doi:10.20896/7psj7r53

PERSPECTIVE OPEN ACCESS

Enhancing Elderly Care through Health Data Innovation: Developing a Mobile Application for Seniors

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Abstract

In an environment where the number of older individuals is increasing, innovative solutions for their independent living and improved quality of life are essential. This study assessed the health status, care needs, and technological features necessary to develop a mobile health application for the ageing population. Using a mixed-methods approach, the study collected quantitative data from 420 elderly respondents through structured questionnaires that covered demographic information, health conditions, and technology usage. Qualitative data were collected from 40 participants through in-depth interviews to gain a deeper understanding of the health experiences of the elderly and their concerns regarding digital interventions. Descriptive statistics were used to analyse the data. The majority of respondents were female (71.4%), with an average age of 69 (61.3%), and reported their health as relatively good. Additionally, 56.8% experienced at least one health problem. Most participants expressed a need for memory training and health information, including basic routine healthcare and self-monitoring of their health. Although these elderly participants sought to engage with technologies, they had usability concerns, which were identified as a key aspect to be addressed. The qualitative information revealed that the development of mobile applications should be designed to 1) monitor daily activities, provide health parameters, and notify the users of emergencies, and 2) connect older individuals to their family members, caregivers, health experts, and the community via a user-friendly interface that prioritises user-centred design and data security. This application not only ensures the safety of the elderly but also enhances their mental well-being.

Keywords: Elderly Care; Mobile Health Application; Health Needs Assessment; Ageing Population; Self-Care; Caregiver Support; Technology Readiness; Thailand

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Introduction

Global statistics show that the elderly population is expanding. It is predicted that by 2050, the population aged between 75 and 80 will likely grow by 56.1%, and the total number of people considered elderly (65 years and older) will increase by 39.3 million (El Moulat et al.,2020).
Studies show that Thailand has become an ageing society, with more than 20% of the country's population, or approximately 1 in 5 of the Thai population, aged 60 years and above (Paweewun & Sirimai, 2016). By 2040, Thailand is expected to have a population of 21.7 million older adults, accounting for 33.1% of the total population (Prakongsai & Chunharas, 2023). The status of an aged society in Thailand impacts perspectives towards society, the community, the economy, education, and elderly health.
Policymakers in many countries are concerned about the growth of these elderly groups, which may suffer from a lack of sufficient services, relevant treatments, and care. In many countries, there is a shortage of medical personnel to care for older people, as well as inadequate services and support for the elderly. The matter has led policymakers in many countries to support the idea of innovations that promote the well-being of older adults, enabling them to live independently in urban environments (Uhlenberg, 2009) and to be prepared for societal issues that may arise (Dombrowski, 2013).

Additionally, the post-COVID-19 era has led to changing social and economic pressures, both physical and financial, on global citizens, especially the elderly. The density of public health system usage has impacted health services worldwide, particularly in terms of efficiently providing thorough treatment, and the cost has increased for the elderly who suffer from low incomes and lack access to pensions or health insurance (U.S. Census Bureau, 2004). Therefore, in a world that prioritises addressing social marginalisation and social issues, there is a need to refocus on and engage more deeply with power distribution and the securing of community harmony (Anderson, 2016). There are also benefits to maintaining the equilibrium of workload in the public health system and elderly care. Such issues have highlighted the need to expand health services for older people while not compromising health services within the community, ensuring an equal distribution (Luangthongkum, 2007) to support the physical and mental well-being of older people, and to prevent extreme illnesses. Furthermore, this improves the accessibility of health services for older people by allowing them to become more independent within the economy and society. The health service system within the community should prioritise the needs and satisfaction of elders to inform the design of the system and the health services, as well as the presentation of products and services that are relevant and appropriate for older people (Bickerstaff, 2013).

The COVID-19 crisis has drastically altered the health care of older people (Ministry of Community Development, Committee on Ageing Issues, 2006). Care for elderly patients needs to be transformed into virtual telecare (Ohannessian, 2020). Gerontology (Özsungur, 2019) encompasses applications that enhance quality of life, promote social interaction, provide medical and mental support, ensure safety, and facilitate education, as well as promote understanding of older people's health literacy. A key component of gerontology is mobile communication or mobile applications. Due to the rapid development of technology and the capabilities of mobile devices, as well as the convenience this offers for people's daily lives, mobile health applications (mHealth) have emerged to provide new opportunities for delivering health services to patients and physicians. Such mHealth solutions, including building healthy community lifestyles and disease self-management, have garnered public attention, especially in recent years (Appling & Pappalardo, 2014).

Although older people are generally less familiar with technology than younger people, numerous studies have shown that they are now more digitally aware and use technology more widely than in the past. Nowadays, older people are

often seen using smartphones more frequently than mobile devices and other technological tools. The social media of interest to older people is primarily focused on communication and awareness (Klimova & Maresova, 2016). Today, older adults are also increasingly eager to learn how to use smartphones, particularly in healthcare (Zhao et al., 2020). However, older people's accessibility to smartphone applications and assistive technologies remains challenging, unfamiliar, and requires appropriate training. Therefore, if a health or exercise promotion application is explicitly designed and appropriate for older people, it will ensure that they and those entering their elderly years maintain good physical and mental health. Hence, the researcher's goal is to study the guidelines for creating an elderly database and the need to use applications that will successfully promote the health of older people.

This study began with a comprehensive literature review to gain a thorough understanding of the development of health monitoring systems for elderly care. The introduction outlines the background and the research gaps identified from the literature. Then, the literature section summarises prior studies on elderly care and health monitoring in order to establish the rationale for the study. Methods detail the mixed-methods approach and outline the procedures for participant selection, instrument implementation, and data collection. Finally, the results section presents the research findings from both quantitative and qualitative data, providing practical implications for community-based elderly care mobile applications and further direction for future research.

Literature Review

The Importance of Health Issues for the Elderly

Healthcare among older people is complex, as the elderly often experience complex health issues and are likely to suffer from comorbidity. With increased life expectancy amongst older people, it is found that both physical and psychological hazards are affected by depression and pressure due to heart disease, hypertension, and diabetes. Issues related to these three diseases most often co-occur due to visual and hearing dementia and movement dementia (Gulia et al., 2022). [1]According to Aliouche's study (2022), in low- and middle-income countries, 60% of older people with dementia developed symptoms at the age of 75, 75% at the age of 79, and over 75% between the ages of 85 and 89 (Gulia et al., 2022). In another study on the elderly, when the aged are diagnosed with common diseases like hypertension, it shares a high possibility of being combined with heart disease and extensive diabetes (Xiang et al., 2024).

Rondón & Ramírez (2018) discovered that a lower quality of life is likely to be found as people age, affecting their health and their ability to access health welfare services. Earlier, Thakur et al. (2013) suggested that, by the age of sixty years, 83.29% of older people suffered from health problems, 1.47% used hearing aids, and 52.3% of older people had mental health problems, with the research suggesting that these issues were often unaddressed or not responded to, especially for socio-economically disadvantaged older people. It has therefore been noted that national policies should develop easily accessible tools to address the health problems of older people, preventing them from occurring and thus alleviating the fiscal conditions that impact the health benefits of older people (Tomstad et al., 2012).

Abdi et al. (2019) suggest that the number of older people requiring care support but needing a public response has increased significantly. In the UK, there is an increase in the number of older people living with chronic bedridden conditions with various levels of disability. The

[1] Visual dementia: difficulty in recognising objects or spatial orientation despite normal eye function (Gulia et al., 2022).
Hearing dementia: impaired understanding of sounds or speech with normal hearing (Gulia et al., 2022).
Movement dementia: decline in motor functions such as tremor or stiffness (Gulia et al., 2022).

UK population is ageing rapidly: by 2039, nearly 24% of people in the UK will be aged 65 or older, and the number of those aged 85 and above is expected to double to approximately 2.6 million by 2046. In one longitudinal study of care-home residents, the prevalence of severe disability rose from 63% in 1992 to 87% by 2014, underlining how functional dependency among elderly residents has grown appreciably over recent decades (Robert et al., 2021). Older people face numerous physical, psychological, and social challenges, and they often require social and relational support. They experience intervening factors such as a lack of expert advice, self-care, and poor health services. If technology is used to manage health, it can enable the design of health policies to support individualised health care from a comprehensive comorbid basis. In addition, Enssle (2020) notes that most older adults yearn to manage their health independently but often lack the necessary tools and knowledge to care for themselves effectively. Therefore, utilising technology to support the management of older people's health has become an urgent necessity.

The Necessity of Using Technology to Manage the Health of the Elderly

Mostaghel (2016) explains that as the proportion of older adults in the population increases quickly due to demographic shifts, governments and societies face a significant rise in the costs needed to provide long-term and elderly care services. In many countries, efforts have been made to reduce the cost of healthcare and services for older people by improving the quality of life of older people or to reduce funding for healthcare and health services by integrating innovation and technology into the healthcare of older people so that they are free from dependency (Magnusson & Hanson, 2003a).

In this regard, health innovations such as the Internet of Things (IoT), Electronic Health Records (EHRs), and Big Data have introduced efficient treatment methods by employing wearable devices to collect the health data of older people. For example, collecting blood pressure, heartbeat, and blood sugar levels (Wang et al., 2021) makes it possible to respond to calls from older people or prevent potential health problems for the elderly (Wang et al., 2021), which in turn makes it possible to help them in the case of emergencies. Especially in older men, diseases like hypertension, diabetes, heart disease, stroke, chronic lung disease, and dyslipidemia are common. Among older women, high blood pressure, diabetes, stroke, arthritis, and lung disease are common (National Science and Technology Development Agency (NSTDA), 2020).

The development of Android applications among older adults is increasingly in demand due to their efficiency in accessing health systems, health data, and medication notifications or telemedicine (Chen et al., 2020). Mostaghel (2016) suggests that research utilises technology to measure the status of patients with dementia by analysing descriptive statistics. It is proposed that utilising technology to support individuals with dementia can significantly enhance the cognitive function of older adults. In 2002, Magnusson et al. (2002) argued that information technology can be employed to care for older individuals with chronic illnesses by providing them with knowledge and skills through online counselling using digital media and access to health information. Additionally, utilising technology to care for older adults also alleviates the burden on caregivers, enabling them to care for themselves better and enhancing the quality of life for both caregivers and the elderly. Magnusson & Hanson (2003a) similarly suggested that employing information technology to support elderly individuals can help lessen the strain on caregivers, promoting emotional well-being for older adults and improving the quality of life for both older adults and online caregivers. It can also equip them with the skills needed to care for themselves at home, allowing them to live effectively alongside their caregivers.

In recent years, gamification has been increasingly used to promote the health of older adults. Gamification refers to the application of techniques that incorporate game elements to enhance learning and motivation, such as scores,

banners, achievement levels, or competitions designed to engage learners (Christopher, 2014). For older adults, gamification can foster exercise, mental health development, and social skill enhancement, encouraging them to seek solutions to challenges (Chulalongkorn University, 2024). The use of gamification—applying game concepts to various contexts—has become a popular trend. Koivisto & Malik (2021) noted that, historically, gamification was primarily aimed at adolescents and adults, with limited application for older adults. Tarbé (2020) suggested a similar perspective, emphasising that using games to promote and improve the health of older adults, particularly in dementia prevention, could effectively reward, monitor, and encourage health-promoting behaviours.

Koivisto & Malik (2021) further suggest that despite the variety of high-efficiency applications for monitoring older adults, challenges remain from different perspectives. These include creating a user-friendly interface for older adults, assisting with memory, finding solutions to slow the progression of dementia, and promoting social connection through games that require participation with others. If successfully designed, this could foster excitement and motivation among older adults to take better care of themselves, reduce loneliness, and boost their confidence in using technology. This literature emphasises that while advanced monitoring technologies for older adults offer high efficiency, significant challenges remain in implementation, usability, and ethical issues (Koivisto & Malik, 2021). Recognising these challenges helps inform my study by highlighting potential barriers to the adoption of technological interventions in aged care. It also aids in exploring solutions that strike a balance between efficiency and practicality, as well as user acceptance among both older adults and caregivers.

Guidelines for Designing and Developing Mobile Applications for the Elderly

Klenk et al. (2023) suggest that older people often face multiple difficulties and obstacles when using mobile applications. Significant challenges include usability issues, inconvenient access, lack of technological literacy, fear of making mistakes, insufficient family support, and a lack of guidance or support options when questions arise. Kapp (2012) proposed a similar analysis regarding the role of digital skills for older individuals: older people who utilise mobile health applications, supported by their families and those around them, have greater access to these applications than those without such support. Additionally, education and income levels have also been shown to influence access to applications. Individuals with higher education and income tend to have better access to and usage of applications compared to those with lower incomes. Furthermore, digital development targeted at older people is also found to be crucial. Therefore, communities and families should consistently provide training in digital skills development for older individuals, while also considering the design for accessibility, simplifying usage, and minimising complexity.

The Office of the Government Chief Information Officer (2022) highlights one approach to developing elderly-friendly applications, emphasising the need to understand the specific requirements of older users, such as adequate font size, color, and contrast, since many older individuals experience vision problems. Applications should also feature easy-to-understand navigation and notification systems. Meanwhile, A3logics (2023) offers a similar perspective, stating that applications should be user-friendly, less complicated in data organisation, and include a clearly noticeable redo button. The system should deliver health and elderly care notifications, such as medication reminders, utilising sounds, vibrations, and blinking lights. These features should enhance the social connectivity of older users with trusted individuals, placing top priority on security measures. High-priority health information, data encryption, and identity verification are essential to prevent unauthorised access to sensitive information, and a clear privacy policy should be established to address the specific needs of older individuals and enforce strict safety protocols. Attention to these details will enable older users to use the

application effectively and enhance their quality of life.

Zhou et al. (2023) proposed that an appropriate mobile application design approach for older adults requires reducing barriers caused by physical issues and the ability to learn technology. They suggest that health applications for older adults must have uncomplicated and straightforward screens and menus, allowing them to access core functions without navigating through multiple stages and minimising the use of unnecessary features that require advanced technical understanding. Helpful elements should be included, such as on-screen instructions or help buttons, using easy-to-understand terminology. Settings and notification functions should be intuitive and customisable to meet individual needs, helping reduce technological access disparities. Li et al. (2022) present an interesting point that ancillary technologies, such as wearable bracelets, should be available in conjunction with the application, aiding in health monitoring and providing timely health information, which can increase confidence in self-care. These accessories should ensure device accuracy and reliability, and the design must prioritise ease of use to help older adults accept them more readily. Since older adults may have limited technological capabilities, they should receive support from family, friends, and healthcare personnel to enhance their comfort and confidence in using the device. Tyack & Camic (2020) propose that technology should utilise touch screens, especially for older adults with dementia, through engaging activities like games, viewing pictures, and listening to music, highlighting the importance of simplicity in design.

The Interaction Design Foundation (n.d.) believes that mobile applications should facilitate communication among older adults, establishing a system that enables questions and answers through audio interaction. The chatbot system must be adaptable to suit the personality and needs of each older adult. Furthermore, Zhou & Kumar (2024), in their review of Artificial Intelligence (AI) usage, propose that chatbot design for older adults has the potential to enhance their health and daily living. This can reduce emergency risks, alleviate stress, and boost confidence in daily activities. However, the design still requires testing and improvement to ensure that chatbots function effectively and address seniors' needs in challenging situations. El Moulat et al. (2020) offer a review of the application of Internet of Things (IoT) technology in elderly care, emphasising its significance in enhancing the quality of life and healthcare for older individuals, while noting the associated advantages and challenges.

In a similar context, Martin et al. (2021) present a new approach to designing and developing a chatbot system for older individuals, aimed at helping and encouraging them to improve their quality of life by providing information, health advice, and continuous care to support their emotional and mental well-being. Additionally, utilising AI to support older people's mental health represents a novel approach. For instance, AI can serve as a conversation partner to alleviate loneliness or help remind users of past activities, enabling seniors to feel engaged and lessening feelings of depression. AI can recognise warning signs, such as falls or potential abnormal symptoms, and will immediately notify caregivers or emergency medical services, facilitate prompt assistance and reduce the risk of injury to older adults.

Beyond technology and AI, Mynatt et al. (2000) examine the use of technology to create a care network for the elderly. The primary objective is to ensure that older individuals can live safely and enjoy a better life in familiar environments. They emphasise that community and family support remain essential for elderly individuals. The network channels information from the reporting application to the caregiver's device or email, allowing caregivers to respond promptly to the needs of older people.

Acceptance of technology is crucial for older individuals. The application should be designed with this demographic's specific needs and limitations in mind. It must be straightforward, reliable, and provide clear health benefits. Furthermore, backing from families and healthcare professionals is vital in encouraging

older adults to adopt technology, helping them manage their health more effectively and enhance their quality of life.

Mobile Applications in Southeast Asia and Scalability Considerations

Due to the digital transformation in Southeast Asia, there has been an increase in the adoption of mHealth technologies to address an ageing society. Several countries have launched community-based mHealth solutions that support the study's points.

Singapore has a Healthy365 mobile application that provides support for elderly individuals with chronic diseases, promoting preventive care through tailored health tracking and wearable devices (Wickens et al., 2021). This is part of its national Smart Nation initiative to prevent unhealthy behaviours among older people.

Similarly, Malaysia's MySejahtera application, developed by the government for COVID-19 management, features include chronic disease monitoring and vaccination records (Azlan et al., 2022). The application can serve the Malaysian population and integrate population databases.

In Thailand, Halodoc and Alodokter applications[2] provide users with remote medication consultations and also incorporate health education (National Science and Technology Development Agency, 2020).) In contrast to these models, the Pakkret mobile application integrates community-based support and family caregiver networks because families remain the primary unit of care for the elderly (Knodel & Teerawichitchainan, 2017)

Scalability remains critical due to digital literacy challenges, especially in central Thailand, such as Pak Kret Municipality. Therefore, balancing centralised health governance with municipal adaptability to meet the population's diverse needs remains highly important (Barua et al., 2020).

Research Design and Methodology

Qualitative Method

The study employed qualitative research, conducting in-depth interviews with 40 older individuals and their related staff to understand the needs and experiences of mobile applications that promote the health of older adults. It focused on opinions on the use of health applications in daily life, drawing on 70 minutes of critical incident interviews and scenario-based cognitive interviews. The researcher conducted interviews based on questions adjusted according to each case. The interviewer obtained the interviewee's consent to take handwritten notes and analysed the content according to the defined issues to identify the needs and proposals for the elderly application. The findings led to proposals for designing appropriate applications for older people. The interviews were conducted in Thai, the participants' native language, to ensure clarity and comfort during data collection. All audio recordings were transcribed verbatim in Thai. For analysis and reporting in English, the researcher translated the transcripts into English and had them verified by a bilingual expert to ensure accuracy and maintain the original meaning.

Participants and Sampling

A total of 40 elderly participants were purposively selected for in-depth interviews to ensure diversity in gender, age, education, living arrangements, and technology literacy levels. Participants were recruited from Pak Kret Municipality, Thailand, including both urban and peri-urban populations, to ensure the reliability of the information.

Inclusion Criteria

The targeted population consisted of individuals 60 years old or older who were willing to provide informed consent. They also needed to have experience with the elderly and access to mobile

[2] Halodoc: an Indonesian digital health platform that provides online medical consultations, medicine delivery, and healthcare services through its mobile application and website.

Alodokter: another leading Indonesian health-tech platform offering telemedicine services, health information, doctor booking, and medical content for patients through its website and mobile app.

technology. This approach ensured that both technologically proficient and less digitally inclined seniors were included. This led to a comprehensive examination of various barriers and facilitators related to the adoption of mobile health technology.

Data Analysis

The transcribed data were analysed using thematic content analysis, following Braun and Clarke's (2006) six-phase framework. This framework includes familiarising oneself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. The data's reliability was checked using the Delphi method, which involved appointing three experts with at least five years of knowledge in ageing and application development to investigate the findings.

Quantitative Method

Study Design

The research was a pilot study aimed at developing mobile applications for the elderly. The study employed a cross-sectional, quantitative pilot study to collect empirical data on the healthcare needs, technology readiness, and usability preferences of elderly individuals, informing the development of a mobile health application. The study aimed to gather the user requirements and key features that would enhance the application's design and functionality for elderly care.

Participants and Sampling

The study collected information from 420 participants residing in Pak Kret Municipality, Thailand. The participants were randomly sampled to ensure representation across sub-districts, within the age group of 60 years and above.

Inclusion criteria

The sample interviewees were required to be at least 60 years old and able to engage effectively in conversation. Participants were required to provide informed consent and be able to answer questions.

Instrument

A structured questionnaire was created based on the insights of three gerontology experts and healthcare professionals. The questionnaire encompassed three domains: 1) Demographic Information, 2) Health Status, and 3) Technology Usage and Mobile Application Preferences. The questionnaire used Likert-scale responses (5-point scale) and was pre-tested with 30 elderly participants to ensure content validity and reliability before use.

Data Collection Procedure

Trained researchers collected data through face-to-face interviews at the municipal centre. Each interview lasted approximately 70 minutes to gather information accurately from participants, especially those with lower digital literacy.

Data Analysis

The study employed SPSS with descriptive statistics (percentages) to summarise: 1) the demographic information, 2) health status, 3) technology usage, 4) emergency response needs, and 5) mobile application preferences. The results directly informed the functional specifications, interface, design, and training protocols integrated into the mobile application.

Ethical Considerations

This study was conducted with careful consideration for ethical issues. The protection of the informant's identity was carried out with utmost care. All questions beforehand were sent to the relevant ethics authorities under the researcher's affiliation, and all relevant concerns were considered by the organisation representing the study area, such as the Municipality. There were no audio or video recordings; only note-taking was used. The objectives and basic information of the study were explained to the respondents in advance, and participants were informed that they had the right to refuse to answer uncomfortable questions or withdraw their consent from the study at any time. During the reporting process, neither personally identifiable information nor any indications of the participant's personality

were used in written reports without the participant's prior permission.

Results

General Characteristics of the Respondents

Gender Distribution

Table 1 presents the gender distribution of the respondents. A total of 420 questionnaire results indicate that most respondents were female, comprising 297 individuals (71.4%), while male respondents comprised 119 individuals (28.6%).

Table 1: Gender Distribution of Respondents

Gender	Frequency (n)	Percentage (%)
Male	**119**	**28.6**
Female	**297**	**71.4**
Total	**416**	**100**

Source: Developed by the Authors

The distribution of respondents by age group indicates that the majority were aged 60 to 69 years, comprising 253 individuals (61.3%). This group is followed by respondents aged 70 to 79 (131 individuals, 31.7%), those aged 80 to 89 (25 individuals, 6.1%), and the remaining participants were over 90 years old. In terms of respondents' self-reported health status, most rated their health as "fairly good" (125 individuals, 37.7%) or "good" (125 individuals, 37.7%), followed by "poor" (66 individuals, 19.9%). In contrast, the rest rated their health as "excellent." Additionally, the majority reported having a caregiver (257 individuals, 78.8%), while the others indicated they did not have a caregiver.

Health Status

Respondents reported that over half of the elderly participants had at least one health problem. Specifically, 233 respondents (56.8%) indicated experiencing health issues, while 177 (43.2%) reported no health problems. Regarding the types of health issues, vision impairment was the most frequently reported, affecting 128 respondents (35.1%). This was followed by mobility difficulties (88 respondents, 24.1%), hearing impairment (56 respondents, 15.3%), and cognitive or memory problems (44 respondents, 12.1%). Additionally, 50 respondents (13.7%) reported having no specific health problems. Other health conditions were reported at lower frequencies, including: 1) Other unspecified problems (16 respondents), 2) Bedridden status (4 respondents, 1.1%), 3) Hypertension and combined hypertension with hyperlipidemia (3 respondents each, 0.8%), 4) Headache/dizziness and heart disease (2 respondents each, 0.6%), 5) Chronic obstructive pulmonary disease (COPD), diabetes with hyperlipidemia, walking difficulties, frozen shoulder, cataracts, respiratory issues, hyperlipidemia, coughing, internal organ disorders, neck pain, migraines, depression, kidney disease, neurological disorders, muscle pain, thyroid issues, herniated disc, combined hypertension and diabetes, and occasional illnesses, each reported by one respondent (0.3%).

Technology Usage and Assistance Needs from Application Features

The analysis of respondents' needs for assistance from applications related to learning and memory problems (multiple responses allowed) is presented in Table 2. The majority of the respondents, comprising 208 individuals (53.9%), indicated that they did not require any assistance. Among those who reported needing support, 102 respondents (26.3%) sought training programs to enhance their learning and memory, while 69 respondents (17.8%) required medical interventions and medications related to cognitive functions. Additionally, 24 respondents (6.2%) expressed a need for caregiver support, and two respondents (0.5%) reported other forms of assistance. Most respondents reported a need for information on basic self-care, with 179 individuals (48.0%) indicating this preference, followed by

information on basic self-health monitoring (163 individuals, 43.7%). Additionally, 83 respondents (22.3%) expressed a need for physical health information, while 25 respondents (6.7%) requested information related to mental health. Only five respondents (1.3%) stated that they did not require any health information support. Other needs were mentioned by two respondents (0.5%). Furthermore, one respondent (0.3%) suggested mobile medical check-ups twice a year and requested training on mobile application usage for seniors, emphasising the need for technology that is accessible, easy to use, and suitable for independent use by elderly individuals with various health conditions.

Table 2: Health Information Needs of the Respondents

Type of information and features needed for the application	Frequency (n)	Percentage (%)
Self-care information	179	48.0
Health monitoring	163	43.7
Physical health information	83	22.3
Mental health information	25	6.7
No information needed	5	1.3
Other	2	0.5
Mobile check-up and app training accessibility needs	1	0.3
Total	458	100

Source: Developed by the Authors

User-Centered Design

The involvement of older people in the design process is crucial to ensure a genuine response to their needs, particularly within the elderly community. This highlights the significance of considering older adults' specific abilities and limitations when designing and developing user-friendly and effective technologies or applications.

Facial Recognition Software

Facial recognition is crucial for older adults who may experience memory impairment. Facial signature reference technology enables seniors to access applications easily since they do not need to remember a code. This technology enables the face to be distinguished from the background. The system collects image data from the front-facing camera of the mobile device. It measures key facial features, such as the distance between the eyes and the depth of the eye socket, while ensuring the system remains sufficiently stable. An elderly informant from Nonthaburi Province proposed:

> Some types of applications are difficult to access because they require an access code, which must be at least eight characters long and include numbers, to ensure the security of application users. This can deter users from using the application due to the hassle of remembering the code.

Facial recognition enhances security by controlling access to the application and can identify health conditions in older adults, such as memory loss or high blood pressure. Combined with other technologies, such as AI, it enables the application to provide personalised health advice tailored for older individuals, thereby reducing the risk of theft or impersonation. However, robust data protection and privacy management systems must be established to

collect facial data and prevent the use of fake photos or videos.

Using a Chatbot System to Answer Health Questions for Older Adults

The Chatbot system for addressing health inquiries from older adults is designed to assist them or their caregivers in easily and conveniently accessing health information. This system can provide general healthcare advice, including recommendations for proper conduct and basic medication use, as well as reminders for users to attend to their health. It can also provide heart rate monitoring information by connecting to a measuring device, such as a wristband, that tracks heart rate and the relationship between heart rate levels and movement. This enables the identification of any abnormal functions. Real-time monitoring of health changes allows doctors or caregivers to recognise early warning signs and respond swiftly. A 68-year-old elderly informant living in Nonthaburi Province suggested:

> The application should be linked to other devices, such as watches that can measure coordinates, pressure, heart rate, and movement, to detect health abnormalities early. It should also have a notification system for hospital personnel to call in for treatment promptly if abnormal symptoms are detected. Alternatively, suppose a movement stop is detected along with an abnormal heartbeat. In that case, the system can automatically send an SOS alert to the nearest hospital, prompting an emergency unit to be dispatched for assistance.

Offering a Variety of Functions

Some key features of a mobile application for the elder care technology system are essential. Especially, the application should detect movement and daily activities while tracking the behaviours of older adults, such as walking, sitting, sleeping, and using household appliances. This information helps caregivers assess their patients' behaviour and health. Caregivers or families can be notified immediately if any unusual changes are detected.

A system is in place for reminders regarding medication and medical appointments. Some older people may forget to take their medication or miss a doctor's appointment. This system provides notifications when it is time to take medication or make appointments, reducing potential problems caused by healthcare neglect.

Connected to family and community care networks, the system can link the data from the tracking to the broader care network, including families, neighbours, or caregivers in the community. This information is shared on a limited basis to protect privacy, with the capability to be used to help and monitor the health of older people on an ongoing basis.

Emergency alerts are issued if the system detects an event that could pose a risk to the health or safety of older people, such as a fall or unsafe condition. The alert is immediately sent to the caregiver or family for quick rescue action.

The challenges and limitations of technology have been identified, and apps need to address them in terms of privacy. Surveillance and recording of health data can infringe upon the privacy of older individuals. Therefore, it is necessary to have data protection and an agreement to share information between users. In terms of familiarity with technology, older adults may not be familiar with using new technologies, which can be a barrier to implementing the system and requires financial support and accessibility. Installing a health surveillance and monitoring system can be costly. This may make it inaccessible to certain groups of older people. However, privacy protection needs to be improved. The design of an easy-to-use system and the support of the government or organisations are required in

order to make this care technology accessible to all groups of seniors.

Use of Artificial Intelligence (AI) Technology

Help Assessing

Tracking devices linked to applications can continuously monitor the health of older people, including heart rate, blood glucose levels, and movement. Real-time detection of health changes allows doctors or caregivers to recognise early warning signs and respond promptly. Such information can be used to prioritise assistance. Participants were classified into four risk levels based on their health monitoring data.[3] For example, individuals in the red group require urgent medical attention, while those in the orange group need to see a doctor for closer treatment. The yellow group can consult a doctor via telemedicine and receive medication, combined with additional care, based on accurate medical advice.

In comparison, the green group consists of older adults who can initially manage their health by chatting with chatbots, without needing to speak directly with a doctor. They can also participate in online volunteer training to assist other older adults. The 71-year-old elderly informant residing in Nonthaburi Province proposed:

> The application should detect danger signs such as falls or possible abnormal symptoms, and AI will instantly alert caregivers or emergency medical units, allowing for quick assistance and reducing the risk of potential injuries.

AI as Personal Counselling

AI can also help to analyse and make appropriate recommendations for personalised elderly care using IoT, a technology that connects devices through the Internet to exchange information and collaborate automatically. In aged care, IoT enables various devices and sensors to collect health data and relay it to caregivers or doctors in real time. This facilitates effective monitoring and management of the health of older adults. With sensors such as heart rate and blood pressure monitors, health data can be collected and forwarded to doctors or caregivers immediately, allowing for early detection of alarms.

Using the IoT system to monitor the health of older people in real time reduces the risk of emergencies and helps older people receive appropriate care immediately. IoT devices can track the daily activities of older people, such as walking and other activities. This information helps caregivers better understand older people's health and daily life. Motion sensor systems allow for immediate notification in the case of older people falling, and the integration of IoT with AI systems can help create health management systems for older people, such as medication management and reminders. The device can remind older people to take their medication on time and notify their caregivers if they do not take their medication on time. This feature reduces the problem of forgetting to take medication, a common problem in older people. The IoT system allows older people to live independently in their daily lives, such as with electrical control and home security systems. Seniors can use IoT to control the switching on and off of lights or doors through smart devices. This feature allows seniors to care for themselves and gain more independence even when alone.

Care Network Development

There are many dimensions that may be prioritised in order to ensure the development of an effective care network.

Creating a Volunteer System to Help Provide Continuous and More Efficient Care

[3] Red group: individuals showing critical health indicators requiring urgent medical attention or immediate hospital intervention.
Orange group: individuals with moderate health concerns needing in-person medical consultation and closer follow-up.
Yellow group: individuals with mild health issues that can be managed via telemedicine consultation with medication and supplementary care.
Green group: individuals with normal or stable health indicators who require routine monitoring only without immediate medical intervention.

Developing a community network to connect older people with care applications is crucial for enhancing healthcare and improving the quality of life through applications specifically designed for this purpose.

Connecting Caregivers and Families

The application can directly connect older people with their families or caregivers, doctor's appointments or exercise. Using the application also allows caregivers to stay informed of real-time health information, such as heart rate, blood sugar levels, or other vital data, which can be used to monitor their health and make informed decisions on time.

Community and Neighbourhood Support

Developing a network in the community allows seniors to receive additional care from neighbours or volunteer groups who are on hand to monitor and assist in emergencies, and who can receive notifications from the application if seniors require help. The application can also serve as a channel to organise community activities that promote health, such as fitness activities, annual health check-ups, or health education conferences.

Coordination with Medical Teams and Public Health Officials

The application can connect with a team of doctors and local health officials by forwarding the health information of older people directly to specialists. This enables doctors to continuously monitor and assess their patients' health in detail. This collaboration also enables the medical team to provide prompt medical advice or take action in the event of abnormalities.

When developing a community network that connects to the application, not only community and neighbourhood support but also data security and privacy management should be considered. The health information of older people must be properly protected, following privacy requirements such as data encryption and restricting access to information to only authorised individuals. Clear terms of use should be established so that seniors and their families acknowledge how their data will be used and who has access to it.

Community Application Training

It is essential to provide training on the application to seniors and community members, enabling them to understand and utilise it effectively. This includes teaching how to display readings on the application or report emergency events. Additional training should also be provided for family members and caregivers. This enables older people to be more effectively supported when using the application.

To better connect with community support, the application should also serve as a platform to promote communication among older people in the community. This can involve chatting, sending messages, or organising online discussion groups. It allows them to exchange experiences and encourage each other. This communication feature can help alleviate feelings of isolation and support the mental health of older people.

Continuous application improvement through the development of an elderly care application should include updates and enhancements to features based on user needs. For example, new functions should be added to meet changing needs, or the interface should be improved to make it more user-friendly. Listening to feedback from users and collaborative feedback between users and administrators on an ongoing basis will help make the application development more efficient and responsive.

Analysis of the Results

The demographic data indicated that 71.4% of participants were female, which aligns with the observation that women in Thailand tend to have a longer life expectancy than men. The majority of respondents were aged 60 to 69 years (61.3%), reflecting a younger elderly population that may possess higher functional capacity and digital literacy compared to older groups.

Most respondents characterised their health status as fairly good or good (75.4%), while 56.8% acknowledged having at least one health

problem. This indicates that the majority of individuals enjoy very good health. Additionally, 35.1% reported experiencing vision impairment, 15.3% reported hearing impairment, and 24.1% reported mobility issues. This suggests that individuals aged 60 and over begin to face age-related functional decline.

The findings reveal that a significant portion of people perceive their health issues and chronic illnesses as the primary concerns that the municipality should address, highlighting the need for more effective support to address their health needs.

Most of the respondents (78.8%) stated they have a caregiver, while the rest do not. This illustrates that although the municipality provides caregiving support for the elderly within the community, informal caregiving remains widespread. Nevertheless, many respondents lacked caregivers, resulting in challenges related to isolation and limited support, which heighten their vulnerability when it comes to health assistance. This underscores the need for applying for elderly care to enhance their quality of life.

The results examined the needs for elderly assistance related to learning and memory issues; 53.9% reported no need for support, reflecting the proportion of younger elders with better cognitive capabilities. However, 26.3% expressed interest in training to improve their cognitive function, and 17.8% indicated a desire for medical interventions. This reflects the community's proactive stance toward their health and well-being.

Regarding the need for applications for the elderly, most participants indicated that the application should provide basic self-care information (48.0%) and offer guidance on self-health monitoring (43.7%). These findings demonstrate that older adults are willing to independently support their own health by using applications to access understandable health information and are interested in lifelong learning in health education.

Furthermore, the respondents expressed a need for practical, user-friendly technology to help them adopt a healthy lifestyle, utilising mobile applications specifically designed for older users. This indicates that most respondents emphasise the importance of user-friendly interfaces and tailored training programs as part of mobile applications.

Studies have shown that application technology for older people should include easy-to-understand touch technology. For older people to participate in various activities, they should have a simple work style and be encouraged to reduce the burden on their caregivers by allowing them to undertake activities via screens. This finding aligns with the data from a study by Tyack & Camic (2020), a systematic review of the literature on using touchscreen technology to promote well-being. In addition, the use of AI systems and chatbots is aligned with the findings of Kim et al. (2022) which proposes that mobile applications should create communication between older people. This can involve setting up a system that allows for interaction and exchange of questions and answers using the audio system. The chatbot system must be improved to suit the personality and needs of each older person. In this context, Zhou and Kumar (2024) have reviewed the literature to suggest how the use of AI can support the care of older people in achieving a better quality of life, including health monitoring, daily care, and emotional support.

Furthermore, the study highlights that the development of technology that responds to the needs of older people, especially technology that assists with health treatment and well-being in the household, is crucial, because many older adults require an independent lifestyle while still needing attention and help from family and community. Therefore, developing a care network is crucial in reducing the burden on families and caregivers. This is in line with the results of a study by Mynatt et al. (2000) proposed that applications should be developed to create a system that can connect the data obtained from the tracking with a broader network of caregivers, such as families, neighbours, or caregivers in the community. This information is shared on a limited basis to

protect privacy, providing the ability to help and monitor the health of older people on an ongoing basis. It is crucial to be aware of data privacy and security because the use of AI in healthcare involves the personal data of older people; secure access and management of data should be a matter of strict consideration.

Summary of Study

The overall results of the quantitative and qualitative components of the study revealed that there is a high readiness and willingness among younger elderly individuals to engage with technology that can support their health by providing them with their routine health management and health-related management. Moreover, chronic health problems are prevalent and should be integrated into the mobile application for health care monitoring and caregiver coordination functions. More importantly, there is a significant need for personalised health information, cognitive training, and community support services to be incorporated into the mobile application as a one-stop solution service. Caregiver involvement in the mobile application as a service provider, peer-based training, and location positioning should be designed as featured support service systems in the prototype health mobile application to meet the needs of the target elderly population.

The results of the study also indicate that application development should be user-friendly, including health alerts, recording features, and an emergency alarm system, which enhance safety and help older individuals live more freely and confidently. Additionally, community networks contribute to health promotion activities and foster communication among older people, making them feel cared for and alleviating feelings of isolation. Aged care applications are crucial in assisting older individuals to lead safer and more independent lives. The application should include a reminder function to help users take their medication. Health check-ups, doctor's appointments, and daily behaviour monitoring—such as walking or sleeping—along with emergency alert systems or detection of unusual events like falls, enable families and medical teams to stay informed and take timely action, which can minimise risks for older individuals.

However, the study recommends enhancing personal data protection and providing older people and their family members with training on application usage, so that they can safely utilise the technology. Whether it is a neighbour or a volunteer group, community involvement will help older people receive additional care through surveillance and assistance when needed. Community involvement also helps to create connection and warmth at the social level, which helps reduce older people's feelings of isolation.

Additionally, creating community activities such as exercise and health education can help encourage older adults to stay healthy and feel a sense of belonging within the community. This will help promote mental health, reduce feelings of isolation, and increase older people's confidence in their lives.

The insights gained from the quantitative and qualitative data of elderly individuals in Pak Kret Municipality, Thailand, can inform the development of mobile health applications. This would ensure that the diverse needs of elderly users are addressed. Finally, mobile applications can play a crucial role in promoting community healthcare systems in an ageing society.

Legal and Policy Implications

The development of health applications for older people needs to consider various laws and policies to ensure that the application is safe, compliant with regulations, and respects the privacy rights of users. The key components related to law and policy for health applications for older people are as follows:

Data Privacy and Security

Health applications often store personal information about older adults, such as health details, medical history, and medication usage data, which are considered essential. Therefore, strict protection measures must be implemented. Personal data protection laws, including the Personal Data Protection Act

(PDPA) in Thailand and the General Data Protection Regulation (GDPR) in the European Union, require service providers to safeguard data from unauthorised access, which includes data encryption and secure server storage.

Consent and Access Rights

Application developers must obtain the consent of older adults or their caregivers before collecting or using personal information to comply with the law and prevent unauthorised data use. Additionally, users must have access to their personal information, including the ability to request corrections or deletions of data that are inaccurate or not beneficial for their treatment.

Quality and Safety Standards

Relevant agencies, such as the FDA (Food and Drug Administration) or other organisations responsible for medical device application reviews, should review and certify health applications to ensure they are of high quality and safe. Furthermore, data accuracy and functionality should be tested to prevent risks to users, mainly if the application provides health advice or diagnoses.

Artificial Intelligence Regulations

In the case that the application uses AI to analyse health data or provide health recommendations, developers should follow the regulations for using AI to ensure that their algorithms are transparent, unbiased, and verifiable. AI should focus on fairness and accuracy in service to prevent errors or risks in the health care of the elderly.

Liability and Compensation

The developer or provider of the health application should be held responsible if it causes harm to the user, such as a mistake in health advice that adversely affects the health of older individuals. The warranty and compensation policy should be clearly stated in the Terms of Use, allowing users or their families to claim compensation in the event of an application error.

Recommendations for Future Research

Explore the cost-effectiveness and accessibility of technology: Studies should consider ways to make technology more accessible, including research on financial support models such as health insurance or government support that enable older people to increase their use of technology.

Explore the Role of AI and Machine Learning

Studies should focus on enhancing the ability of AI to adapt to individual health concerns and send real-time notifications to forecast health data. However, legal and ethical considerations are crucial in preventing data leakage and the development of biased algorithms.

Integration of Family and Caregiver Roles

As older people require assistance from caregivers and family, the research should also evaluate the role of caregivers in this context. For example, providing features that enable caregivers to monitor the health of older individuals when needed.

Limitations of the Study

Due to the available grant and time constraints, the study was limited to specific areas and focused on a sample size within the region. Additionally, although the study could have been expanded to larger regions or even international studies, it remained focused on specific provinces in Bangkok, Thailand, due to time and funding limitations. The study's data collection limitations were as follows: relying on self-reporting data may introduce a bias towards memorisation, especially in the elderly, who may have limitations in recalling information. This may need to be corrected in the reported data, either in terms of self-assessment or accuracy in the answers of older people, as there are varying degrees of familiarity and ability in using technology. Finally, this study did not cover the experiences of people who are not skilled in using technology.

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Ethical Approval

We declare that the manuscript has been prepared in accordance with the principles outlined in the Declaration of Helsinki. Additionally, we declare that there are no conflicts of interest, whether financial or non-financial, related to the manuscript submitted to Journal Space and Culture, India. The research project received the ethical clearance certification from Thammasat University, project number SSTU-EC196/2566

Conflict of Interest

The authors declare that they have no conflicts of interest. The authors have reviewed and agreed with the contents of the manuscript, and there are no financial interests to disclose. The authors certify that the submission is original work and is not currently under review by any other publication.

Author Contribution Statement

AC (First Author): conceptualisation; collecting resources; writing the first draft; initial reviewing and cross-checking for references

MPC (Corresponding Author): conceptualisation; collecting references; developing the first draft with the incorporation of new ideas and relevant resources; data curation; methodology; re-writing the final draft; final reviewing of the draft and final editing.

SS (Third Author): data curation; rewriting the final draft; final reviewing of the draft and final editing.

Funding

The research was funded by the Faculty of Social Administration, Thammasat University, Bangkok, Thailand.

Informed Consent

All subjects gave informed consent.

Data Availability Statement

We declare that the collected data are original, that the authors collected all the data themselves, and that they are primarily available within this study.