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Abstract. As in many countries, ageing and aged care in China is an important issue. There is a need for more research on the potential for technology to assist older people and their families, particularly given the disappointing levels of adoption in developed countries. Accordingly this paper aims to gain insight into the perceptions of older people and stakeholders in relation to issues of ageing and their interest in adoption of technology. Using convenience sampling, the authors surveyed 277 participants to understand peoples concerns concerning ageing and use of technologies. Results from this study provide a basis for discussion with stakeholders, particularly concerning ageing in China.

Keywords: China, Ageing, Technology

1 Background

This research was conceived as an initial step in a long-term program to gain greater insight into the perceptions of older people and stakeholders in relation to issues of ageing and their interest in adoption of technology. The adoption of home telehealth and intelligent assistive technology has to date been disappointing [1] and there is a lack of convincing research evidence of its benefits. The needs and concerns of older adults as computer users may be different from those of younger users as a result of the changes associated with the ageing process [2]. There is a need for a greater appreciation of ageing and adoption of assistive technologies from the perspective of older people and their families.

The increased use of healthcare associated with ageing is well documented [3] including the increasing use of medications needed to manage chronic conditions [4]. Other challenges of ageing include elder abuse particularly financial abuse [5]. Associated with increasing use of health and support services is the need to manage documentation and processes for making claims on government or health insurance. It can be a challenge for carers of the frail elderly, likely to be elderly themselves [6], to navigate the complexity. ICTs offer potential benefits for older people including

management of records, personal safety, comfort for families, reminders for medications and other needs, remote access to clinical and other care services, social connections, quality information for self-care, GPS (Global Positioning Systems) tracking and assistance in way-finding, support for people with specific disabilities amongst many others [7].

The stoicism of the War Generation may result in a reluctance to seek help or to report instances of breaches of privacy. Anecdotally a commonly-reported comment from older people is they don't want to be a "bother" to people. Entry into the aged care system can occur through a catastrophic event such as a serious fall or from a visit from a relative who observes the older person is no longer able to care for themselves. Better use of ICTs (Information and Communication Technologies) such as Personal Alarms or other sensors and monitors may allow difficulties to be known earlier and for help to be obtained to assist someone to live at home. Trials of Telecare and telehealth have shown these to be well-accepted by consumers and their families.

ICTs are usually designed by young people with good eye-sight, dexterity and familiarity with technologies. Older people often have poorer vision; there are slower connections in the brain. The choice of fonts is rarely undertaken with cognisance of the needs of older users. The ICT hardware and software that older people have may not be updated as frequently as that of other ICT users. They may not understand how to use the automatic updates that software vendors provide leaving them vulnerable to the security gaps these fixes may have addressed.

The cohort of older adults today is very different from previous cohorts of older people, and the next cohort of the elderly, the "baby boomers," is also likely to be different from today's elderly [8]. Baby boomers can be expected to continue their high use of ICTs into their older years. They will have high expectations of services that can be delivered, of ways they can manage their own care. An issue for them will be maintaining their competencies in the face of the relentless change of technologies; already there is a large gap between teenagers and older people in the social networks and other applications used. The nature of cyber-attacks has changed considerably and baby-boomers may find it a challenge to keep up to date with technology change.

2 Chinese government policy on ageing, aged-care and technology

Ageing is an area of high priority for governments in China as evidenced by the 12th Five-Year Plan [9] and the conclusions of the third plenum session of 18th Party Congress [10]. Included in the "CCP (Chinese Communist Party) decision on deepening the reform of some major issues" latter amongst other recommendations for health and aged care services is "Make full use of information technology tools to promote high-quality medical resources longitudinal flow".

3 Methods

The researchers are involved in organising an annual Aged Care Exhibition in Nanjing, China. This is hosted by the Department of Civil Affairs of Jiangsu, Office of Jiangsu Provincial Committee on Aging, and the China Council for the Promotion of International Trade, Jiangsu Sub-Council. Exhibits include products for mobility, nutrition and dietetics, dietary supplements, mobility devices, training, TCM (Traditional Chinese Medicine) and complementary therapeutics, age-specific real estate, assistive devices, diagnostic devices, "age-friendly" household articles and construction materials, accident prevention products, bathroom products, communication devices, positioning systems and many others. Attendees include government officials, providers of services for the aged, and suppliers; the attendees are largely consumers and the event attracts large numbers of older people. Lectures and presentations are provided by suppliers, researchers, government officials and others covering topics such as analysis of the "silver" market, government policies, the plans of care service organisations and workshops on specific topics such as on ophthalmology and prevention and treatment of cardiovascular diseases. Nanjing was selected as the venue for the annual event; it has an older demographic than most of China, it is easily accessible and it is seen as a desirable city that is a popular venue for conferences.

In 2013 the opportunity was taken to try to survey attendees about concerns of ageing and opinions of assistive technologies. Convenience sampling was undertaken of attendees of the annual Aged Care Technology Expo at Nanjing over three days in November 2013. Approval for a survey of attendees was granted by ISTIC through their processes for research and a survey form developed and tested. This asked for ranking of concerns of ageing and indications of technologies that attendees might be interested in. The options were decided upon following a focus group of aged care policy officials and researchers.

A volunteer assisting at the conference agreed to invite attendees to complete the survey form and a reward was offered in the form of a plastic finger massage device. The volunteer was located at a booth near the main entrance to the Exhibition. Consequently approaches were made only to people who passed near the booth, as the entrance to the exhibition was across several large doors to the Exhibition only a minority of attendees was invited to complete it.

4 Results

277 attendees completed the survey form which is a very small level of participation given that attendance at the event is around 50,000 people. The numbers of attendees might itself have been a barrier to participation as only a small number of people would have been able to see the volunteer due to the large numbers of people and that entry to the event was through a large open doorway. The volunteer only asked people who passed near her particular booth; there were 190 exhibitors at the event using booths or other displays for their projects and services.

Of the ten options provided on the form for concerns of ageing the responses, in priority order were: health (190), maintaining social activities (140), physical decline (134), accessing public transport (130) Family not taking care of you (113), not

having enough money (111), mental decline (99), house not suitable for an older person (76), and family taking your money and assets (63). No respondees selected "other". The responses to the question "Which of the devices people would be happy to purchase" the responses to the options given were: Home telehealth device for on-line medical consultations (117), Reminder service (appointments, medications etc) (102), Home sensors (87), GPS tracking device in case I get lost (71), Home cameras so my family can see I am OK (69), other products/services (0). No respondees selected "other".

5 Discussion

Concerns of people about their own ageing are many and varied. There are concerns about a decline in health, increasing chronic disease and disability. Of concern to consumers, funders and care providers is the correlation between the rising number of chronic conditions accumulated with ageing and rising healthcare costs [11]. There are expectations and some evidence that a greater use of technology might assist consumers and their carers to better manage health including remote access to care services. In this sample health and physical were the major concerns of ageing ranked first for health and third for physical decline. There is some evidence of the benefits of maintaining social activities for health and well-being and that was the second major concern of the respondees. Despite China, and especially Nanjing, having a reasonable public transport system in terms of a metro, bus and train networks, accessing public transport was the next concern of respondees. There are indications that transfers are the greatest risk for frail elderly in accessing transport although most Metro and train stations have elevators as well as escalators.

China is a nation influenced by the Confucian tradition which values age and places expectations that your family not taking care of you in older age. The option of "family not taking care of you scored 113 responses suggesting it is a concern of some older people. Nanjing is in the developed east coast strip where greater wealth is evident compared to inner or western Chin yet "not having enough money" scored 111 responses. Lower scores were received for "mental decline" (99) and "house not suitable for an older person" (76). Most Chinese live in apartments and depending on whether they were serviced by elevators might indicate their suitability for frail aged.

Elder abuse is a sad feature of societies and ICTs could offer an additional channel for this to occur, particularly financial abuse [12]. Older people often use ICTs to manage their retirement savings and investments. They may be less alert to instances of fraud or errors by financial institutions and may be more trusting of institutions such as banks; they may need help to access accounts and manage security including password changes. It may be tempting for people assisting to take advantage of that trust. In this research the concern of "family taking your money and assets scored low (63) but enough to indicate this was a concern of some older people.

6 Technology and new service models

The need for streamlined service models for aged care has been identified [13] and technology has potential to help transform the experience of ageing and the delivery of care and support services. While a great deal of work has been done on pilot studies, time-limited trials and telehealth frameworks for health delivery [14] very little research has been done on analysing the critical successes and failures of the delivery models. There is disappointment in governments, providers and remote clients that telehealth has not been adopted at an expeditious rate and the reasons for this warrant investigation [15].

This research invited responses to the question "Which of the devices you would be happy to purchase". The highest response was for the option "Home telehealth device for on-line medical consultations" (117 responses). Telehealth has the potential to automatically provide a consultation including taking of vital signs through peripheral devices. A Reminder service (appointments, medications etc) (102) was the second most popular item followed by Home sensors (87), GPS tracking device in case I get lost (71) and Home cameras so my family can see I am OK (69). The form provided space for respondees to indicate other devices but no reponses were received for "other".

Technology along with innovations such as universal housing design [16] has the potential to meet people's needs at various stages of their lives. These can make our homes safer and reduce the need to move home in the event of illness, frailty or disability. The aged and community care sector is yet to fully embrace the wide range of technology innovations that are increasingly available.

Smart home technologies include Telecare, Telehealth, robotics, wearable devices, and ubiquitous sensors on appliances such as microwave ovens and light switches. The needs of people with dementia that technologies could assist with are great and varied. This includes reminders for ADLs (Activities of Daily Living) and medications. Consumers, families and carers could access care through Telehealth technologies; that is technologies that can provide an automated consultation, a link to a remote clinician when required and information for guided self-care. Similarly these and other devices can facilitate social connections and some residential care facilities already make Skype available for residents. Telecare can help keep people safe through movement detectors, out-of-bed sensors, automated lighting to guide someone to the toilet when they get out of bed in the night, sensor for extreme heat in the kitchen and flooding in the bathroom. Signals can be selectively routed such that an alert about a fall might have a different recipient than an alert about a fire.

As many people are aware the responsibility of caring for a person with dementia can be consuming and allow little time for other responsibilities. Through the technology families can have reassurance that their family member is safe. Sensors can detect if a person opens a door, uses the microwave or other appliances, has a fall, and is taking medications and otherwise following ADLs. The technology can give respite to families so they can live more of their own lives or even to be able to go shopping knowing they will receive an alert in the event of an adverse event such as a fall or in the case of wandering. Technology has the potential to relieve clinicians of much of the non-clinical tasks that clinicians need to deal with, allowing them to focus more on the functions they were trained for.

Sensor networks can be connected to Big Data tools that can analyse massive amounts of data that various sensors can capture. The analytical tools can detect

subtle changes in behaviour that might otherwise be missed by busy clinicians. Home visiting care staff members typically spend significant hours driving from client to client. The technology can assist to triage and prioritise visits it can also indicate when the client may not need a personal visit. Clinical staff can reduce unnecessary visits and instead focus on more critical needs for their skills. Overseas these technologies have been demonstrated to reduce admissions, readmissions, and length of stay when a client is admitted. There is also an environmental benefit in reducing client and carer travel to access services.

Despite the long-anticipated benefits the adoption of Smart Home technologies for care has been slow but there are signs that the pace of adoption is starting to accelerate. There have been a small but increasing number of larger-scale roll-outs. There is more available evidence to support the expectations of benefits from Smart Home technologies. The better known studies include the Whole System Demonstrator in the UK [17] which involved over 6000 patients in a randomised controlled trial. It found show that Telehealth can deliver a 15% reduction in A&E/ED (Accident & Emergency or Emergency Department) visits, a 20% reduction in emergency admissions, a 14% reduction in elective admissions, a 14% reduction in bed days and an 8% reduction in tariff costs and a 45% reduction in mortality rates. This was not dissimilar from the evaluation of a similar project in the Veterans Administration system in the USA which found 25% reduction in bed days, 19% reduction in hospital admissions and high consumer satisfaction at a relatively modest cost [18].

There is an expectation that the move of Baby-boomers into the age when they will require aged care services will have significant impacts. This is in terms of their political pressure for improvements including greater access to technology as well as provide markets for “killer aps”, that is innovations that perhaps have not yet been invented but which by themselves will drive massive-scale adoption. Another driver may be the ageing cohorts in Asia which already has the countries with the largest numbers of older people (India and China), the regions with the most aged demographics (Hong Kong, Macau, Japan) and the most rapidly ageing countries (Korea and Taiwan).

Smart home technology has matured significantly over the past decade and there is much to learn from the way different technologies are being used successfully in different services and different countries. There is no lack of technology innovations but there is much to be done in learning how to adopt and realise the benefits. It appears many of the Smart Home projects in Australia and overseas are not independently evaluated which can mean that valuable lessons are lost. Care providers are encouraged to partner with some of the many researchers in this field who can assist in finding research grant funds and in distilling the learning to the benefit of all.

7 Limitations of the study

The study had many limitations. It was a convenience study of people attending an aged care event so only people with the capacity and means to attend the event could

be included in sampling. The volunteers invited people who came near their booth but had no way of knowing their age, whether they were visitors to the event or participating in another capacity such as an exhibitor, presenter or accompanying family member. The volunteer's booth was near the main entrance so many of the respondees would not have seen the many technologies on display which may account for no-one selecting "other" as technologies they would like to adopt.

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