RESEARCH BRIEF

e-Health and Healthy Aging Among the Participating Countries in JST Sakura Science Exchange Program 2019

Myla M. Arcinas[1], Melanie P. Tolentino[2*], Cyril Ryan A. Lituañas[1], Joseph S. Cadeliña[1] and Yoshihide Obayashi[3]
[1]De La Salle University, Philippines
[2]Central Luzon State University, Philippines
[3]Hokkaido University, Japan
*meltolentino_21@yahoo.com

The Japan Science and Technology (JST) Sakura Exchange Program in Science in March 2019 had focused its theme on "Exploring Sustainable Ageing Society Driven by Technical and Social Innovation." The five participating countries in this JST program were Japan, South Korea, Thailand, the Philippines, and Sri Lanka. The aging population is a global phenomenon, and these JST participating countries have pressing concerns related to their respective aging populations. Japan and South Korea have the highest percentage of an aging population, 33.6% and 20.2%, respectively (http://worldpopulationreview. com). Thailand is also a rapidly aging society with 17.1% of the older adults in their total population, whereas Sri Lanka and the Philippines have an older adult percentage of 14.7 and 7.7, respectively, and will be catching up in 2030 to 2050 (http:// worldpopulationreview.com). An aging population has several implications, such as increased demands on health needs, issues on living arrangements, falling fertility rate, and graying workforce. Hence, there is a need to tackle the aging-related issues and collaborate to be able to share innovations related to the health of the older people. During the 10-day short term course program, the participants had discussions on the state of aging and innovations of their respective countries. In this collaboration, technology-driven innovations were

identified to help aging people to live independently, yet integrated into society.

Innovations in information and communication technology can fix health disparities and address the unfulfilled demand of health consumers (Lu et al., 2010) through communication, education, and monitoring (Faiola & Holden, 2017; Faiola et al., 2018). Mobile phones and the Internet are potential platforms to provide health information and support viable for the older adult population (Joe & Demiris, 2013; Zapata et al., 2015; Matthew-Maich et al, 2016). E-health or mobile health refer to the medical and public health practices supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices (World Health Organization, 2011). These devices include smartphones, smartwatches, and wristbands. Bujnowska-Fedak and Pirogowicz defined e-health as "the use of ICT, especially the internet, to enable healthcare and improve health of the population" (2014, p 696) and has great potential in improving access and support to efficient and effective care for the older people. Considering the optimistic value of this health innovation, its usage can positively contribute to healthy aging, that is, enabling the older people "to meet their basic needs; to learn, grow and make decisions; to be mobile; to build and maintain

relationships; and to contribute to society"(World Health Organization, n.d., par. 3).

This paper reviews the related studies on e-health and healthy aging among the five participating countries in the JST Sakura Exchange Program in Science in 2019. Forms of e-health specific for each JST participating country are identified. Social media usage among the older people is also included in this review as part of e-health services. Healthy aging, in this review, highlights the domains that include the freedom to make choices, the ability to build and maintain a relationship, and to contribute to society. This research brief has two objectives: first, to describe the current e-Health services and usage of the five participating countries in the JST Sakura Exchange Program in Science in 2019; and second, to determine how e-health services contribute to their healthy aging in terms of freedom to make choices, ability to build and maintain a relationship, and to contribute to society.

E-health services and usage in Japan, South Korea, Thailand, Philippines, and Sri Lanka

Japan has been a leading country in research and development on life innovation, which includes care service infrastructure to support the aging population (Carlsson, 2006). In 2012, Akiyama and Nagai reported the need for an Internet-ready health IT system that will allow storing and sharing of health and medical information between patients and provider. There are two recent developments in the e-health of Japan, namely, monitoring sensor system (*minamori sensă*) and ICT-based Telehealth networks implemented across the country (Brucksch, 2018). Specifically included in these forms are smart homes, generic ICT products, services, and applications with assistive technology to deliver support to older people living on their own (Carretero, 2015).

Monitoring sensor system highlights the functions of "monitoring multiple rooms at the same time, allowing for help no to be solely dependent on the care-receivers voluntary actions, sending an alarm to caregivers if the care-receiver falls, sending information to caregivers after changes in health of the care-receiver is detected" (Brucksch, 2018, p. 2). This e-health service has been integrated into sensor technologies in both housing solutions manufacturing and house building companies. Specific examples of these are the Welfare Techno House and Smart Healthcare House with automated monitoring system within the home that enables health checks and support such as ECG, which can be taken while in bed, in the bathtub, and on the toilet without the patient's awareness (Brucksch, 2018; Tamura et al., 2007).

Telehealth networks, as another form of e-health measure, is implemented by local and prefectural governments in Japan, which aids in the declining capacities of older adults as well as on the shortages of financial resources and health care professionals in rapidly aging peripheral areas of the country (Brucksch, 2018). An example of this is in Nishiaizu town where health-related data, such as blood pressure, ECG, and blood oxygen of the older people with lifestyle illnesses, are transmitted to a remote medical institution via a telecommunications network (Akematsu & Tsuji, 2009).

South Korea shares significant similarities with Japan in e-health services. In South Korea, homes are also equipped with monitoring devices that facilitate care management among the older people (Chan et al., 2009; Hussain et al., 2012). Seo and Park (2004) studied the comprehensive home health monitoring system, which they call uHouse, developed for and utilized by older adult health consumers. This uHouse monitors the patient's biosignals and activities such as ECG, snoring, weight changes, and movement patterns through several sensors and devices located at the bedside of a patient. This monitoring system is connected to ADSL and Bluetooth, which transmit signals from home to hospital. Moreover, this e-health service is known to be effective in managing health status of people with metabolic syndrome, and specifically for the following purposes: education services for patients who have chronic diseases, non-smoking promotion services, personalized and visiting health management services, preventive services for chronic diseases, and emergency healthcare for the older people living alone (Arcelus et al., 2007; Song et al., 2011; Oh et al., 2015; Yi et al., 2018). However, the use of mobile healthcare services among the older people in South Korea is limited by older adult's fear of technology and cost of its use (Neves et al., 2015). Hence, an encouraging attitude from the family members significantly influences the behavioral intention of the older people in utilizing this e-health system (Jen & Hung, 2010).

In Thailand, their e-health service is popularly referred to in the literature as the Smart Healthcare

system and Internet-of-Things-based (IOT-based) home solution (Thaduangta et al., 2016; Pal et al., 2018). The former consists of biosignal measurements of blood pressure, heart rate, and temperature and a web of application for both doctors and the older people (Thaduangta et al., 2016). Moreover, the system has a life-saving mechanism via an alert button. This e-health service can be beneficial for the older people who lack information about their health. However, studies have shown that the acceptance to these e-health services, despite the perceived usefulness, is relative to its usability (Thaduangta et al., 2016; Jaemtim & Yuenyong, 2019; Boon-itt, 2019). Low adoption among the older Thai people had also been observed due to the conservative stance of older people in technology (Techatraiphum et al., 2016; Pal et al., 2018). Effort expectancy or the degree of ease (leading predictor), expert advice, perceived trust, and perceived cost are factors that influence older people's acceptance behavior in the smart home healthcare system (Pal et al., 2018). As Thai society is also rapidly aging and the benefits of Smart Healthcare and IOT-based home solutions are explicated in many studies, the use of e-health services is encouraged (Simons et al., 2018). This is undertaken by focusing on its perceived value, facilitating conditions, and effort expectancy—factors that will impact in maintaining healthy lifestyle among older people (Boontarig et al., 2012; Srisawatsakul & Papasratorn, 2013; Srisawangwong & Kasemvilas, 2014; Narkwilai et al., 2015; Sukkird & Shirahada, 2018).

The e-health services in Sri Lanka are similar to developing countries like the Philippines, where access to health services is limited, especially in remote areas. Marasinghe et al. (2007) have traced the introduction of e-health in Sri Lanka through the initiatives of the government in the use of telephone network and ICT in hospitals, which began in the 1990s. Accordingly, the use of ICT is more common among private hospitals such as telephone, e-mail, and the Internet for advertising, on-call ambulance/ mobile services, appointment booking, finance and hospital management, patient record-keeping, patient information, and pathology record (Chapman & Arunatileka, 2010; Vatsalan et al., 2010; Stranieri et al., 2017). Some individuals provide health information and consultation via websites such as EHealth.lk website, which provides information about available drugs and diseases related to Sri Lanka.

Some websites also provide free consultations for patients (Marasinghe et al., 2007). At present, these websites of health-related systems are promoted by the Sri Lankan government, including Health Net, Nivarana, Happy Life, Wedanenasala, Epidemiology Unit, and the Ministry of Health (eHealth, http://www. labour.gov.lk/). Another recent innovation on e-health is the e-health cards distributed among Sri Lankan citizens. This e-health card contains the patient's complete medical reports that entail immediate medical treatment in any part of the country ("Issuing e-health cards," 2019).

Another form of e-health service being introduced in Sri Lanka is the Telemedicine. This e-health service provides "distance clinical health services using electronic information and communication technologies" ("Telemedicine: The future of Sri Lankan health," 2018). Despite the promising benefits of Telemedicine, especially in rural areas in Sri Lanka, its adoption is challenged by cultural issues, lack of computing skills among rural health consumers, and scarce ICT infrastructure (Jayasinghe et al., 2016).

E-health in the Philippines is still in the process of policy-making, planning, and initial implementation at the institutional level. It is mainly concerned with "improving the flow of information, through electronic means, to support and facilitate the delivery of quality and responsive health services" (eHealthPH, 2016, par. 7; Rashid & Elder, 2009; Hersh et al., 2010). In 2014, a specific program related to e-health was launched, through the Department of Health (DOH) and the Department of Science and Technology (DOST), called Philippine Health Information Exchange (PHIE; "Government launches e-health system," 2014). Accordingly, PHIE is a centralized system of health-related registries and linkages that works with devices like RxBox. Through the medical sensors in this device, patients can be diagnosed by monitoring blood pressure level, the oxygen level in the patient's blood, and the heart's capacity to pump blood. This medical information can be stored in the PHIE and can be accessed through another RxBox in other areas of the country. As of 2014, there were only 20 RxBox available in selected government health centers.

The private sector in the Philippines and in abroad have also taken initiatives to introduce e-health services such as PhilCare. New mobile apps such as "Hey Phil,"

"mClinica," and "SwipeRx" are all forms of e-health services that have the following features: can make hospital transactions faster, efficient, and paperless,; uses AI to find doctors, clinics, and hospitals; and connects health organizations, pharmacies, and patients for more efficient sharing of health information (dela Cruz, 2018; https://www.mclinica.com/).

The five participating countries in the JST Sakura Exchange Program in Science in March 2019 have varied forms of e-health services. Although they share certain characteristics, that is, the use of ICT platforms, the functions of the systems and dynamics of users are different in certain areas among the five countries. Nevertheless, e-health encompasses many categories, including social media (Parikh & Huniewicz, 2015). Social media such as Facebook, WhatsApp, Twitter, and Instagram are e-health forms worth investigating and commonly used in Japan, South Korea, Thailand, the Philippines, and Sri Lanka. Based on a survey of Internet users aged 16–64, the Philippines has the highest score, 3 hours and 57 minutes, in the average time spent on social media, followed by Thailand (3 hours 10 minutes), South Korea (1 hour 12 minutes), and Japan (48 minutes) (We Are Social, 2017). No data is available for Sri Lanka.

The use of social media is becoming a popular trend among the older people; they use it to bridge geographic distance between them and their loved ones, to be informed, to visit government agencies, to connect with like-minded individuals, and to join discussions about life and health issues (Dogruel et al., 2015; Kamiel, 2016). Social media is marking its role in health care among patients and health professionals for increasing knowledge and exchanging advice and communication (Antheunis et al., 2013; Silver, 2015; Panahi et al., 2016; Smailhodzic et al., 2016).

The Role of e-Health to Healthy Aging

Freedom to Make Choices

Healthy aging entails the ability of older people to learn further and make decisions (World Health Organization, n.d.) or the freedom to make choices. Sufficient, accessible, and reliable information is necessary to empower older adults to be free and actively involved in caring for their health and being. E-health plays an important role in the freedom of the older people to make choices (Kickbusch et al., 2005; Watkins & Xie, 2014) through the following:

encourages physical activity and mobility due to non-restricting monitoring system, self-management of illnesses through reminders and recommendations, self-reported health information, and brain training. This health innovation empowers the older people to build and maintain a healthy lifestyle by providing health information, self-monitoring, and collaborative effort between the provider and health consumer (Faiola et al., 2018).

One of the strongest features of e-health services in Japan, South Korea, and Thailand is the monitoring system. Through this function, the activities and changes in the health of the older people can be easily reported and addressed by health providers or family members away from home. This monitoring system built in the homes of the older people or in mobile devices encourages physical activity and enhanced mobility among the older people because their biosignals can be monitored even without their awareness or physical strains of a traditional regular check-up (Seo & Park, 2004; Tamura et al., 2007).

Older people have enhanced control of their health through the health and medical reminders that health providers deliver via e-health; hence, this contributes to increased compliances on self-management of certain illnesses such as diabetes (Joe & Demiris, 2013). Similarly, in the study of Bujnowska-Fedak and Pirogowicz (2014), e-health supporters desire to receive simple medical recommendations, reminders for scheduled visits, and prescribed medications via mobile phone or a computer that enables them to make an informed decision.

E-health also helps in the early detection of illness through self-reported health information of older adults (Joe & Demiris, 2013). This function can lead them to be more attentive and attuned to the state of their mind, emotion, and body. Relative to this, a study in South Korea proposed the clinical decision support service (CDSS) that provides guidelines and recommendations based on the observed activities of the patient. This is deployed on a platform that supports various sensors and emotion recognition applications (Hussain et al., 2012).

Lastly, e-health in the social media category is a platform that contributes to the brain training of older people (Silva & Correia, 2014). Social media usage among older people is an activity that involves mental stimulation and memory enhancement (Quinn, 2018). Considering these influences of e-health to

healthy aging, the support from the older people as end-users should be assured. According to Lorenz and Opperman (2008), mobile health monitoring is most relevant among 50+ years old; however, this group is said to have less perception and control capability and less experienced in the use of information technology. Nevertheless, older adults are more diverse in cognitive, sensory, and motor skills than younger individuals. Hence, to increase usage, the development of user interfaces designed for the needs and diverse capabilities of the aging population is a need.

To Build and Maintain Relationships

Healthy aging includes the ability of older people to build and maintain relationships. Although e-health in the forms of a monitoring system, telehealth network, and telemedicine focuses on the maintenance of health, especially of the older people who live alone, social media usage and Internet-based communication contribute to help older people be integrated to society. By using social media, the older people can keep in contact with relatives and friends, which brings a positive effect on their well-being (Sum et al., 2008). Interpersonal communication mediated by Internet use eases depression, especially when getting social support through e-mail exchanges with close associates (LaRose et al., 2001). Facebook usage and other forms of online communication contribute to the generation of bonding social capital that helps to maintain close ties with family members and friends, which entitle them to accrue benefits such as emotional support (Putnam, 2000; Steinfield et al., 2008). This is further supported by the study of Chan (2013) that both voice and online communication, which are integral to social media use, have positive relationships with the indicators of subjective well-being, bonding, and bridging social capital. Social media usage as an e-health service ensures a channel for psychological support that the older people need most as their aging makes them vulnerable to social isolation. In Japan, the use of mobile phones for sociability purposes is negatively associated with loneliness; thus, it increases the subjective sense of connectedness among older adults in the country (Wang et al., 2018). Social media usage leads the older people to take initiatives in building and maintaining relationships by giving them venues to share stories and offer support to their circle or other people (Strecher, 2007).

To Contribute to Society or Generosity

Healthy aging is not only beneficial for the older adult population but to the society as well. A healthy and longer life is an opportunity for older people to contribute to the shaping of community life. Networks and ties of the older people are investments to build social capital (Putnam, 2000) that can be beneficial in two ways: (1) at the individual level, the older people may benefit in information and support from his or her connections with other; (2) at the relationship level, the community and the young individuals may have role models to values and civic engagements, as shown in the study of Tolentino and Arcinas (2018) that older adults' presence in community life through religious activities, community festivities, and civic-oriented actions positively influence children's conduct and values.

E-health, in the form of social media usage or Internet-based communication, plays an important role in enabling older people to contribute to society. As older people become homebound, their adoption of e-health is motivated by informational and educational aspects (Kamiel, 2016). Within the comfort of their homes, they can connect with social agencies and widen their networks that are key to combating social isolation. According to Sum et al. (2009), being part of an online community is positively associated with a sense of belonging, sense of community, and well-being. This entails greater awareness of social concerns and a platform for the older people to voice out their needs. This dynamics instigates volunteering (Warburton et al., 2007) or act for certain causes that involve the older adults and the young people. Moreover, greater use of social media and similar applications is related to a higher level of social capital (Sum et al., 2008).

The older people in Japan are becoming part of virtual communities (Kanayama, 2003), which is a relevant observation because social media usage is a significant predictor of engaging people to social and civic participation (Zuñiga et al., 2012). This is in line with one of the basic responses of Japan to its super-aging society, that is, increased learning and social participation (Obayashi, n.d.). Hence, increased social media use and more active promotion of ICT solutions (Obi et al., 2013) will enable not only the senior members, but a whole community, to have social participation in addressing the rapidly aging society while promoting healthy aging.

Conclusion

Among the five participating countries in the JST Sakura Exchange Program in Science in March 2019, Japan, South Korea, and Thailand have the most advanced health innovations in terms of e-health services. These three countries are rapidly aging societies where the demands to address related concerns of aging, such as increasing health care needs, diminishing care workers, social isolation of elders, and declining workforce, are high. Thus, there is a pressing need to promote health innovations for the older adult population. E-health services among these rapidly aging societies are primarily focused on monitoring of end-consumers or the older people and direct networks of health information and response between end-consumers and health providers. On the other hand, e-health systems in the Philippines and Sri Lanka are emerging in terms of telemedicine, computer-based health records, and health and drug information websites that cater to the general population but not specific to older people. In the Philippines, social media is popularly used compared to Japan, South Korea, and Thailand; however, Filipino social media usage is concentrated on entertainment, online selling, and gaming activities.

E-health services and social media usage have promising potential in the promotion of healthy aging, as supported by several studies. Hence, the older population is encouraged to adopt this health innovation while also addressing concerns on privacy, effort expectancy, and ICT infrastructures. The JST Exchange Program in Science in March 2019 has been an instrument for collaboration and sharing of knowledge and experiences among the five participating countries in tackling sustainable aging. The Philippines and Sri Lanka will soon be aging societies in the next 10 years and still have to learn from the experiences and innovations of the three rapidly aging societies.

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Declaration of ownership:

This report is our original work.

Conflict of interest

None.

Ethical clearance

This study was approved by the institution.

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