops will dramatically trim down the user experience. Although currently there are many sophisticated solutions in the telecommunication industry offering reliable Internet access to rural areas, like NokiaSiemensNetwork's village connection project [7], it will probably take one to two years time to cover most of the rural area in China.

IV. Political Aspect

A typical remote health care system involves not only hospitals and nursing houses as service providers, but needs also an underlying quality of services (QoS) providing telecom network operator to offer connectivity. In case of misdiagnoses or misjudgments, which can result serious consequences, there is no defined law or regulation to adjudicate the responsibility and to protect customers.

Another important political issues in China is the central management system. China has joined WTO (World Trade Organization) since 2001, and many areas have been opened for foreign investments. Still, in some key areas like communication and integrated chip production, government has made exclusive laws to protect the local research institutions and the outcome technologies. To cite an example, the Little Smart (Xiao Ling Tong), which originates from a

Japanese technology called PHS (Personal Handy-phone System), has achieved exceptional success in both urban and rural areas in China. Experts believed the advantages offered by Little Smart would build up a solid business case with remarkable market share. Nevertheless, with the upcoming of TD-SCDMA (Time Division–Synchronized Code Division Multiple Access), Industry and Information Technology Department of China has issued a command [8] that China Telecom and China Unicom (current operators of Little Smart) shall not expand the Little Smart network and they should stop to acquire more subscribers. By the end of 2011, the frequency band used now by Little Smart, which is from 1900 to 1920 MHz, should be totally cleaned up. The reason behind this is to promote and support nation's TD-SCDMA technology, with Chinese own intellectual property rights. Large portion of Little Smart subscribers are then estimated to shift to TD-SCDMA network, operating by China Mobile.

Whether this act violates consumer rights is still under heavy discussion, and it is not a topic in this paper. But it is very clear to see the significant influence of the central management system to the successfulness of a certain technology in China. This would be considered as a barrier for certain areas of technological development. Therefore, under these circumstances, any academic or industrial projects within certain key areas, such as digital communication and integrated chip production, aims at designing truly applicable products for Chinese market, should always keep an eye on the development mainstream in China. Project groups should try to make their outcome to be in harmony or at least to be inter-operable with it. Typically, this can be achieved through enhancing cooperation with Chinese officials, universities and companies.

V. Ethical Aspect

When modeling the user acceptance of any information system, there are five criterions to evaluate, namely relative advantage, compatibility, complexity, triability and observability. [9] Based on these five criteria, individuals perceive a certain innovation's usefulness and make their decisions to adopt or reject it. As for adoption the new critical system like remote health care, all the five criteria have to be perfectly fulfilled. On contrast, most of the on-going research is more focus on technical engineering, lacking user centric design or usability engineering process. What makes this even worse is that, general patients in China have a very limited awareness of remote health care techniques and services.

Still one more factor which prevents Chinese people to accept remote health care is belief and preference in TCM - Tradition Chinese Medicine. Unlike in western world, people consider TCM as an alternative medical system. In China, TCM is believed to be more effective, sometimes offering palliative efficacy where the practices of western medicine fail or they are unable to deliver treatment, particularly for routine ailments such as flu and allergies. The essence of TCM is in human interactions, which are described as observe (wàng), smell (wén), inquire (wèn), and touch (qiē). Realizations of smell and touch in remote health care technology are still not invented yet. The attractiveness amongst the regular users of TCM is greatly reduced for this reason. From psychological point of view, people constantly feel unreliable and unsecured when communicating with computer, especially about critical topics like personal health care. What will happen if error occurs during the data transmission, or my biological data and disease information is leaked or eavesdrop by somebody, and later used for malicious activities? All these problems have to be addressed properly, and only after that it is possible to convince patients and senior citizens to accept and utilize remote health care.

VI. Conclusion & Opportunities

Slow progress in development of remote health care systems in China is really a complex issue. All the four factors, economical, technological, political and ethical, contribute to this phenomenon. Large scale deployment seems to be seriously hindered in the next one or two years. Additionally, although remote health care technologies are under heavy research, there are still many potentials for improvements, like proper integration of existing mature technologies; establishing inter-operable standards; further reducing equipment cost; considering services application and business models, and involving user-centric engineering in design processes. There are certainly customers and services that could be joined to form an applicable business case based on remote health care technologies in China. However, a holistic approach is now required to make this all truly to happen.

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