

DEVELOPMENT OF THE ASSISTIVE TECHNOLOGY MODEL FOR THE ELDER CARE SYSTEM

Supakorn Iamamporn¹, Varit Kankaew², Pradit Songsangyos² and Jirawadee Yingkongdee¹

¹*Faculty of Business Administration and Information Technology, Rajamangala University of Technology Suvarnabhumi
Pranakhon Si Ayutthaya, Thailand*

²*Faculty of Science and Technology, Rajamangala University of Technology Suvarnabhumi,
Pranakhon Si Ayutthaya, Thailand*

ABSTRACT

Currently, the world demographic population, including Thailand, has changed. The number of senior citizens is increasing. Whereas their family members living in the same household is decreasing. Senior citizens may need the technology for a self-care assistant. This study develops the assistive technology model for the elder care system. The study aimed at medical assistants and social assistants. The research is divided into two stages. Stage 1: Design an assistive technology model for the elder care system. The assistive technology model for the elder care system consists of the following. 1. Senior citizen. 2. Family members or caregivers. 3. The Community of the senior citizens. 4. Assistive technologies. 5. Functions of the elder care system. 6. The outcome of the proposed model is medical assistance and social assistants. Stage 2: The experts evaluated the appropriateness of the proposed model. The appropriateness assessment of the proposed model by seven experts who have experience in the area of medicine and healthcare, besides information and communication technologies, overall is excellent.

KEYWORDS

Assistive Technology, Elder Care System, Senior Citizen, Telehealth, Activities of Daily Living

1. INTRODUCTION

Currently, the world demographic population, including Thailand, has changed. The number of senior citizens is increasing, whereas the birth rate is decreasing. Also, it drastically reduces family members living in the same household (Economic Research Institute for ASEAN and East Asia, 2021). The elder's health is genetic. Most are due to their homes, neighbourhoods, and communities, as well as their characteristics. Supportive physical and social environments enable senior citizens to do what is important to them, despite losses in capacity (World health organisation, 2022). A study by Sharif, M.S. (2018) found that the elder will need assistance with shopping, companionship, medicine, socialising, housework, exercise, meals, personal care and exercise. Whereas Martinez-Martin, E. and Costa, A. (2021) categorised technological assistants for the elderly into medical or rehabilitation assistants and social assistants.

This study was conducted to develop a model of assistive technology for the elder care system. The study aimed at medical assistance and social assistants.

Medical assistants

A cognitive assistant uses wearable devices as assistive technology to measure the elder's health status. So the elderly could be taken care of by family members or caregivers. In addition, they continuously monitor their health parameters at anytime and anywhere (Martinez-Martin, E. and Costa, A., 2021) (Alejandrino, M.A., 2018). According to Kemisetal (2012) (Cited in Martinez-Martin, E. and Costa, A., 2021), when the heart rate is greater than 110 bpm while the senior citizen is at rest, they confront abnormal heart rate patterns and require immediate care. So, the equipment should notify the condition or alert their family member or caregiver. Whereas Sumi, L.et al. (2019) studied IoT-based fall prevention and detection for senior citizens, physically and intellectually disabled. Fall detection triggers an alarm if a fall is detected, then notify family members or caregivers via emails and SMS. Bruun-Pedersen, J.R. et al. (2014) studied augmented exercise biking with virtual environments for elderly users: a preliminary study for retirement home physical therapy. The study

had the exercise of a Chair-based exercise bike using a countryside base virtual environment (VE) as home physical therapy for senior citizens. The study found that a majority of senior citizens preferred the VE-based exercise to the conventional training.

Social assistants

Wungrath, J. (2021) studied the healthcare education process adopting the line application in conjunction with tele-counselling to improve knowledge, behavior and satisfaction among elderly with diabetes mellitus during the COVID-19 pandemic. The researcher sends video clips and infographics via the line group. Later, researchers have a discussion and explanation with group members. In addition, tele-counselling provided the senior citizen to call researchers if needed nutritional assistance. Researchers educated senior citizens by teaching and emphasising participation. Then described the essentials of health practices. An assessment was conducted and used to highlight the benefits of behavioural practices. In addition, speech to persuade the sample group to their ability to take appropriate care of themselves. As well as having an exchange of ways to deal with the problems and obstacles (Martinez-Martin, E. and Costa, A., 2021) (Supasri, S., 2021). Wungrath, J. et al., 2020 study Effect of Using Basic Elderly Care Handbook on Knowledge and Behavior Regarding Elderly Care Among Caregivers of the Elderly in Choeng Doi Subdistrict, Doi Saket District, Chiang Mai Province. The study found that the content in the manual includes the senior citizen's nature and dynamics, the senior citizen, mental health of the senior citizen, the role of family and community to the senior citizen, and nutrition for the senior citizen. In addition, exercise, an appropriate environment for the senior citizen and health problems the senior citizen. By the way, Chiangmai is a city with a high potential for retired people from many countries worldwide. Besides, the city has good infrastructure, including healthcare, with low living expenses.

2. METHODOLOGY

The data collection using an assessment form for the assistive technology model for elder care system. The population in the study consisted of experts who have experienced in the area of medical and healthcare, besides information and communication technologies. The samples group comprised of seven experts who either held a doctoral degree or had at least five years' experience in their field for evaluation and suggestions. A purposive selection method was selected. Jamil (as cited in Hamzah F. et al., 2019) stated that a minimum of five years of working experience would be enough to ensure expertise in their respective fields. Analyse the results of the evaluation of the appropriateness of a proposed model using mean and standard deviation.

The research is divided into two stages. Stage 1: Design the assistive technology model for the elder care system as follows. (1.1) Relevant articles and research papers were analysed and synthesised in the following topics: Assistive technology, Elder care system, Senior citizen, Telehealth, Activities of daily living (ADL), Smartwatch and smart band, Community of senior citizens, Elderly health care guide, Self-care, Internet of Things (IoT), Falling detection and augmented exercise biking. (1.2) Use the obtained information to synthesise and summarise as the assistive technology model for the elder care system. (1.3) Research instrument was designed as an appropriate evaluation form. Stage 2: The experts evaluated the appropriateness of the proposed model as follows. (2.1) Propose the concept idea and the assistive technology model for the elder care system to seven experts for evaluation and suggestions. (2.2) The proposed model was verified, and the seven identified experts filled in appropriate evaluation forms. (2.3) The proposed model was modified based on the advice of the experts. (2.4) Analyse the results of the evaluation of the appropriateness of the proposed model using mean (\bar{X}) and standard deviation (S.D.). Five criteria for assessment were considered using Likert scales anchored with the terms Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree (Samsudin, S. et al., 2019; Brown, S., 2010).

Results of the study are as follows.

Stage 1: The assistive technology model for the elder care system was designed as illustrated in figure 1.

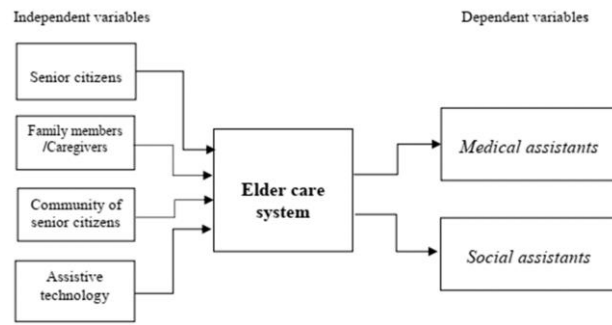


Figure 1. The assistive technology model for elder care system

The assistive technology model for the elder care system consists of the following. 1) Senior citizens aged 60 years and over. Older age is also characterised by the emergence of several complex health states commonly called geriatric syndromes (World health organization, 2022). 2) Family members or caregivers. Parents of a senior citizen or a person who is responsible for healthcare. 3) The Community of the senior citizens, as a group of elders or through online social. The community gathers to talk to each other, organise joint activities, exchange knowledge and experiences related to the direction, and deal with problems and obstacles. Then lead to a change in daily life to promote healthy behaviour. 4) Assistive technologies include the following: (4.1) Smartwatch and Smart band that has many functions to indicate the user's health at an affordable cost. (4.2) Exersight biking, present the user to view on-demand environment on the screen of smart Television, notebook, or smartphone. (4.3) Internet of Things (IoT) devices and various application software. Which support the senior citizens, including detection of falling and no movement, schedule for their exercise or appointment, and notifying them to take medication or an appointment. 5) The proposed model will apply hardware and software. The assistive technologies have the main functions: (5.1) Measuring heart rate and blood pressure. (5.2) Detection of falling and no movement. (5.3) Notify the time to take medication or have an appointment with a doctor (5.4) Exercise schedules, with Exersight biking. (5.5) Elderly health care guide. (5.6) Appointments Schedule for joint activities and conversations with friends or community of the senior citizens. 6) The outcome of the proposed model is classified into two areas. (6.1) Medical assistants (physician assistants) to reduce health problems, promote self-care ability, and facilitate family members or caregivers (6.2) Social assistants make senior citizens not feel isolated and proud in taking care of themselves. Then encourage them to follow the elderly healthy guide and collaborate to present the direction and how it works.

Stage 2: Assessment of the assistive technology model for the elder care system.

The experts evaluated the appropriateness of the assistive technology model for the elder care system, as shown in Table 1.

Table 1. Appropriateness of the assistive technology model for the elder care system

Descriptions	\bar{X}	S.D.	Level of appropriation
Senior citizens	4.71	.49	Strongly Agree
Family members / caregivers	4.57	.53	Strongly Agree
Community of senior citizens	4.29	.96	Agree
Assistive technology	4.57	.68	Strongly Agree
Functions of Elder care system	4.71	.46	Strongly Agree
Medical assistant	4.71	.49	Strongly Agree
Social assistant	4.57	.79	Strongly Agree
Overall	4.63	.56	Strongly Agree

The experts evaluated the appropriateness of the assistive technology model for the elder care system overall as Strongly Agree, with a mean of 4.63, S.D. = .56. Senior citizens and family members or caregivers as Strongly Agree. Community of senior citizens as Agree. Assistive technology and functions of the elder care system as Strongly Agree. The outcome of the proposed model, medical assistant and social assistant, is Strongly Agree. Regarding the smartwatch / smart band, detection of falling and no movement and notification to take medication or an appointment had the highest score, as Strongly Agree, by a mean of 5.00, S.D. = 0.0. The exercise schedules had the lowest score, Agree, with a mean of 4.00, S.D. = 0.0.

3. CONCLUSION

This study develops the assistive technology model for the elder care system. The research is divided into two stages. Stage 1: Design the assistive technology model for the elder care system. Stage 2: The experts evaluated the appropriateness of the proposed model. The assistive technology model for the elder care system consists of 1. Senior citizens. 2. Family members or caregivers. 3. The Community of the senior citizens. 4. Assistive technologies. 5. Functions of the elder care system. 6. The outcome of the proposed model is medical assistants and social assistants. The appropriateness assessment of the proposed model by seven experts with experience in medicine and healthcare, besides information and communication technologies, is excellent. The study was designed based on healthy senior citizens maintaining their health by self-care or less assistance from family members or caregivers at affordable cost.

For further study, researchers initially developed a prototype of Exersight biking. Next, conduct the community of senior citizens as a pilot project. All components were then integrated to build a prototype of the assistive technology for the elder care system. Furthermore, a study of the critical success factor for Thailand's healthcare market, especially for retired foreign people, should be concerned.

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