

# Designing Information Technology to Improve Elderly Quality of Life

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## ABSTRACT

*This research explores the information technology needs of the elderly to enhance their quality of life and proposes design guidelines to promote effective technology use. The findings indicate that well-designed information technology can significantly improve the elderly's quality of life by facilitating social interaction, boosting self-esteem, and preventing depression. Additionally, technology can support physical health by recording and monitoring health information, enabling timely communication with healthcare providers, and improving overall well-being. Design considerations for elderly-friendly technology include using appropriate colors, accommodating hearing impairments, providing adjustable font sizes, and ensuring flexibility to meet individual needs. A survey of 51 elderly individuals revealed a strong preference for technology that encourages communication and knowledge sharing through social media. Suggestions also highlighted the importance of integrating smart home features, such as sensor systems, robots, and artificial intelligence, which could contribute to the development of future smart cities. Overall, the research underscores the potential of information technology to enhance the quality of life for the elderly and provides guidelines for designing accessible, effective, and supportive technologies.*

**Keywords:** Elderly, Designing Information Technology, Quality of Life, Web Accessibility

## 1 INTRODUCTION

In recent years, Thailand has been experiencing a rapid demographic shift towards an aging society, a trend that presents both challenges and opportunities for the nation. According to the Foundation of Thai Gerontology Research and Development Institute, Thailand is poised to become a completely aged society by 2021, with the elderly population (aged 60 and above) constituting 20% of the total population [1]. This demographic transition is occurring at an unprecedented rate, making Thailand the second-fastest aging country in Southeast Asia, trailing only Singapore. By 2024, Thailand's transition toward an aging society has significantly advanced. The percentage of those aged 60 and above reached approximately 20% of the population in 2023, formally classifying Thailand as an "aged society." Projections indicate that by 2033, around 28% of Thailand's population could be elderly, making it a "super-aged" society, where more than one-fifth of the population is over 65. This trend, while mirroring global aging patterns, poses specific challenges for Thailand as a developing nation. By 2024, Thailand's transition toward an aging society has significantly advanced. The percentage of those aged 60 and above reached approximately 20% of the population in 2023,

formally classifying Thailand as an "aged society." Projections indicate that by 2033, around 28% of Thailand's population could be elderly, making it a "super-aged" society, where more than one-fifth of the population is over 65. This trend, while mirroring global aging patterns, poses specific challenges for Thailand as a developing nation [2].

Thailand's rapidly growing elderly population underscores the need for thorough preparation across multiple sectors, including healthcare, infrastructure, and, crucially, information and communication technology (ICT). As technology increasingly influences all aspects of modern life, it becomes essential to close the digital divide for older adults a goal that has now become a national priority. Integrating ICT into the daily lives of seniors can enable better access to services, foster social inclusion, and help them stay engaged with their communities.

This focus on digital inclusion is embedded within Thailand's 20-year National Strategy (2018-2037), which aims to promote ICT use for equitable information access for all citizens, including the elderly [3]. By reducing digital inequalities, Thailand aims to cultivate a more inclusive digital economy that serves the entire population. However, achieving this vision requires a deep understanding of the technological needs and preferences specific to older adults, ensuring that digital tools are accessible, relevant, and user-friendly.

In this regard, the principle of "Web Accessibility" has gained momentum, highlighting the importance of designing digital platforms that accommodate users of all ages and abilities. Despite increased attention to accessibility, many digital products remain predominantly oriented toward younger demographics, often overlooking the unique needs of elderly users.

Addressing this gap, the current study investigates the ICT needs of Thailand's elderly population, examining how older adults engage with technology in their daily lives. By understanding these needs, the research aims to inform the design of age-friendly digital solutions that enhance the quality of life, promote self-care, and support social engagement. This approach not only empowers the elderly but also advances Thailand's broader goal of building a resilient, inclusive society.

## **2 MATERIAL AND METHODS**

This research aims to study and design information technology needs for the elderly. The research methods are as follows:

### **2.1 The Concept of The Elderly**

Thailand is experiencing a demographic shift into a fully aging society, where the elderly population constitutes a significant portion of the population, reflecting global aging trends. According to the United Nations' World Population Ageing Report [4,5], Thailand's dependent population, which includes children and elderly individuals, has exceeded the working-age population, a change largely due to the country's declining birth rate. Consequently, the number and proportion of elderly individuals in Thailand have risen rapidly, placing substantial demands on social, economic, and healthcare systems [2].

Elderly citizens profoundly impact various sectors, including the economy, politics, society, and culture. Recognizing these impacts, scholars have emphasized the importance of studying the elderly population in the 21st century to gain insights into their needs and contributions, informing policies that can enhance their quality of life [6,7]. This need for understanding is echoed in official definitions of “elderly” across government bodies and international organizations.

The National Committee for the Promotion and Coordination of the Elderly in Thailand, under the Office of the Prime Minister, classifies elderly individuals as those aged 60 and above, further dividing them into early age (60-69), middle age (70-79), and late age (80 and above). A recent survey revealed that 56.5% of Thai elderly individuals fall within the early age group [8]. Similarly, the United Nations has long defined “elderly” as individuals aged 60 and older, as established in the 1982 World Assembly on Ageing [9].

Following this, Thailand’s Department of Mental Health officially declared the country an “aging society” in 2005, when 10.4% of the population was aged 60 or older. By 2021, Thailand had entered a “complete aging society” stage, with elderly individuals comprising over 20% of the population [10]. Projections indicate that by 2031, Thailand will progress to an “ultimate aging society,” where over 28% of the population will be elderly, underscoring the urgency of preparing for the social and economic implications of this demographic shift.

### **2.1.1 Changes in the elderly**

As people enter old age, nearly every body system undergoes significant changes, including a natural decline in function and resilience. The metabolic rate slows down, muscle mass reduces, and skin elasticity decreases, leading to wrinkles and a thinner, more fragile appearance of the skin [11]. With age, blood circulation can also weaken due to the heart’s reduced efficiency, affecting oxygen and nutrient delivery throughout the body [12].

Aging also impacts glandular function, with sweat glands becoming less active, often resulting in dry and cracked skin. Bone density decreases, contributing to frailty and a higher risk of fractures, while joint flexibility and muscle strength diminish, often leading to mobility limitations [13]. Additionally, digestive efficiency lessens, and the nervous system becomes more vulnerable to degeneration, making older adults more susceptible to cognitive issues and diseases such as dementia [14].

Typically, organ function reaches its peak by around age 30, after which a gradual decline begins, although individual aging processes vary based on genetics, lifestyle, and health conditions [15,16].

## **2.2 The Concept of Quality of Life**

Quality of life refers to a person's readiness in terms of body, mind and other aspects that are necessary for living that will result in living happily in society [17,18]. There are 5 types of quality of life as follows:

- i) Physical and material happiness, physical happiness means having complete health, being strong, free from various illnesses, being able to move the body and be self-reliant, being able to eat food in sufficient quantities and nutrients to meet the body's needs, having a stable and safe place to live, having convenient facilities for daily life, and having enough money to live.

- ii) Relationships with other people include relationships with family members and other people, learning and adjusting to live with others appropriately and being able to live happily.
- iii) Social and community activities, participating in various community activities to see one's value and be accepted by others makes one more confident in oneself.
- iv) Personality development and complete success according to development, such as intellectual development, learning new things, studying strengths and development points of the tree, being able to work, and receive appropriate compensation.
- v) Recreation is an activity for relaxation. To enjoy free time, reduce stress, and make good use of free time, which will make the body strong and emotionally intelligent.

### **2.3 The Importance of Digital Technology for The Elderly**

Nowadays technology is deeply embedded in daily life, enhancing quality of life across all age groups, including the elderly. Technology provides older adults with faster and easier access to health information, enabling them to be more self-reliant and reduce dependence on family members, which can alleviate household expenses [14]. Through reliable digital resources, older adults can gain insights into health, finances, and self-care, minimizing unnecessary time and travel costs for information access [15]. Technology also offers ways to counter physical decline, enabling older adults to maintain active participation in their communities and personal lives.

Through electronic devices, elderly learners can acquire new knowledge, helping to keep their minds sharp and potentially reduce the risk of dementia. Access to online learning also fosters lifelong education and engagement. Socially, technology allows older adults to stay connected with family and friends, often through video calls, which strengthen social bonds and reduce feelings of loneliness. By promoting connection and mental well-being, digital technology encourages a stronger sense of community and personal value among the elderly [19].

Information needs among the elderly have evolved alongside technological changes. The 2019 Thailand Internet User Behavior Report found that older adults aged 55-73 spend around ten hours daily online, engaging primarily with social media, watching movies, listening to music, and learning new information. Emerging trends show increasing interest in online services such as food delivery and e-commerce. For social engagement, most elderly Thais use Line and Facebook, with those aged 50-59 being more active, while those aged 60-70 use social media moderately. The primary use of social media in these groups is for reading news and staying informed about societal events, while online shopping and content creation activities are less common [4].

Motivations for technology use among the elderly can be grouped into four main areas: social participation with peers, financial security, personal development, and health management. While many elderly users are proficient in digital media literacy, especially those transitioning into their senior years, technological barriers still exist, such as visual impairments, complex interfaces, and privacy concerns. Advertisements with exaggerated claims also present challenges, along with misconceptions about technology's impact on health [13].

To address these challenges, policy recommendations have been proposed to support digital access for elderly users in Thailand's "Society 5.0." Suggested measures include subsidized access to high-speed internet, improved digital literacy programs, and device design tailored for elderly

accessibility. Additionally, policies could encourage online business incubators and platforms for creative online work to foster financial empowerment among seniors [20].

## **2.4 Related Work**

The research [21] conducted a study on “Attitudes of active older Internet users towards online social networking.” This was qualitative research by conducting in-depth interviews with 54 people aged 45-74 who were internet and social network users. The results of the study found that most of the sample were females more than males. Most of the sample were 60 years old. From the study of the demographic characteristics, it was found that different genders, education levels, and living statuses had different computer usage frequencies. Males had higher computer usage frequencies than females. Samples with higher education levels had higher computer usage frequencies than samples with lower education levels. Samples living in cities had higher computer usage frequencies than samples living in rural areas. For internet usage, males had higher usage frequencies than females. The purpose of using the internet was for education and to develop the quality of life, to contact family and friends, and to reduce feelings of loneliness. Samples under 58 years old had a moderate frequency of internet usage and were more familiar with online social networks than the sample aged 58 and over, who had low internet usage frequencies and were less familiar with online social networks. The study on “Attitudes towards Online Social Networks of the Elderly” is a study of the demographic characteristics of the sample group that affect their computer usage behavior. It was found that the sample groups with different demographic characteristics have different computer usage behaviors. It is interesting to see whether the demographic characteristics of the elderly sample group that uses the Line application have different or consistent usage behaviors and purposes.

## **2.5 Research Design and Data Collection**

This study used a mixed-methods approach divided into two sequential phases to thoroughly explore technology engagement among the elderly.

Phase 1 comprised qualitative research, focusing on a review of literature and documentation on how information technology impacts the quality of life for elderly individuals. This phase aimed to understand the current technology systems used by older adults and identify factors that either facilitate or hinder their accessibility to modern digital tools.

Phase 2 involved quantitative research to gather specific data from the target population. Semi-structured questionnaires and in-depth interviews were employed to collect detailed responses. In this phase, a sample size of 51 elderly participants was selected. This number was determined using a formula based on the population proportion method, aiming to achieve a confidence level of 90% and a margin of error of  $\pm 10\%$ . This sample size was chosen to ensure representativeness and reliability within the study's target population, capturing a comprehensive range of perspectives on technology use among elderly participants.

### 3 RESULTS AND DISCUSSION

In this study, the sample predominantly consisted of females, representing 62.7% of the participants, with a majority aged 65-69 (29.4%). Occupation data indicated that 25.5% were farmers, with 37.3% having been civil servants or working in agriculture. The average monthly income ranged between 5,000-9,999 baht, and 84.3% of participants lived with family members. Technology usage habits showed limited computer use; instead, 74.5% relied on mobile phones primarily for communication, with usage limited to fewer than five times per day. Figure 1 shows percentages of mobile usage of the elderly, they mostly focused on making calls (27.5%) and engaging with social media platforms like Facebook and Line (25.5%).

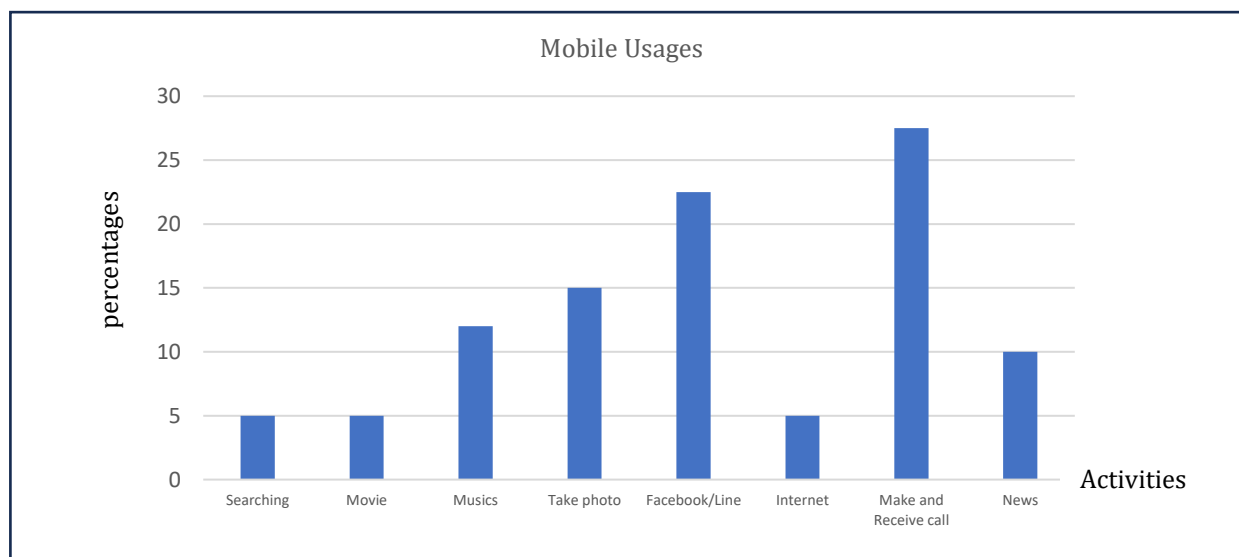


Figure 1 : percentages of mobile usage

As shown in Table 1, participants reported high perceived benefits from Internet use. Notably, 54.9% believed it enhanced knowledge acquisition (mean rating: 4.25), and they valued the Internet's potential to foster communication and reduce cognitive decline (mean rating: 3.96). Participants indicated a strong preference for accessibility features such as larger font sizes (mean rating: 3.90). Additionally, the Internet was seen as a tool for reducing loneliness and facilitating social engagement, allowing participants to build new social connections and share information effectively.

Table 1 : Factors of technology acceptance among the elderly

| <b>Factors of technology acceptance among the elderly</b>                                                                                                                                  | <b>Average</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 1. Using the Internet allows the elderly to search for information, gain knowledge, and receive news about taking care of their health.                                                    | 4.25           |
| 2. Using the Internet makes it easy to communicate with people quickly and conveniently, such as using email, Facebook, Line, and Instagram, etc.                                          | 3.90           |
| 3. Using computers helps restore the elderly's abilities by moving their hands while working with the keyboard and mouse.                                                                  | 3.90           |
| 4. Using computers helps the elderly stimulate their thinking, learning, reading, memory, and delay the onset of dementia.                                                                 | 3.96           |
| 5. Using computers and the Internet can help older people reduce feelings of loneliness, depression and depression because they have friends and can connect with friends on the Internet. | 3.90           |
| 6. Using computers and the Internet is not difficult, complicated or a problem for the elderly.                                                                                            | 3.80           |
| 7. Comfortable web surfing for seniors' means being able to enlarge the font size for comfortable reading and adjusting the clarity of the font and images.                                | 3.90           |
| 8. Elderly people can search for websites of nursing homes and care facilities for the elderly on the Internet.                                                                            | 4.01           |
| 9. Seniors can search for information on health products on the Internet to get more details before deciding to purchase.                                                                  | 4.01           |
| 10. Seniors can share photos or videos with friends or family on websites that provide services via the Internet.                                                                          | 3.84           |
| 11. Web and internet applications have brain teaser games to train the brain and memory for the elderly.                                                                                   | 3.66           |
| 12. Elderly people can order products and services on the Internet or e-commerce systems by themselves.                                                                                    | 3.70           |

|                                                                                                                                                                       |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 13. Senior citizens can conveniently conduct financial transactions with various banks via the Internet without having to waste time traveling to the bank in person. | 3.66 |
| 14. Elderly people can search for fun and enjoyable information on websites such as travel and sports.                                                                | 3.88 |
| 15. Elderly people can watch movies and listen to music on the Internet for entertainment, which can greatly relieve stress.                                          | 3.90 |
| 16. Elderly people in today's society need to have knowledge and ability to use computers and the Internet.                                                           | 3.90 |
| 17. Social media and online communities provide an opportunity for older adults to build new communities, meet new friends, and share information among their peers.  | 3.84 |

As shown in Figure 2, the elderly suggested using face-to-face technology for various forms of communication (23.5 percent), 27.5 percent suggested using automatic systems such as automatic door openers, and 13.7 percent suggested using robots. Most importantly, 35.3 percent suggested using a system to notify children and grandchildren when an accident occurs.

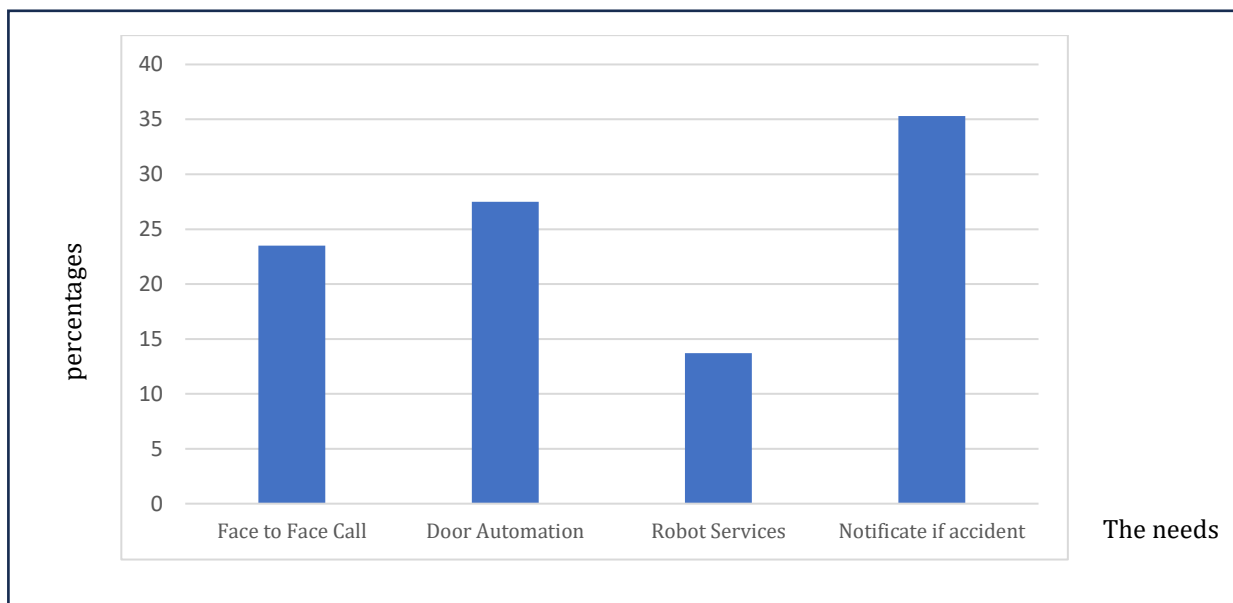


Figure 2 : Percentage of the feature needs for the future



Moreover, the current changes in information technology, also affect the elderly. From the study of related research [22-24], it was found that information technology for the elderly can be divided into 5 main groups as follows:

- i) Information technology or Big Data that helps in collecting and analysing data such as body movement data, communication data, and various online transactions by using AI to help in decision making.
- ii) Motion detection devices (Sensors) are devices that detect movement, such as cameras, monitor movement, and can be checked if the caregiver is not there, watches that collect heart rate data, including installing GPS that can check the location to identify the elderly. Motion detection devices can be developed in the form of canes, shoes, bracelets, watches, etc. In addition, various devices have been developed for experimentation.
- iii) Social media (Social Network) allows the elderly to communicate with relevant people faster and more efficiently, including studying additional knowledge.
- iv) Robots In the future, robots will be another technology developed to take care of the elderly. They can be used as a reminder to take medicine. Or see a doctor
- v) Application is a computer system that has been widely developed, such as Web Application or Mobile Application. The development of applications for the elderly will focus on content (Content) according to needs and necessities, including the development of user interfaces (UI) that are suitable for the elderly, easy to use, and user-friendly.

### **3.1 Guidelines for designing information technology for the elderly**

Initial recommendations for designing user interfaces for the elderly that comply with the Web Content Accessibility Guidelines 2.0 (WCAG 2.0) include designing following the perception and understanding of information and user interfaces, including font size, font shape and layout, color, multimedia, and pronunciation.

Since most elderly people have vision problems, developers must consider the following to develop applications that are effective for users:

- i) Color Avoid using blue text colors. This is because the elderly can see red, orange, and yellow better than blue, green, and purple. Colors should be used in contrast to create a contrast between buttons or content.
- ii) Font size: Normally 12px should be increased to 16px and have a feature that allows users to adjust the size.
- iii) Icons or buttons should be the right size for the user's fingers. Apple recommends 44x44 pixels.
- iv) Hearing: The design of the application or device should have a voice that can read out various commands for users to hear, especially the elderly who are visually impaired, or make a sound when pressing a button or sending an email to indicate that a task has been completed.
- v) Ease of use: Since the elderly need time to understand how to use the application or device, the design should be easy to understand. And consistent with the original experience or real experience of the user by designing it to be easy to see, and understand the operation of various functions through icons, buttons, and images automatically (Intuitive)

- vi) Gesture Design (Gesture Interaction Design) Designing the reaction of body movement in using devices or touching the screen to use various functions.

## 4 CONCLUSION

This research employed a mixed-methods approach to study and design information technology requirements for older adults in Phatthalung Province, Thailand. The study combined qualitative document analysis with quantitative data collection through semi-structured questionnaires administered to 51 elderly participants.

The findings reveal that appropriate technology for seniors in the 21st century should possess five key characteristics:

- 1) Support for big data analytics to assist in health monitoring and management Motion sensors for safety and activity tracking
- 2) Social interaction devices to combat isolation and loneliness
- 3) GPS technology for navigation and location tracking
- 4) Robotic assistants for various care and support functions

Additionally, the study identified crucial design considerations for developing effective applications for older users:

- 1) Colour schemes that avoid blue and favour red, orange, and yellow
- 2) Larger font sizes (16px minimum) with adjustable options
- 3) Appropriately sized icons and buttons (44x44 pixels recommended)
- 4) Audio feedback and text-to-speech capabilities
- 5) Intuitive and easy-to-use interfaces aligned with users' experiences
- 6) Gesture interaction design optimized for older adults' physical capabilities

These findings provide valuable insights for developers and policymakers working to create age-friendly technologies. The research underscores the importance of user-centred design that takes into account the specific needs and preferences of older adults.

Future research should focus on implementing and evaluating these design principles in real-world applications, as well as exploring the long-term impact of such technologies on the quality of life and independence of older adults. Additionally, studies examining the role of technology education and community support in promoting adoption among the elderly would be beneficial.

As the global population continues to age, the development of accessible and user-friendly technology for older adults becomes increasingly critical. This study contributes to the growing body of knowledge in this field and provides a foundation for future innovations in age-friendly technology design.

Limitations of the research, this research, it was during the COVID-19 outbreak, which made the researcher unable to fully collect data in the field. The data was only available to small groups, which may not allow for full data exchange in the community.

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