# Telecare and Telehealth care network in Taiwan

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*Abstract*—**In Taiwan, there are three types of caring patterns for elders, home care service, community care service and institution care service. In recent years, many syndicates have "advanced welfare park", which purpose is to provide a perfect caring system thus, improving the living quality of the elders. This dissertation proposes another innovative commercial management pattern for the elder care service, named, "Small Scale Multiple Care Service Spot (SSMCS)". This innovative care service is directly designed for the abidingly retiring elders in the future; those who are stationed in any of these care service spots will be able to enjoy a much higher quality environment. They will be provided with basic and extra services. All these services shall enable the youngsters to work contentedly while their parents are under such comprehensive care services. Such innovative pattern can also be expanded by adding more spots and can be managed as a linked industry. This can not only be duplicated or removed, but the residents can also cross different areas freely, as well as cross various nations to the linked spots for long stay. Finally, this dissertation provides some crucial techniques and specific conditions for the development of SSMCS. These information shall also serve as a reference for setting a spot and managing it in the near future.**

## I. INTRODUCTION

ACCORDING to a survey of registered permanent address and general housing in Taiwan conducted by the government in 2007,over 65 years of age, so called elderly population ratio has reached 10.06%. Taiwan Executive Yuan Economic Development Committee also estimated that in 2050, Taiwan's aging population ratio will reach as high as 29.8% make Taiwan's aging speed faster than that of general industrialized countries as shown in figure 1. Taiwan's fast aging is attributed to three reasons: (1) low fertility rate (2) young people's decision to remain single and (3) advanced medical technology. This aging population with long life expectancy therefore is one of the four factors influencing health care demand along with increased GDP, accessibility and availability of services, efficiency and effectiveness of health technology.

The problem of an aging population and its Long Term Care (LTC) is now an important topic. The welfare and service for the elderly is now a major concern of

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Taiwan government. There are generally, three types of caring patterns for elderly in Taiwan; home care service, community care service and institution care service. Based on the ability of taking care of oneself, the institution care service can be subdivided into three different levels; secure service home, raising service home, and nursing service home. In recent years more than ten syndicates have "advanced welfare parks", like Ruen-Fu newlife[1], Chang-Gung Health and Culture Village[2], etc. The purpose is to provide a perfect caring system thus
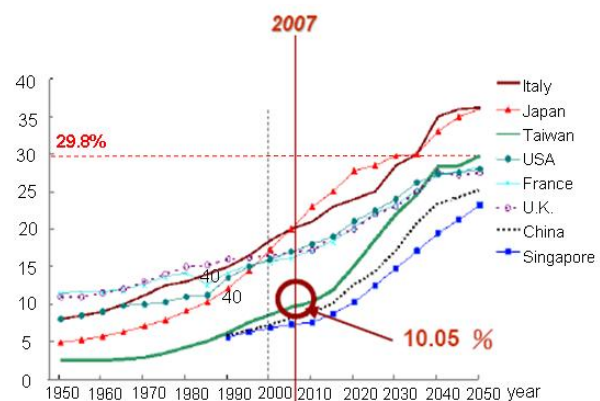


Fig. 1 Taiwan government predicted that elderly population will take 20% in 2026 and 29.8% in 2050 toward total people in Taiwan.

improving the living quality of the elders.

Figure 2 shows the variety of elderly care types in Taiwan such as home care, community care, institution care and welfare park.  Each type of care services has its own advantages and service content. No matter what, each service depends on the user's activity, physical, education level and culture. In this research, we have introduced some tele-health care and tele-home care case in Taiwan. Besides, we have analyzed which care service is worthwhile to



| Institution Care | Home Care | Community Care | Welfare Park | Health promotion |
|---|---|---|---|---|
| Secure home<br>Raising home<br>Nursing home | Home care<br>Meat serve<br>Home Rehabilitation<br>To escort<br>housework<br>Instead of care | Community care<br>Elderly apartment<br>Rehabilitation<br>Day care<br>Temperately care<br>Spirit care<br>Transportation | Reun-Fu Newlife<br>Chang-Kung village | Short term<br>New start point |
| Accepted migrant caregivers | | | | |
| Telecare and Telehealth care | | | | |

**Fig. 2 The variety of elderly care types in Taiwan**
develop in Taiwan based on the users' demand.

Among Taiwan's 2.3 million elderly population, over 1.3 million (56%) elders suffer from chronic disease, but only 0.85 million elders need to be cared. However, more than 0.3 million elders are close to losing living capability, and are not yet to be taken care of [3]. Therefore, more efforts shall be done regarding the health-care for elderly. In Taiwan, 97.7% of the elderly prefer to age at home or live in the community with relatives and friends; instead of staying in institutions[4]. Given this fact, the demand for

Tele-home care and Tele-health care service shall increase. This growing trend however, is not only in Taiwan but also in the world[5].

In Taiwan, many Telecare and Telehealth care systems have been implemented since 2007 in participation of the government campaign and replication of a feasible care model. The first project was the so called "U-care" project announced by the Department of Industrial Technology (DoIT). U-care means ubiquitous care for the elderly anywhere and anytime. Although Telecare and Telehealth care systems can be used in the improvement of the care quality, however, the elderly demand for a full function care service shall be considerate , thus, the development of an innovative care business model so called "Small Scale Multiple Care Spot (**SSMCS**)" for the elderly was provided.

In this paper, many projects of Telecare/Telehealth care which were held in Taiwan are briefly described in section II. In section III, an innovative care business model so called **"SSMCS"** for the elderly is introduced. A key technology for implementing this care model is discussed in section IV and conclusions are given in section V.

## II. PREVIOUS STUDIES

### A. Definitions

The Telehealth care system collects vital signs from peripheral devices and subjective patient information, and transmits the data directly to the Telehealth or disease management company's own clinical information system. Typically, the peripheral devices certified for using with the Telehealth care system includes weight scales, blood pressure monitors, blood glucose meters, peak flow meters, SpO2 meters, one lead cardiogram and heart and lung sounds. All the peripheral devices are specially designed extremely simple and intuitive to use for elderly patients. Meanwhile Telehome care system sometimes so called the Telecare system is a continuous, automatic and remote monitoring of real time emergencies and lifestyle changes over time in order to manage the risks associated with all ages living independently. Telehome care system consists of various sensors placed around the home linked to a telehome care system and monitored 24 hours a day, 265 days a year by a service center, allowing swift action to be taken should an incident occur. Typically, the peripheral devices certified for using with the Telehome care system includes panic button, medication dispensers, bed/chair occupancy sensor, telephone for the elderly, wireless environment security sensor, fall detector etc. All the peripheral devices are specially designed automatic trigger even and transmitted emergence events or alarm as audio/visual signal to the safety care center.

### B. Previous studies

There are many telehealth/telecare technology providers in the world, such as Tunstall [6]and telemedcare [7] in UK, Rtx telecom [8] in Denmark, Viterion [9], Honeywell [10] and Health hero network[11 ] in USA. In using the systems as mentioned, many clinical trials have been done. An obvious result of the literature study is the fact that most of the research done on Telehealth is performed with a strong technical viewpoint supporting two dominant service: vital sign parameter (VSP) measurement and audio-video teleconsultation [12]. Besides, another research done on Telecare focused on the technology of dwelling safety on preventing fall injuries of elders.

Most of papers deal either with the description of own developed solutions, mainly for data acquisition and transfer from the home to a specialist clinic, or with case studies describing implementation and test of off-the-shelf products for teleconsultation using audio-video communication. A deeper evaluation of Telehealth in form of randomized controlled clinical trials and large scale, long-term empirical studies is still lacking. In addition, scientific evidence of the effects of home Telehealth solutions is still rare [13].

Not surprisingly, in studying telehealth, the majority of publication deals with vital sign parameter measurement and audio-video consultations technology which have all been developing since 1991[14-18]. Taiwan is in the primary stage; we are focused on developing the peripheral devices such as blood pressure monitors, blood glucose meters, peak flow meters, SpO2 meters, ECG recorders and hart and lung sounds etc. However, in 2006, the Department of Industrial Technology (DoIT) of Taiwan government announced an "U-care project", and in 2007, the Department of Health (DoH) executed a so called "Taiwan pilot Telecare project". Taiwan has been aggressive in developing the Telecare/Telehealth service country. Both projects are briefly described as follows:

(1)U-care project of DoIT

This is a long term project which is intended to run in three years. It is divided into two stages: one is the "plan in advance" project and the other is "build - up" project stage. The first one has been opened to any company which needs to develop its care business model after which, can apply for stage 2. The interested company can apply plan in "advance project" or "build –up" project directly. The scope of this project was an emphasis on innovation for creating a valuable Telecare/ Telehealth care service business model. Table 1 shows the projects being executed in Taiwan area; there were 8 projects executed in 2006, and 12 projects in 2007 respectively.

Table 1 The "U-care" projects being executed in

| 類型 | | 主導企業 | 共同執行 | 計畫名稱 |
|---|---|---|---|---|
| 建置 | 集中 | 長庚紀念醫院 | | 銀髮族優質照護服務創新計畫 |
| | 分散居家 | 中興保全(股) | 嘉義基督教醫院、馬雅資訊開博科技 | 優化生活,幸福連線-健康照護服務計畫 |
| | | 耕莘醫院 | 真茂科技、天使學園網路 | 全方位老人生活健康照護網計畫 |
| | | 敏盛醫控(股) | 神通電腦、義隆電子、捷ş 科技、合世生醫科技 | 去機構化之高齡者照護服務平台計畫 |
| | | 雲林老人協會 | 泰博科技 | 無線生理監測系統運用於居家糖尿病及高血壓老人照護服務計畫 |
| | | 慈聯企業(股) | - | 銀髮族行動數位資訊健康照護服務系統 |
| | | 榮電(股) | 台灣普吉帝、昱源科技、經緯科技、仲琦科技 | 銀髮族行動照護服務計畫 |
| 規劃 | 分散居家 | 遠傳電信(股) | - | 遠距健康照護示範服務先期規劃 |

(2) Taiwan pilot Telecare project of DoH

Figure 3 illustrates the scope of this Taiwan project, which will combine home care, institution care, community health care and living supports. The service contents

include Telecare , Telehealth and living supports, such as safety and security, self-managing their health and living supports. In addition to, the pilot system will network with existing health information systems; 26 long-term care networking platform and other Telecare stations. In this pilot project, two sub-project will be executed by Wan-Fung Hospital and Taipei Medical University separately for caring system "assessment" and "evaluation" shown in Figure 4. The initial results will be released end of June, 2008.
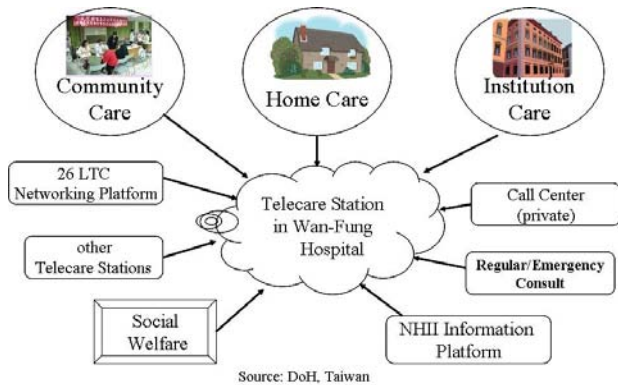


Fig. 3 illustrated the architecture of DoH Telecare pilot project.
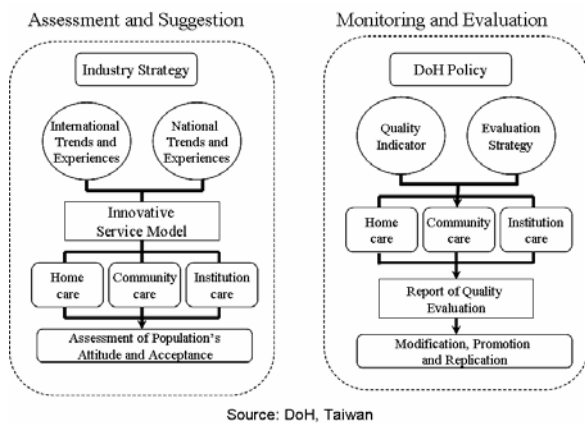


Fig. 4 Two sub-project of pilot Telecare project.

### III. INNOVATIVE CARE MODEL FOR ELDERS

In Taiwan and even in most countries in the world, the elderly prefer to age at home and to live in the community; instead of staying in institutions. Given this fact, the demand for Tele-home care and Tele-health care service shall increase because to stay in the institution means that someone will be isolated from their family members, isolated from their best friends and leave the familiar living environment. Even if the living quality of institution may be better than their own dwelling, the elderly still refuse to stay in the institution because they lose their freedom and power.

In recent years, due to elders' better economic conditions and influenced by low fertility rate, they change their mind and hope to reduce care loading from their children. Besides, They want to enjoy (i.e. traveling) with their friends, living together with colleague and/or best friend and taking care of each other. Some care service providers can support them with providing partly their needs, but the elderly hope to be free or independent at the same time. Simply said, they want to age with their best friend not child, and they totally want to have self-esteem like they are young and have power to dominate everything. For these demands of the elderly, an innovative care service model shall be developed. Figure 5 shows the concept of an innovative care service model. The new business model so called SSMCS is similar to a logistical supply chain except that the service object is the elderly, not a company or a general consumer. In addition, the service contents include food, domicile, entertainment, clothes, transportation, continuing education, traveling, medical treatment and consultations etc. Based on these components, the service indeed does not sound so easy like general logistic system.

### A. the SSMCS architecture

There are many gathered group type dwelling houses in eastern countries. They are located in rural and urban. They can be organized to become a SSMCS system as Figure 5, comprising
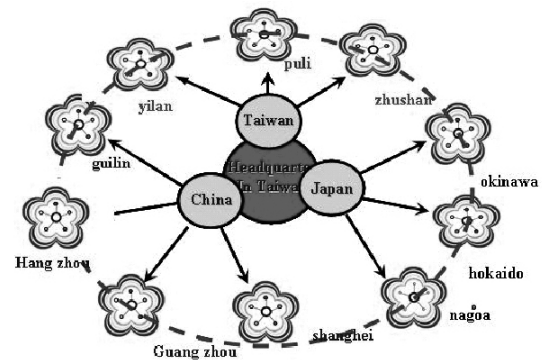


Fig. 5 The SSMCS system structure consisted of Headquarter/Enterprise, Branches and Care Spots.

(1)Headquarter/enterprise

The Headquarter/enterprise of SSMCS is a main company to manage financial, manpower, logistical support and business operation. Logistical system provides i.e. dwelling management, Telecare service, Telehealth care service, food, clothes, domicile, transportation, continuous education, entertainment, traveling, medical treatment and audio-video consultations service etc. The SSMCS enterprise is profit oriented. It can be a tactic to join with other companies for a variety of logistical support. Besides, it can also join other countries' companies for a variety service such as traveling or extended business to another country.

Because the main company combines many branches and many care service spots around the world, the elderly can join to the main company as members. The main company shall serve for the members anywhere and anytime there is a care service spot. It means that the elderly can travel in many locations, if they applied a travel support from the main company.

(2)Branches

The SSMCS enterprise can branch out with each local branch supporting care service spots. However, the branches remain under the supervision of the main headquarter. Branch was located in each country i.e. Taiwan, Japan, China….. A branch is comprised by many domestic care spots.

(3) Care Spot

A care service spot is comprised by local (i.e. Gung Zhou, yilan …) dwelling /housing /apartment owner as a care giver. One unit (housing) serves for single /couple elderly. Care giver can organize a 10-20 units as a care service spot joint to the SSMCS system. The care service spot owner actually acts as a secretary or a manager to serve the residents. Since each care service spot is a partner of main company, the logistical system of the main company will provide basic services supports. and extra service from spot such as local shopping, taking urgent errands, etc. This way, care givers can keep paying attention in providing high quality service i.e. warmer and family like environment for attracting future customers.

(4) The retired elderly

The retired elderly can be grouped into 10-20 members which can normally consist of colleagues or best friends. However, the group members should have joined the SSMCS Headquarter as members first , then they can choose a variety care service spot  for living. The elderly who live in the care service spot will be served by the spot owner/manager. They can choose short time stay or long stay depending on their needs.

In Asia, many countries retire at 60 or 65 years old. Those elderly appear to be highly active and strong. They want to travel in the world without their children worrying about them; also, they desire to be engaged in many activities with much freedom. To sum, they prefer to be independent and hope to reduce care loading from their children of which, the SSMCS care business model can help them fulfill.

## IV. KEY TECHNOLEDGY

There are many challenges to let SSMCS become a successful business:

(1) The acceptance of elderly and children

The elderly prefer living with their friends than with their children, because due to high economic pressure from children, the children need to work far from their hometown so they can not stay with their parents at home. In the children side, they are always worried about the safety problem of their parents because elderly living independently are usually more exposed to high risk of accidents than those who stay with their families. But if a care giver and/or parent's friend can care each other, the children can be released from the high care loading pressure. They can pay attention to their job.

(2) The management technique of enterprise

Many techniques can be used to manage a huge enterprise, However, Kaplan and Norton's Balanced Scorecard (BSC) may be more suitable for managing an enterprise. The BSC began as a concept for measuring whether the smaller-scale operational activities of a company are aligned with its larger-scale objectives in terms of vision and strategy. It was developed in 1992. By focusing not only on financial outcomes but also on the human issues, the BSC helps provide a more comprehensive view of a business, which in turn helps organizations act in their best long-term interests. The strategic management system helps managers focus on performance metrics while balancing financial objectives with customer, process and employee perspectives. Measures are often indicators of future performance. [19]

(3) Integrated Logistical Support (ILS) system

The Integrated Logistical Support (ILS) system for SSMCS is complex engineering because the system provides large quantity and variety of services for the elderly who live in the spatial care service spot. There are many existing logistical systems around the word, like 7-Eleven, McDonalds, etc. The ILS system can operate with existing system or create a new system for these business, or the branch can help to implement this ILS system, specially, the food support to prevent long distance transportation.

(4) Financial

The elderly who avail of this service, shall pay the membership dues to Headquarter/enterprise first, then pay an annual cost to that company when the elderly stay in the care service spot for regular service. Some extra services for the elderly i.e. outside the care service spot for sporting as golf etc. shall be charged by the care spot giver/manager. The enterprise will then pay back the care service spot for their regular service.

(5) The culture

Understandably, different countries have different culture so, the SSMCS system shall be adjusted to fit local culture requirement like McDonald which changes its foods a little bit for local customers.

(6) Telecare and Telehealth service

Health insurance is controlled by the government, while the medical insurance in general is held by private insurance companies. The SSMCS adapts the advance Telecare and Telehealth technology to care the resident which live in the spot. There are different levels of care service in different care centers. Basic medical service can be executed by locally hospital or clinic. The care centers in Headquarter/enterprise provide health care and emergency alert service. Meanwhile, when a resident applies for transfer to any care service spot, local or overseas, headquarter/enterprise care center will be set-up to care for the member anywhere and anytime. The charge shall be paid from the Health/medical insurance department if it is possible.

(7) Marketing volume

The marketing volume, of course shall have a limitation and the scale needs more studies. Two

enterprises have been launched to provide these kinds of care service, one is Sheng-En Enterprise Ltd. In Taiwan and other is Chin-Ho Yuan in mainland China.

(8)Technical perspective

SSMCS needs an advance ICT to implement and manage this kind of service. The technology has been developed; however, the quality measurement has not been well defined yet in the world. Fortunately, Telecare Services Association (TSA) in UK[20] and America Telemedicine Association (ATA) in USA[21] can provide valued report for telecare/telehealth issue.

## V. CONCLUSIONS

The Telecare and/or Telehealth service shall face many challenges such as payment and reimbursement, licensure, cost, sustainability, varied demands of elders, different urban versus rural perspectives etc. Taiwan experience in developing Telecare and Telehealth care proves that both services can not meet varied demands of the elderly thus, the concept of an alternative solution. A roughly-conceptualized total service for the elderly, the SSMCS system may be the one solution to realize ubiquitous care. However, practical implementation of the related research results is even more complex as those systems will have a high impact on organization, society and legislation. It will be interesting to see how SSMCS system will build up and advance.

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