



# Development of mobile application program to promote travel for the elderly in the city community to use healthcare services in Sirindhorn Hospital, Bangkok

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## Abstract

Aging health circumstances combined with travel challenges in the city community of Sirinhorn hospital have a direct relation to the deteriorating health and environment of the elderly, which are generally based on a number of different old age-related diseases. Hence, this is the main reason for healthcare service provision to the elderly for enhanced life quality. In addition, a number of other broader factors such as the overall service system of hospitals, hospital accessibility, public transportation system, the elderly's private vehicles, and supportive technology for the elderly's travel to hospital can potentially impact their means to acquire hospital-based health services. Therefore, this two-fold research was conducted to develop a mobile application program to promote travel for the elderly in the city community, who currently seek health services at Sirindhorn hospital in Bangkok and to evaluate the developed mobile application program's effectiveness and efficiency in supporting the elderly's travel to hospital. The program development process involved specialists, experts and thirty elderly participants who pilot-tested the developed mobile application program for their travels to the hospital. Results showed that participants were satisfied with their experiences in using the developed application program, particularly through the convenience in giving and acquiring information on the application program that significantly supported their travels to the hospital. This study presented implications for public healthcare stakeholders in their provision of effective health services to the Thai elderly.

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## Introduction

Thailand has entered an “Ageing Society” with its population of above 60 year-olds since 2007 exceeding ten percent of the general population (i.e., 10.72%) in Thailand. Considering the overall number of the elderly in the Asian region in 1997, Thailand ranked second after Singapore with the largest number of elderly. For an individual, life at a different age promotes learning, which leads to gaining experience and skills to facilitate decision-making. Life paths taken are not directly dependent on one's life experience or skills, and with age, life-long learning cultivates self-reliance, which is essentially the most significant life goal. However, the elderly who are presently near the end of their lifetime need more self-reliance as they are likely to suffer from chronic diseases incurring more treatment unless they receive adequate care (Health Education Division: Department of Health Service, 2015). The elderly has typically faced numerous physical issues encompassing various aspects in daily life which are associated with congenital diseases or a specific illness such as auditability, forgetfulness, physical balance, accidents, fall, and incontinence.

The World Health Organization promotes the importance of creating quality of life for the elderly through propagating the “Age-friendly City” idea, comprising residential support, sociability, respect and social inclusion, civic participation and employment, communication and community support, health services, public area and building design, and transportation. The present study into scenarios of elderly receiving health services covers two phases; Phase One—a survey of the health situation in ageing society and problems in elderly's travels in the city community nearby Sirindhorn Hospital, Bangkok, and Phase Two—developing a mobile application program to promote the elderly's travels for health services. The Phase One results categorised the elderly into three key groups who: (1) are fully self-caring with complete ability to seek health service; (2) are able to use medical equipment for movement with a care-taker; and (3) have lost the ability of self-care and being assisted by a care-taker during travelling. For data analysis, the researchers in this study considered the key notions of health problems or ageing and definition by the World Health Organization in 1998, and employed the “Health Literacy” proposition within the Thailand context including perception of health information, health intelligence, knowledge of health, and health literacy (Indhraratana, 2015). Preliminary

results in Phase One revealed the samples' travelling patterns for acquiring health services, that led to development of specific travelling patterns when using health services: (1) designs of activities for the elderly when they acquire health services based on their appointments and promotion of community participation; and (2) supporting factors of travelling for acquiring health services. In the subsequent Phase Two, that leveraged technology in assisting the elderly's travel for receiving, two key themes on safety and convenience were the focus.

In educational institutions and other related departments, online lessons are generally conducted for training staff and other stakeholders to reinforce their knowledge of health, technology literacy, information and community in imparting health-related information (Thongjuea & Themmake, 2017) due to the many benefits of the Internet as resourceful public platforms such as google.com, ask.com, dogpile.com, and wikipedia.org in searching for information about career, daily life or education. In this study, these popular online websites were considered as useful for searching for information in developing technology for the elderly's use during travelling for health services.

With acknowledgement of the ubiquitous use of different websites online today, investigating and developing effectiveness of a mobile application program to equip the elderly with appropriate technological skills to acquire health services must be easy and convenient. Additionally, the use of highly effective technology in digital knowledge management should be systematic for community-based education development and public health (Pangbourne, 2018). To date, the elderly can readily take advantages of technology assistance, which has been constantly improving, to support themselves with health services. For this study, the researchers integrated this important concept in developing a mobile application program with the aim to aid the elderly acquiring health services. The literature review showed no prior similar research, therefore, Phase Two study focused on the development of technology in helping the elderly acquiring health services. Following that, suggestions and directions for selecting choices of travel among the elderly were taken into account to provide specified types of technology and further develop travel-related information for health services in the city community in Bangkok. It is anticipated that the present study can produce a design that offers a friendly travel environment of travel especially for the elderly, establish sustainability among the future generations, and develop wider community participation.

This research shed light on technological development to assist the elderly in the city community in the area of Sirindhorn Hospital in Bangkok with the following goals to;

1. Develop a mobile application program to promote travelling for the elderly who need to acquire health services in the city community.
2. Evaluate effectiveness of efficiency of the developed mobile application for the elderly in the city community to acquire health services.

To achieve the above goals in this research, developing a mobile application program will promote travelling among the elderly to acquire medical services when they are able to experience an effective and efficient use of technology.

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## Literature Review

The present study was developed based on three main concepts. Firstly, the concept of mobile application program development embedded on System Development Life Cycle or used to explain a system that needs to be developed and consider the option with the most turnover to an organisation. Logical process is a part of developing an information system to address problems of health services problems affecting the elderly and serve their demands. The system developed can either be new or remains as current and requiring an improvement. Different steps undertaken in this concept can assist a system analyst with systematic guidelines to operate the system to control time consumption and budget in operating the system. The SDLC cycle shows concise steps from the beginning to the end of developing the system. Taocharee (2011) postulated that SDLC is usable and helpful for a system analyst in understanding specific steps to be followed and how to deal with them. The steps in the concept of SDLC cycle include as follows: (1) Project Identification and Selection; (2) Project Initiating and Planning; (3) System Analysis; (4) Logical Design; (5) Physical Design; (6) System Implementation; and (7) System Maintenance.

Secondly, the concept of technology with connection between users and database accessibility (Netayawijit, Taumsuk, & Kwiecien, 2015) was applied in developing a mobile application program for the elderly's travel to acquire health services. The researchers chose the Android operation system on smartphones in developing an open-source application program since it is free of charge.

Lastly, the concept of the current situation of an ageing society and travel-related problems in acquiring health services retrieved from the preliminary study in Phase One study (from May to August 2019) was also considered. Information about the elderly's travel was highly important in classifying conditions of the elderly into three main groups who were: (1) able to walk; (2) using a wheelchair; and (3) bedridden. This empirical evidence was taken into account when developing a mobile application program to perform tasks such as identifying the elderly's travel patterns of travel for health services, arranging activities for the elderly and building community participation as well as supplying travel information to access to health service points safely (Thipayasothon, Chaichana, Ruangrit, Phetsinchorn, & Monkong, 2019), which complied with universal design principles characterising equitable use, flexibility, simple and intuitive use, perceptible information, tolerance for error, low physical effort as well as size and space for approach.

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## Methodology

Developing a mobile application program for the elderly is a technological innovation aimed to support the user's acquirement health service. Phase One of this study commenced with a preliminary study on the current health situation in an ageing society and travel-related problems for acquiring health services of the elderly in the city community, which was analysed with the data obtained from the elderly who regularly sought health services at Sirinhorn hospital in Bangkok. The results indicated important directions to identify essential skills of elderly who needed to travel for health services effectively and safely, in addition to evaluating their travelling demands. Research procedures in the present study included three steps: (1) designing of instrument of application program and interviewing four media production experts about application program on communication equipment; (2) developing and evaluating instrument of an application program by five experts in informational techniques and communication production; and (3) pilot-testing and evaluating instrument of the developed mobile application program with 30 elderly volunteers who participated in Phase One. The participants used the developed application on their mobile devices to travel from their homes to Sirinhorn hospital for health services.

## Participants

Population in Step One: surveying selection of technology for designing travel for the elderly from experts in technology and information in the government sector and non-profit organizations.

Samples in Step One: were part of the population, consisting of four specialists in technology and information for travelling in the government sector and non-profit organizations. Three specialists were experts in mobile application, mobile site, and responsive website respectively, while the fourth specialist was a representative from the information division at Sirinhorn hospital.

Population in Step Two: designing and developing instrument of an application program by experts in techniques in information production techniques. Samples in Step Two: were selected using purposive sampling. Five of them evaluated the developed application program.

Population for Activity Three: pilot-testing the developed application program by the elderly in the city community, who voluntarily travelled to the hospital in Phase One. Samples for Activity Three: there were 30 elderly, selected using purposive sampling: (1) Ten elderly who could take care of themselves (five of them taken from Phase One); (2) Ten elderly with partial self-caring or partial caring from others (five of them were from Phase One); and (3) Relatives or care takers who helped and supported the elderly with complete inability in taking care of themselves (five of them were from Phase One). The need analysis started from the beginning of travelling to the hospital, in which the information was used to support three groups of the elderly who were: (1) able to walk: support them to

provide information from their homes to the hospital effectively; (2) using wheelchair: develop information of travelling with ramp; and (3) bedridden: develop information of space and navigation for travelling.

## Data Collection

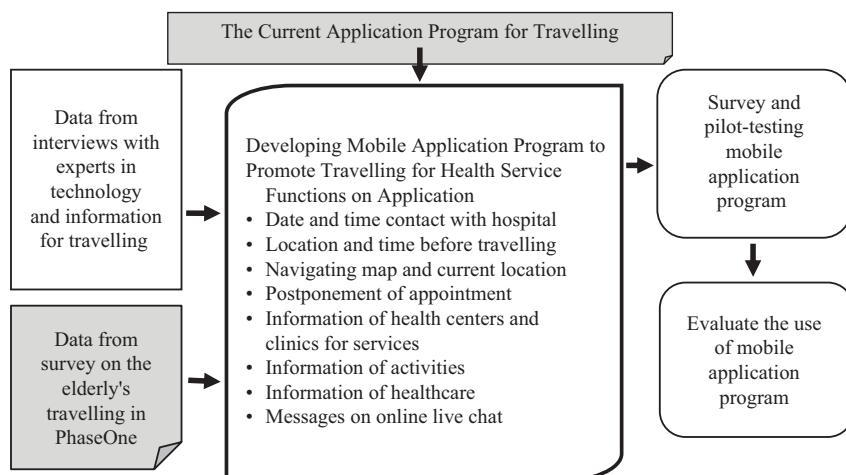
This research followed a plan to develop a model of instrument for mobile application program designed for the elderly as shown in [Figure 1](#) below.

[Figure 1](#) presents the results of developing a mobile application program that enhances and supports the elderly's travelling to hospital, and demonstrates a follow-up evaluation of how effective and efficient it is for the elderly to use during travelling to hospital for health services as planned in conducting the present study.

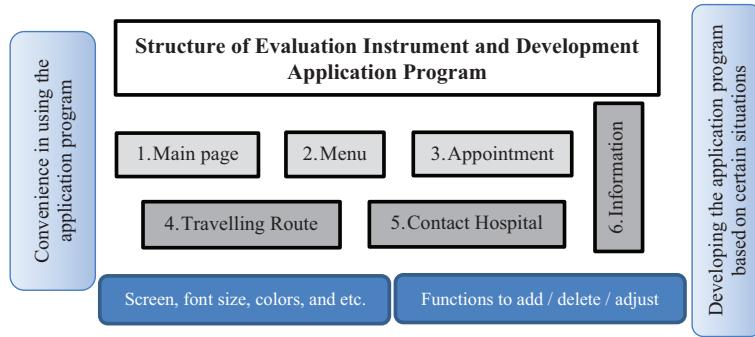
Overall functionality patterns of the developed mobile application program showed it has good quality and further provided useful feedback and suggestions that can be used for further improvement in future research to fit users' behaviours. [Figure 2](#) shows evaluation of the developed application program and directions for improved development in future.

An example of outcome from the developed mobile application program in serving the elderly to travel to hospital for health services that was used with the samples in a pilot study is displayed in [Figure 3](#).

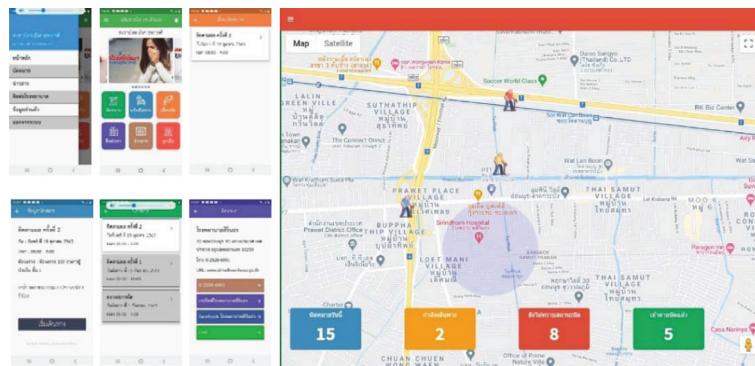
[Figure 3](#) summarises patterns of the developed application program, which was incorporated accordingly following different criteria in application designing by specialists in media and information, and subsequently assessed by computer technology experts. The processes advanced the development of a mobile application program for the elderly's travelling to hospital.



**Figure 1** Summary of Research Procedures



**Figure 2** Summary of Evaluation of Instrument and Developing Application Program



**Figure 3** Model of Instrument in the Developed Mobile Application Program

### Data Analysis

Data analysis of components in the developed network on application program and the designed computer system for supporting the elderly's travelling needed to consider users' provision of personal information (e.g., user's information retrieval and destination hospital). A control of safety system illustrating plan of data analysis in the application program is shown in Figure 4.

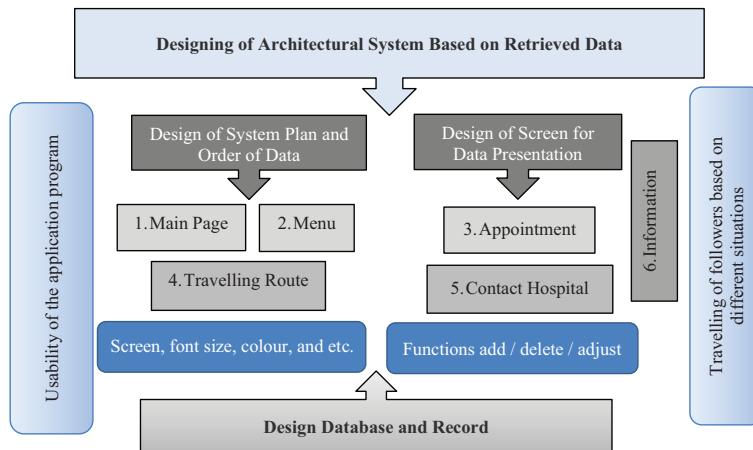
The system of information giving and retrieving patterns of the developed application program for the elderly's travelling was related to the following components: (1) characteristics of usage in specific groups; (2) image on screen in the application program; (3) elements in working system; and (4) directions for development with physical changes. These factors influence an emergence of quality innovation and create value beneficial to different stakeholders involved in travelling.

The analysis of research findings on the designing and developing of a mobile application program is based on population and sample combined with different factors such as individual's preference on technology at different ages, screen displays, and the computer system components which can ensure safe data retrieving and sending.

Findings revealed that designing and developing the mobile application program needed to consider user's usage patterns at different ages, image on the screen, and elements on computer system which supported safe information giving and retrieving.

### Discussion

Effectiveness of the developed mobile application program was evaluated within the concept of the decision in selecting patterns of travelling and travelling route to Sirinhorn hospital (Thipayasothon et al., 2019) and criteria in public relations and information informing from user's original departure to their destinations. The researchers assessed the developed mobile application program used by the samples which led to results showing that principles of design exemplify the following criteria: (1) Search and select the desired services; (2) Start and plan of travel (3) Data analysis for sending to destination; (4) Information design for destination; (5) Self-location identification; (6) Installation of application on mobile; and (7) Maintenance of application program



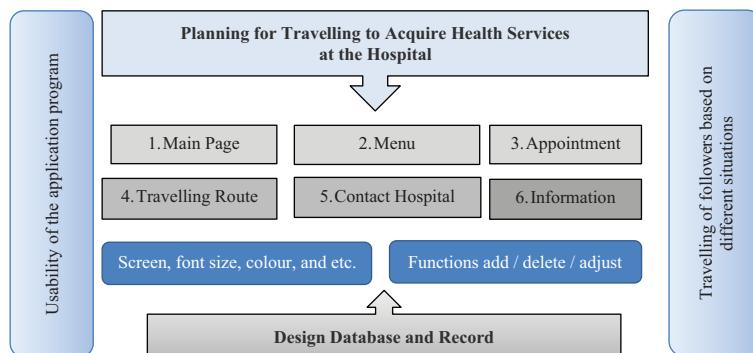
**Figure 4** Plan of Data Analysis on the Mobile Application Program

Results from the evaluation of the developed mobile application program during travelling with the elderly participants in terms of giving and retrieving information to their destination hospital were based on their conditions including: (1) those who were able to walk, whose who used a wheelchair; and (2) those who were bedridden. The results also revealed that more than 70 percent of the elderly with three different conditions needed information about travelling to the hospital on their mobiles. This important finding reinforced the fact that conditions of the elderly played a key part in designing and developing the mobile application program.

Information sending and retrieving was the key component indicating effectiveness and efficiency of the mobile application program as reported by the elderly participants. It was found that more than 90 percent of the participants were satisfied with the

information given on the mobile application program. Convenience in sending and retrieving information on the application program could help the hospital in providing effective medical service to the elderly. The elderly and hospital staff could communicate via real-time online chatting through the support of patterns and symbols on the application program screen. Usability testing for the developed mobile application program is presented in Figure 5.

In Figure 5, the communication effectiveness of the output using the mobile application program achieved the target criteria, which was reported at a satisfactory level. Samples displayed their positive satisfaction after using the developed mobile application program. Efficiency of the developed application program was remarkable in giving and retrieving information during the elderly's travelling to hospital for health services of the elderly, which aligned with the objectives of the present study.



**Figure 5** Test for Usage on the Developed Mobile Application Program

## Discussion

Service design is a crucial factor in supporting design principles of design for people of all ages. Information management with categories of different service users and production design on the developed application program are in line with service standard that enables information exchange between senders and receivers. Seangwichienkit (2013) noted service design principles link user's usage benefits and their consumption, which in turn direct to the development of a mobile application program for bolstering travelling of the elderly living in the city community.

Focusing on relations between during-travelling and accessibility to health services that stemmed from several supporting factors at macro level, Choksunthornnithi (2013) asserted that accessibility to health services at policy management level is feasible. Hence, the developed application program for the elderly using technology and information support for giving and retrieving information during their travelling helps to improve quality of health services.

The advantage of technology and information through the mobile application program enhances effective communication between the elderly and staff at their destination hospitals (Taocharee & Yodchai, 2013). The developed application program elicited immediate and real-time communication in giving and retrieving information from the elderly's location to the hospital.

Elements in information system, such as hardware, software and/or instruction set that control the overall working system in the application program, constituted the effectiveness of the developed application program. Functions in the developed application program were consistent with the ideas from Perna, Varriale, and Ferrara (2020), that highlighted the use of technology for supporting life convenience and suitable communication. Apart from that, the use of Android in the application program was developed from two main parts, namely, instrument of IONIC framework and database. As reported by the elderly participants, these two components were regarded as significant factors as supported by Theprot's (2017) stance in the use of technology and information with guidelines in the selection of computing cloud for infrastructure services aimed to provide convenience to hospital's registry department and activity management for the elderly.

## Conclusion and Recommendation

Development of the mobile application program for the elderly and their travelling followers for health services is useful for information management that enables them to indicate their residential locations, suitability of travelling patterns, facilities' locations, suitable choices of travelling as well as specific needs. This study contributes to a review of marketing plan in developing an application program on smartphone for elderly users. Moreover, the processes in developing the application program came up with necessary factors that an application programmer needs to pay attention not only to the elderly users but also all users of any age.

To sum up, the development of the mobile application program for the elderly and their followers raised an awareness to all stakeholders in providing quality health service especially with the elderly members and healthcare-related government departments. As the present study specifically focused on samples of old people, it is recommended for future researchers to design an application program that caters to the needs of general public members.

## Conflict of Interest

There is no conflict of interest.

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