

## Development of a Positioning and Navigation Application for Assisting Needy People According to Islamic Perspective in Thailand

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**Abstract.** The southern region of Thailand is the region with the highest proportion of impoverished people in the country, particularly in the southern border provinces in which the majority of the population profess Islam. Due to the ineffective and outdated data collection of poor people by the government, resulting in the reliability of the collected data is low. As a result, even those who are no longer living in poverty may still be included in the database of needy people, while many truly impoverished people who are not included in the database do not receive proper assistance from the government. This paper presents an effective and reliable method for collecting data on impoverished Muslims by utilizing data of the annual zakat recipients, collected by the mosque committee. In addition, this paper proposes a mobile application that can search for information, pinpoint locations, and provide navigation to needy Muslims in order to facilitate public and private-sector agencies as well as charitable organizations in assisting them. Furthermore, the system analysis and design as well as the functionalities of the application are also presented. The Customer Satisfaction (CSAT) score is used as an index to measure user satisfaction with the application. The respondents are asked to provide their opinion using a 5-point Likert scale. The assessment results reveal that IT experts and the sample users involved in the aid and welfare of low-income people are highly satisfied with the interface, performance, and functionality of the application with the CSAT score of 95% ( $\bar{x} = 4.36$ , S.D.= 0.59) and 83.21% ( $\bar{x} = 4.16$ , S.D.= 0.69) respectively.

**Keywords:** Mobile Application, Positioning and Navigation, Needy, Poor, Zakat Recipient, Thailand's Southern Border Provinces.

## **1. Introduction**

The outbreak of the Coronavirus Disease 2019 (COVID-19) (Singhal, 2020) has affected Thai people in all sectors as a result of restrictive control measures announced by the Thai government (Kittiprapas, 2023), especially the low-income people who are unable to earn income as usual due to the lack of work (World Bank Group, 2021). The government of Thailand provided remedies for those affected by the COVID-19 pandemic through various subsidy programs (Ministry of Finance Thailand, 2021) to give financial aid and alleviate poverty such as the “No One Left Behind” scheme, “We Win” scheme, “Co-Payment” scheme, “State Welfare Card” scheme, etc. Those subsidy programs can be classified into two major categories: (1) Comprehensive assistance, including the programs that provide general financial support for everyone. It ensures that everyone in the country has sufficient income according to the minimum living standards and the cost of program management is low. However, it will unnecessarily consume a large amount of the budget because people who are not genuinely impoverished may receive financial assistance from the government. Therefore, this kind of assistance is relatively limited. (2) Specifically targeted assistance, consists of the schemes which provide financial assistance to specific target groups. It has the advantage of requiring a smaller budget as it provides financial aid only to genuinely impoverished people. Nevertheless, this method has weaknesses in accurately identifying poor people and incurs high costs in obtaining reliable income data for each person. As a result, some people who are not really poor may receive government assistance, while some genuinely impoverished people may not receive any financial aid.

In addition, Thailand's southern border provinces which consist of a large majority of Muslims (Haemindra, 1976) have the highest proportion of poor people in the country (Benbourenane, 2021). The poverty line of Narathiwat, Pattani, Yala, and Satun province have been below the regional and national poverty line (World Bank Group, 2020). Pattani and Narathiwat are the provinces with the second and third-highest poverty rates in the country respectively (World Bank Group, 2020). Hence, the majority of the low-income individuals in the southernmost provinces of Thailand are Islamic people.

Furthermore, the southern border region of Thailand has been enduring prolonged unrest for over two decades (Jampaklay et al., 2020). This situation has arisen due to historical factors, territorial divisions, drug abuse, illicit trade, unjust treatment of the local people, as well as issues of inequality (Chambers et al., 2019). These events have had adverse effects on the lives of the people in the region in terms of society, economy, and education. Moreover, the repercussions of the COVID-19 pandemic have further exacerbated the poverty issues in the southern border provinces of Thailand (World Bank Group, 2021), particularly impacting vulnerable groups, which are at a high risk of falling into poverty when confronted with various hardships such as illness, unemployment, and economic crisis (United Nations, 2020). The vulnerable groups comprise (1) households relying on external financial assistance, such as elderly households, (2) households with breadwinners employed in sectors prone to job losses, such as retail, tourism, and manufacturing, and (3) agricultural households lacking sufficient arable land for sustenance. Although the government has announced relief measures to alleviate the distress of the people, certain segments of the poor remain unable to access some of these aid measures due to eligibility limitations and the requirement to register for state welfare exclusively through designated websites. Consequently, a significant number of people enduring hardships are unable to register to receive appropriate assistance (Health Information System Development Office (HISO), 2021; Lhakard, 2022).

According to Islamic law, every year, all qualified Muslims are required to pay zakat (a portion of their wealth as an obligatory form of almsgiving or charity in Islam) (Al-Faizin et al., 2017) which is then distributed among eligible eight groups as prescribed by the religion (Othman & Noor, 2012; Hakim & Noviyanti, 2022). Two of those who are entitled to receive zakat include the poor (i.e. Fakir which means a Muslim who has no property or income, or has property or income but does not reach fifty percent of the fundamental needs) and the needy (i.e. Miskin which means a Muslim who has property or income that can only sustain more than fifty percent of the fundamental needs but does not

reach the sufficient limit) (Bhari et al., 2022). Therefore, zakat, with its religious obligation, provides an excellent basis for assisting the unprivileged Islamic people. Furthermore, it has many benefits and several positive impacts on Muslim society. Efficient utilization of zakat can minimize the wealth inequality between the wealthy and the impoverished. (Kailani & Slama, 2020; Owoyemi, 2020). It also enhances social and economic well-being by way of social security contribution (Widiastuti et al., 2021). In addition, zakat information management systems have been developed and implemented in Muslim-majority countries to manage the collection and distribution of zakat funds to eligible recipients in a systematic, transparent, and effective manner (Lubis et al., 2019; Swandaru, 2019; Daily Times, 2020). Elsayed and Zainuddin (2020) suggested that enhancing zakat information system technology could lead to better zakat performance in Malaysia's zakat institutions. Swandaru (2019) evaluated the service quality of the zakat management information system in Indonesia (called SiMBA) in dimensions of efficiency, system availability, fulfillment, and privacy as well as revealed the positive results towards overall service quality. Nurhayati et al. (2023) stated that socialization and intensive training for users of SiMBA are required in order to enhance the quality of information in management reporting. However, there remain numerous issues that can be studied and improved upon to optimize the efficiency and effectiveness of zakat management systems (Lubis et al., 2019).

In Thailand, zakat localization is practiced in villages based on Islamic law. Zakat is mostly distributed to the poor and needy Muslims (i.e. Fakir and Miskin) in each village. For zakat management, in general, every year the Imam (Mustafa et al., 2017) (i.e. a Muslim religious leader who primarily leads congregational prayers in the mosque) and the mosque committee (i.e. Bilal (a person who performs the call to prayers), Khatib (a person who delivers the sermon), and local representatives), by virtue of their status, are responsible for verifying the eligible village members who are able to receive zakat, collecting zakat, and then distributing zakat to the eligible zakat recipients (Dorloh et al., 2020). Due to the involvement of religious beliefs and practices, the list of low-income people who are eligible to receive zakat, which is verified and compiled by the mosque committee, is a highly accurate and reliable Muslim poverty database in Thailand.

The data of low-income citizens in Thailand, collected by government agencies, have been stored in diverse databases managed by different government units. Each poverty database has different criteria for measuring the level of poverty. Generally, the Ministry of Interior collects essential household data (i.e. census-based Basic Minimum Need (BMN) data (Boonyamanond & Chaiwat, 2020) annually in every province, except for Bangkok, to benefit other government agencies in improving the quality of life for the population. Households categorized as low-income based on BMN data criteria have an average income of less than 38,000 baht per person per year (Boonyamanond & Chaiwat, 2020). However, due to a potential lack of transparency and reliability in data collection by state officials, inaccurate data may be recorded in the database, including the data of non-poor individuals who desire to obtain government assistance, particularly those closely related to the data collectors. Additionally, genuinely impoverished individuals might be overlooked and not surveyed. Furthermore, for another poverty database, the Ministry of Finance has implemented a policy to provide a cost of living allowance to low-income Thai citizens through the "Pracharat Welfare" project (Chayanon et al., 2019). Eligible low-income people are required to verify their identity at designated agencies to receive the "State Welfare" card, which can be used to reduce expenses on consumer goods, services, and transportation. Individuals with an income below 30,000 baht per year receive 300 baht per month, while those earning 30,001 to 100,000 baht per year receive 200 baht per month to purchase essential consumer goods from specified stores (United Nations, 2022). Nevertheless, low-income individuals who are disabled, elderly, or bedridden might be unable to travel to verify their identity for the purpose of registering to receive government support. In addition, the National Electronics and Computer Technology Center (NECTEC) partnered with the Office of the National Economic and Social Development Council (NESDC) to develop the Thai People Map and Analytics Platform (TPMAP) (The Nation, 2023; National Electronics and Computer Technology Center (NECTEC), 2023) as a data analytics tool to analyze the

poverty situation as well as provide poverty alleviation and improve quality of life for Thai citizens. TPMAP utilizes the Multidimensional Poverty Index (MPI) developed by the Oxford Poverty and Human Development Initiative (OPHI) and the United Nations Development Programme (UNDP) in conjunction with the BMN database and the register-based data source from the “Pracharat Welfare” project to determine Thailand's targeted poor people. Nonetheless, targeted poor people in the TPMAP system are only low-income people who appear in both the MPI-based BMN database and the “State Welfare” card holders database (see Figure 1), potentially leading to significant exclusions of impoverished individuals. Moreover, the poverty databases are accessible solely to government agencies, as a result, private organizations and charitable institutions are unable to utilize the data to directly aid the impoverished people.

To address the research questions which include: (1) how can zakat recipient data improve the accuracy and reliability of the Muslim poverty database in Thailand? and (2) how usable and satisfactory is the proposed mobile application for assisting Muslim needy people in Thailand?, therefore, this study aims to: (1) develop a model for collecting accurate and reliable Muslim poverty data in Thailand by utilizing annual zakat recipient records, and (2) develop and evaluate a mobile application for searching, positioning, and navigating Muslim needy people in Thailand. The application is able to facilitate government officers and various charitable organizations in providing assistance to Thai impoverished Muslims. By utilizing the data of zakat recipients, every year, the data of low-income Muslims used in the system are collected and updated by the mosque committee in each village and then verified by the Imam of the mosque, community leader, and the provincial Islamic council (McCargo, 2010) to guarantee accurate and reliable information. The application functionalities and interfaces were assessed by experts in the field of Information Technology (IT) and the sample users involved in the aid and welfare of low-income people through the user satisfaction questionnaire. The study results exhibit that the respondents were highly satisfied with the application.

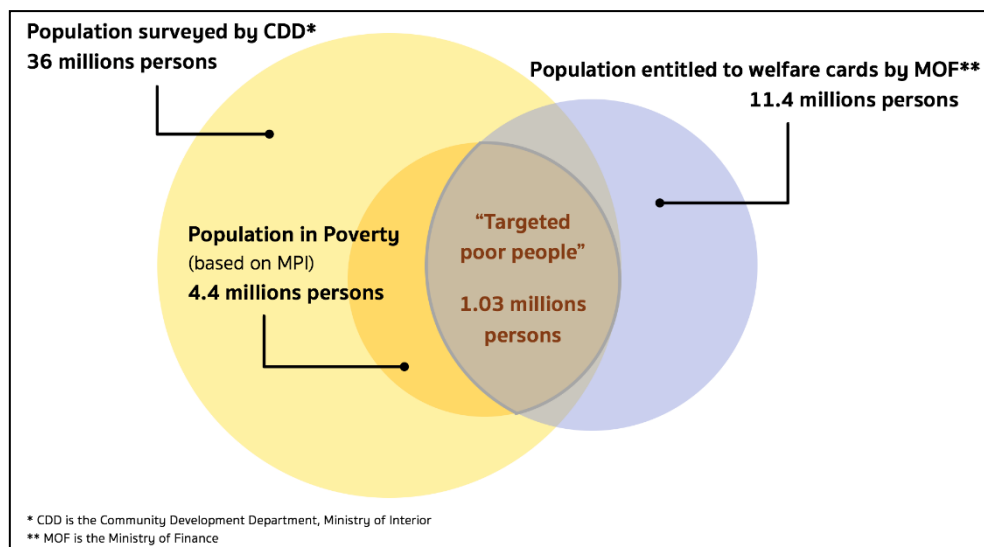


Fig. 1: Data of targeted poor people in the TPMAP system (National Electronics and Computer Technology Center (NECTEC), 2023).

The rest of this article is organized as follows: Section 2 describes the research methodology which includes the information management analysis and design process, the application development process, and the data analysis method. In Section 3, the information management model is explained in detail. The system analysis and design are presented in Section 4 followed by the application functionalities given in Section 5. Subsequently, Section 6 reveals the study results and discussion. The conclusion, limitations, and future works are provided in Section 7. Finally, the satisfaction assessment form is

shown in the Appendix.

## **2. Research Methodology**

This study consists of two main parts: firstly, the design and development of a model for collecting accurate and reliable data of needy Muslims in Thailand, which applies a qualitative research approach, and secondly, the development and evaluation of a mobile application for managing data of needy Muslims in Thailand, which involves both qualitative and quantitative research approaches. The quality of all research instruments was evaluated by 3 qualified experts, including (1) a government official involved in assisting impoverished people, (2) a researcher specializing in community development and marginalized populations, and (3) a researcher specializing in mobile application development. The detailed research methodology for each part will be further explained in the following subheadings.

### **2.1. Information Management Analysis and Design Process**

In order to obtain and maintain accurate and reliable information of the low-income Muslims in the system database, the information management model is analyzed and designed through in-depth interviews with relevant stakeholders including 5 representatives from the provincial Islamic council and mosque committee involved in assisting the Islamic low-income people, 3 representatives from the government agencies involved in helping the impoverished people, and 3 representatives from private-sector and charitable organizations providing assistance to needy people. The purposive sampling method (Campbell, 2020) is used to select the key informants.

### **2.2. Application Development Process**

This study, which involves research and development (R&D), uses both quantitative and qualitative methods to collect data in order to develop the positioning and navigation application for assisting needy Muslims in Thailand. The concept of the SDLC (System Development Life Cycle) model (Gurung et al., 2020) is applied in the application development process as described as follows (see Figure 2): In order to meet the user requirements and achieve the research objectives, a descriptive study is conducted through relevant literature reviews and in-depth interviews with 11 relevant end-users and 3 IT experts to analyze issues, problems, needs, and suggestions. Subsequently, the functionalities and interfaces of the application are analyzed, designed, and developed according to the user requirements. In order to evaluate the performance, interface, and functionality of the application, the user satisfaction assessment forms are analyzed, designed, and created. The performance, interface, and functionality of the application are tested and evaluated by 6 IT experts and 80 sample users involved with the aid and welfare of low-income people. The purposive sampling method (Campbell, 2020) is used for sample selection. After that, the application is improved according to the comments and recommendations from IT experts and the sample users. Finally, the application is deployed and maintained on a server.

### **2.3. Data Analysis Method**

Descriptive statistics such as average ( $\bar{x}$ ) (Gould & Ryan, 2019) and standard deviation (S.D.) (Gould & Ryan, 2019) are used to quantitatively summarize and describe the basic features of the data. In addition, the questionnaire deployed to assess a user's satisfaction with the application applies the Likert scale of 1 to 5 categories. The category options include a scale of 1 for "Very Dissatisfied", 2 for "Dissatisfied", 3 for "Neutral", 4 for "Satisfied" and 5 for "Very Satisfied" (Taherdoost, 2019). The user satisfaction questionnaire was developed based on previous technology acceptance studies (Laumer et al., 2017; Jayatilleke et al., 2018; Abdullah et al., 2019; Muhtasim et al., 2022; Phally et al., 2022; Guo et al., 2023). The question items in the questionnaire were assessed by 3 qualified experts (Lynn, 1986) with the aim of validating the questionnaire. In this study, the independent variables include performance and accuracy, user interface design, and information security, whereas, the dependent variable is user satisfaction. The index of item-objective congruence (IOC) (Rovinelli & Hambleton, 1977) is used to verify the validity of the questionnaire. IOC score of more than 0.6

indicated excellent content validity (Turner & Carlson, 2003). Table 1 exhibits the validity results of the research questionnaire. Subsequently, the questionnaires are distributed to 30 respondents who are in charge of taking a try-out test in order to measure the reliability of the research instrument using Cronbach's alpha (Cronbach, 1951; Bujang et al., 2018). Cronbach's alpha value of 0.7 or higher indicates an acceptable level of reliability (Falah & Napitupulu, 2023). Table 2 displays the reliability results of the research questionnaire. Furthermore, the Customer Satisfaction (CSAT) score (Dikov, 2021; Raileanu, 2023) is used to measure a user's satisfaction levels with the interface, performance, and functionality of the application. After collecting the user satisfaction assessment results, the CSAT score is calculated using the following formula:

$$CSAT = \frac{\text{Total number of positive results}}{\text{Total number of respondents}} \times 100$$

where the positive results include all users that reply with a scale of 4 or 5 to be satisfied with the application. The interpretation criteria of the CSAT score are presented in Table 3 (Raileanu, 2023).

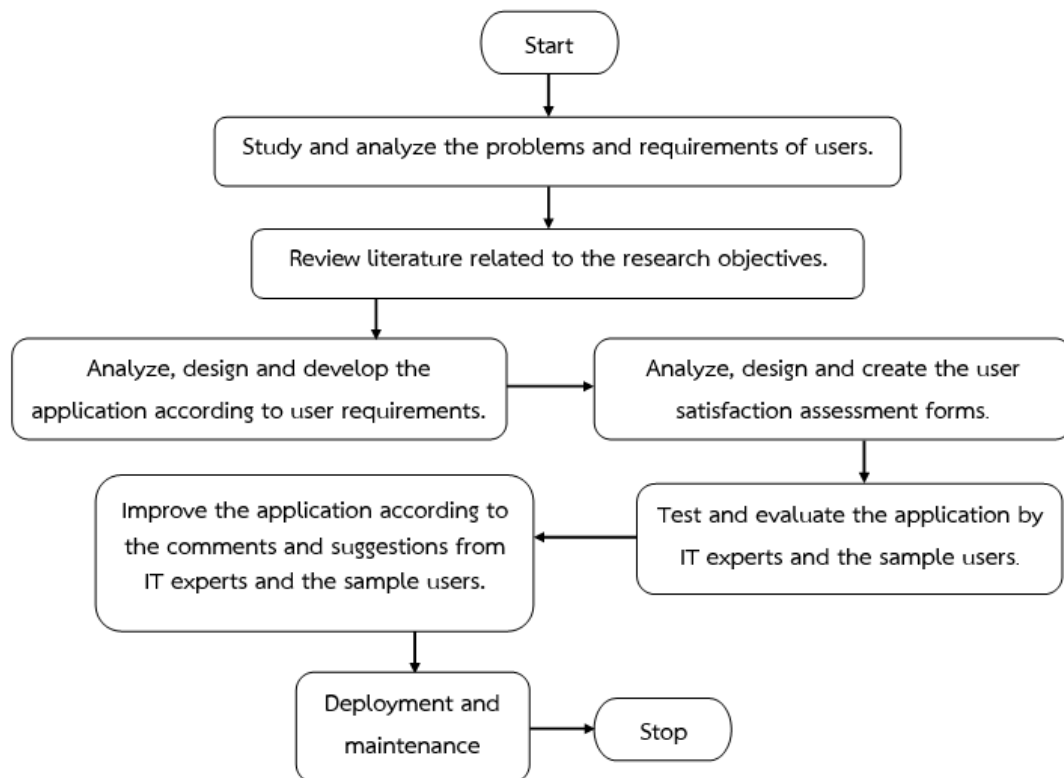


Fig. 2: Application development process.

Table 1: Validity results of the research questionnaire

| Assessment Items                                                  | Rating of Item         |                        |                        | $\Sigma$ | IOC Score | Interpretation of IOC Score |
|-------------------------------------------------------------------|------------------------|------------------------|------------------------|----------|-----------|-----------------------------|
|                                                                   | 1 <sup>st</sup> Expert | 2 <sup>nd</sup> Expert | 3 <sup>rd</sup> Expert |          |           |                             |
| Satisfaction with the performance and accuracy of the application |                        |                        |                        |          |           |                             |
| 1. The speed of response of the system functions                  | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 2. The accuracy of displaying the results of each menu            | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |

| Assessment Items                                                | Rating of Item         |                        |                        | $\Sigma$ | IOC Score | Interpretation of IOC Score |
|-----------------------------------------------------------------|------------------------|------------------------|------------------------|----------|-----------|-----------------------------|
|                                                                 | 1 <sup>st</sup> Expert | 2 <sup>nd</sup> Expert | 3 <sup>rd</sup> Expert |          |           |                             |
| 3. The accuracy of search results based on search conditions    | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 4. The accuracy of processing data                              | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 5. The accuracy of user authentication and access rights        | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| <b>Satisfaction with the user interface design</b>              |                        |                        |                        |          |           |                             |
| 1. The design is beautiful and modern.                          | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 2. The application menus meet the user's needs.                 | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 3. It has an easy-to-use design.                                | 0                      | +1                     | +1                     | 2        | 0.67      | Valid                       |
| 4. It displays complete information.                            | 0                      | +1                     | +1                     | 2        | 0.67      | Valid                       |
| 5. It uses the appropriate words and phrases.                   | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 6. The font size and style are legible and appropriate.         | 0                      | +1                     | +1                     | 2        | 0.67      | Valid                       |
| 7. The images used are appropriate.                             | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 8. The image size is appropriate.                               | 0                      | +1                     | +1                     | 2        | 0.67      | Valid                       |
| 9. The colors used are appropriate.                             | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 10. The arrangement of the elements is appropriate.             | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| <b>Satisfaction with the information security in the system</b> |                        |                        |                        |          |           |                             |
| 1. Authentication before using the system                       | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 2. Assigning access rights to each type of user                 | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |
| 3. Verifying data before entering it into the system            | +1                     | +1                     | +1                     | 3        | 1.00      | Valid                       |

Table 2: Reliability results of the research questionnaire

| Variables                               | Number of Indicators | Cronbach's Alpha ( $\alpha$ ) | Interpretation of $\alpha$ |
|-----------------------------------------|----------------------|-------------------------------|----------------------------|
| Performance and Accuracy                | 5                    | 0.921                         | Reliable                   |
| User Interface Design                   | 10                   | 0.948                         | Reliable                   |
| Information Security                    | 3                    | 0.895                         | Reliable                   |
| <b>The whole research questionnaire</b> | <b>18</b>            | <b>0.953</b>                  | <b>Reliable</b>            |

Table 3: Interpretation criteria of customer satisfaction (CSAT) score (Raileanu, 2023)

| CSAT Value Range | Interpretation Criteria |
|------------------|-------------------------|
| 0% - 35%         | Highly Dissatisfied     |
| 35% - 50%        | Dissatisfied            |
| 50% - 65%        | Quite Satisfied         |
| 65% - 80%        | Satisfied               |
| 80% - 100%       | Highly Satisfied        |

### 3. Information Management Model

After interviewing the sample stakeholders, including the district chief officer, the committee of various mosques, the provincial Islamic council, and representatives from the government and private-sector organizations involved in providing assistance to needy people, the authors have proposed a model of managing the information of Islamic low-income people (see Figure 3) in order to ensure the accuracy and reliability of Muslim poverty database in Thailand, which presents the processes of collecting, updating, verifying and importing the information in the system as described as follows: (1) Firstly, the mosque's committee collects and updates the information of poor people according to Islamic principle (Fakir and Miskin (Bhari et al., 2022)) in the community. This process is typically carried out in the month of Ramadan every year (according to the Hijri calendar), in which a list of Islamic low-income people who are eligible to receive the annual zakat will be collected and updated. (2) After that, the mosque's committee will send the information of the impoverished Muslims to the Imam of the mosque and community leader in order to verify the information. (3) Once the information has been verified by the Imam and community leader, the district chief officer will coordinate with the graduate volunteers for homeland development (Internal Security Operations Command (ISOC), 2020) in order to gather more information of the Islamic low-income people such as the careers that want to be supported, house picture and the coordinates of the house location, etc. (4) Then, the graduate volunteers fill all the information in the application. (5) Next step, the provincial Islamic council will log in to the application in order to verify the information that the graduate volunteers have entered into the system database. (6) After the information in the system has been verified, the users will be able to search for such information through the application. (7) Finally, the system will be administrated and maintained by the Southern Border Provinces Administrative Centre (SBPAC) (Wheeler, 2010) so that the application and database can be accessed and used at any time.

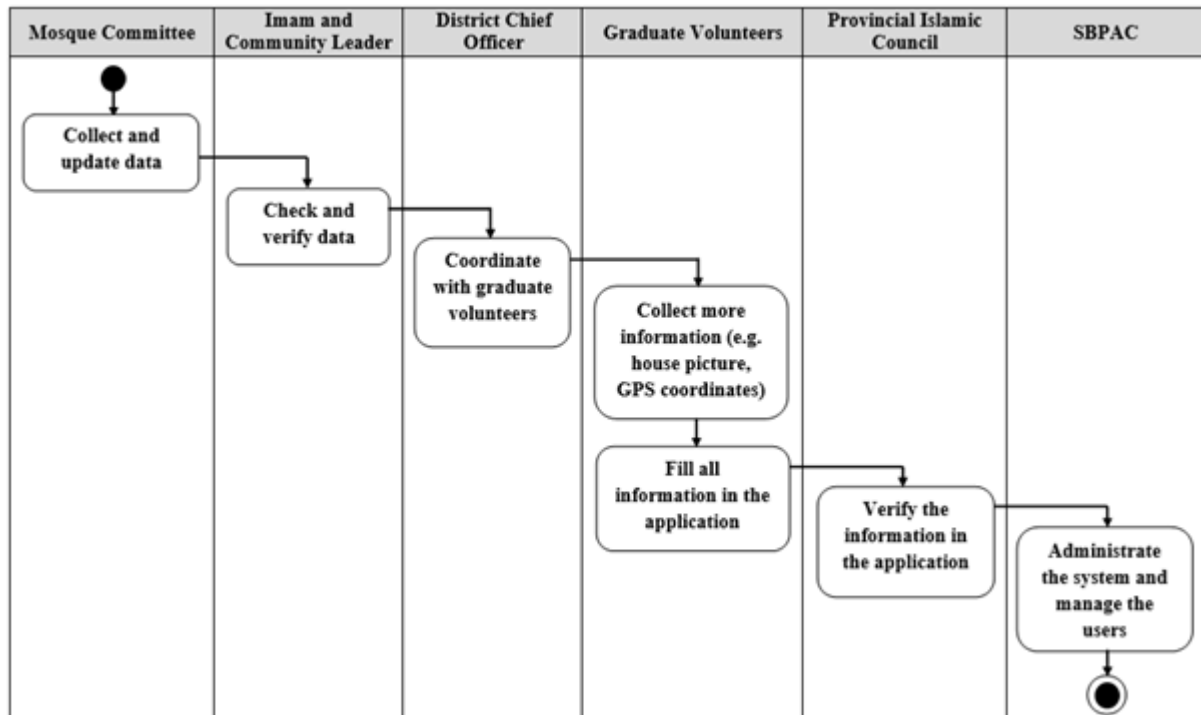


Fig. 3: Information management model.

#### 4. System Analysis and Design

The problems and requirements of users were analyzed through stakeholder interviews. Consequently, the application functions have been designed in order to meet the user's needs, which include the main features as follows: (1) The user can search and view the personal information of Islamic low-income people (Fakir or Miskin) in different areas. The information includes full name, identification number, current address, contact number, current occupation, average monthly income, average monthly expenses, the number of people under care, the surveyor information, etc. (2) The user can search and view the careers that can be encouraged for the Islamic low-income people in different areas. The government and private-sector organizations can use that information to help and support the Islamic poor people to pursue additional careers in order to increase their incomes and sustainably escape poverty. They may help in the form of career funding, career tools, or career training. (3) The user can see the residence environment of the Islamic low-income people. The information can be used for consideration for helping them in various aspects. (4) The user can view the house location of Islamic low-income people on the map and the application can navigate the user to that location.

The functional structure of the application is illustrated in the use case diagram (see Figure 4), which summarizes the details of the system's users and depicts how they relate to the functions in the system (Wazlawick, 2014). The main users can be divided into 5 categories as follows: (1) SBPAC is mainly responsible for administrating and maintaining the system so that the application and databases can be accessed and used at any time. In addition, the user accounts are also verified and managed by SBPAC. (2) Graduate volunteers for homeland development are primarily responsible for entering the information of needy Muslims into the system database, such as personal information, careers that can be encouraged for them, community information, surveyor information, etc. (3) Provincial Islamic council has the main task of examining and verifying the information of impoverished Muslims that the graduate volunteers have filled in the application. (4) Government agencies or private-sector organizations involved in helping the community are able to search and view the information of the Islamic poor people in different areas. Furthermore, they can find and see careers that can support them

in the community. Also, they can see the house location on the map and let the application navigate to it in order to help them in various aspects. (5) Ordinary people can also search and view information of needy Muslims in different areas in order to provide assistance to them. However, some information is hidden because of security reasons, such as identification number, contact number, etc. Nevertheless, they can contact Imam (a mosque leader) in order to help the Islamic poor people.

Figure 5 exhibits the data flow diagram (DFD) level-1 which provides the system overview by depicting the main system processes, data stores, and the users associated with them as well as the way information flows through the processes in the system (Tilley & Rosenblatt, 2016).



Fig. 4: Use case diagram.

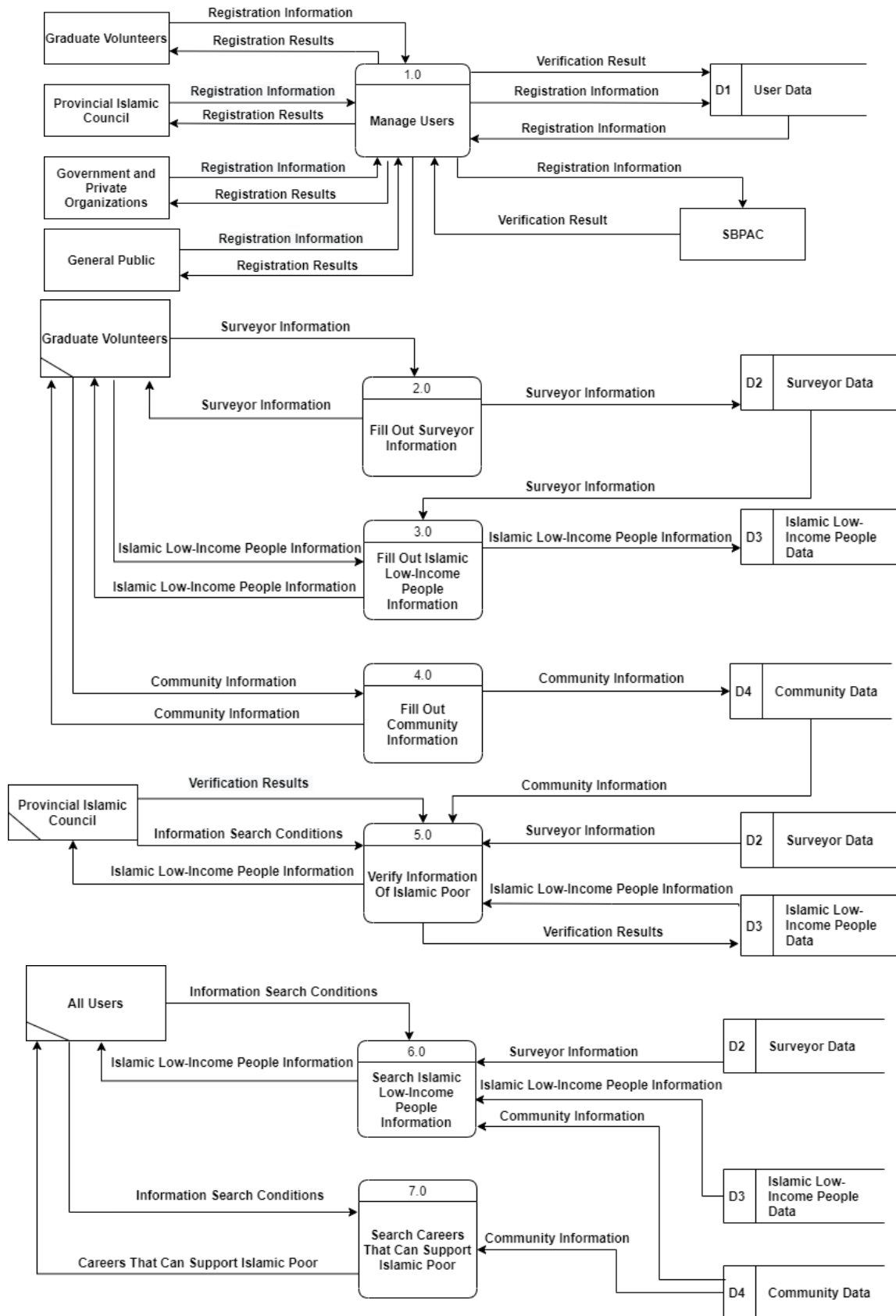


Fig. 5: Data flow diagram (DFD) level-1.

The system consists of the following main processes: (1) User management process, (2) Process of filling out the surveyor data, (3) Process for filling out the information of the Islamic impoverished people, (4) Process of filling out the community information, (5) Process for verifying the information

of the Islamic poor people, (6) Process of searching for information of the low-income Muslims, and (7) Process of searching for careers that can support them.

In addition, the system data stores include the table of user data, the table of surveyor data, the table of Islamic impoverished people data, and the table of community data.

## 5. Application Functionalities

When the application is launched, the login page will be displayed and allow users to gain access to the application by entering their e-mail address and password that have been previously registered (see Figure 6). In case a user has never registered before, the user can make the registration by pressing the “Sign Up” link. After successful login, the application will display the main page which shows a dashboard summarizing the number of Islamic low-income people separated by sub-district name. Users can choose to view a summary of the number of poor Muslims as specified by selecting the survey year, province, and district (see Figure 7).



Fig. 6: Login page.

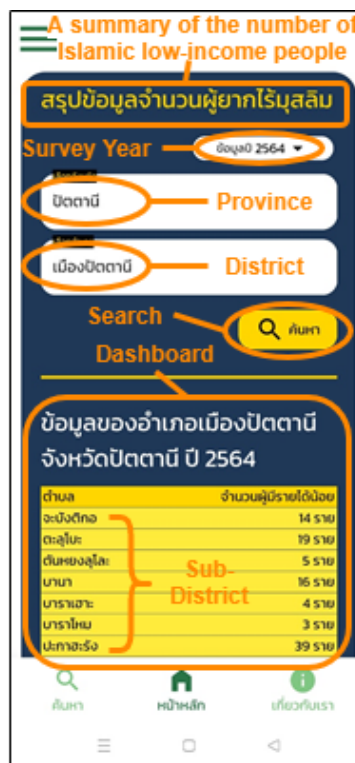


Fig. 7: Dashboard of the number of Islamic low-income people.

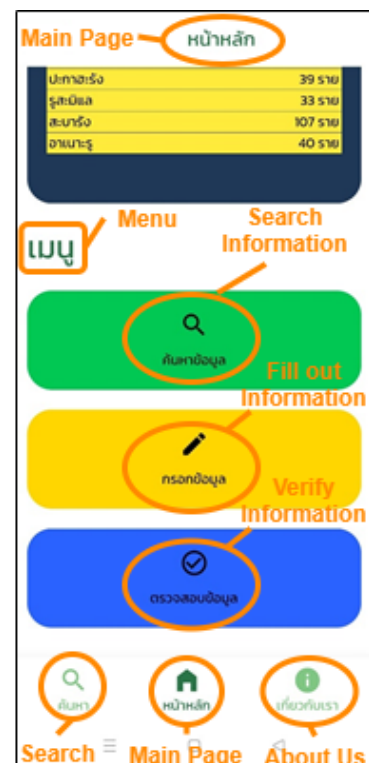


Fig. 8: Main menus.

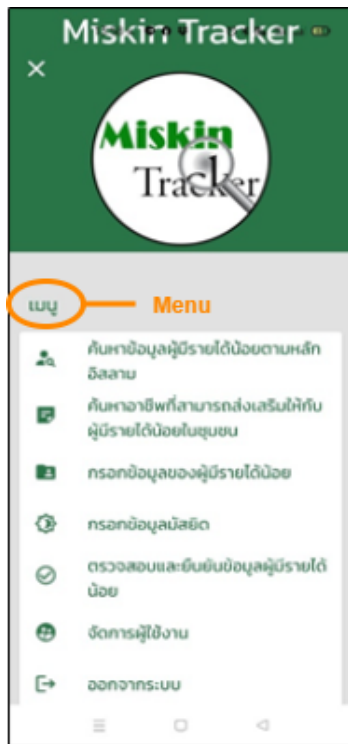


Fig. 9: Sidebar menus.

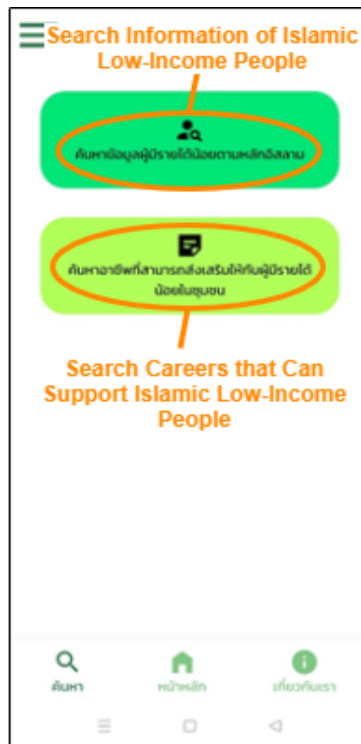


Fig. 10: "Search Information" page.

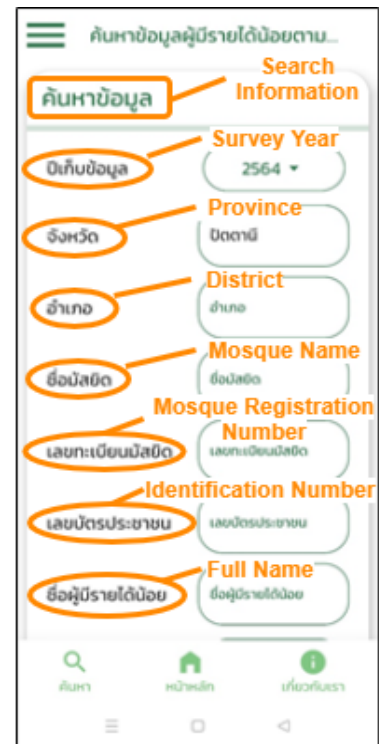


Fig. 11: "Search Information of Islamic Low-Income People" page.

In addition, there are main menus for users on the main page. Each category of users has a different menu that can be used. The government or private organizations as well as ordinary people can use only the "Search Information" menu. The application will display the "Fill out Information" and "Search Information" menu for the graduate volunteers. For the provincial Islamic council, the "Verify Information" and "Search Information" menu will be shown. The SBPAC which acts as the system administrator is able to use all previously mentioned menus (see Figure 8). Moreover, the users can quickly navigate the various menus through the sidebar navigation menu as well (see Figure 9).

On the main page, when a user presses on the "Search Information" button, the application will display the "Search Information" page which shows two sub-menus, i.e. "Search Information of Islamic Low-Income People" and "Search Careers that Can Support Islamic Low-Income People" menu (see Figure 10). In the "Search Information of Islamic Low-Income People" page, the users can set the scope of searching for information of Islamic low-income people as needed by specifying the search conditions, such as survey year, full name, identification number, poverty type (Fakir or Miskin), sub-district, district, or province name (see Figure 11). The Islamic low-income people's information consists of full name, identification number, current address, contact number, current occupation, careers that can be encouraged, average monthly incomes, average monthly expenses, the number of people under care, poverty type, house picture, coordinates of house location, community information, surveyor information, etc. (see Figure 12). Furthermore, the user can view the house location on the map and the application can navigate the user to that location by pressing the "Navigation" button on the "Map and Navigation" page (see Figure 13).

Figure 12 displays three screenshots of the 'Information of Islamic Low-Income People' page. The first screenshot shows the 'ข้อมูลการสำรวจ' (Survey Information) section, which includes fields for 'ผู้สำรวจข้อมูล' (Surveyor Name), 'เบอร์ติดต่อผู้สำรวจ' (Surveyor Contact Number), 'จังหวัด' (Province), 'อำเภอ' (District), 'ตำบล' (Sub-District), 'หมู่บ้าน/ชุมชน' (Village), and 'ชื่อมัสยิด' (Mosque Name). The second screenshot shows 'ส่วนที่ 1' (Part 1) with fields for 'ชื่อ' (Name), 'นามสกุล' (Surname), 'เลขประจำตัวประชาชน' (Identification Number), and 'เลขประจำตัวประชาชน' (Identification Number). The third screenshot shows 'ส่วนที่ 2' (Part 2) with fields for 'บ้านเลขที่' (House Number), 'หมู่ที่' (Village Number), 'ตรอก/ซอย' (Alley/Lane), and 'รูปบ้าน' (House Picture).

Fig. 12: "Information of Islamic Low-Income People" page.

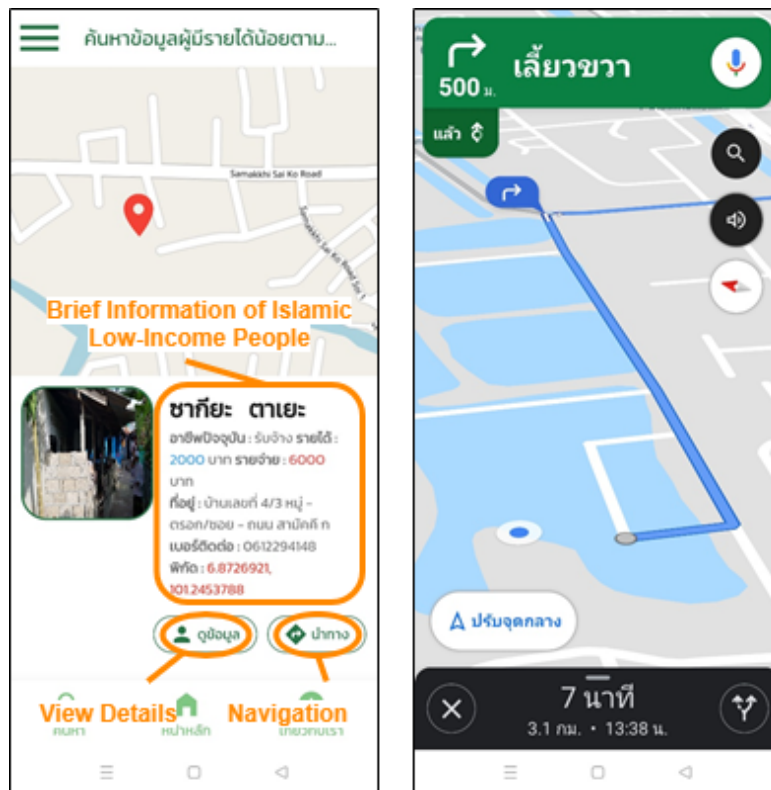


Fig. 13: "Map and Navigation" page.

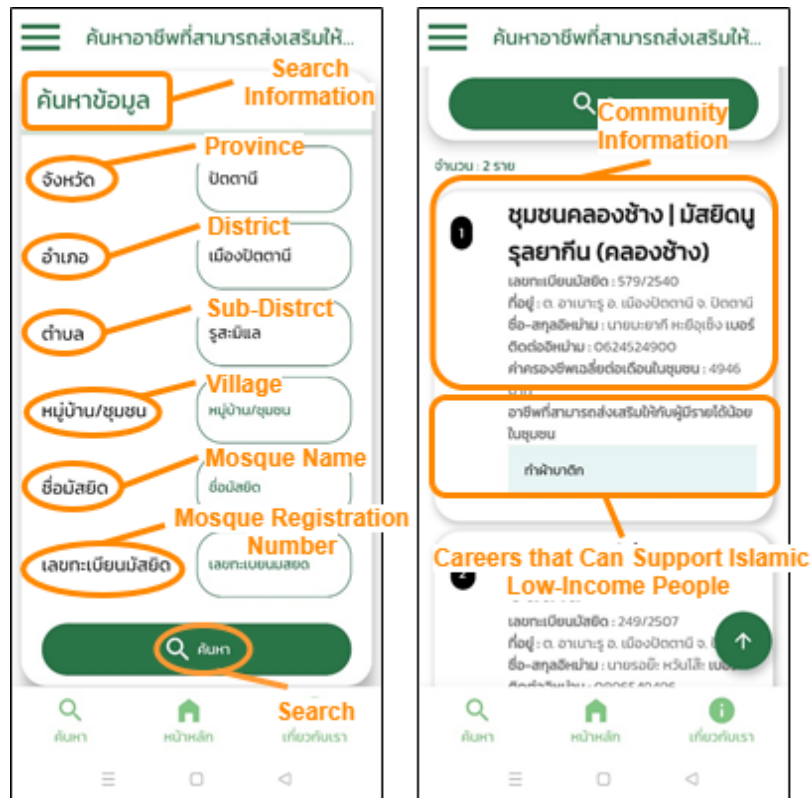


Fig. 14: “Search Careers that can Support Islamic Low-Income People” page.

In the “Search Careers that can Support Islamic Low-Income People” page, the users can set the scope of searching careers that can be encouraged for needy Muslims by determining the search conditions, such as community information, sub-district, district or province name (see Figure 14).

The “Fill out Information” menu contains two sub-menus (i.e. “Fill out Islamic Low-Income People Information” and “Fill out Community Information” menu) which will be used by the volunteer graduates in order to fill out the information of low-income Muslims, their communities as well as careers that can support them in the application.

The “Verify Information” menu will be used by the provincial Islamic council in order to check and verify the information of Islamic low-income people that the graduate volunteers have entered into the system database.

The SBPAC which acts as the system administrator will manage the user accounts through the “Manage User” menu that appears on the sidebar navigation menu (see Figure 9).

## 6. Results and Discussion

In order to assess the quality and user satisfaction of the application, the sample users were determined to use the application for a period of time, subsequently, satisfaction questionnaires were prepared and provided to them. Additionally, the sample users were intimated about the research and given ample time to fill in the questionnaire. The sample users are divided into two groups. The first group includes 6 IT experts, whereas, the second group has 80 sample users which consist of the committees of various mosques, the graduate volunteers for homeland development, and the officers affiliated with government and private agencies involved in the aid and welfare of low-income people. The respondents were asked to provide their opinion using a 5-point Likert scale ranging from 1 meaning “Very Dissatisfied” to 5 meaning “Very Satisfied” (Taherdoost, 2019). Descriptive statistics such as average ( $\bar{x}$ ) (Gould & Ryan, 2019) and standard deviation (S.D.) (Gould & Ryan, 2019) are used to

summarize and describe the characteristics of data. Also, the CSAT (Customer Satisfaction) score (Dikov, 2021; Raileanu, 2023) is used to measure a user's satisfaction level with the application. The demographic characteristics of the sample in the first and second group are presented in Table 4 and Table 5, respectively.

Table 4: Demographic characteristics of the sample in the group of IT experts

| Attribute        | Characteristics    | Frequency | Percentage (%) |
|------------------|--------------------|-----------|----------------|
| Gender           | Male               | 4         | 66.67          |
|                  | Female             | 2         | 33.33          |
| Age              | Below 20 years     | 0         | 0.00           |
|                  | 20 - 29 years      | 0         | 0.00           |
|                  | 30 - 39 years      | 1         | 16.67          |
|                  | 40 - 49 years      | 5         | 83.33          |
|                  | 50 years and above | 0         | 0.00           |
| Education Degree | Below Bachelor     | 0         | 0.00           |
|                  | Bachelor           | 0         | 0.00           |
|                  | Master             | 2         | 33.33          |
|                  | Doctor             | 4         | 66.67          |

Table 5: Demographic characteristics of the sample in the group of users involved in the aid and welfare of low-income people

| Attribute                                         | Characteristics      | Frequency | Percentage (%) |
|---------------------------------------------------|----------------------|-----------|----------------|
| Gender                                            | Male                 | 37        | 46.25          |
|                                                   | Female               | 43        | 53.75          |
| Age                                               | Below 20 years       | 0         | 0.00           |
|                                                   | 20 - 29 years        | 3         | 3.75           |
|                                                   | 30 - 39 years        | 13        | 16.25          |
|                                                   | 40 - 49 years        | 28        | 35.00          |
|                                                   | 50 years and above   | 36        | 45.00          |
| Education Degree                                  | Below Bachelor       | 29        | 36.25          |
|                                                   | Bachelor             | 46        | 57.50          |
|                                                   | Master               | 5         | 6.25           |
|                                                   | Doctor               | 0         | 0.00           |
| Type of Application User                          | Mosque Committee     | 51        | 63.75          |
|                                                   | Government Agency    | 18        | 22.50          |
|                                                   | Private Organization | 11        | 13.75          |
| Skill Level in Using Smartphones and Applications | Poor                 | 2         | 2.50           |
|                                                   | Basic                | 11        | 13.75          |
|                                                   | Intermediate         | 28        | 35.00          |
|                                                   | Advanced             | 21        | 26.25          |
|                                                   | Expert               | 18        | 22.50          |

Table 6 reveals the results of user satisfaction assessment by IT experts. It is obvious that the group of IT experts is very satisfied with the performance and accuracy of the application. The mean value of overall satisfaction with the performance and accuracy of the application is 4.47 with a standard deviation of 0.60 whereas the average CSAT score is 96.67%. Moreover, the overall satisfaction with the user interface design is at the "Highly Satisfied" level. The mean value of overall satisfaction with the user interface design is 4.18 with a standard deviation of 0.62 whereas the average CSAT score is 88.33%. Furthermore, the group of IT experts is also extremely satisfied with the information security in the system. The mean value of overall satisfaction with the information security in the system is 4.44 with a standard deviation of 0.54 whereas the average CSAT score is 100%. In conclusion, the overall

satisfaction in all aspects evaluated by the group of IT experts is at the “Highly Satisfied” level with a mean value of 4.36, a standard deviation of 0.59, and a CSAT score of 95%.

Table 6: Results of user satisfaction assessment by IT experts

| Assessment Items                                                          | Results from IT Experts |     |     |     |     |     | $\bar{x}$ | S.D. | CSAT Score | Interpretation of CSAT Score |
|---------------------------------------------------------------------------|-------------------------|-----|-----|-----|-----|-----|-----------|------|------------|------------------------------|
|                                                                           | 1st                     | 2nd | 3rd | 4th | 5th | 6th |           |      |            |                              |
| Satisfaction with the performance and accuracy of the application         |                         |     |     |     |     |     |           |      |            |                              |
| 1. The speed of response of the system functions                          | 4                       | 4   | 4   | 5   | 5   | 5   | 4.50      | 0.55 | 100%       | Highly Satisfied             |
| 2. The accuracy of displaying the results of each menu                    | 3                       | 5   | 5   | 5   | 4   | 5   | 4.50      | 0.84 | 83.33%     | Highly Satisfied             |
| 3. The accuracy of search results based on search conditions              | 4                       | 5   | 4   | 4   | 4   | 5   | 4.33      | 0.52 | 100%       | Highly Satisfied             |
| 4. The accuracy of processing data                                        | 4                       | 5   | 4   | 4   | 5   | 5   | 4.50      | 0.55 | 100%       | Highly Satisfied             |
| 5. The accuracy of user authentication and access rights                  | 4                       | 5   | 4   | 4   | 5   | 5   | 4.50      | 0.55 | 100%       | Highly Satisfied             |
| Overall satisfaction with the performance and accuracy of the application |                         |     |     |     |     |     | 4.47      | 0.60 | 96.67%     | Highly Satisfied             |
|                                                                           |                         |     |     |     |     |     |           |      |            |                              |
| Satisfaction with the user interface design                               |                         |     |     |     |     |     |           |      |            |                              |
| 1. The design is beautiful and modern.                                    | 3                       | 3   | 4   | 4   | 5   | 4   | 3.83      | 0.75 | 66.67%     | Satisfied                    |
| 2. The application menus meet the user’s needs.                           | 3                       | 4   | 4   | 4   | 4   | 4   | 3.83      | 0.41 | 83.33%     | Highly Satisfied             |
| 3. It has an easy-to-use design.                                          | 5                       | 4   | 4   | 4   | 4   | 4   | 4.17      | 0.41 | 100%       | Highly Satisfied             |
| 4. It displays complete information.                                      | 3                       | 5   | 4   | 5   | 4   | 4   | 4.17      | 0.75 | 83.33%     | Highly Satisfied             |
| 5. It uses the appropriate words and phrases.                             | 3                       | 4   | 4   | 5   | 5   | 5   | 4.33      | 0.82 | 83.33%     | Highly Satisfied             |
| 6. The font size and style are legible and appropriate.                   | 4                       | 3   | 5   | 5   | 4   | 5   | 4.33      | 0.82 | 83.33%     | Highly Satisfied             |
| 7. The images used are appropriate.                                       | 4                       | 3   | 4   | 4   | 5   | 5   | 4.17      | 0.75 | 83.33%     | Highly Satisfied             |
| 8. The image size is appropriate.                                         | 4                       | 4   | 4   | 4   | 5   | 5   | 4.33      | 0.52 | 100%       | Highly Satisfied             |
| 9. The colors used are appropriate.                                       | 4                       | 4   | 5   | 5   | 5   | 4   | 4.50      | 0.55 | 100%       | Highly Satisfied             |
| 10. The arrangement of the elements is appropriate.                       | 4                       | 4   | 4   | 5   | 4   | 4   | 4.17      | 0.41 | 100%       | Highly Satisfied             |
| Overall satisfaction with the user interface design                       |                         |     |     |     |     |     | 4.18      | 0.62 | 88.33%     | Highly Satisfied             |
|                                                                           |                         |     |     |     |     |     |           |      |            |                              |
| Satisfaction with the information security in the system                  |                         |     |     |     |     |     |           |      |            |                              |

| Assessment Items                                                        | Results from IT Experts |     |     |     |     |     | $\bar{x}$   | S.D.        | CSAT Score  | Interpretation of CSAT Score |
|-------------------------------------------------------------------------|-------------------------|-----|-----|-----|-----|-----|-------------|-------------|-------------|------------------------------|
|                                                                         | 1st                     | 2nd | 3rd | 4th | 5th | 6th |             |             |             |                              |
| 1. Authentication before using the system                               | 4                       | 4   | 4   | 4   | 5   | 5   | 4.33        | 0.52        | 100%        | Highly Satisfied             |
| 2. Assigning access rights to each type of user                         | 4                       | 5   | 4   | 5   | 4   | 5   | 4.50        | 0.55        | 100%        | Highly Satisfied             |
| 3. Verifying data before entering it into the system                    | 4                       | 5   | 4   | 5   | 5   | 4   | 4.50        | 0.55        | 100%        | Highly Satisfied             |
| <b>Overall satisfaction with the information security in the system</b> |                         |     |     |     |     |     | <b>4.44</b> | <b>0.54</b> | <b>100%</b> | <b>Highly Satisfied</b>      |
| <b>Overall satisfaction in all aspects</b>                              |                         |     |     |     |     |     | <b>4.36</b> | <b>0.59</b> | <b>95%</b>  | <b>Highly Satisfied</b>      |

Table 7 exhibits the results of user satisfaction assessment by the sample users involved in the aid and welfare of low-income people. It is observed that the group of sample users is extremely satisfied with the performance and accuracy of the application. The overall satisfaction with the system performance and accuracy has a mean value of 4.17 with a standard deviation of 0.72 whereas the average CSAT score is 82.59%. Additionally, the overall satisfaction with the user interface design is at the “Highly Satisfied” level. The mean value of overall satisfaction on the user interface design is 4.22 with a standard deviation of 0.68 whereas the average CSAT score is 85.88%. Besides, the group of sample users is also very satisfied with the information security in the system. The overall satisfaction with the information security in the system has a mean value of 4.09 with a standard deviation of 0.71 whereas the average CSAT score is 81.18%. In summary, the overall satisfaction in all aspects assessed by the group of users involved in providing assistance to impoverished people is at the “Highly Satisfied” level with a mean value of 4.16, a standard deviation of 0.69, and a CSAT score of 83.21%.

From research results, the model for collecting and verifying data of impoverished Muslims in Thailand was developed and proposed by utilizing annual zakat recipient records with an aim to ensure the accuracy and reliability of the Muslim poverty database in Thailand. Likewise, zakat institutions in Muslim-majority countries utilize the data of zakat recipients to distribute zakat funds to the poor and needy (Kailani & Slama, 2020; Mesawa & Rana, 2021; Sheikh et al., 2021; Bhari et al., 2022). In addition, for the convenience of using the aforementioned poverty database, the mobile application for searching, positioning, and navigating Muslim needy people in Thailand was developed based on user requirements. The application can facilitate government officials and various charitable organizations in providing assistance to Thai low-income Muslims. Furthermore, the user satisfaction assessment of the application, in aspects of performance and accuracy, user interface design, and information security, was conducted. The assessment results showed that both groups of IT experts and users involved in assisting impoverished people were overall satisfied with the application at a high level. The high satisfaction with the mobile application aligns with the study findings of Steele et al. (2017) in mapping poverty using mobile phone and satellite data. Nevertheless, the limitation of this research is that the database of impoverished individuals available in the system is specific to those who are Muslims. Therefore, future research should aim to find methods for collecting accurate and reliable data on impoverished individuals who adhere to other religions.

Table 7: Results of user satisfaction assessment by the sample users involved with the aid and welfare of low-income people

| Assessment Items                                                         | $\bar{x}$ | S.D. | CSAT Score | Interpretation of CSAT Score |
|--------------------------------------------------------------------------|-----------|------|------------|------------------------------|
| <b>Satisfaction with the performance and accuracy of the application</b> |           |      |            |                              |

| Assessment Items                                                                 | $\bar{x}$   | S.D.        | CSAT Score    | Interpretation of CSAT Score |
|----------------------------------------------------------------------------------|-------------|-------------|---------------|------------------------------|
| 1. The speed of response of the system functions                                 | 4.22        | 0.68        | 85.88%        | Highly Satisfied             |
| 2. The accuracy of displaying the results of each menu                           | 4.15        | 0.68        | 83.53%        | Highly Satisfied             |
| 3. The accuracy of search results based on search conditions                     | 4.16        | 0.7         | 82.35%        | Highly Satisfied             |
| 4. The accuracy of processing data                                               | 4.12        | 0.75        | 80.00%        | Highly Satisfied             |
| 5. The accuracy of user authentication and access rights                         | 4.19        | 0.79        | 81.18%        | Highly Satisfied             |
| <b>Overall satisfaction with the performance and accuracy of the application</b> | <b>4.17</b> | <b>0.72</b> | <b>82.59%</b> | <b>Highly Satisfied</b>      |
| <b>Satisfaction with the user interface design</b>                               |             |             |               |                              |
| 1. The design is beautiful and modern.                                           | 4.21        | 0.71        | 83.53%        | Highly Satisfied             |
| 2. The application menus meet the user's needs.                                  | 4.2         | 0.8         | 78.82%        | Satisfied                    |
| 3. It has an easy-to-use design.                                                 | 4.15        | 0.73        | 82.35%        | Highly Satisfied             |
| 4. It displays complete information.                                             | 4.26        | 0.68        | 87.06%        | Highly Satisfied             |
| 5. It uses the appropriate words and phrases.                                    | 4.28        | 0.65        | 89.41%        | Highly Satisfied             |
| 6. The font size and style are legible and appropriate.                          | 4.2         | 0.63        | 89.41%        | Highly Satisfied             |
| 7. The images used are appropriate.                                              | 4.2         | 0.65        | 88.24%        | Highly Satisfied             |
| 8. The image size is appropriate.                                                | 4.21        | 0.67        | 87.06%        | Highly Satisfied             |
| 9. The colors used are appropriate.                                              | 4.2         | 0.65        | 85.88%        | Highly Satisfied             |
| 10. The arrangement of the elements is appropriate.                              | 4.21        | 0.66        | 87.06%        | Highly Satisfied             |
| <b>Overall satisfaction with the user interface design</b>                       | <b>4.22</b> | <b>0.68</b> | <b>85.88%</b> | <b>Highly Satisfied</b>      |
| <b>Satisfaction with the information security in the system</b>                  |             |             |               |                              |
| 1. Authentication before using the system                                        | 4.11        | 0.67        | 82.35%        | Highly Satisfied             |
| 2. Assigning access rights to each type of user                                  | 4.09        | 0.68        | 81.18%        | Highly Satisfied             |
| 3. Verifying data before entering it into the system                             | 4.07        | 0.69        | 80.00%        | Highly Satisfied             |
| <b>Overall satisfaction with the information security in the system</b>          | <b>4.09</b> | <b>0.68</b> | <b>81.18%</b> | <b>Highly Satisfied</b>      |
| <b>Overall satisfaction in all aspects</b>                                       | <b>4.16</b> | <b>0.69</b> | <b>83.21%</b> | <b>Highly Satisfied</b>      |

## 7. Conclusion

After the situation of the COVID-19 pandemic, a lot of people have faced economic challenges, especially those who are impoverished and need to work day by day to make a living. Those people may lose their jobs and lose income to make a living, resulting in a significant increase in the proportion of poor people.

According to the population statistics in the southern border provinces of Thailand, several

provinces rank among the top 5 with the highest proportion of needy people in the country. The majority of the population in these areas profess Islam, therefore, most of the poor people are Muslims. Currently, the government's data collection of impoverished people is still inefficient and outdated. As a result, a significant number of people who are no longer impoverished still remain in the database of poor people, while many truly impoverished people who are not included in the database do not receive proper assistance from the government.

To address the aforementioned issues, in this article, the authors present a highly accurate and reliable method for obtaining data of poor Muslims. The approach utilizes the information of the poor people according to Islamic principles who are eligible to receive zakat each year as a database of poor Muslims. Additionally, the authors propose a mobile application that can search for information, pinpoint locations, and provide navigation to impoverished Muslims in order to facilitate public and private-sector agencies as well as charitable organizations in assisting them. According to the user satisfaction assessment of the application, which was evaluated by IT experts and a sample group of users involved in assisting needy people, the results revealed that both groups were highly satisfied with the interface, performance, and functionality of the application.

This study demonstrates the value of integrating religious data with technology for comprehensive poverty analysis. However, the research's constraint lies in the fact that the database of needy individuals within the system is limited to those who adhere to Islam. For future work, the authors intend to further study the reliable and effective data collection of impoverished people who profess other religions. Moreover, a comprehensive study of addressing poverty issues according to the principles of various religions should be conducted. Additionally, modern technology that can provide more convenience and efficiently assist low-income individuals should be further studied.

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### **Appendix: Satisfaction Assessment Form for “The Positioning and Navigation Application for Assisting Needy People According to Islamic Perspective in Thailand”**

#### **Part 1: General Information**

1. Gender: ☐ Male ☐ Female
2. Age: ☐ Below 20 years ☐ 20 - 29 years ☐ 30 - 39 years ☐ 40 - 49 years  
☐ 50 years and above
4. Education Degree: ☐ Below Bachelor ☐ Bachelor ☐ Master ☐ Doctor
5. Type of Application User (if applicable): ☐ Mosque Committee ☐ Government Agency  
☐ Private Organization
6. \_\_\_\_\_ Job
- Position: \_\_\_\_\_
7. \_\_\_\_\_ Affiliation
- Name: \_\_\_\_\_
8. Skill Level in Using Smartphones and Applications:  
☐ Poor ☐ Basic ☐ Intermediate ☐ Advanced ☐ Expert

#### **Part 2: Satisfaction with the performance and accuracy of the application (Please mark ( X ) in the blank which the most match your opinion)**

| Assessment Items                                             | Very Satisfied (5) | Satisfied (4) | Neutral (3) | Dissatisfied (2) | Very Dissatisfied (1) |
|--------------------------------------------------------------|--------------------|---------------|-------------|------------------|-----------------------|
| 1. The speed of response of the system functions             |                    |               |             |                  |                       |
| 2. The accuracy of displaying the results of each menu       |                    |               |             |                  |                       |
| 3. The accuracy of search results based on search conditions |                    |               |             |                  |                       |
| 4. The accuracy of processing data                           |                    |               |             |                  |                       |
| 5. The accuracy of user authentication and access rights     |                    |               |             |                  |                       |

#### **Part 3: Satisfaction with the user interface design (Please mark ( X ) in the blank which the most match your opinion)**

| Assessment Items                                        | Very Satisfied (5) | Satisfied (4) | Neutral (3) | Dissatisfied (2) | Very Dissatisfied (1) |
|---------------------------------------------------------|--------------------|---------------|-------------|------------------|-----------------------|
| 1. The design is beautiful and modern.                  |                    |               |             |                  |                       |
| 2. The application menus meet the user's needs.         |                    |               |             |                  |                       |
| 3. It has an easy-to-use design.                        |                    |               |             |                  |                       |
| 4. It displays complete information.                    |                    |               |             |                  |                       |
| 5. It uses the appropriate words and phrases.           |                    |               |             |                  |                       |
| 6. The font size and style are legible and appropriate. |                    |               |             |                  |                       |
| 7. The images used are appropriate.                     |                    |               |             |                  |                       |

