PAPER-BASED VERSUS ELECTRONIC DATA CAPTURE TOOL FOR MALARIA VECTOR CONTROL SURVEY AMONG KAREN HILL TRIBE POPULATION

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A THEMATIC PAPER SUMMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (BIOMEDICAL AND HEALTH INFORMATICS) FACULTY OF GRADUATE STUDIES MAHIDOL UNIVERSITY 2014

Thematic Paper
entitled

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ACKNOWLEDGEMENTS

It would not have been possible to finish this thematic paper without the help and support of the kind people around me, to only some of whom it is possible to give particular mention here.

Foremost, I would like to express my sincere gratitude to all of my advisors; Dr. Wirichada Pan-ngum, Dr. Jaranit Kaewkungwal, Dr. Saranath Lawpoolsri Niyom and Dr. Suporn Pongnumkul. Without their helps, supports and suggestion this thematic paper could not be completed successfully.

My sincere thanks also goes to Dr. Oranuch Pacheun and Dr. Pattariya Jarutut, for encouraging and supporting me to continue my Master degree. I am also indebted to Rockefeller Foundation for their financial support during this course.

I wish to thank all the teachers, who have provided the knowledge to do this thematic paper, and my sincere thanks also go to staff, who take care of Biomedical and Health Informatics course for providing the information, facilities and any kind of supports.

I am extremely grateful to Dr. Surapon Yimsumran and all the staffs from The Rajanagarindra Tropical Disease International Centre (RTIC) for their kind support during the training and data collection process.

I would also like to express my gratitude to staff from the Center of Excellence for Biomedical and Public Health Informatics (BIOPHICS) who provide detailed suggestions and help me for developing the tool.

I am very thankful to all of my friends, especially to Tong, Win Min Thit, Seng, Nok and Mong who always support and encourage me to do this project. Also, I especially thank my sister for standing beside me, cheering me up and encouraging me all of the time. Last but not least, I am also very grateful to my family for supporting me spiritually throughout my life.

Siriporn Monyarit

PAPER-BASED VERSUS ELECTRONIC DATA CAPTURE TOOL FOR MALARIA VECTOR CONTROL SURVEY AMONG KAREN HILL TRIBE POPULATION

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ABSTRACT

Objectives: The present study aims to develop and implement an electronic data capture tool (EDC) for use in malaria vector control survey among the Karen hill tribe population, a minority group in Thailand, who are considered as the high risk population for malaria. The user acceptance of EDC was also measured. Furthermore, the purpose of this study is to compare between using the EDC and the paper-based method for data collection in terms of the satisfaction and the time consumed. The last objective was to explore the strengths and weaknesses of using both methods for data collection.

Methods: The study was conducted in two villages of Suan Pheung district. The paper-based questionnaire and EDC were developed using the same questionnaire structure. Thirty community health volunteers were divided into two groups. Each groups used both methods to collect data from Karen respondents following the randomized cross-over design. Then, the time consumed, the users' satisfaction and interviewees' satisfaction between the two methods were assessed using the questionnaire and compared. The user acceptance of EDC was also assessed using the questionnaire and described statistically. Three focus group discussions were also conducted among the community health volunteers to explore the strengths and weaknesses of both methods.

Results: The development and implementation of the EDC were successful. Using EDC was more time consuming than the paper-based questionnaire. Both interviewers and interviewees were, however, more satisfied with EDC than the paper-based questionnaire. Both methods have their own strengths and weaknesses. The EDC was an acceptable method for data collection and proved the more appropriate tool for the present study.

KEY WORDS: ELECTRONIC DATA CAPTURE TOOL / USER SATISFACTION / USER ACCEPTANCE / KAREN HILL TRIBES

151 pages

แบบสอบถามรูปแบบกระดาษกับเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง

PAPER-BASED VERSUS ELECTRONIC DATA CAPTURE TOOL FOR MALARIA VECTOR CONTROL SURVEY AMONG KAREN HILL TRIBE POPULATION

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บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาและทดลองใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ในการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง ซึ่งถือเป็นหนึ่งในกลุ่มชาติพันธุ์ชนกลุ่มน้อยในประเทศไทย และมีความเสี่ยงในการติดเชื้อมาลาเรีย รวมถึงประเมินการยอมรับต่อเครื่องมือที่พัฒนาขึ้น นอกจากนี้ยังมีการเปรียบเทียบระยะเวลาที่ใช้ในการเก็บข้อมูล และความพึงพอใจ ระหว่างการใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์กับการใช้แบบสอบถามกระดาษในการเก็บข้อมูล รวมไปถึงการค้นหาจุดแข็ง และจุดอ่อนของเครื่องมือแต่ละแบบเมื่อใช้เก็บข้อมูล

การศึกษาได้ดำเนินการในพื้นที่สองหมู่บ้านของตำบลตะนาวศรี อำเภอสวนผึ้ง จังหวัดราชบุรี แบบสอบถามกระดาษและรูปแบบอิเล็กทรอนิกส์ถูกพัฒนาขึ้นโดยใช้โครงสร้างแบบสอบถามเดียวกัน จากนั้นอาสาสมัครสาธารณสุขชุมชน 30 คน ได้ถูกแบ่งเป็นสองกลุ่มเพื่อใช้เครื่องมือทั้งสองรูปแบบสัมภาษณ์ประชากรชาวเขาเผ่ากะเหรี่ยงในลำดับที่กลับกันตามรูปแบบการศึกษาเชิงทดลองแบบไขว้ จากนั้นระยะเวลาที่ใช้ในการเก็บข้อมูล และความพึงพอใจทั้งในผู้ที่ให้สัมภาษณ์ และผู้ที่ใช้เครื่องมือในการสัมภาษณ์ได้ถูกประเมินโดยใช้แบบสอบถามแล้วจึงนำมาเปรียบเทียบระหว่างเครื่องมือทั้งสองแบบ นอกจากนี้ยังมีการใช้แบบสอบถามประเมินการยอมรับต่อเครื่องมือเก็บข้อมูลอิเล็กทรอนิกส์ของอาสาสมัครสาธารณสุขชุมชน และจัดการสนทนากลุ่มขึ้นเพื่อค้นหาจุดแข็ง และจุดอ่อนของเครื่องมือแต่ละแบบ

ผลการศึกษาพบว่าการพัฒนาและทดลองใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์นั้นประสบความสำเร็จ การใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ใช้เวลาเพื่อเก็บข้อมูลมากกว่าแบบสอบถามกระดาษ อย่างไรก็ตามทั้งฝ่ายผู้ที่ใช้เครื่องมือสัมภาษณ์และผู้ให้สัมภาษณ์ต่างก็พึงพอใจต่อเครื่องมือเก็บข้อมูลในรูปแบบอิเล็กทรอนิกส์มากกว่าแบบกระดาษ เครื่องมือทั้งสองแบบมีทั้งข้อเด่นและข้อด้อย สำหรับการศึกษาครั้งนี้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์เป็นเครื่องมือที่อาสาสมัครสาธารณสุขชุมชนให้การยอมรับและมีความเหมาะสมในการใช้เก็บข้อมูลมากกว่าแบบสอบถามกระดาษ

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LIST OF ABBREVIATIONS

ABBREVIATIONS	TERM AND MEANING
API	Annual Parasite Incidence
BIOPHICS	Center of Excellence for Biomedical and Public Health Informatics
CDC	Centers for Disease Control and Prevention
CHVs	Community Health Volunteers
DDC	Department of Disease Control
EDC	Electronic Data Collection Tool
GPS	Global Positioning System
ICT	Information Communication Technology
IRS	Indoor residual spraying
IS	Information System
IT	Information Technology
ITNs	Insecticide-treated nets
LLINs	long-lasting insecticidal nets
NMCP	National Malaria Control Programme
PC	Personal Computer
PDA	Personal Digital Assistant
QNN	Questionnaire
RTIC	Rajanagarindra Tropical Disease International Centre
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
USAID	U.S. Agency for International Development
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Rationale of the study

Evidence-based public health was defined as the development, implementation, and evaluation of effective programs and policies in public health through application of principles of scientific reasoning, including systematic uses of data and information systems, and appropriate use of behavioral science theory and program planning models(1). As the definition, information was the critical element which was used as an evidence to support decision making as well as driving public health policy. Since the better information leads to the better decisions we need to pay a greater attention on obtaining the useful information. However, information is inferred from data (2). Working with poor data quality was very dangerous and it could ultimately lead to invalid results as well as the wrong conclusions being drawn. To maintain data quality, the data collection was the important process need to be considered. Policymakers and health care providers at all level need accurate, updated and a real-time basis data in order to measure the effectiveness of current policies and programs as well as to produce the effective policies(3). Numerous health surveys have been done in the past and are ongoing. The data were collected for providing the information to support the decision-making.

Malaria has been the problem in Thailand for many years. Presently, the transmission rates are very low or have been interrupted in most parts, but several western border districts and a few in the southern and southeastern parts of the country still display high transmission rates(4). In 2009, Thailand reported a higher number of cases amongst foreigners than Thai nationals and the risk groups of malaria including ethnic minority groups, migrants, mobile populations, refugees in camps and those who stay in the forest at nights(5). In 2010, most of malaria cases occurred in 30 provinces along Thai and neighborhood border areas and total number of cases increased by 7.1%

compared with the year 2009. Twenty-five percent of the reported cases were foreigners, mostly from Thai-Myanmar borders (94 %) and 3% from Thai-Cambodian borders. Based on the findings, today, ethnic minorities groups are one of majority groups of malaria transmission in Thailand.

In Thailand, the national malaria control program was initiated in 1949. Afterward, in 1996, it was combined with other vector-borne disease programmes. Currently, it has become the Bureau of Vector-borne Disease within the Department of Disease Control in the Ministry of Public Health. The responsibilities were producing policy for malaria control, managing of malaria-related research, and evaluating the malaria control programmes(6). The data being used in malaria control program came from two main sources. The first source was from the routine source including malaria surveillance system, web-based malaria information system, drug resistance monitoring, insecticide resistance monitoring, and entomological surveillance. The second was from the periodic source, which included KAP surveys, operational research and special survey, and programme reviews and evaluations. In order to develop the effective strategies, high data quality is needed. Presently, Thailand has a well-structured reporting system to report the data across all level in malaria control programme. However, most of data were in paper-based form. The flows of data across the programme are displayed in **Figure 1.1**.

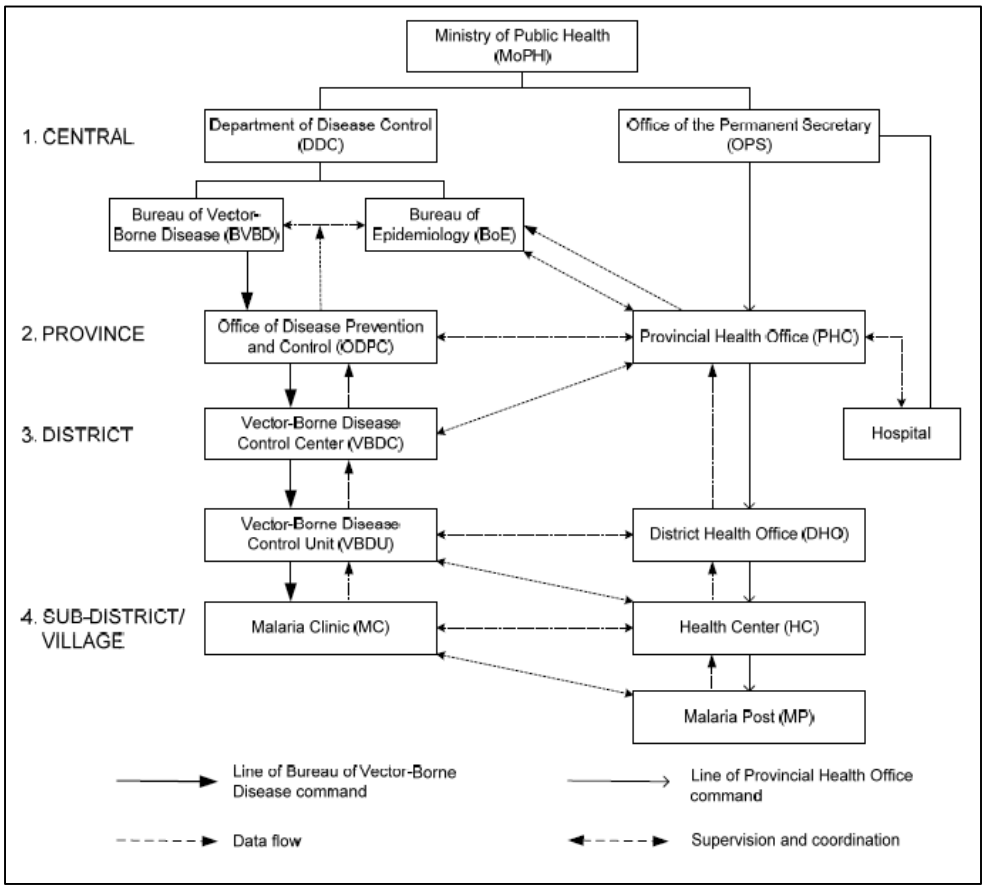

Figure 1.1 Organigram of the flow of data, supervision and coordination at each level

Source: National Monitoring and Evaluation Plan for Malaria Control and Elimination in Thailand (2011-2016)

The paper-based system made it inefficient to extract data for monitoring and evaluation, planning, and allocating appropriate resources. The vast amounts of data were being generated and recorded in the containment project, and still remained stored were not being utilized as a basis for strategic planning, and to drive operations(4). The data in electronic format can only find in aggregated data. Detailed data were only kept on paper at the peripheral levels(7). According to the development in information technology, the National Malaria Control Strategic Programme plans to upgrade its existing system into electronic system. The plan for using information technology in data collection process aimed to reduce redundancy in filling out the same information on multiple paper forms, improve data quality, make data quickly accessible, enhance its warning and detection algorithm, tailor data and information for each level and better monitor mobile populations.

At present, the National Malaria Control and Elimination Strategy of Thailand is in the strategy for year 2011 -2016. The overall goal is to reduce malaria morbidity and mortality and move towards the elimination of malaria parasites in Thailand. One of specific objective to achieve this goal is to prevent transmission of malaria parasites through effective vector control and personal protection measures among vulnerable populations (7). In order to prevent malaria, vector control remains the most generally effective measure to prevent malaria transmission (8). Two universal interventions in vector control which were recommended by WHO and used by public health distribution programs are long-lasting insecticidal net (LLIN), which was the preferred form of Insecticide-treated mosquito nets (ITNs), and indoor residual spraying (IRS). Indoor residual spraying (IRS) were recommended to use in 2003 and ITNs/LLINs were distributed free of charge to all age groups in 2008, but the population at high risk was protected with either IRS or ITNs only 38 percent(9). The data collection in malaria vector control survey regarding the distribution of insecticide treated nets (ITNs) and indoor residual spraying (IRS) were always performed in regular basis across malaria endemic areas. However, the traditional paper-based form was still used for data collection.

There were many problems of paper-based data collection such as poor handwriting of data collectors, incomplete filling of form and form damaged or lost. Once data had been collected, more errors were introduced during data entry. The ethnic minority groups were considered as the high risk group of malaria, especially the population along Thai-Myanmar border. They mainly lived in the remotest areas, where it was difficult to provide health services and they moved frequently across borders, where health care facilities were almost non-existent. The priority policy recommendations was to understand their behavior patterns in order to target appropriate interventions (4). Thus, the data collection needed to perform among these groups as well. Another challenge was the communication between interviewers and interviewees during the survey. These groups were considered as hard-to-access groups and mostly they used their own language for communication. Social and culture were also the barriers of the effective communication. The way that people seeing, hearing, and interpreting were influenced by their culture. The same word can mean different things for those who come from difference cultures, even when they speak the same

language. Since the languages were different, the translation had to be performed to communicate; the possibility for misunderstanding increased (10)and bias may be introduced during interviews with translation. Development of the instrument for data collection could help in reducing those barriers during data collection. The purpose of this study were to minimize data collection problem, allow quick and reliable data entry in the field, pre-set translations into different languages, create the effective communication between interviewers and the participant who speak different languages other than Thai, provide standardized questions and answers while doing the survey, reduce later manual data entry since the survey have done. In addition, the way to use was easier and more attractive than traditional paper-based data collection.

The electronic data capture instruments or electronic forms were defined as self-completed screen-based questionnaires or interfaces that the respondent entered data into manually (11). The devices that used to enter data can be varied depending on the task. Many benefits of using an electronic data capture (EDC) for data collection have been demonstrated in several previous studies in health care areas around the world (12-18). While some are more emphasize on comparison of various methods to collect data included paper-based method (17, 19-23), several studies have concluded about the advantages of the electronic data collection such as reduced time for data collection(13), more complete data(17), user friendly(24), allowed the use of transparent decision algorithms and improved data entry and data integrity(25). Implementation of the electronic data collection was one way to decrease expenditures and increase collected data quality (24). However, there were a few research in Thailand demonstrating the use of electronic data capture for data collection (26, 27).

The current study aimed to develop the electronic data capture tool to collect the data in malaria vector control survey among ethnic minority groups who are the risk group and live in high malaria transmission areas. Karen (or Kareang in Thai language), one of ethnic minority groups in Thailand, were the major group of hill tribe population. Typically they lived in northern and western of Thailand along the Thai-Myanmar border where malaria transmission was high. Thus, they were also the risk group of malaria transmission due to the location of their households. Suan Phueng district was the district under administration of Ratchaburi province, which was well known as a place of Karen population due to the majority of population was Thai-Karen people (28).

There was Tanaosri mountain at the western site of district at the boundaries between Thailand and Myanmar (28). The highest malaria cases in Ratchaburi province continuously occurred in Suan Phung district. The malaria incidence rates were showed in **Figure 1.2.**

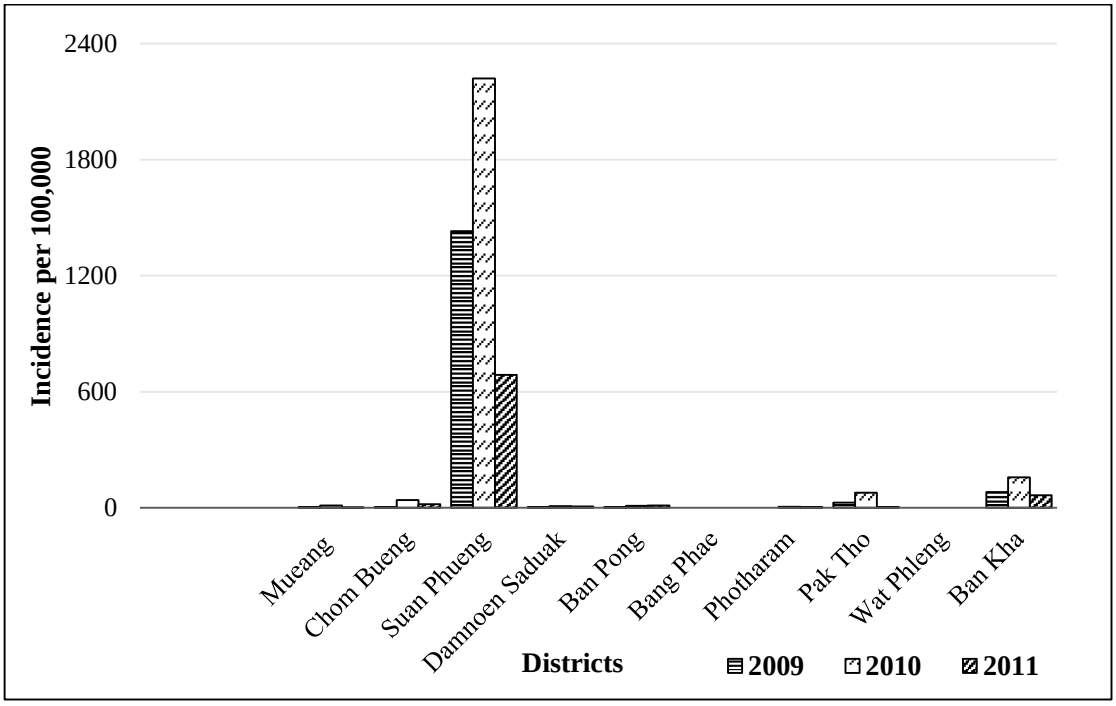

Figure 1.2 Malaria incidences in district level, Ratchaburi province (2009-2011)
Source: Bureau of Epidemiology, DDC, MoPH, Thailand

As mentioned above, the electronic data capture tool (EDC) was developed to apply with Karen hill tribe people. However, the success of EDC was not only meeting the goal in the application, but also achieving the user satisfaction and user acceptance or their willingness to use after the tool was implemented. The target populations who were interviewed also represent a good indicator to measure the success of new method. Importantly, the evidence of comparing electronic with traditional paper-based methods also needed for making the decision to select the proper data collection approach.

1.2 General objectives

1) To develop and implement an electronic data capture tool (EDC) use in malaria vector control survey among Karen hill tribe population.

2) To compare between using an electronic data capture tool (EDC) and paper-based method for data collection.

1.3 Specific objectives

1) To assess the user acceptance of using an electronic data capture tool (EDC) among community health volunteers.

2) To compare a time consumed between using an electronic data capture tool (EDC) and paper-based method for data collection.

3) To compare users/interviewers and interviewees' satisfaction between using an electronic data capture tool (EDC) and paper-based method for data collection.

4) To explore the strength and weakness of using an electronic data capture tool (EDC) and paper-based method in pilot study.

1.4 Significance of the study

The instrument from the study could help to improve data collection process. Since an electronic data capture tool could provide a proper translation of questions-answers in Karen languages, it could reduce misunderstanding of information and help to understand the actual behavior patterns of Karen population, which may different from majority of population. Using electronic data capture tool (EDC) could assist the health survey to overcome the language barrier of participants, go across the limitation of paper-based method, and also less requirements on educational level of health volunteers and of participants. The use of electronic data capture tool (EDC) did not only improve the data collection method but also improve the flow of information, reduce human resource, and thus served as support to the data management process plentifully. The use of electronic data capture tool demonstrated in this study can set a good example for similar kinds of studies where population consisted of various tribes

and nationalities. The result in the users' satisfaction, users' acceptance, the strength and weakness of both instruments could be used for improving its functions later on. Last but not least, the evidence from the comparison between the using of electronic data capture tool (EDC) against the traditional paper-based method could assist the policy makers to make a decision for employing the appropriated data collection approach in malaria vector control survey.

1.5 Operational definitions

- **Electronic data capture tool (EDC)** is a self-completed screen-based questionnaires or interfaces that the interviewers enter data into the system manually.
- **Time consumed** refers to the duration of data collection since the interview starts until finishes (measure in minute per a set of questionnaire).
- **User satisfaction** is defined as the overall affective evaluation of the users, who has involved his or her experience with the instruments (EDC or paper-based questionnaire). The satisfaction were measured in three term as follows:
- **Format** refers to the visual structure for a user interface which the data are presented or displayed both on EDC screen and paper based questionnaire.
- **Ease of use** refers to the property of an EDC or paper based questionnaire that the users can use without an effort.
- **System speed** refers to the operational speed of particular method (EDC or paper-based questionnaire) in order to complete the interview.
- **User acceptance** is defined as the willingness of the community health volunteers (CHVs) to use an electronic data capture tool (EDC) for support their job towards data collection in malaria vector control survey.
- **Perceive usefulness** is defined as the degree to which the community health volunteers (CHVs) believes that using an electronic data capture tool (EDC) would enhance his or her job performance towards collecting the data in malaria vector control survey.
- **Perceive ease of use** is defined as the degree to which the community health volunteers (CHVs) believe that using an electronic data capture tool (EDC) for collecting the data in malaria vector control survey would be free from effort.

- **Intention to use** is defined as the intention of the community health volunteers (CHVs) to use an electronic data capture tool (EDC).

1.6 Conceptual framework

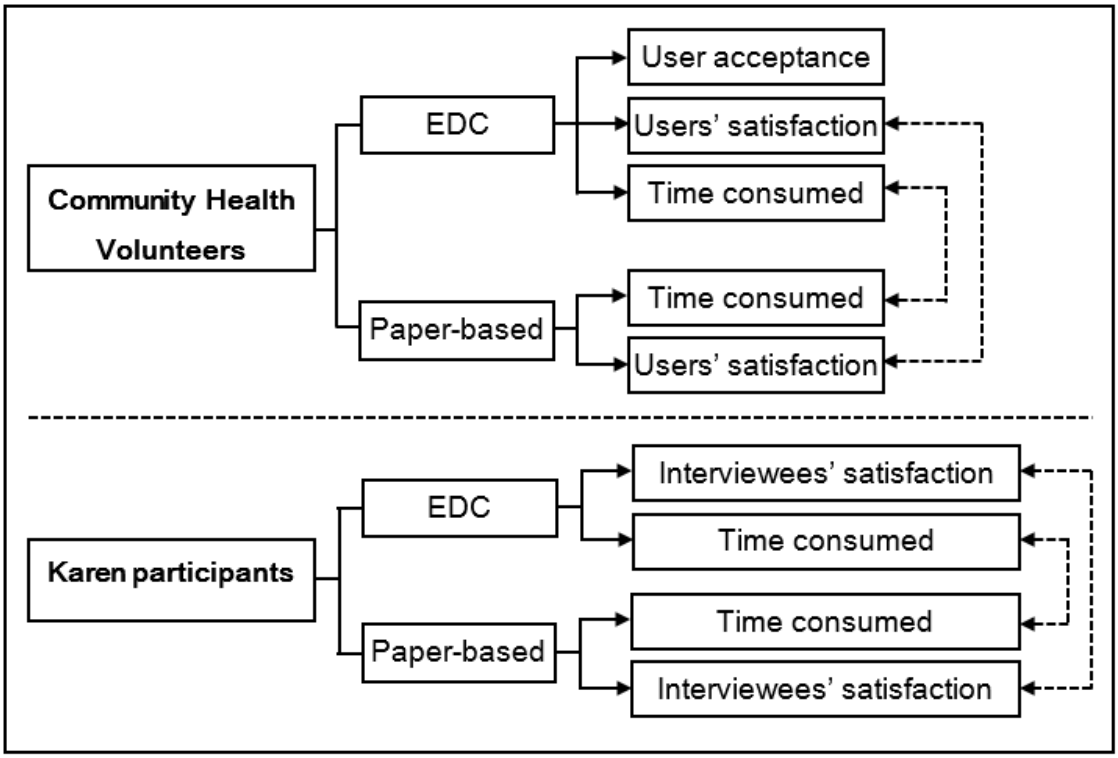

Figure 1.3 Conceptual framework of the current study

CHAPTER II
LITERATURE REVIEW

2.1 Malaria situation in Thailand

Malaria has been considered as a public health problem in Thailand for many years. Presently, the transmission rates are very low or have been interrupted in most parts of Thailand(4). From 2000 to 2011 , case incidence decreased by more than 75%, while 8 percent of the population were still living in high transmission areas (≥1 case per 1000 population)(9). For parasite species, the prevalence of P.*vivax* was higher than P.*falciparum* during 2002 to2010. In 2010, P. *vivax* and P. *falciparum* were detected 58% and 41% respectively. Furthermore, 0.1% caused by P. *malariae*, and also mixed infection of P. *vivax* and P. *falciparum* were found 0.7%. Twenty-five percent of reported cases were foreigners, mostly from Thai-Myanmar borders (94 %) and 3% from Thai-Cambodian borders. In 2009, Thailand reported a higher number of cases amongst foreigners than Thai nationals(5). In 2010, most of malaria cases occurred in 30 provinces along Thai and neighborhood border areas and total number of cases increased by 7.1% compared to year 2009. Malaria mortality rate in Thailand year 2010 by provinces is shown in **Figure 2.1** The risk groups of malaria were ethnic minority groups, migrants, mobile populations, refugees in camps including those who stay in the forest at nights(5)

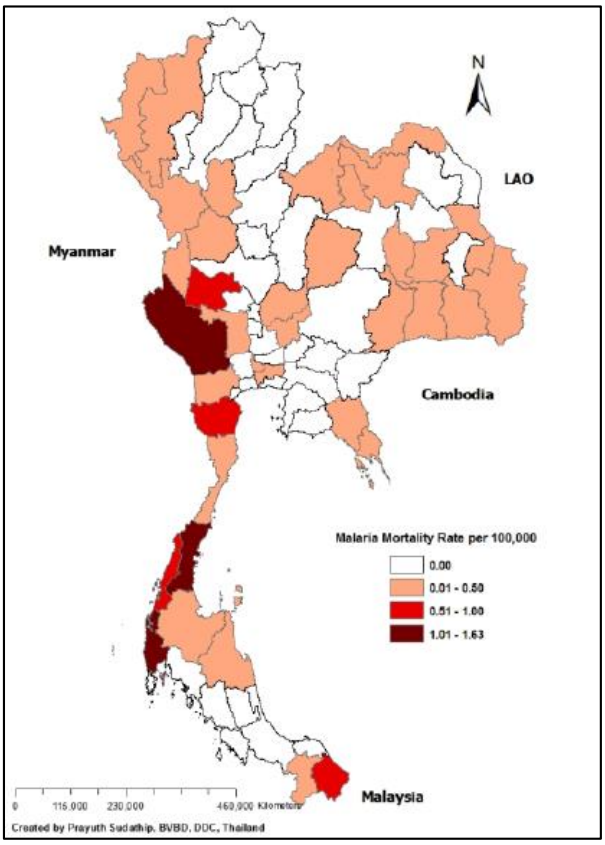

Figure 2.1 Malaria mortality rate in Thailand by provinces, 2010

Source: National Strategic Plan for Malaria Control and Elimination in THAILAND (2011-2016)

Whereas, the burden of malaria had decreased greatly, a number of malaria cases still occurred in the border provinces of Thailand with neighborhood i.e. Myanmar in western border districts, Malaysia along southern border and also along southeastern parts of the country such Cambodian and Laos. Undoubtedly, the problems of malaria along Thai-Myanmar border and among ethnic minority groups were a big challenge in malaria elimination.

2.2 Malaria vector control

2.2.1 Main interventions

Vector control remained the most generally effective measure to prevent malaria transmission (8). Two universal interventions in vector control which were

recommended by WHO and used by public health distribution programs were long-lasting insecticidal nets (LLINs), the preferred form of Insecticide-treated mosquito nets (ITNs), and indoor residual spraying (IRS).

Insecticide-treated nets (ITNs) are mosquito nets which repelled disabled and/or killed mosquitoes when they came into contact with insecticide on the netting material. There are two types of ITNs including:

1) A conventionally treated net is a mosquito net which had been treated by dipping the net in a WHO-recommended insecticide. The nets should be re-treated after three times of washing to maintain insecticidal effect. Without washing,, the re-treated process should still be performed at least once a year.

2) A long-lasting insecticidal net (LLINs) is a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around the fibers. The net must retain its effective biological activity without re-treatment for at least 20 WHO standard washes under laboratory conditions and three years of recommended use under field conditions.(29)

Indoor Residual Spraying (IRS) is an application of a long-lasting, residual insecticide to potential malaria vector resting surfaces such as internal walls, eaves, and ceilings of all houses or structures (including domestic animal shelters) where such malaria vectors may come into contact with the insecticide(30). The purpose of using an indoor residual spraying (IRS) is to kill the mosquitoes that come into the houses and rest on sprayed surfaces. Thus, this is the step that stop malaria transmitted process. The most common insecticides used are DDT29 and pyrethroids. Usually, it is used in seasonal transmission areas, epidemic-prone areas and particularly in malaria endemic areas.

The use of both interventions are the effective tool for malaria prevention and has increased broadly during the past 10 years as part of a driven towards universal coverage of all populations at risk, saving hundreds of thousands of lives(31).

2.2.2 Malaria vector control in Thailand

In Thailand, the national malaria control program was initiated in 1949. After 1996, it was combined with other vector-borne disease programmes. Today, it has become the Bureau of Vector-borne Disease within the Department of Disease Control

in the Ministry of Public Health. The administration is divided in regional level, provincial level and district level. Currently, there are 12 Disease Prevention and Control offices at the regional level, 39 Vector-borne Disease centers at the provincial level and 301 Vector-borne Disease units at the district level across the country. All of those are responsible for the prevention and control of malaria as well as other vector-borne diseases. Particularly for malaria, there are 329 malaria clinics throughout the country. The village malaria volunteers are actively involved in prevention and control activities in each community(32).

The activities on malaria vector control based on a stratification of malaria transmission risk is recommended by WHO as a model approach to stratify malaria endemic areas with specific targeted interventions(7). The Stratification of malaria transmission risk in Thailand was shown as follows:

A Control (area with transmission)

A1 perennial transmission area (transmission reported for at least 6 months per year).

A2 periodic transmission area (transmission reported but for less than 6 months per year

B Elimination (area without transmission)

B1 high and moderate receptivity (transmission not reported within the last 3 years but primary and secondary vectors present).

B2 low and no receptivity (transmission not reported within the last 3 years and primary and secondary vectors absent, suspected vector may be present).

The malaria control programme was very successful. The number of villages classified as A1 falling from 781 villages in 2004 to 426 villages in 2009. In A1/A2 villages where malaria transmission persisted and in areas still considered to be receptive to transmission with potential for reintroduction, control activities remain extremely managed through vertical programme structures. While, in other areas, malaria diagnosis, treatment and case investigation were fully integrated into and managed by routine health care services(7). In Thailand, there is a special program responsible for malaria, namely the National Malaria Control and Elimination Strategy of Thailand. This program is running from year 2011 -2016. The vision of the National

Malaria Control and Elimination Strategy was that 80 percent of the total country areas will be free from locally acquired malaria transmission by the year 2020(32). Moreover, the targets of program were as follows:

1. Annual Parasite Incidence (API) (all species) per 1000 mid-year population among Thai + non Thai M1 migrants reduced from 0.4 per 1000 (baseline 2010) to 0.2 per 1000 population (2016)

2. Malaria Mortality Rate reduced from 0.14 per 100,000 (baseline 2010) to 0.05 per 100,000 population (2016)

3. Percent of districts achieving interruption of malaria transmission (no indigenous cases of malaria for three years) increased to 60% by 2016 and 80% by 2020.

The overall goal of the current National Strategy for Malaria Control and Elimination in Thailand (2011 -2016) is to reduce malaria morbidity and mortality and move towards the elimination of malaria parasites in Thailand. One of the specific objectives to achieve this goal was to prevent transmission of malaria parasites through effective vector control and personal protection measures among vulnerable populations(7). Indoor residual spraying (IRS) were recommended to use in 2003 and ITNs/LLINs were distributed free of charge to all age groups in 2008. In 2010, ITN/LLINs delivered were sufficient to protect 25%–50% of the population at high risk(33). However, the population at high risk was protected with either IRS or ITNs only 38 percent(9). The percentage of high risk population protected with IRS and ITNs in 2011 was shown in **Figure 2.2.**

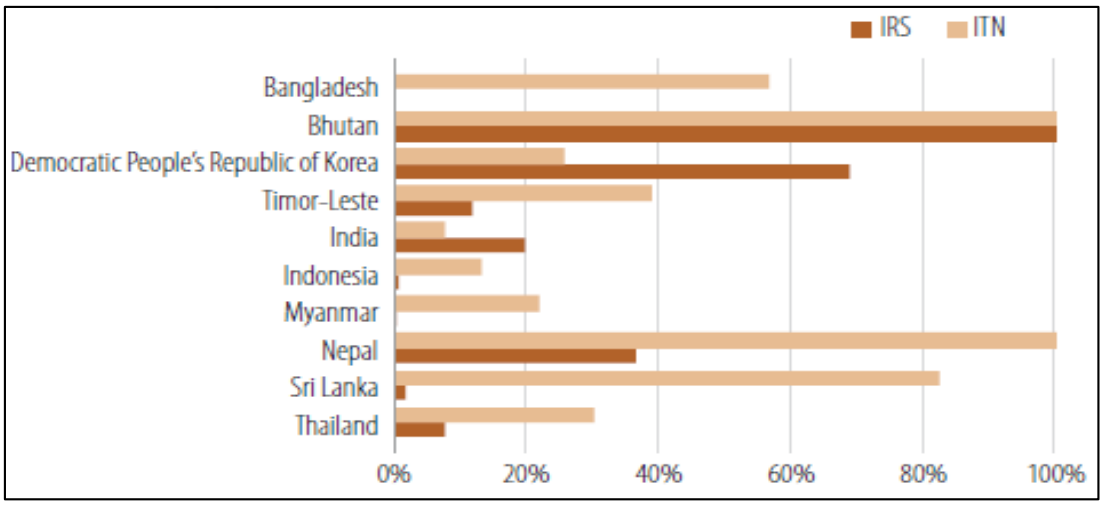

Figure 2.2 Percentage of high risk population protected with IRS and ITNs, 2011

Source: World malaria report 2012, WHO

The national malaria control program intentions were to be more active by exploring and validating innovative outreach strategies, most of them relying on interventions planned and driven by communities using suitable tools adjusted to the poor education and socio-economic status of the target groups. Although the annual parasite incidence (API) reduced significantly, malaria morbidity and mortality continued to reach the highest level along the Thai-Myanmar border. In addition, there was some evidence of artemisinin resistance emerging along the Thai-Cambodia border. Highly mobile populations are thought to hold up the achievement in the reduction of malaria burden(32).

2.2.3 Malaria vector control survey

The outcome of malaria control program had to report regularly as the information for improve malaria vector control programme. The data collection was performed across the country. The data being used in malaria control program were come from two main sources. Firstly, data come from routine sources included malaria surveillance system, web-based malaria information system, drug resistance monitoring, insecticide resistance monitoring, and entomological surveillance. The second was periodic sources included KAP surveys, operational research and special survey, and programme reviews and evaluations. Currently, Thailand has a well-structured reporting system to report the data across all level in malaria control programme, but the system is mostly paper-based form. It is inefficient to extract data for monitoring and evaluation, planning, and allocating appropriate resources. The vast amounts of data that were being generated and recorded in the containment project, and still remained stored were not being utilized as a basis for strategic planning, and to drive operations(4). The data that were available in electronic format can find only in aggregated data. Detailed data were only kept on paper at the peripheral levels(7). Presently, malaria control programme has many paper forms which are listed below:

EP 1: Blood Record Form

EP 2: Monthly Report of Malaria Case Detection

EP 3: Investigation and Radical Treatment of Malaria Case

EP 4: Monthly Report of Investigation and Radical Treatment

EP 5: Report of Malaria Focus Investigation

EP 6: Malaria Case Registration

EP 7: Summary of Surveillance Operation

VC 1: Operation Area of Vector Control

VC 2: Operational Plan of Vector Control

VC 3: Daily Report of Vector Control Activities

VC 4: Summary of Vector Control Operation

VC 5: Report of Mosquito Larva Control

EN1: Daily Adult Survey

EN2: Daily Larval Survey

EN3: Summary Record of Entomological Studies

IEC: Report of IEC activities

LAB17 Laboratory report forms

According to the development in information technology, the National Malaria Control Strategic Programme planned to upgrade its existing system into electronic system. One ongoing project is the collaboration between the Bureau of Vector-borne Disease and the Center of Excellence for Biomedical and Public Health Informatics (BIOPHICS), Mahidol University since 2009 in developing and testing a web-based malaria surveillance system implemented in 7 provinces bordering Cambodia. The National Malaria Programme planned to later expand the web-based malaria information system nationwide(7). The planning for using information technology in data collection process aimed to:

1) Reduce redundancy in filling out the same information on multiple paper forms
2) Improve data quality
3) Make data quickly accessible
4) Enhance its warning and detection algorithm
5) Tailor data and information for each level
6) Better monitor mobile populations

There were many problems of paper-based data collection such as poor handwriting of data collectors, incomplete filling of form and form damaged or lost. Once data had been collected, more errors were introduced during data entry. The ethnic minority groups were considered as the high risk group of malaria, especially the

population along Thai-Myanmar border. Information from this risk group is therefore important. However, language barrier is a main communication problem during interview, and bias may be introduced in the translation. Paper-based data collection can be time consuming, labor-intensive and yet produce low data quality. Working with poor data and data management can ultimately lead to invalid results and wrong conclusions being drawn.

2.3 Karen hill tribe population

Before explaining in detail about Karen, there were two important terms to be clarified, "ethnic minority group" and "hill tribe". These terms were related to each other and could be confusing. The term "ethnic minority" comprised of Tai, Lao-Tai, Thai-Malay, Chinese, Mon, Khmer and Hill tribes(34). In **Figure 2.3** shows number of ethnic groups during 1960 – 1996.

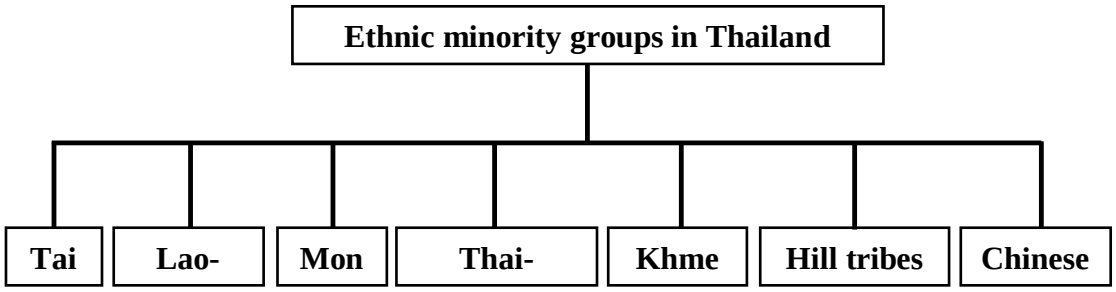

Figure 2.3 The ethnic minority groups in Thailand, 1960 – 1996

Source: 'Hill Tribes' and Forests: Minority Policies and Resource Conflicts in Thailand

Thus, hill tribes were subgroup of ethnic minority groups. The term chao khao or in English "hill tribes" was used as a common, semi-official term for the various non-Thai groups who lived in the remote highland areas of northern and western Thailand, dating from the late 1950(34, 35). After that, in 1959, Thai Government has established the Central Hill Tribe Committee (CHTC). At that time, the term "hill tribes" has been officially used in Thailand(36). There are six major groups of hill tribes in Thailand consists of Akha, Lahu, Karen, Hmong, Mien and Lisu. In each group, they have their own cultures, languages, customs, belief, modes of dressing which are distinct from the majority Thai people, and which are distinct from each other(37).

Hill tribes are vulnerable groups of Thailand(37, 38). These groups live their lives facing with several barriers including a lack of formal education and information, lack of infrastructure, limited access to Thai citizenship(39), delayed land settlement, poverty and also language barrier as some of them cannot communicate in the Thai language (37, 38). Importantly, they have poorly access to basic health services(37) so, health problems are also a big issue in their life(38, 40). In 2002, the research by Food and Agriculture Organization of the United Nations (FAO) revealed that the main health problem in highland areas was diarrhea, followed by stomach problems and malaria(38). The strategies for health promotion or prevention provided by Ministry of Public Health, however, might not support in some target population such hill tribes with the issue of citizenship. Also, they may reject to receive health care services because of lacking knowledge, language barrier, or any other reasons related to their cultures.

Karen or Kareang in Thai language is one of ethnic minority groups in Thailand who is the major group of hill tribe population. They have been living in some parts of Thailand for a long time since the beginning of the second millennium(34). Some information stated that a number of Karen moved to Thailand according to the combat with Burmese domination around the middle of the eighteenth century(36). Nearly half of all hill tribe population in Thailand composed of Karen. Karen are considered as the members of the Tibeto-Burman group. Based on a survey of the Tribal research institute(TRI), Department of Public Welfare, Ministry of Labor and Social Welfare in 2002, the number of Karen population in Thailand was about 404,450 or 47.93 percent of all hill tribes in Thailand(41). Karen have their own language which was classified as Sino-Tibetan language family (34, 36, 42). Karen population in Thailand can be distinguished into 4 subgroups comprise of Skaw Karen (the largest group of Karen people), Pwo Karen or Plong, Pa-o Karen or Tong Soo and Bwe Karen or Kayah(43). Their own tradition is different from others and their life style is very peaceful and supportive. The **Figure 2.4** showed the different dresses of each Karen subgroups.

Figure 2.4 The different traditional dresses among Karen subgroups.

Source: Technical Promotion and Support Office zone 10, Department of Social Development and Welfare, Ministry of Social Development and Human Security.

Typically they live in the northern and western of Thailand along Thai-Myanmar border. They are living both in the mountains and on the plains. Currently, Karen live in 15 provinces of Thailand included 9 provinces in northern (Chiang Rai, Mae Hong Son, Chiang Mai, Lamphun, Lampang, Tak, Kamphaeng Phet, Phrae and Sukhothai) and 6 provinces in western of Thailand(Uthaithani, Suphanburi, Kanchanaburi, Ratchaburi, Phetchaburi and Prachuap Khiri Khan)(41).

They are also the risk group of malaria transmission and the location of their household also is considered as a malaria endemic areas according to the Report of the Programmatic Review of the National Malaria Control Programme in Thailand.

At present, malaria risk is mainly high in some of the remotest areas populated by ethnic minorities, health services are minimal. They move frequently across borders where health care facilities are almost non-existent. The priority policy recommendations focus on the high risk populations and their behavior patterns in order to target appropriate interventions(4). In order to provide appropriate interventions, it is very important to understand their behavior which is very challenging for health care workers due to the difficulty of communication with these specific populations.

2.4 Electronic Data Capture Tool (EDC)

2.4.1 Definition

Data collection is critical to public health area. The data will be analyzed in form of information and used for decision making to produce the public health policy for improve and maintain population health. Recent technologies have created an opportunities for data collection. Thus, data quality could be improved. In this study, both an electronic data capture and an electronic data collection are considered the same meaning. Some studied might use either one or the others, so it is important to state the definition before explaining in the application. Electronic data capture instruments or electronic forms are defined for the purpose of this study as self-completed screen-based questionnaires or interfaces that the respondent enters data into manually(11). Electronic data capture can be divided into two categories: (i.e. electronic data capture and remote data entry). Electronic data capture is what you do on site; it consists of making a single entry using a handheld device. Remote data entry is another way of collecting information electronically. Generally, you collect information on a piece of paper and then transfer it to a laptop or PC and send it via the Internet (*Stolworthy Y.*, 2003)(44).

2.4.2 Relevant reviews

Several previous studies have done research regarding an electronic data capture/collection (EDC). The findings were found as follows:

Pace and Staton aimed to explain the benefits and problems of using an electronic data collecting methods within practice-based research networks (PBRNs). They found that an electronic system allowed use of transparent decision algorithms and improved data entry process as well as data integrity. Tablet PCs showed the benefits for direct patient data collection. PDAs worked well for collecting defined data elements at the point of care. While, internet-based systems worked well for data collection that can be completed after the patient visit. In addition, they suggested that when planning to collect data electronically, ….. should also consider the study design(25).

Wilcox *et al*., 2012 intended to determine the advantages and disadvantages of using multiple data collection methods among 5 system including COMET, Indiana PROSPECT, Pediatric Enhanced Registry, SAFTINet and WICER. These systems were

different from each other. They selected 5 participants who perform primary data collection in each method. Each participant then was interviewed via telephone about 30–45 minutes. Based on the result they pointed out that each system has their own strengths and weaknesses(23).

Haller *et al*., 2009 conducted the randomized cross-over trial in clinical research field to compare users' speed, number of entry errors and users' satisfaction between using handheld and laptop computers for data collection. Four data coders were trained to record and enter data from160 different paper-based questionnaires which equally balanced sequence in a quiet environment. After they compared the result, it showed that the coding by using the laptop computer was faster than the handheld computer and data accuracy also improved. Moreover, the users were more satisfied using laptop than the handheld computer. Finally, they suggested that handheld computers should be used with cautions even if it is commonly used in clinical research. It can double the duration of the data entry process, increase the risk of typing errors and missing data. All of these are significant issues when those who are unfamiliar with Computer Technologies have to use the device (20).

Several studied intend to compare the performance between electronic method and paper-based method for data collection. Childs *et al*., 2006 compared the performance between electronic method with using PDA and paper-based method for data collection. They conducted the study in a Behavioral Program for Children with Autism. Data were collected by 9 behavior therapists. They found that using electronic method was better than using paper-based method. Although, it was much more time consuming at the training step, the average daily use, and progress report preparation time was less than paper-based method. Moreover, electronic method can help to saving the total time consuming(19). In Peru, Bernabe-Ortiz *et al*., 2008 compared the quality of sexual behavior data collected between using handheld computers (PDA) and paper-based questionnaires. The results showed a lower number of inconsistencies and missing values in case of using PDA-based system. The researcher also suggested that developing a low-cost application for handheld computers were feasible, and PDAs were feasible alternatives for collecting field data in a developing country (12). A recent research by Thriemer *et al., 2012* also showed the higher performance of personal digital assistants (PDA) compared with paper-based data collection in a fever surveillance

study. The results indicated the benefits of using an electronic data collection for direct data entry and direct data transfer (21).

With different view, Gallihe *et al*., 2008, suggested other hardware solutions other than PDA, such as tablet computers or cell phones which can link via a wireless network directly. According to the results from their study conducted in an office-based patient interview survey, it revealed a numerous missing data caused by technical difficulties with using the handheld computers or loss or stealing although it can produced more complete data than the paper method(17). Recently, Wan *et al*., 2013 conducted a health-related survey among a hard-to-reach population in China using handheld computers (PDA) for data collection (HCDC) and also assessed the acceptability and adoption of HCDC in China. The results suggested that HCDC was a favorable method to be used in survey-based research in China. Although some technical problem had occurred during data collection process, it remained a feasible, acceptable, and preferred method by Chinese interviewers(15).

Ruf H. D., 2012 also aimed to compare the accuracy and the time requirement of an electronic data collection method and a traditional paper-based method in the educational field. In addition, he also assessed users' preference and system usability. He also concluded that electronic data collection was a feasible alternative to traditional paper-based methods due to data was more accurate and less time requirement for data collection. Moreover, the result showed higher preference in the electronic-based data collection method(45).

Thwin et al., 2007 studied the benefits, efficiency, and innovations of an EDC system used in six cancer research network sites. The data in medical record from each site were entered directly into a computer-based automated menu-driven EDC system using Microsoft® Access 2000. The outcome demonstrated the effectiveness of EDC among multiple data collection sites including the faster information flow, providing an effective data collection process, reducing the time during data collection process and increasing the time for manuscript preparation (46).

A study by Walther *et al*., (2011) was conducted in a West African. They also aimed to compare the result among difference methods of data collection. They compared the duration of data capture and accuracy among four electronic data capture (EDC) methods including PDA, Netbook, Tablet PC, telephone and paper-based

approach. The data was collected from urban, rural and remote locations by 5 interviewers. Netbook, PDA, and tablet PC use face-to-face interviews, but mobile phones were used in telephone interviews. They used the Graeco Latin square to compare error rates between the five data entry methods. They concluded that, providing appropriate training and adequate support, the field workers and nurses would be able to use electronic devices and software for EDC. The tablet PC and the netbook were performed the work better than the PDA and the telephone interview. For data entry, the interviewers favored the netbook with a keyboard more than the tablet PC/pen/touchpad combination. Thus, using EDC was more time effective, more accurate, and cost effective method than the standard paper-based data collection method under the good designed(22).

There are many researches more focusing on tablet PC. Abernethy *et al.*, 2008 conducted pilot study among 66 breast cancer patients in Primary/Duke Breast Cancer Clinic in United States. Data was collected using both paper based form and e/Tablet-based form. The findings displayed the validity, feasibility, and acceptability of using tablets PC for collecting research-quality data as well as patient-reported outcomes data in outpatient academic oncology(14). To pay attention in the patient side, Hess *et al*., 2008 evaluated the ease of use with a self-administered tablet computer-based questionnaire among the patients in a university-based primary care practice. The results indicated that using a self-administered tablet computer-based questionnaire was not difficult among the majority of patients(16). Horng, *et al*., 2011 also interested in using tablet PC for data collection. They conducted a prospective cohort pilot study in Massachusetts, USA with 13 emergency physicians to explore the possibility of physicians using tablets in the emergency department. They concluded that using of a tablet PC could reduce the number of times that the physicians logged into a computer workstation and a reduction in the amount of time they spent on the Emergency Department Information System (EDIS) (13).

A number of studies emphasized on mobile devices. Braun *et al*., 2013 conducted a systematic review concerning the using of mobile devices for the delivery of health services among community health workers. The evidence indicated that mobile technology helped community health workers to improve the quality of services(47). Chaiyachati *et al*., 2013 also assessed the acceptability and feasibility of using a mobile

phone application for health care delivery among healthcare workers (HCWs). However, they found the conflicting results, the healthcare workers expressed their positive perceptions towards mHealth, but the results demonstrated poor uptake in their actual practice(48).

In Thailand, two pilot studies were conducted to demonstrate the use of information technology for improving health. The studies combined web-based and mobile technology and applied in their routine work. Both were focused on an under-served population in a border area. The first program aimed to improve antenatal care (ANC) and expanded programme on immunization (EPI) services. The project was successful and revealed the feasibility of using electronic devices for data collection in the low resource settings. In addition, the extension to which community healthcare personnel in the low resource setting could efficiently utilize it to perform their duties (27). The other project aimed to improve the management of malaria cases by establishing the module for disease and treatment monitoring of malaria (DTMM) in order to replace a paper-based workflow of malaria staff, in which they used for treatment and care for malaria patients in their responsibility. It was modified and enhanced to be Malaria Information System (MIS) with the purpose to expand for implementation in seven provinces along the Thai-Cambodian border later on(26). This study also demonstrated the advantages of information technology for disease prevention and control, as well as effective communication.

2.5 User satisfaction

2.5.1 Definitions

User satisfaction is one of the six dimensions in the D&M IS success model. The D&M IS success model is widely known in the information system area, consisted of six dimensions or success factors i.e. system quality, information quality, usage, user satisfaction, individual impact, and organizational impact(49) (**Figure 2.5).** Several studies have used or adapted it to explain the IS success in various conditions (50-52). Moreover, Peter et al. stated that the D&M IS success model (2003) was a useful framework for understanding the key success dimensions and their

interrelationships(50). Before going into detail of user satisfaction, it is important to state its definition. This study accepted the definition of the user satisfaction which was provided by Chin and Lee (2000): they defined the end-user satisfaction with an information system as the overall affective evaluation of the end-user, who has involved his or her experience with the information system. Also, the word "experience", as they mentioned earlier, might be more specific in different aspects related to the information system such as computing or training(53). The user and end user in this study mean the same thing, they are the community health volunteers (CHVs) who use the electronic data capture tool (EDC) during the implementation phase of the study.

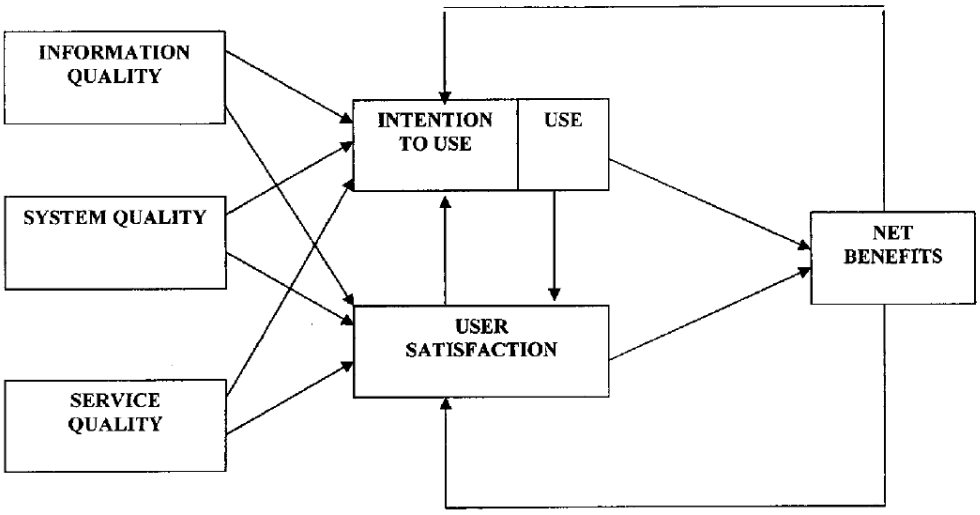

Figure 2.5 Updated D&M IS Success Model (DeLone and McLean, 2003)

According to the D&M IS success model, it is clear that user satisfaction is the key role of the information system success and also influences the intention to use. It is also considered as an alternate indicator for success and effectiveness of information system (54, 55). It is one of the most appropriate ways of assessing information system because it is easy to study(56). The similar conclusion from Baroudi *et al.* is that user satisfaction lead to system use, and it should be considered as a measure of the success of an information system(57). Choi et al. have also developed the information system success model but specific in the customer relationship management (CRM) systems. Based on their results, they suggested that the perceived usefulness and user satisfaction had significant influence on individual performance as well as an indirect influence on organizational performance(52). Therefore, user satisfaction is an important measurement for measure information system success and affecting individual

performance. The present study will develop the electronic data capture tool (EDC) to help the community health volunteers (CHVs) in collecting data. The CHVs will use the EDC during the implementation phase in the study. In order to assess the success of developing electronic data capture tool (EDC) in view of the user, the measurement of user satisfaction is the significant indicator to achieve the objective. The level of satisfaction can guide the trend of using the EDC. Furthermore, the different dimensions of user satisfaction will help to improve the EDC later on.

2.5.2 Relevant reviews

There were many previous researches on user satisfaction. There are two main types of these studies. First, the researchers only aimed to determine, describe or measure the user satisfaction. On the other hand, they also focused on the development, validated or revised the instrument which was used to measure the user satisfaction. In 1996, the study on user satisfaction regarding physician order entry (POE) in Brigham and Women's Hospital (BWH) in Boston (58) found that the user satisfaction was correlated most strongly with ease of use, system speed, and perception about productivity, but POE features directed at improving the quality of care were less strongly correlated with satisfaction. Subsequently, the instrument that was very popular in the way to measure the satisfaction was developed in 1988 by Doll and Torkzadeh(59).

In their context, the users were those who directly interacted with computer for a specific application. The data was obtained from 618 end users and a factor analysis was performed in order guide the modification of the instrument. Finally, they presented the EUCS model that measure in five dimensions i.e. content, accuracy, format, ease of use and timeliness. The instrument consisted of 12 items. The results also showed that this instrument was valid and reliable. **Figure 2.6** provides a model for measuring end-user computing satisfaction by Doll and Torkzadeh.

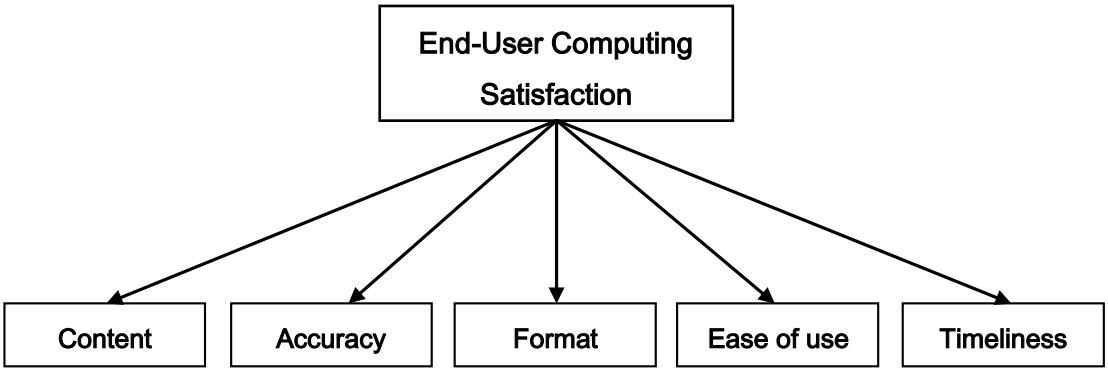

Figure 2.6. A model for measuring end-user computing satisfaction (Doll and Torkzadeh, 1988)

Mahmood *et al.* performed meta-analysis to examine the results from 45 end-user satisfaction studies published between 1986 and 1998. The variables that demonstrated a strongly relationships with user satisfaction are perceived usefulness, user involvement, user experience, user attitude and organizational support (56).

In 2007, Iliasa *et al.* (60) conducted the research in East Malaysia. The research aimed to measure the level of satisfaction among the end-users of computerized accounting system (CAS) in government sectors. Also, it determined the relationship between seven factors consists of five factors of Doll and Torkzadeh Model (1988), system speed by Chin and Lee (2000). In addition, they have developed one factor in the study, system reliability. The result found that most of end users are satisfied with the CAS. The majority of staffs satisfied with the content and less satisfied with timeliness. Importantly, the result displayed a strong relationship between seven EUCS factors and satisfaction. Thus, those seven factors were powerfully impact user satisfaction and if those who were satisfied with one of the factors is also influenced the overall satisfaction.

Later on in 2009(61), they used the same dataset to examine critical factors among seven factors that influence most end-user's satisfaction. The multiple regressions analysis was added in the study. The result revealed that ease of use, content, and accuracy had a significant effect on end-users satisfaction. Afterward, Dastgir and Mortezaie purposed to explore the factors that affecting the end-user computing of accounting information system satisfaction in Tehran's stock exchange with all financial managers in 80 companies listed on Tehran's stock exchange. Their findings indicated that ease of use, the information content, correctness and accuracy of information,

format of the reports and timeliness of information influence the end-user computing satisfaction(62).

Not only use, but a number of researches also aimed to revise or validate the instrument. According to Xiao and Dasgupta, their study was conducted in classes at a large mid-Atlantic university among 340 students, who were considered as the representative of the overall population of internet users. They purposed to validate an instrument for measuring user satisfaction as well as developing the instrument for measuring user satisfaction in a web-based environment, internet portals. They decided to start by the test of validity and reliability of the end-user computing satisfaction instrument developed by Doll and Torkzadeh (1988). Based on the results of factor analysis, they maintained all factors in the existing instrument. Nevertheless, after they performed the item-total correlation and criterion related correlation test, they removed one question. Finally, they suggested that a revised instrument with some changes to the EUCS instrument is still valid in measuring user satisfaction(63).

The extension of the end-user computing satisfaction (EUCS) instrument by Doll and Torkzadeh was performed in Taiwan(55). The EUCS instrument was applied to 342 Taiwanese end-users of typical business software applications. The result gave the evidence that the instrument is a valid and reliable measure in Taiwanese applications. After that Heilman and Brusa (64) conducted a survey in private and public organizations in northern Mexico in order to assess the reliability and validity of the EUCS survey instrument in a Spanish version. The EUCS questionnaire which was developed by Doll and Torkzadeh (1988) was translated to Spanish. Then, it was distributed to the employees who were Spanish-speaking computer users in each selected organizations to complete the form. Base on the results, they concluded that the Spanish translation of the EUCS survey is a valid and reliable instrument. Additionally, these results supported the generalizability of the EUCS instrument in a diversity of contexts.

As a study by Abdinnour-Helm *et al.* in United States, they purposed to revise and revalidate the End-User Computing Satisfaction (EUCS) instrument presented by Doll and Torkzadeh (1988). They also intended to measure a users' satisfaction with a web site from a usability view. Their study was more focused on web context. They differentiated the end-user in web site from another context by using four

dimensions including competitive environment, marketing environment, usage, and usability to make the web unique as design environment. The participants were 176 students who using the Lands' End Web site performed five tasks. Based on the results, they concluded that the EUCS model was valid and robust even though the timeliness sub-factor might require further refinement in the future (65).

In 2009, Ong, *et al.* (66) have developed the instrument use to measure user satisfaction with the Question Answering Systems (QAS), namely USQAS. The structure of USQAS instrument based on two model are models of IS user satisfaction and technology acceptance. Firstly, they carefully chose 35 items from previous study in the areas of user information satisfaction, end-user computing satisfaction (EUCS), The Technology Acceptance Model (TAM), and some QAS-related articles. They then conducted the QAS-related focus group interviews, pre-testing and pilot testing in order to remove redundant items or add some significant items. Finally, their USQAS instrument consisted of 18 items in four primary dimensions i.e. ease of use, service quality, usefulness and information quality.

The recent study in Portuguese (67), also used the same instrument by Doll and Torkzadeh (1988) to determine the level of end-users satisfaction with the Siafi, identified the main factors responsible for the calculated index of user satisfaction and also validated the instrument for evaluating performance in the public sector. The data was collected from 77 Siafi end-users. According to these results, Siafi end-users showed little satisfaction with this IS. Users showed some satisfaction only for the 'format' factor, dissatisfaction for the 'precision' and 'ease of use' factors, and indifference to the other factors. The model was valid and reached good levels of fitness and consistency. They concluded that the measurement of user satisfaction with public-sector information systems was validated and suggested this measurement for use as a tool for evaluating ICT performance.

After reviewing related literature and theories for measure the end user satisfaction of the electronic data capture tool (EDC), there has been no instrument to date in the published literature that has been completely measure the user satisfaction with electronic data capture tool. All studies that were mentioned above mostly emphasized on the user satisfaction in the information system area. The popular instrument which was used in this area is the EUCS instrument by Doll and Torkzadeh

(1988). Although, it had been tested and validated in several researches and showed its reliability and validity in a number of previous studies among difference contexts of information system. Some components (content accuracy and timeliness) are considered inappropriate for measuring the user satisfaction of the electronic data capture tool (EDC) based the following reasons:

1) The user or end-user in this study will use only the electronic data capture tool (EDC), but not involve in the whole system. They interact with specific application on the user interface of the tool.

2) The method to use the tool is difference from the end-user computing context. The users only enter the data manually but not retrieve the information from the tool meant that they do not gain any information from an electronic data capture tool (EDC).

Consequently, this study will adapt only the appropriated factors that shape to the context of the users' satisfaction by using electronic data capture tool (EDC). The selected two factors included format and ease of use from Doll and Torkzadeh (1988). Also, system speed will be adapted from Iliasa *et al.*, 2007. Finally, the users' satisfaction of electronic data capture tool (EDC) will be measured in three dimensions consisted of format, ease of use, and system speed. In addition, the questions in the questionnaires will be developed especially for current context of using electronic data capture tool (EDC) in order to provide the relevant and appropriated term. The constructs of satisfaction are shown in **Figure 2.7.**

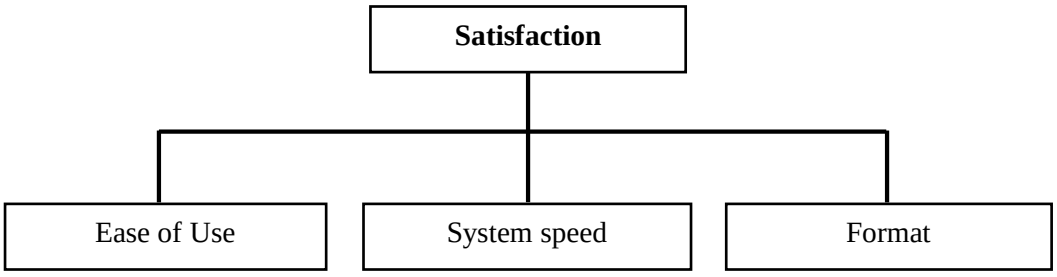

Figure 2.7 Concept for measure the users and interviewers' satisfaction

Source: Adapted from Doll and Torkzadeh, 1988 and Iliasa *et al.*, 2007

2.6 User acceptance

2.6.1 Definition

The successful of project cannot consider only the application of the tool meet the objectives. Another important measurement help to ensure that the tool will be used in the future is the user acceptance. User acceptance has been defined as "the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support" (Dillon & Morris, 1996, p.5).

The acceptance in current study meant in the way of acceptance in information technology. Technology acceptance is also the one of the best prediction for the using of new technology, which is more emphasized on the user part. Lack of user acceptance was a barrier to the success of newly implemented IT systems (Davis, 1993). Technology acceptance directly relates to IT usage and also important for the implementers to completely understand the determinants of IT acceptance because they are the one who have to plan effectively for it(68). Understanding the factors affecting the user acceptance could help in improving technology design to support the user requirement and ensure that the user would use the presented technology. Consequently, there is a need to assess the user acceptance of using electronic data capture tool (EDC) to make sure whether the EDC's user willing to use the tool. Then, the tool will be employed in the future after it was improved and can offer full function.

2.6.2 Relevant reviews

Many previous studies have developed the technology acceptance theories and models in order to explain user acceptance and adoption of new technologies as well as the affecting factors. There are many well-known theories or model that often use to measure the user acceptance adoption, and usage behavior such as the Theory of Reasoned Action (TRA), the decomposed theory of planned behavior, the theory of planned behaviour (TPB), the technology acceptance model (TAM) and innovation diffusion theory as well as the recent model such Unified Theory of Acceptance and Use of Technology (UTAUT) presented by Venkatesh, *et al.* in 2003.

This study focuses on The Technology Acceptance Model (TAM) (Davis, 1989) which is well-known in information system area. However, it is important to

explain the theory that impress the Technology Acceptance Model (TAM) such The Theory of Reasoned Action (TRA). The Theory of Reasoned Action (TRA) was introduced by Fishbein and Ajzen in 1975 which interested in individuals' intended behaviors(69). This model was originated in social psychology and used commonly in the human behavior research field. TRA believe that a behavior can be determined by two factors consists of attitude toward behavior and subjective norms(70). The primary concern is to find the basic factors of the construction and change of behavioral intent(71). The Theory of Reasoned Action (TRA) is shown in the **Figure 2.8.**

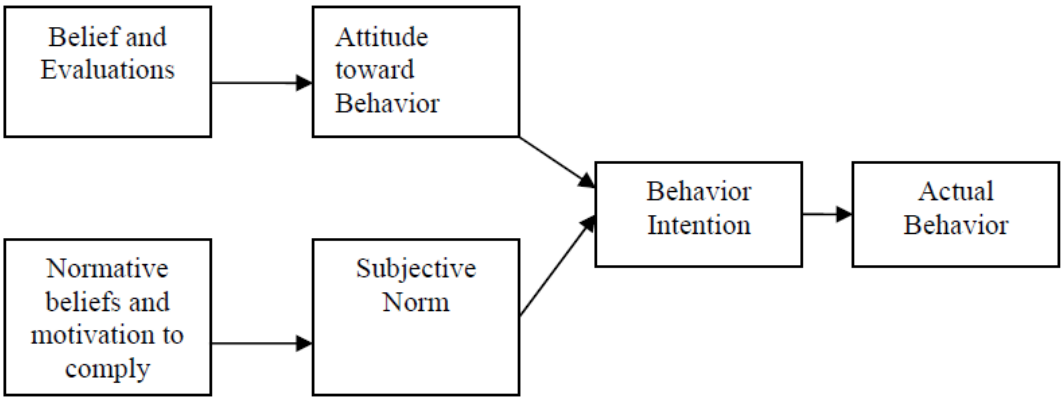

Figure 2.8. The theory of Reasoned Action (Fishbein and Ajzen, 1975)

The Technology Acceptance Model (TAM) (Davis, 1989) is the theory that has widely known in the information system area for a long time in part due to its understandability and simplicity(72). This is one of the first and most widely used and accepted model to study user acceptance which was developed by Davis in 1989(73). The model draws on the Theory of Reasoned Action (TRA) as mentioned above and mainly aim to modelling user acceptance of information system in order to provide an explanation of the factors influence user acceptance. The goal that TAM aimed to reach is to provide a basis for finding the impact from the external factors to internal belief (i.e. perceived usefulness and perceived ease of use), attitude and intention to use(69). Davis, 1988 stated that the external factors that influence intention to use and actual usage through mediated effects on perceived usefulness and perceived ease of use(74).

The main components in TAM included actual usage, behavioral intention to use, attitudes towards usage, and two main beliefs included perceived usefulness and perceived ease of use. (**Figure 2.9)**

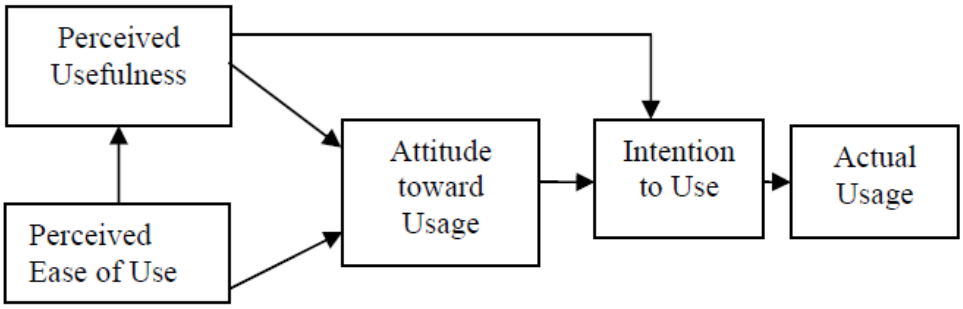

Figure 2.9. The original TAM (Davis, 1989)

According to Davis *et al.*, 1989, behavioral intention refers to the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior. Attitude was defined as individual's positive or negative feeling about performing the target behavior. Perceived usefulness is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organization context. While perceived ease of use is defined as the degree to which the prospective user expect the target system to be free of effort(69).

In the interaction of these factors, an actual system usage is determined by behavioral intention to use. Whereas, the intention to use technology was predicted by attitude and it was also determined by perceived usefulness and perceived ease of use. In addition, perceived ease of use influenced perceived usefulness(75). The behavioral intention to use is an important factor that determines whether users will actually utilize the system(76). Davis *et al.*,1989, stated that behavior intention was the major determinant of usage behavior thus usage behavior should be able to predict by behavior intention(69). They also pointed out that perceived usefulness strongly influenced peoples' intentions, perceived ease of use had a small but also effect on intentions, while attitudes only partially mediated the effects of these beliefs on intentions(77). In support, Davis and Venkatesh and Davis,1996 also stated that attitude would not play a significant role but rather that perceived ease of use and perceived usefulness would determine the intention to use a technology(70). Consequently, the final model of TAM to predict actual usage was the one with attitude removed and intention to use was, instead, introduced as shown in the **Figure 2.10**(78).

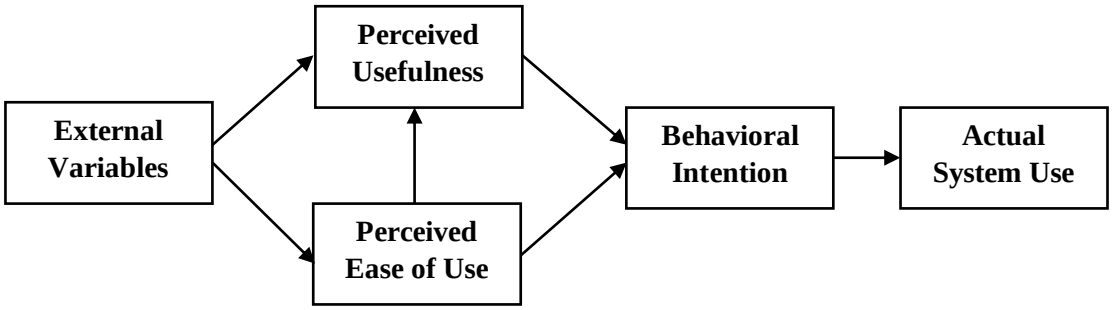

Figure 2.10 Final version of TAM (Venkatesh & Davis, 1996)

Source: Adapted from Chuttu, 2009 (78)

Adapting and extending of TAM

TAM was proved in a number of researches that it is a valid, robust and powerful model for predicting user acceptance (72, 77, 79). Impressively, a lot of researcher paid extensive attention in this model and TAM was applied in different application types and field settings(80). TAM also was extended and modified in order to make the suitable framework in various contexts. Some studies included attitude while some removed it and preferred only behavior intention to use. Yet, two main constructs that predict the intention to use such as perceived usefulness and perceived ease of use remained used in common among many studies.

Hu *et al*., 1999 used TAM to explain the physicians' decisions to accept telemedicine technology in the health-care context. In their research, they focus on the intention to use the technology rather than actual usage due to the telemedicine technology was in developing stage at that time. They stated that TAM was able to explain the intention to use telemedicine technology of the physicians in their setting context. In addition, they pointed out that perceived usefulness was affecting attitude and intention to use while perceived ease of use was not(81).

In attempt to fulfill the missing elements regarding social influence in TAM research, Venkatesh & Morris, 2000 extended TAM by integrated the subjective norm, gender and experience into the model. They found the strongly relationship between gender with perceptions of usefulness and ease of use as well as subjective norm. Their findings were that perceptions of usefulness of men influenced their decisions to use technology. In difference, women were influenced by perceptions of ease of use and subjective norm, even if the effect of subjective norm reduced over time(82). Yi and Hwang, 2003 aimed to predict the use of Web-based information systems. They also

extended the technology acceptance model without attitude with the motivation variables of self-efficacy, enjoyment, and learning goal orientation. Based on the finding of their model, they pointed out that self-efficacy, enjoyment, and learning goal orientation can be able to determine the actual use of the system. Also, perceived ease of use, perceived usefulness influenced behavioral intention to use, but perceived ease of use had no significant effect on perceived usefulness as often shown in many studies(80).

Similarly, Wu *et al.*, 2005 had also extended TAM by integrated innovation diffusion theory, perceived risk and cost into the TAM in order to determine the factors affecting user mobile commerce (MC) acceptance. They also suggested that perceived ease of use did not influence behavioral intention to use. While perceived usefulness and all others variables influenced especially the compatibility had strong influence to behavioral intention to use(83).

Afterword, King and He, 2006 conducted a statistical meta-analysis of the technology acceptance model (TAM) using 88 published studies on TAM. They found that TAM are highly reliable and can be used in a diversity of contexts and perceived usefulness is strongly influence on behavioral intention. They also conclude that TAM is a powerful and robust predictive model for predicting user acceptance(72).

Fetscherin and Lattemann, 2008, assessed the user acceptance of Virtual Worlds among 249 participants via online-survey. They extended TAM by adding subject norms (SN), performance expectancy, anxiety and Socio-demographical variables into their purposed model. The results showed that perceived usefulness strongly influenced behavioral intention to use of Virtual Worlds and also found perceived ease of use influenced intention to use. Moreover, community factors also influenced user intention and acceptance of Virtual Worlds. Park, S. Y., 2009, did a similar research in university student in Korea. Their research also focused on the Technology Acceptance Model (TAM). They also emphasized that TAM was a worthy theoretical instrument to understand users' acceptance in the context of e-learning. Nonetheless, this study has extended TAM model and added some variables that they had reviewed from previous study including self-efficacy, subjective norm and system accessibility. The results indicated that both perceived usefulness and perceived ease of use affected user attitude, self-efficacy was the significant construct for explaining their

model followed by subjective norm(74).

Yusoff *et al*.,2011 also suggested that perceived usefulness was the significant factor defining users' intention to use of mixed reality technology in the future. Their study was conducted in Malaysia among Biomedical Science students in two public universities. They also used TAM as a part of their research including perceived usefulness, perceived ease of use and intention to use. However, they have added two more constructs in their study consists of personal innovativeness and perceived enjoyment. Based on the results, they also found a positive linear correlations between the constructs(84). In the same year, a publication of Shroff et al., 2011 validated TAM and stated that TAM was a robust theoretical model which can extend to an e-portfolio context. Their study purpose was to investigate the relationships between the factors in TAM in the context of an e-portfolio system. The study was conducted among undergraduate students enrolled in Bachelor of Education (BEd) Programmes at the Hong Kong Institute of Education (HKIEd). They also found that students' perceived ease of use influenced on attitude towards usage and it also strongest influence on perceived usefulness(76).

Al-alak, B.A., & Alnawas, 2011 conducted the research among Jordanian lecturers in order to examine their attitudes concerning the adoption of e-learning system. The researchers used two factors in TAM including perceived usefulness and perceived ease of use and also added five factors into their model consists of experience, computer anxiety, computer knowledge, normative pressure, and management support, which they believed that these factors also impact users' behavioral intentions in the direction of adopting a new system. Finally, the result revealed the positive relationship between perceived usefulness, perceived ease of use, computer knowledge, and management with intention to adopt. However the negative relationship were founded between normative pressure, computer anxiety and intention to adopt(71). Currently, Lule et al., 2012 aimed to study factors that influenced the acceptance of Mobile-banking in Kenya. They used the Technology Acceptance Model (TAM) in their research as well. The constructs that they adopted from TAM included perceived ease of use, perceived usefulness, attitude to use, and adoption. Moreover, four variables were added into the original TAM consisted of perceived credibility, transaction cost, perceived self-efficacy and perceived normative pressure. Confirmatory Factor

Analysis was performed for data analysis. The results indicated that perceived ease of use, perceived usefulness, perceived self-efficacy and perceived credibility affecting the attitude towards the using of Mobile-banking in Kenya.

Callum and Jeffrey, 2013 conducted a survey among 446 students from three tertiary institutions to determine how ICT skills impact students' adoption of mobile learning. Their purpose was to find the relationship between perceived ease of use and usefulness from TAM and self-efficacy beliefs (as measured by previous experience) as well as the intention of students to use mobile learning in the future. They suggested that the perceived usefulness and ease of use on mobile technology would mediate the relationship between ICT skills and the intention of students to adopt mobile learning.

From the literature review above, it proves that TAM is a powerful and robust model for measure user acceptance and still used frequently until today. TAM was extended and modified in order to make the suitable framework in various contexts. Some studies included attitude while some removed it and preferred only behavior intention to use. Yet, two main components that predict the intention to use such as perceived usefulness and perceived ease of use remained used in common among many studies. In this study, actual usage of the electronic data capture tool (EDC) cannot be measured because the study is still in the tool development phase. However, previous studies have proven that intention to use caused the actual use. Therefore, the behavior intention to use the electronic data capture tool (EDC) in the future when it is completely developed is considered as a successful of implementation in the current pilot study. In addition, attitude will not be included in the research model as it was found to be a weak mediator and was removed in the final model of TAM(69, 70). According to the purpose of TAM, it aims to evaluate the complete technical systems or applications (e.g. online banking, e-learning web based system). They do not provide information about the evaluation of single technical characteristics of a product(79). This study also extended TAM in order to measure user acceptance of the electronic data capture tool (EDC) which is not the whole system. This is the time to show capacity of TAM in another context where the objective is to focus on the tool more than the whole system. The structure of TAM used in this study is shown as follows:

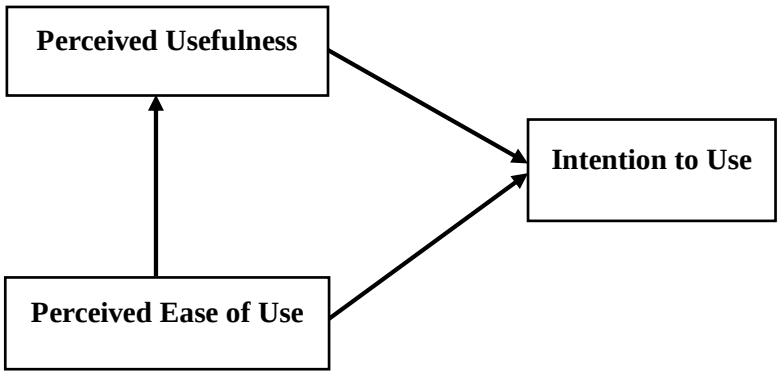

Figure 2.11 Core concept of TAM use for measure the user acceptance
Source: Adapted from TAM (Davis, 1989)

2.7 Summary of literatures

As mentioned above, data is the most important component to support decision making for improving malaria vector control programme. However, the system is mostly paper-based form. It is inefficient to extract data for monitoring and evaluation, planning, and allocating appropriate resources. There are many problems in data collection process such as poor handwriting of data collectors, incomplete filling of form and form damaged or lost, time consuming. Moreover, collecting data from ethnic minority people required the effective communication due to their culture and their languages. The results of overall review had been reported on many advantages of an electronic data capture/collection method. So, this study demonstrated the performance of an electronic data collection tool (EDC) in improving health by start from improving the fundamental unit of information as data. In order to measure the successful of EDC development and implementation, the satisfaction and user acceptance will be used as the instrument to ensure the intention to use of the users. The satisfaction will be measured by using two methods of data collection (i.e. electronic data capture tool (EDC) and paper-based methods) in term of format, ease of use and system speed as well as the overall satisfaction. User acceptance will be measured among those who have used electronic data capture tool (EDC) to collect the data. It will be measured in three constructs such as perceived usefulness, perceived ease of use and the intention to use.

CHAPTER III
MATERIALS AND METHODS

3.1 Study design

The study was conducted in both quantitatively and qualitatively. It was a randomized cross-over design study. The community health volunteers were randomly allocated to two arms where each arm consisted of a sequence of two data collection methods given sequentially. Each arm of the community health volunteers performed the same two data collection instruments, but in reverse order. The representatives of households were also assigned into two arms and each arm was interviewed by the same two data collection methods, and in reverse order. In order to prevent "the carry over effect" this study introduced a step of a "washout period" (no intervention) between sequential interventions which aimed to make the effects since the first intervention fade out.

After the process in cross-over study had done, the representative in each household was interviewed about their satisfaction of being interviewed by two methods. Also, the community health volunteers (CHVs) were asked to answer the questionnaire concerning their satisfactions of using two methods and the acceptance in the electronic data capture tool (EDC). Then, the qualitative study by focus group discussion was performed among community health volunteers in order to collect more data to explore the strength and weakness of both methods

3.2 Study areas

The current study was conducted in two villages (i.e. Huai Muang and Huai Numnak). Both villages were located along Thai-Myanmar border in Tanaosri sub-district, Suan Phueng district in Ratchaburi province, Thailand. In Tanaosri subdistrict, about 90% of population are Thai-Karen people(85). The study area was located around

The Rajanagarindra Tropical Disease International Centre (RTIC) as shows in **Figure 3.1.**

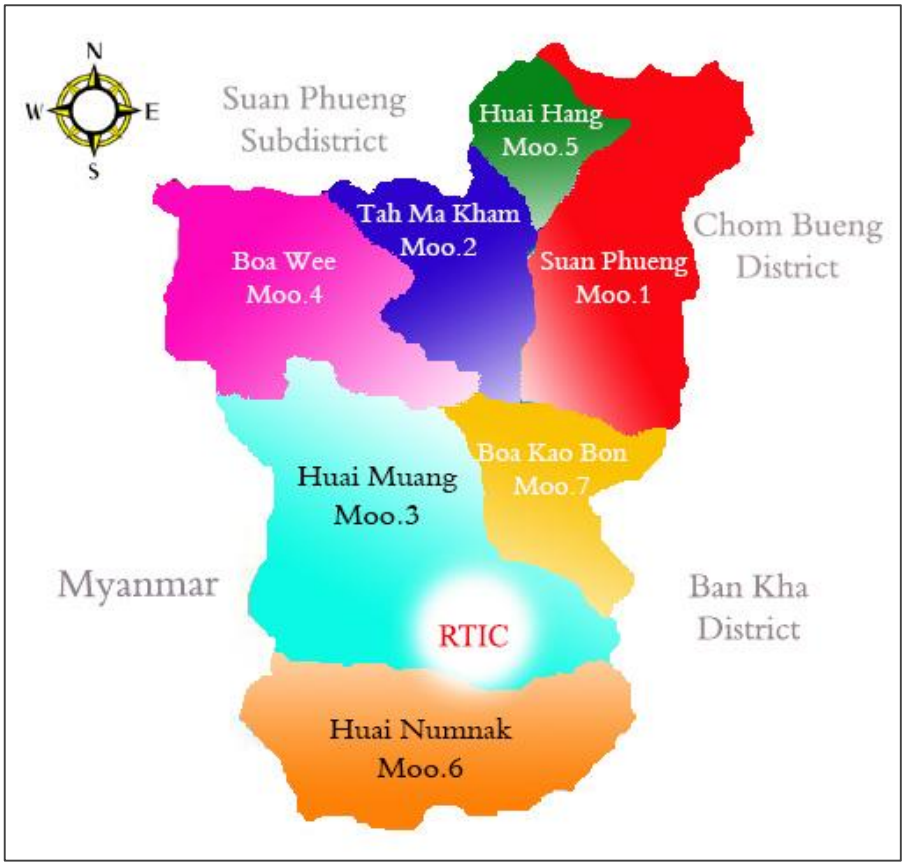

Figure 3.1 The map of Tanaosri sub-district, Suan Phueng District, Thailand

Source: http://suanphueng.ratchaburi.doae.go.th/ATSC/Mainpage/040.html

Majority of the people who lived around here were Karen people and most of the residents did not speak Thai language. The information concerning malaria in both villages was obtained from The Rajanagarindra Tropical Disease International Centre (RTIC). The demographic information and households in the study area was also obtained from RTIC. The number of malaria cases in Tanaosri subdistrict reported at RTIC during 2008-2012 were shown in **Figure 3.2.**

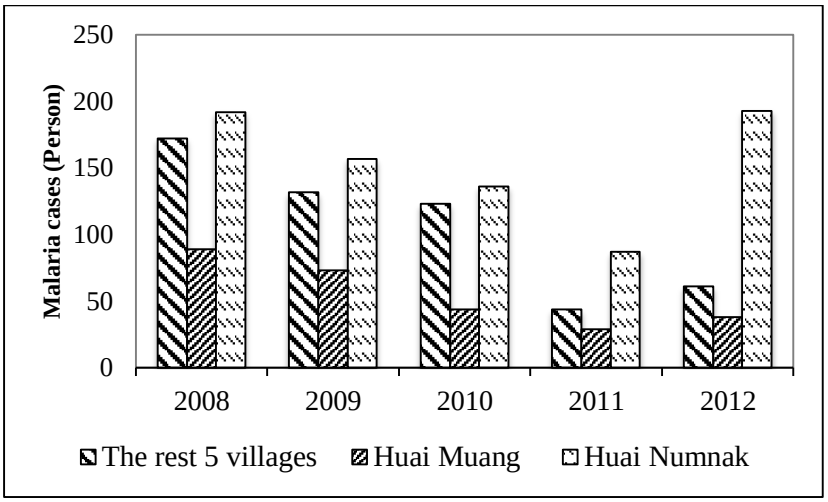

Figure 3.2 The number of malaria cases in Tanaosri sub-district, 2008-2012

Source: The Rajanagarindra Tropical Disease International Centre (RTIC), 2013

The Rajanagarindra Tropical Disease International Centre (RTIC) was located at Huai Muang village, Tanaosri subdistrict. The RTIC has established since November 2000 through the financial assistance of The Tropical Disease Trust Fund, under the Honorary Chairmanship of Her Royal Highness Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra. Malaria was the main project in RTIC since before the construction. Since then, RTIC had treated numerous of malaria patients and has been done a lot of research projects with focus on the further study of malaria. Free-of-charge malaria clinic has implemented since the beginning of RTIC activities and remain performed until today. Blood samples of patients who suspected malaria were examined by microscopists. Then if they have got the positive result, the proper malaria drugs were provided free of charge for malaria positive patients. More than 10,000 visits per year coming from the villages either in Tanaosri or Suan Phung sub-district. The relationship between the RTIC staff and the local people was built since a long time. Some of those who lived in the villages willing to work as the community health volunteers (CHVs). They were trained by the RTIC staff and worked as a network of the RTIC(86).

3.3 Population samples

3.3.1 Study population

The respondents consisted of two groups including:

1) The community health volunteers (CHVs) who were the interviewers.

Inclusion criteria:

- The community health volunteers age ≥ 18
- Live in the study area.
- Able to speak both Thai and Karen language.
- Able to read Thai language.
- Working as a network of RTIC.

Exclusion criteria: -

2) Karen population who were the interviewees.

Inclusion criteria:

- The Karen people age ≥ 18 years.
- Live in study area.
- The participants were the heads of households and in the absence of the heads of households responsible adults were interviewed.
- The participants were not fully understood Thai language.

Exclusion criteria:

- The participants did not stay at selected household permanently.

3.3.2 Sample size

There were 30 of the community health volunteers participated in quantitative study. As a small sample size the qualitative study with three focus group discussions were performed among the community health volunteers. The 120 of Karen respondents participated as they were the representative of their households.

The number of Karen households relied on the number of community health volunteers. Each of the community health volunteers collected data from four different

households in order to obtain enough experiences regarding two data collection methods.

3.3.3 Sampling method

Simple random sampling technique was used to select the community health volunteers from the name list in The Rajanagarindra Tropical Disease International Centre (RTIC). Then, they were randomly allocated into two groups where each group consists of a sequence of two data collection methods given sequentially. Each group performed the same two data collection methods, but in reverse order. The process of sampling technique for selecting the community health volunteers was shown as follows:

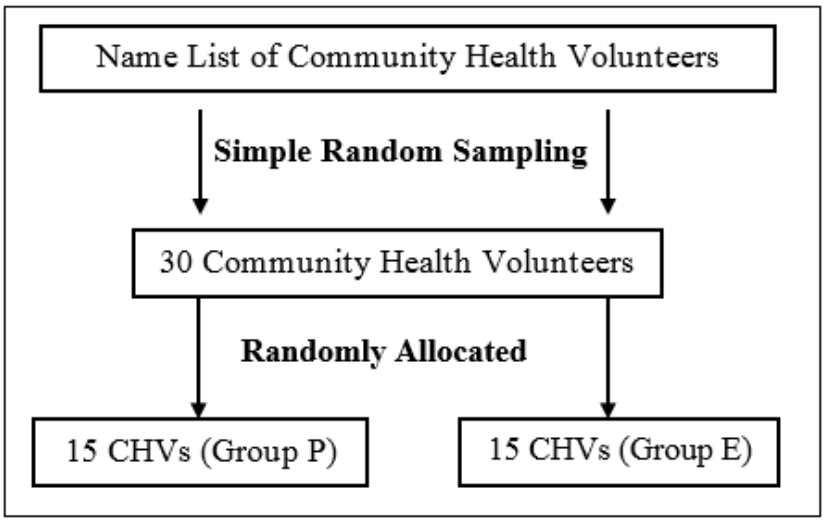

Figure 3.3. The process of selecting the community health volunteers

The convenience sampling technique was employed for Karen house selection. Each of the community health volunteers selected four different Karen houses in his or her responsibility. Then, Karen houses were randomly allocated into two groups depending on the group assigned of the community health volunteers in order to receive the reverse order of data collection methods.

3.4 Research instruments

There were four instruments consisted of three structure questionnaires for the interview and a discussion guideline for focus group discussion. The detail of each instruments were described below:

Instrument 1: the structured questionnaire for interview Karen respondents who were the representatives in each households. The questions asked about the bed nets and the indoor residual spraying (IRS) coverage as well as the factors associated with bed nets utilization. The questionnaires was developed into two types: (i.e. paper-based questionnaires and electronic questionnaires, namely electronic data capture tool (EDC))

The purpose of the study was not only to develop and implement an electronic data capture tool (EDC), but also to compare with traditional paper-based questionnaires. After paper-based questionnaire has been developed, the electronic data capture tool (EDC) was designed by using same structure of questionnaire. The structure of questionnaires consisted of four parts:

Part1 : Socio-Demographic information of the representative in each household; the variables including gender, age, education level and occupation.

Part2 : Household information; the variables included type of wall (partition), the number of family member, the number of child age ≤ 5 years, the number of pregnant woman and the experience with having malaria.

Part3 : Bed Nets utilization; the variables consisted of ownership of bed net, brand of net, bed net use previous night, the reason of not using bed net previous night, the season to use bed net,

Part 4: Receiving of indoor residual spraying (IRS) information; the variables consists of the receiving of indoor residual spraying and the completeness of receiving an indoor residual spraying (IRS).

There were many types of electronic devices use for develop the EDC. In current study, the users are community health volunteers who have not used and not familiar with electronic devices. According to previous study, the tablet PC showed the advantages about user familiarity, easy to carry to many places, less requirements for user training and technical support, low cost and the useful feature such camera device(23), low error rates when the data were input, and low missing rate(22). For

these points, tablet PC was suitable for collect the data in this study. Thus, tablet PC was employed to develop the electronic data capture tool (EDC).

The electronic data capture tool (EDC) consisted of three features including:

(1) **Voice translation feature**; the questions and answers were translated into Karen language and use for interview the Karen respondents. This feature could help to reduce the chance of misunderstanding, reduce interviewer bias as well as create an effective communication.

(2) **Photo capture feature**; for taking pictures regarding brand of net, and indoor residual spraying (IRS) record instead of checking on paper. This feature helped to reduce workload of community health volunteers who are the interviewers and reduced the mistake during the data are recorded into the form.

(3) **GPS feature**; for captures the household locations of the respondents automatically. This feature did not use to compare with paper-based method. However, it was the useful feature that allowed the health care provider to see the resources allocation geographically.

The data was collected and recorded in off-line system. After data collection process had been done, data was synchronized directly into the server later on when the internet connection or cell phone signal were available. In case of taking picture, the researcher then checked the completeness of data and entered data into the software which use for data analysis. The process of work/data flow of using an electronic data capture tool (EDC) to collect the data was summarized and shown in **Figure 3.4.**

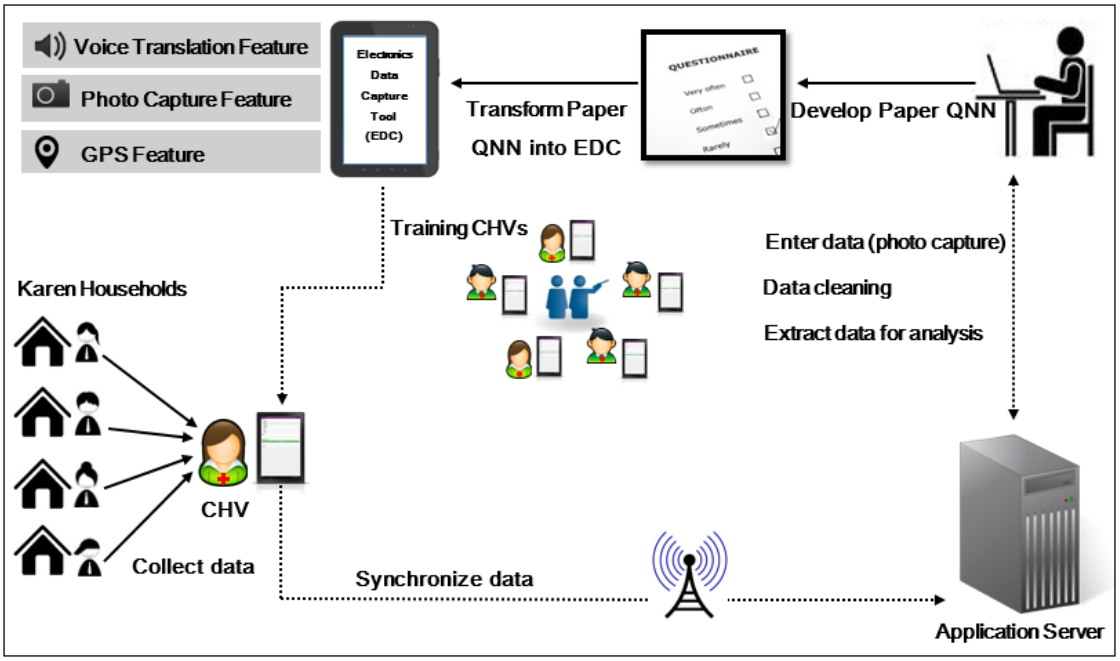

Figure 3.4. The process and work/data flow by using the Electronic Data Capture Tool (EDC) collect the data.

Instrument 2: The questionnaire was used for assess the satisfaction of the Karen respondents who were interviewed by the community health volunteers (CHVs) using two methods for data collection. The assessment focused on three dimensions, two factors were adapted from Doll and Torkzadeh, 1988 included format and ease of use. On the other hand, system speed was adapted from Iliasa *et al.*, 2007. Also, the respondents were asked about their overall satisfaction.

The structure of the questionnaire was asked about the satisfaction of being interviewed by two methods for data collection. The variables consisted of the satisfaction with format, ease of use, system speed as well as the overall satisfaction. The Karen respondents were asked to rate their satisfaction using the 3-point Likert scale ranging from 1= Not too satisfied, 2= moderately satisfied, 3= Very satisfied

Instrument 3: The questionnaire was developed to assess the satisfaction of the community health volunteers (CHVs) who have used two methods for collecting data regarding malaria vector control survey among Karen respondents. Also, the study measured their acceptance in EDC. For the constructs of the satisfaction, two constructs were adapted from *Doll* and *Torkzadeh*, 1988 consisted of format and ease of use. On the other hand, system speed was adapted from *Iliasa et al.*, 2007. The constructs of

user acceptance questionnaire were adapted from The Technology Acceptance Model (TAM) presented by Davis in 1989.

The structure of questionnaires was divided into three parts as follows:

Part1 : Socio-demographic information. The variables included gender, age, education level and occupation.

Part2 : The satisfaction of using two methods for data collection consisted of three dimensions; format, ease of use and system speed. The community health volunteers were also asked about their overall satisfaction. The level of the satisfaction measured by using a 3-point Likert scale ranging from 1= Not too satisfied, 2= moderately satisfied, 3= Very Satisfied

Part 3: The user acceptance in EDC consisted of three constructs; perceived usefulness, perceived ease of use and intention to use. The community health volunteers (CHVs) were asked to rate their opinion using a 5-point Likert scale ranging from 1= Strongly Disagree, 2 = Disagree, 3= Neutral, 4=Agree and 5 = Strongly Agree.

Instrument 4: The discussion guideline was developed to guide in focus group discussion among community health volunteers (CHVs). It assisted the group discussion perform smoothly and appropriately. The questions for discussion are divided into three parts as follows:

Part 1: Engagement questions: these questions used since the beginning of discussion in order to introduce participants and make them comfortable with the topic of discussion.

- Think back to the last whole month that you've used two methods for data collection and please tell us about your fondest memory. (The most enjoyable memory)

Part 2: Exploration questions: go through the contents of the discussion.

- Let’s think about using the paper questionnaire for interview, and please tell me about positive and negative experiences you've had.
- When you think about using an EDC for interview. What impressed you and what needs improvement?
- Suppose your friend have to go to interview as you have done in the last whole month, which methods you will recommend them to use and what would you say in the invitation?

Part 3: Ending question: use for check whether anything was missed in the discussion.

- Of all the things we discussed, what is the most important to you?
- Is there anything else you would like to say about your experience on using two methods collect data?

3.5 Data collection

After the proposal of this study was approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University, the researcher went to contact the staff at The Rajanagarindra Tropical Disease International Centre (RTIC) which located near to the study area. Then, the researcher recruited thirty of the community health volunteers (CHVs) who met the criteria by randomly selecting from the name list. Next, the researcher contacted and invited them to participate in the study. All of the community health volunteers (CHVs) were trained to use both of the paper questionnaire and EDC in workshop training. The nature of this project was also explained to them. Then, they became the interviewers and ready for data collection. Data collection processes of this study were divided into two sections, the details were described below;

Section 1: Collecting data regarding malaria vector control from Karen participants by community health volunteers (CHVs). In the first section, data was collected by the community health volunteers (CHVs) using two methods for collecting data from Karen respondents. The community health volunteers (CHVs) went to the Karen houses which were selected. Next, they explained the nature of the study and how the results were going to be used to the representative in each household only those who met the criteria. Then, they invited the representative of households to participate in the study. It was emphasized that the participation was voluntary and their responses would be kept anonymous and confidential. Then, the Karen respondents were asked to sign the informed consent. If the respondents were willing to participate, the interview was performed after they signed the informed consent. However, the present study employed cross over design and there were two methods for data collection. In order to describe clearly, data collection process were explained respectively.

Paper-Based data collection: Data was collected by the community health volunteers (CHVs) who were the interviewers. Before the interview was started, the interviewers recorded the time at the beginning of interview. The community health volunteers (CHVs) used both Thai and Karen languages for interview depending on the understanding of Karen respondents. After that, the answers were recorded in the paper questionnaires. The time was recorded again when the interview was finished. Then, all of the data were entered into the software manually by the researcher.

Electronic data capture tool (EDC): The community health volunteers (CHVs) were the interviewers but instead of asking the questions by themselves, they only clicked on the screen of EDC. All questions and answers in EDC were provided in Karen language. Some questions regarding the bed net brand or indoor residual spraying record, the interviewers took a photo instead of record the results. The duration of data collection and the location of household were recorded automatically in EDC. In case of the problems occurred during the interview such as crashing, the application stop working, the interview was started again at the same house after the problems were being solved. The house that the problem occurred was not replaced. After conducting the interviews, the data were synchronized to the server later on when the internet connection or cell phone signal were available.

According to the design of this study was randomized crossover design. The steps of crossover design and explanation were showed as follows:

1st data collection The community health volunteers group P were trained to collect data by using paper-based questionnaire and collected data from the representative of households in group A by paper-based questionnaire. While the community health volunteers group E were trained to collect data by using EDC. Then, they collected the data from the representative of households in group B by using EDC.

Washout Period: The researcher did not provide any intervention to all participants about 2 weeks after 1st data collection was completed. During this period the community health volunteers in both groups were trained to use another method of data collection.

2nd data collection: The representative of households in group A was interviewed by the community health volunteers belong to Group P using EDC to collect

the data. While the representative of households in group B were interviewed by the community health volunteers in group E using paper-based questionnaire.

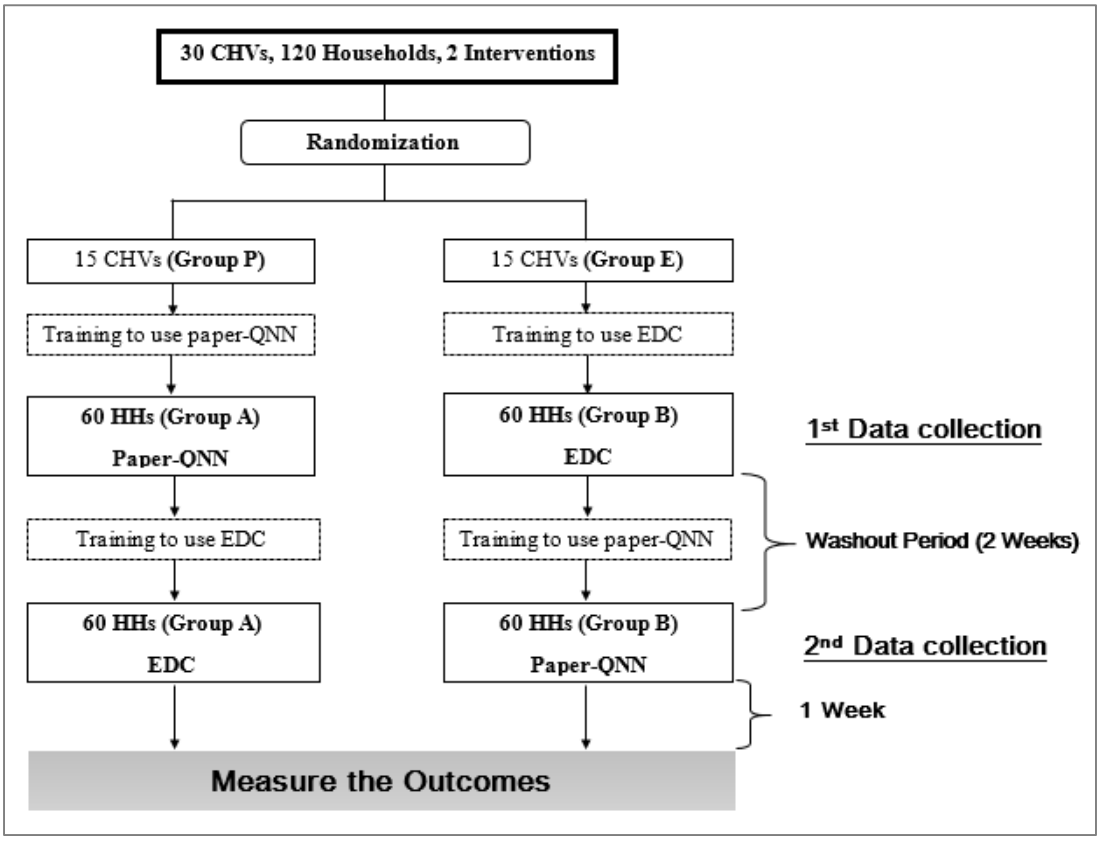

Figure 3.5. Flow chart of step in randomized crossover design

Therefore, at the end of survey, in each household obtained both methods of data collection. Each of the community health volunteer (CHV) also used both methods of data collection. After that the outcomes of this study were measured. The next section was the measurement of outcomes in this study.

Section 2: Measure the outcomes from **Section I** by assessing the satisfaction of both tools (i.e. paper-based questionnaire and EDC. This section consisted of three parts as follow;

Part 1: Collecting data regarding the satisfaction of the interviewees from Karen respondents. Data was collected after the Karen respondents were interviewed by two methods completely about one week. The community health volunteers interviewed Karen participants and recorded the answers in the paper questionnaire.

Part 2: Collecting data regarding the users' satisfaction and user acceptance from the community health volunteers (CHVs). The community health volunteers

(CHVs) who were the interviewers were asked to fill out the questionnaire after the survey finished for one week.

Part 3: Collecting qualitative data by focus group discussion among the community health volunteers (CHVs). In order to obtain the information and opinions concerning the new testing instrument, three of focus group discussions were performed among the community health volunteers. A total number of participants participated in the discussion were 28 persons. There were two groups consisted of 9 participants and one group consisted of 10 participants. In each groups consisted of one moderator. The conversation was recorded by using voice recorder. Three group discussions were performed separately at the same time by three moderators. The questions were asked follow the discussion guideline. In each group took time about an hour.

3.6 Validity

The questionnaires in this study were tested content validity. Three experts refined the items to assure the content validity of the questionnaires. After that, the items in the questionnaires were modified according to their suggestions.

The consistency of the findings obtained from three focus group discussions was also considered. After the coding process, all codes were discussed. Similarities and differences between the results were assessed in order to reduce the variation and bias for coding.

3.7 Data analysis

All data were entered into the Statistical Package for Social Science (SPSS) program version 18.0. The statistical analysis used in this study was explained as follows:

1. Univariate analysis was performed when one variable was analyzed such as the characteristics of the respondents, the level of satisfaction, user acceptance and the time consumed for data collection. The results were reported depending on the data. E.g. frequency, percentage, mean, median, standard deviation.

2. Bivariate analysis was performed when two variables were compared such as the comparison of time consumed when using two methods for data collection. Also, it was used in order to find the association among the satisfactions aspects and among the user acceptance constructs.

3. Multivariate analysis was performed when dealing with three or more variables were analyzed. For example, to test the difference of time consumed for data collection among different age groups.

Qualitative data obtained from three focus group discussions were analyzed using the inductive content analysis(87). The data were transcribed into Microsoft word, the comments were typed word by word. Then, the data were coded and transferred to Microsoft Excel spreadsheet in a separate cell. The unit of quote focused on the meaning regardless of the length of sentences. Then, the researcher filtrated the codes use filter function in Microsoft Excel. All codes were synthesized into different themes and interpret as the results.

3.8 Ethical consideration

The study was approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University. The respondents were described in the nature of the study and asked to participate in this study. The researcher emphasized that their participation would be voluntary and they had the right to withdraw from the study at any time without affecting anything in their life. The participants could ask any questions that they would like to know in the process of this study until they were understood clearly. If the participants decided to participate, they were asked to sign the informed consent. There was no identification of the participants. The individual information was kept confidential with the researcher during data collection and analysis. The participants were able to stop giving an interview or participate in the study any time and did not need to give reason for the withdrawal of the consents.

CHAPTER IV
RESULTS

The result of the current study were presented in two main part consisted of tool development and implementation part and tools assessment and comparison. The details were explained as follows:

4.1 Tool development and implementation

The first objective of the current study was to develop and implement the electronic data capture tool (EDC) used in malaria vector control survey among Karen hill tribe population. Thus, after paper-based questionnaire had been developed, the application for collecting the data was created with the same structure to the paper-based questionnaire. There were 6 phases of tool development and implementation. Each phase was described as follows:

4.1.1 Design phase

This phase started after the paper questionnaire was developed. The paper questionnaire was finalized after several discussions with the investigator, programmer and advisors. Then, we started to design the application of the electronic data capture tool (EDC) which would run on android system. This application was designed to install on tablet Samsung galaxy 7.0 plus.

4.1.2 Development phase

After the users' requirement were created, the programmers started to form the application. The application was built by eclipse software which was open source software. At the same time, the investigator went to the village in the study area. The volunteers were asked to translate the questions from Thai to Karen language.

The question and answer in each item were recorded in one file. The questions were translated twice by two different volunteers. The verified version of the translation was sent to the programmer. Then, the voice records were applied on the application.

4.1.3 Testing phase

After EDC was built, the functions were tested. The tool was used to interview 10 volunteers in the village. Moreover, it was presented to the advisors in order to ask the suggestions on the application. In this phase, the application of EDC run well. However, there were some suggestions on the screen of EDC which needed to be modified.

4.1.4 Modifying phase

According the suggestions, EDC was modified in some functions such as the icon of application, language on the screen (English to Thai), drop down of age (started from 18), and for camera feature (added check box for skip in case that the participant did not allow to take a picture). The **Figure 4.1** showed some screen shots of the first draft application.

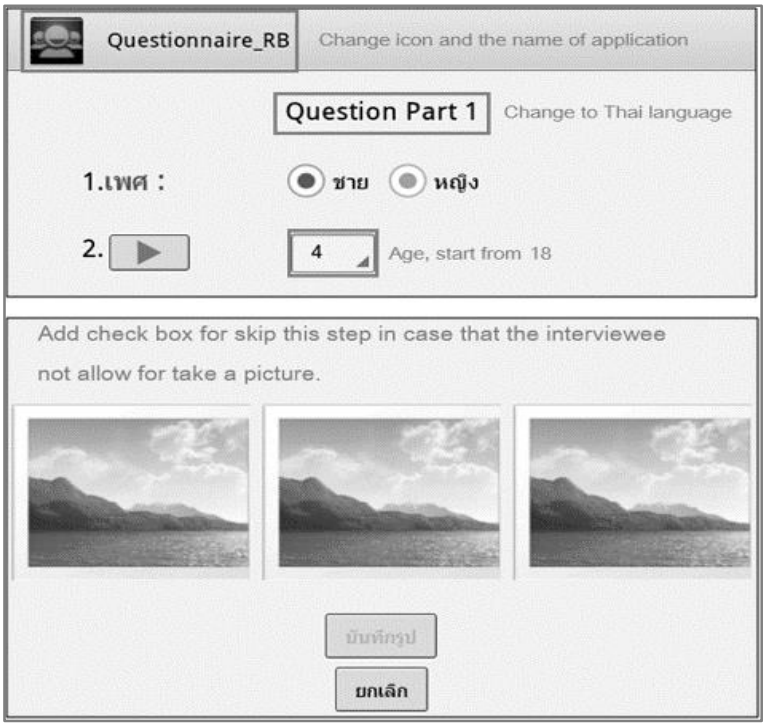

Figure 4.1 Some parts on the screen of an electronic data capture tool (EDC) in the first draft which needed to modify.

4.1.5 Training phase

After the EDC was developed completely, the training workshop was set up. The pictures of the screen in the final version of EDC were shown in the appendix. The community health volunteers were trained to use EDC before the interview. The training lasted around 3 hours, starting from the basic of the tablet.

4.1.6 Implementation phase

After the community health volunteers were trained, they went to the interviewees' houses and performed the interview. Each of them went to four different houses of the Karen respondents.

4.2 Tools assessment and comparison

There were two instruments for data collection in this study (i.e.an electronic data capture tool and paper-based questionnaire). In order to assess the tools as well as comparison between both tools, the assessment has started after the data was collected by community health volunteers among Karen respondents. The assessment was performed in term of time consumed, user acceptance, users' satisfaction and interviewees' satisfaction. The detail of the tools assessment and comparison were shown as follows:

4.2.1 General characteristics of the respondents

There were two groups of the respondents in this study i.e. the community health volunteers and Karen hill tribes. Total of 30 community health volunteers participated in the current study. More than half were female (66.7%) and 33.3% were male. 43.3% were 30 years old or younger, 30% were in 41 - 50 years old, 23.4% were in 31 - 40 years old, only one of them was more than 50 years of age and the average age was 30.9 years (SD = 13.73). In terms of the highest education level, 56.7% of the respondents had finished primary or elementary school, followed by 36.7% had got high school or technical certificate degree and 6.7% were uneducated. On occupation, 46.7% of them were the employee, 30% were unemployed, 16.7% were the agriculturist and the rest were doing the business/trading and work as the government officer. Since the

study design was the randomized cross-over design, 30 community health volunteers were randomly allocated into two groups (i.e. group P and group E). Based on the result, the demographic characteristics of community health volunteers in both groups were not different. The demographic characteristics of the community health volunteers were presented in **Table 4.1**

Table 4.1 The demographic characteristic of 30 the community health volunteers which were allocated into two groups at the time of study.

Characteristic	Group of CHVs		n (%)	*p*
	Group E* n (%)	Group P† n (%)		
Gender				
Male	6 (60.0)	4 (40.0)	10 (33.3)	0.43
Female	9 (45.0)	11 (55.0)	20 (66.7)	
Age (years)				
≤ 30	9 (69.2)	4 (30.8)	13 (43.3)	
31 - 40	0 (0.0)	7(100.0)	7 (23.4)	
41 - 50	5 (55.6)	4 (44.4)	9 (30.0)	
> 50	1(100.0)	0 (0.0)	1 (3.3)	
Mean ±S.D.	28.73±16.09	33.07±11.03		0.40
Education				
Uneducated	0 (0)	2 (100)	2 (6.6)	
Primary School	10 (58.8)	7 (41.2)	17 (56.7)	0.27
High School	5 (45.5)	6 (54.5)	11(36.7)	
Occupations				
Unemployed	7 (77.8)	2 (22.2)	9 (30.0)	
Agriculturist	2 (40.0)	3 (60.0)	5 (16.7)	
Business /Trading	1(100.0)	0 (0.0)	1 (3.3)	0.11
Employed	4 (28.6)	10 (71.4)	14 (46.7)	
Government officer	1(100.0)	0 (0.0)	1 (3.3)	
Total	15 (50.0)	15 (50.0)	30(100)	

* Used EDC in 1st data collection and used paper-based in 2nd data collection

† Used paper-based in 1st data collection and used EDC in 2nd data collection

Additionally, there were 120 of Karen hill tribes participated in this study. Each of them was the representative from each household. The majority of the Karen respondents were female (70%) and 30% were male. Out of total respondents, 36.7% were 30 years old or younger, followed by 31.7% were in 31 - 40 years old, 18.3% were in 41 – 50 years old, 13.3% were more than 50 years of age and the average age was

36.66 years (SD = 12.38). The majority of the Karen respondents were uneducated (69.2%). In terms of the occupation, 66.7% were the employees. The demographic characteristics of the Karen hill tribe respondents were shown in **Table 4.2.**

Table 4.2 The demographic characteristic of the 120 hill tribe respondents at the time of study

Characteristic	n = 120	Percentage
Gender		
Male	36	30.0
Female	84	70.0
Age (years)		
≤ 30	44	36.7
31 - 40	38	31.7
41 – 50	22	18.3
> 50	16	13.3
Education		
Uneducated	83	69.2
Primary School / Elementary School	18	15.0
High School/ Technical Certificate	17	14.2
University or higher	1	0.8
Others	1	0.8
Occupation		
Unemployed	21	17.5
Agriculturist	9	7.5
Business /Trading	5	4.2
Employed	80	66.7
Government officer	4	3.3
Others	1	0.8

4.2.2 Time consumed for data collection

The data was collected from 120 Karen respondents by the community health volunteers. Approximately 75% of those who used paper-based questionnaire for interview spent time not more than 9 minutes for the interview. While 75% of those who used EDC spent time during interview was not more than 8 minutes. However, the median of time consumed when using paper-based questionnaire was less than using an electronic data capture tool (EDC) for data collection, median = 5 and 6.5 respectively.

The data regarding time consumed were not normally distributed. Also, in the **Figure 4.2** showing that and there were the outliers and extreme values. Therefore,

Wilcoxon Signed Ranks Test was performed in order to test the difference of time consumed between two methods for data collection.

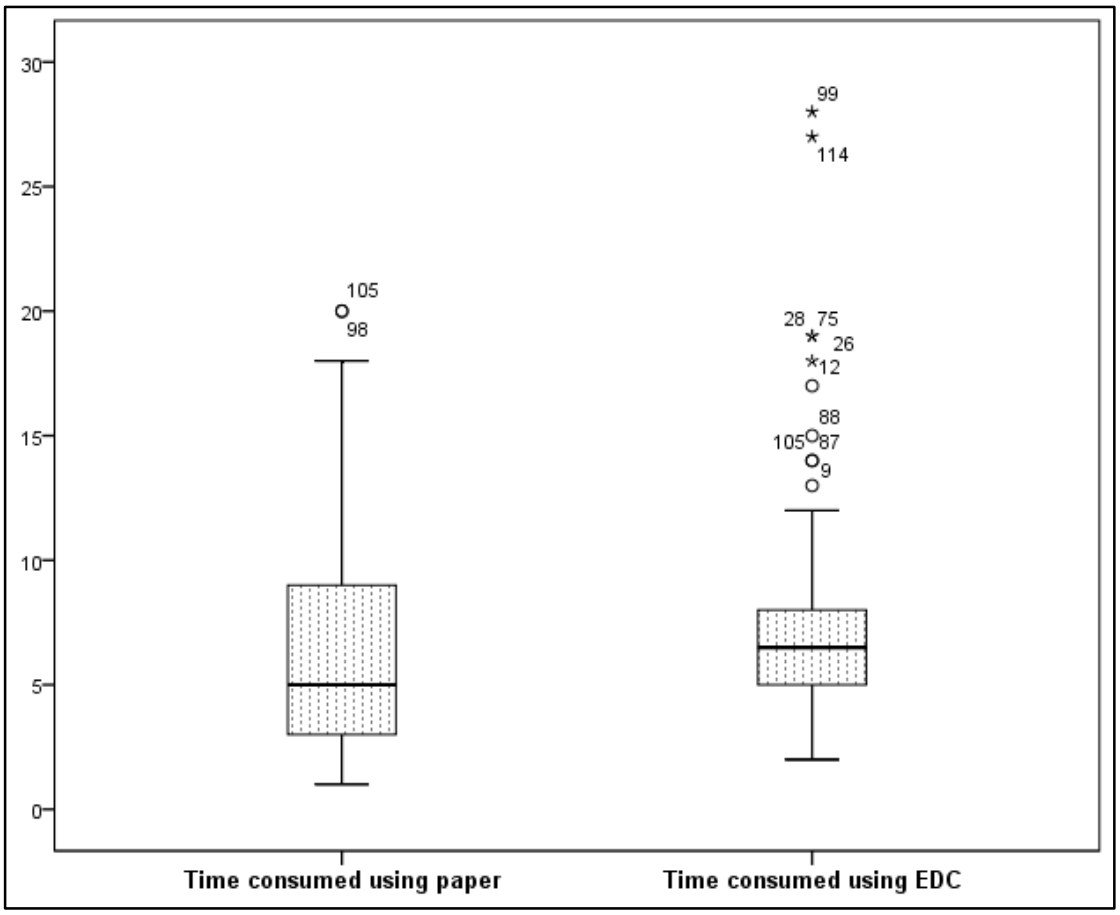

Figure 4.2 Time consumed of data collection by using paper questionnaire and the electronic data capture tool (EDC)

Additionally, data of 2 cases in paper-based form were missing in time consumed variable. Thus, 118 pairs were used for comparison in this test. The result demonstrated that the time consumed for data collection were significantly difference between two methods ($p = 0.03$). Time consumed for data collection by using paper-based questionnaire was less than using an electronic data capture tool (EDC). The result of time consumed by using two methods was shown in **Table 4.3**.

Table 4.3 Comparison of time consumed by using an electronic data capture tool (EDC) and paper-based questionnaire for data collection.

Data collection methods (n = 118)	Time consumed (minutes)				
	Min.	Max.	Median	IQR*	p-value†
EDC	2	28	6.5	8 - 5	**0.03**
Paper-based questionnaire	1	20	5.0	9 - 3	

*IQR = Interquartile range ($Q_3 - Q_1$)

† Wilcoxon Signed Ranks Test

The current study also investigated the difference of time consumed in different characteristics of Karen respondents who lived in 120 selected households. Based on the finding, time consumed of being interviewed by EDC were different between male and female as the time consumed of female interviewee was less than male interviewee (p = 0.035). Instead, the time consumed for data collection was not different among different age groups and education levels. The results were presented in **Table 4.4**.

Table 4.4 Comparison of time consumed for data collection in different characteristics of Karen respondents who were interviewed by two methods.

Characteristics of Karen hill tribe	Time consumed (EDC) (n = 120)			Time consumed (Paper) (n = 118)		
	Median	IQR	*P*	Median	IQR	*P*
Gender*			**0.035**			0.38
Male	7.0	9.0 - 6.0		5.0	10.0 - 3.0	
Female	6.0	8.0 - 4.0		4.0	9.0 - 3.0	
Age (years) †			0.45			0.20
≤ 30	6.0	8.0 - 5.0		5.0	9.5 - 3.0	
31-40	6.0	8.0 - 5.0		4.0	8.0 - 2.0	
41-50	6.5	9.0 - 5.0		4.5	6.0 - 3.0	
> 50	7.5	11.0 - 6.5		8.0	10.5 - 3.5	
Education†			0.07			0.21
Uneducated	6.0	8.0 - 4.0		4.0	9.0 - 3.0	
Primary School	8.0	9.0 - 7.0		5.0	9.0 - 4.0	
High School	6.0	8.0 - 5.0		5.0	8.0 - 2.0	

* Mann-Whitney Test

† Kruskal Wallis Test

The respondents (i.e. the community health volunteers and Karen hill tribes) were divided into two groups in order to gain the experience with two methods in reverse order. The current study also compared time consumed for data collection by using two methods within each group of the respondents as presented in **Table 4.5**. The result showed that the time consumed between using two methods were not statistically different either the respondents belong to group P (p =0.13) or group E (p=0.12).

Table 4.5 Comparison of time consumed by using two methods within each group of the respondents.

Group of the respondents	EDC (minutes)		Paper (minutes)		p-value*
	Median	IQR	Median	IQR	
Groups (n=60)					
- Group P	6	8 - 4	4	9 - 3	0.13
- Group E	7	9 - 5	5	9.5 - 3	0.12

*Wilcoxon Signed Ranks Test

Group P: using paper-based questionnaire in 1st round and using EDC in 2nd round

Group E: using EDC in 1st round and using paper-based questionnaire in 2nd round

4.2.3 The interviewees' satisfaction among Karen respondents

The interviewees' satisfactions with two methods were also assessed among Karen respondents who were interviewed by the community health volunteers. There were 120 of Karen respondents participated in the study. The average ratings in both methods were also above the midpoint. It showed that the Karen respondents satisfied with both methods for data collection.

As for the respondents who were interviewed by EDC, the highest mean was the satisfaction with the system speed (2.78) and the lowest mean was the satisfaction with the format (2.69). Meanwhile, the highest mean of satisfaction when they were interviewed by using paper-based questionnaire was the satisfaction with ease of use (2.43) and the lowest mean was the satisfaction with the format (2.32). (The overall satisfaction was not considered). The interviewees' satisfaction of using an electronic data capture tool (EDC) and paper-based questionnaire for data collection among Karen respondents in each dimension were summarized in **Table 4.6.**

Table 4.6 The interviewees' satisfactions of using an electronic data capture tool (EDC) and paper-based questionnaire for data collection among Karen respondents in each dimension.

Dimensions of Satisfaction	Frequency (%)	
	EDC (n=120)	Paper-based (n=120)
Format		
(1) Not too satisfied	1 (0.8)	4 (3.3)
(2) Moderately	35 (29.2)	74(61.7)
(3) Very satisfied	84 (70.0)	42(35.0)
Mean ± SD	**2.69 ± 0.48**	**2.32 ± 0.53**
Ease of use		
(1) Not too satisfied	2 (1.7)	5 (4.2)
(2) Moderately	26 (21.7)	58(48.3)
(3) Very satisfied	92 (76.6)	57(47.5)
Mean ± SD	**2.75 ± 0.47**	**2.43 ± 0.58**
System speed		
(1) Not too satisfied	2 (1.7)	5 (4.2)
(2) Moderately	22 (18.3)	62(51.7)
(3) Very satisfied	96 (80.0)	53(44.1)
Mean ± SD	**2.78 ± 0.45**	**2.40 ± 0.57**
Overall satisfaction		
(1) Not too satisfied	1 (0.8)	4 (3.3)
(2) Moderately	16 (13.3)	62(51.7)
(3) Very satisfied	103 (85.7)	54(45.0)
Mean ± SD	**2.85 ± 0.38**	**2.42 ± 0.56**

In order to compare the mean difference of satisfaction between two methods in all dimensions, Pair sample t-test was performed. The significant differences were found in all dimensions between two methods. The result indicated that the respondents were more satisfied with EDC than paper-based questionnaire in all dimensions consisting of format of EDC vs. format of paper, ($p < 0.001$) ease of use with EDC vs. ease of use with paper, ($p < 0.001$), system speed of EDC vs. system speed of paper, ($p < 0.001$) and for the overall satisfactions, they were also more satisfied with EDC than paper-based questionnaire, ($p < 0.001$).

4.2.4 The users' satisfaction among the community health volunteers

The users' satisfaction was assessed among community health volunteers who have used two methods for data collection. The satisfaction was classified into

three-point scale. The median of ratings score for all items of using EDC were 3 while the median of ratings score for all items of using paper-based questionnaire were 2.

In terms of EDC, at least 70% of the community health volunteers felt very satisfied in all dimensions. Particularly, in the overall satisfaction with EDC, 80% of them were very satisfied. For the satisfaction with paper-based questionnaire, the majority of them were moderately satisfied in all dimensions. The result of the users' satisfaction among the community health volunteers were summarized in **Table 4.7.**

Table 4.7 The users' satisfaction of using an electronic data capture tool (EDC) and paper-based questionnaire for data collection among the community health volunteers in each dimension

Dimensions of Satisfaction	**Frequency (%)**	
	EDC (n=30)	**Paper-based (n=30)**
Format		
(1) Not too satisfied	0 (0.0)	1 (3.3)
(2) Moderately	9(30.0)	20(66.7)
(3) Very satisfied	21(70.0)	9(30.0)
Median [IQR]	**3 [3 – 2]**	**2 [3 – 2]**
Ease of use		
(1) Not too satisfied	1 (3.3)	2 (6.7)
(2) Moderately	8(26.7)	16(53.3)
(3) Very satisfied	21(70.0)	12(40.0)
Median [IQR]	**3 [3 – 2]**	**2 [3 – 2]**
System speed		
(1) Not too satisfied	0 (0.0)	1 (3.3)
(2) Moderately	8(26.7)	20(66.7)
(3) Very satisfied	22(73.3)	9(30.0)
Median [IQR]	**3 [3 – 2]**	**2 [3 – 2]**
Overall satisfaction		
(1) Not too satisfied	1 (0.0)	0 (0.0)
(2) Moderately	6(20.0)	16(53.3)
(3) Very satisfied	24(80.0)	14(46.7)
Median [IQR]	**3 [3 – 3]**	**2 [3 – 2]**

In order to compare the score of the users' satisfaction in each dimension between two methods, Wilcoxon Signed Ranks Test was performed as the sample size was small. The result pointed out that the users' satisfaction were significantly difference between two methods for data collection in all dimensions. The community health volunteers were more satisfied with EDC than paper-based questionnaire in all

dimensions, comprised of format of EDC vs. format of paper, ($p = 0.002$) ease of use with EDC vs. ease of use with paper, ($p = 0.018$), system speed of EDC vs. system speed of paper, ($p < 0.001$) and for the overall satisfactions, they were also more satisfied with EDC than paper-based questionnaire, ($p = 0.004$).

4.2.5 Correlation between each dimension of satisfaction with the overall satisfaction.

The correlation analysis was used to test the relationships between three dimensions of satisfaction (i.e. format, ease of use and system speed) with the overall satisfaction. The results were divided into two parts, which were shown in **Table 4.8.**

Table 4.8 Correlation(R) between each element of satisfaction with the overall satisfaction

Overall satisfaction	**Format**		**Ease of use**		**System speed**	
	R	***P***	**R**	***P***	**R**	***P***
Interviewers (n = 30) (CHVs*)†						
EDC	0.22	0.25	0.25	0.18	0.64	**< .001**
Paper-based	0.46	**0.01**	0.29	0.12	0.16	0.41
Interviewees (n = 120) (Karen)‡						
EDC	0.52	**< .001**	0.44	**< .001**	0.54	**< .001**
Paper-based	0.46	**< .001**	0.43	**< .001**	0.55	**< .001**

*CHVs = Community health volunteers

† Spearman's correlation (r_s)

‡ Pearson correlation (r)

Part I: community health volunteers

In case of using EDC for data collection, the satisfaction with format were not significantly correlated with the overall satisfaction, $r_s = 0.22$, ($p = 0.25$). The satisfaction with ease of use and the overall satisfaction were also not significantly correlated, $r_s = 0.25$, ($p = 0.18$). On the other hand, there was a significant positive correlation between the satisfaction with system speed and the overall satisfaction. Both variables were strongly correlated, $r_s = 0.64$, ($p < .001$).

In case of using paper-based questionnaire, there was a positive relationships between the satisfactions with format and the overall satisfaction, r_s = 0.464, (p = 0.010). In contrast, the satisfaction with ease of use and system speed were not significantly correlated with the overall satisfaction, r_s = 0.29 and 0.16, (p = 0.12 and 0.41).

Part II: Karen respondents

The results from the respondents who were Karen hill tribe in study area, the significant correlations were found in all dimensions of both methods for data collections.

As for the respondents being interviewed by using EDC, the satisfactions with format was positively correlated with the overall satisfaction, r = 0.52, (p < .001). The satisfactions with ease of use was also positively correlated with the overall satisfaction, r = 0.44, (p < .001). Also, the satisfactions with system speed was positively correlated with the overall satisfaction, r = 0.54, (p < .001).

In case of the respondents being interviewed by using paper-based questionnaire, the satisfactions with format was positively correlated with the overall satisfaction, r = 0.46, (p < .001). The satisfactions with ease of use was also positively correlated with the overall satisfaction, r = 0.426, (p < .001). Also, the satisfactions with system speed was positively correlated with the overall satisfaction, r = 0.55, (p < .001).

4.2.6 The user acceptance of an electronic data capture tool (EDC) among community health volunteers.

The Technology Acceptance Model (TAM) was designed to investigate the user acceptance of electronic data collection tool within community health volunteers. The questions consisted of 11 items (perceive usefulness 5 items, perceive ease of use 5 items and intention to use 1 item) and rated by five-point Likert scale. The results of the user acceptance were summarized in **Figure 4.3.**

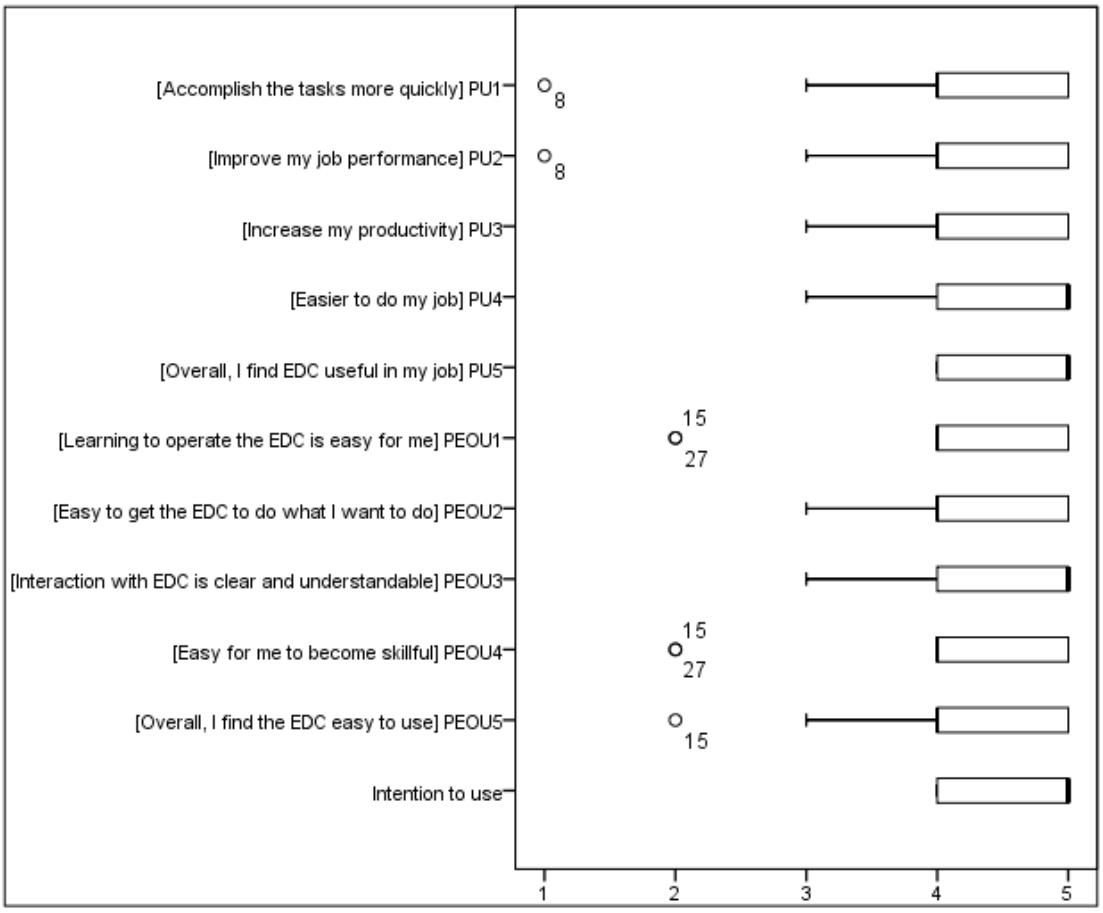

Figure 4.3 The user acceptance of an electronic data capture tool (EDC) among community health volunteers.

From **Figure 4.3,** the median score in all items of user acceptance were above the midpoint. It is indicated that the community health volunteers accepted about an electronic data capture tool (EDC). However, there were two items of perceive usefulness which they felt strongly disagree consisted of PU1 *(Using EDC enable me to accomplish the tasks more quickly)* (n=1, 3.3%) and PU2 *(Using EDC Improve my job performance.)* (n=1, 3.3%). Also, there were three items of perceive ease of use that they answered disagree consisted of PEOU1 *(Learning to operate the EDC is easy for me)* (n=2, 6.7%), PEOU4 *(It would be easy for me to become skillful at using the EDC.)* (n=2, 6.7%) and PEOU5 *(Overall, I find the EDC easy to use.), (n=1, 3.3%).*

In terms of the intention to use, the majority of them were strongly agree (63.3%) that if they had an opportunity to use EDC, they would use it in their job. The 36.7% of them agreed in this item and no one answered neutral, disagree or strongly disagree.

4.2.7 Correlation between the constructs of user acceptance

The Spearman correlation analysis was performed among total score of perceive usefulness, total score of perceive ease of use and intention to use. The finding indicated that perceive usefulness were not correlated with intention to use, $r_s = 0.03$, ($p = 0.27$). The relationship were also not found between perceive ease of use and intention to use, $r_s = 0.30$, ($p = 0.11$). However, there was a significant correlation between perceive usefulness and perceive ease of use, $r_s = 0.38$, ($p= 0.04$). The correlations were summarized in **Figure 4.4.**

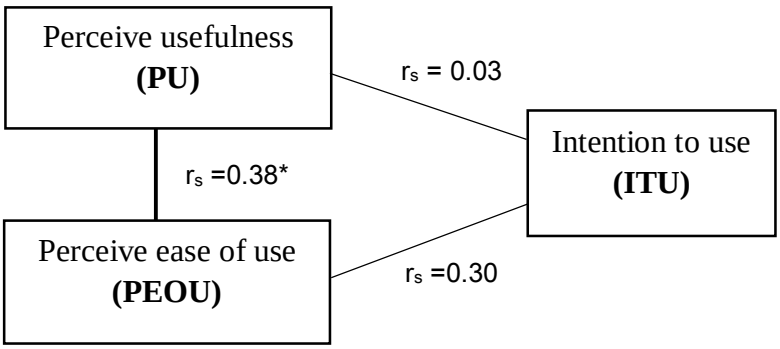

Figure 4.4 Correlation between three constructs (i.e. perceived usefulness (PU), perceived ease of use (PEOU) and intention to use (ITU)) of user acceptance.
The lines indicate a positive correlation, r_s = correlation coefficient, (* = $p < 0.05$)

4.2.8 The strength and weakness of using an electronic data capture tool (EDC) and paper-based method

In the current study, three focus group discussions were performed in order to explore the strengths and weaknesses of using two methods in data collection regarding malaria vector control survey among Karen hill tribe population. Total 28 respondents were community health volunteers. Those who were used two methods for data collection (i.e. electronic data collection tool and paper-based questionnaire) have given the difference views based on their experiences.

Electronic Data Capture Tool (EDC)

The results of using the electronic data capture tool (EDC) were presented in two parts, consisted of the strengths and weaknesses. All themes and quotes were presented in **Table 4.9-4.10.** The explanations of the results were provided as follows:

Strength of the electronic data capture tool (EDC)

1) Ease of use and comfortable to use

For those community health volunteers, the major strength of EDC was the ease of use and comfortable to use. Twelve of them mentioned about this topic. The aspects that the respondents stated were ease of use and comfortable using it.

Three out of twelve respondents emphasized on touch screen. Carrying was also the other reason for the respondents: Three out of twelve pointed out that EDC was easy and comfortable to carry. One out of twelve respondents brought up about camera feature in EDC. They could also take a picture instead of writing. So, it was easy for them to collect data. Additionally, one of the respondents noted that using EDC was easy to edit. If they wanted to change the answer, they could only click in EDC.

2) Quick

Eleven out of 28 respondents noted that by using EDC they could finish the interview quickly. Five of them were more focused on comparing the speed and they felt that using EDC was faster than using paper-based questionnaire.

3) Automatic translation

Automatic translation was also identified as the strength of EDC during the discussions identified by 7 respondents. The interviewer only clicked on the screen, then the questions and answers were translated automatically.

4) Complete information

According to the camera feature, it was not only made them feel easy to use but two of all respondents were also noted that taking picture leaded to the complete information. In their opinion, using EDC for data collection could get more detail information than that of paper-based form. However, one of them respondent stated that the application screen was locked when the user was not completed all questions in that screen. The pictures of brand of bed net took by the community health volunteers were shown in **Figure 4.5.**

Figure 4.5 The pictures of brand of bed net taken by the community health volunteers using the electronic data collection tool (EDC) during data collection process.

Weakness of the electronic data capture tool (EDC)

The weaknesses of using EDC were presented in two parts consisted of the personal factors and instrumental factors.

1) Personal factors

The personal factor explained the side of the users who have used the EDC for data collection. The results were explained as follows:

1.1) Unfamiliarity

Six out of 28 respondents noted that they were unfamiliar with the tablet and they have never used or seen it before. This point also influenced their skills to use tablet PC.

1.2) Lack of skill

Four out of 28 respondents reported that they brought up the problem with touch screen in the groups. They needed to be careful with EDC because they were not skillful with it.

1.3) Negative attitude toward new technology

There were concerns that using tablet did not improve the writing skill. This was the negative attitude about new technology reported by 3 respondents. Moreover, three out of all respondents expressed their attitude with EDC before training. They thought it was difficult for them.

1.4) Require reading skill

Although EDC was designed to translate the questions in Karen language, one of the respondents stated that the interviewers still need reading skill. The interviewers needed to read before selecting the right item of the answer.

2) Instrumental factors

The instrumental factors explained about the physical problems that occurred with the tool consisted of two main aspects (i.e. devices and application)

2.1) Devices problem

The weakness of hardware of tablet PC which was used to build an electronic data capture tool (EDC) was reported by one respondent: short battery life.

2.2) Application Problems

2.2.1) Lack of restore function

The problems related to the application of EDC were also reported. Three of the respondents stated that the application could not retain the current screen in case that they switched to a different screen unintentionally. All data which has collected were gone.

2.2.2) Voice translation feature

There were three points that were reported as the problems in voice translation feature. The first problem was the mistranslation. The mistake for translation was also found in EDC. Some words in the questions and answers which were recorded since the EDC was developed were not correct. Thus, some the interviewees did not understand. The second was the sounds in voice translation were ambiguous. The problem was reported by two of the respondents. The third problem was the question, which was not separated from the answers. Thus, the questions and answers were asked in one time. The interviewee might be able to answer some questions even without the choice of answers. Therefore, it wasted time for interview.

2.2.3) Screen format

Two out of 28 respondents said regarding format on the screen. They noted that size of the letter on the screen was too small, which made them difficult to see.

Table 4.9 Theme and quote of the strengths by using the electronic data capture tool (EDC) for data collection.

Theme	Response No. (persons)	Quote
1. Ease/Comfortable to use	12/28	*"It [EDC] was O.K. for my first time. It is not too difficult more than my capability…… this tool should be promoted in the future because it is comfortable for those who work with……it's comfortable and easy,(V3.4).*
- Touch screen	3/12	*"It's not too confused. Just click…click and finished." (V3.3).*
- Carrying	3/12	*".....It is easy to bring to anywhere."(V3.3).*The other one was also said, *"We only click and let them listen….there was no need to carry many things, carry only one", (V1.7).*
- Camera feature	1/12	*"The paper needed to write, but tablet was only take a picture. We just take a picture and let them (Responsibility people) read themselves, (smiles) (V 1.5).*
- Easy to edit	1/12	*"If we write something wrong in paper questionnaire, we need liquid paper. But this one (EDC) we only click new answers." (V2.3)*
2. Quick	11/28	*"It was quick. As I have been to collect data. Using tablet for interview in four houses not take too long time. Just click and click."(V3.5)*
- Quicker than paper	5/11	*"Tablet was quicker than paper" (V1.1)*

Table 4.9 Theme and quote of the strengths by using the electronic data capture tool (EDC) for data collection. (cont.)

Theme	Response No. (persons)	Quote
3. Automatic translation	7/28	*"Using tablet for me was better. Did not need for translation. Only click for the answers." (V3.9).*
4.Complete information	2/28	***M:*** *From your experience of using tablet, please tell me about the advantage(s) that you have seen.* ***V1.5:*** *The advantage was that in case of the letter, we take a picture. So, we can see them in form of picture.* ***V1.6:*** *It has the detail more than using paper.* ***V1.5:*** *For the paper we needed to write down but this [EDC] was no need for writing. We just took a picture.* ***V1.6:*** *Related to taking a picture of DDT [IRS], in paper form, it did not have this function [photo capture feature] but there was this function in tablet. The information in tablet was much more than paper.*
- Screen was locked	1/2	*"Using EDC was better because if we did not complete all questions, it would not go to the next step, (Laughs)." (V 2.9).*

M = Moderator, ***V***= Volunteer

Table 4.10 Theme and quote of the weaknesses by using the electronic data capture tool (EDC) for data collection.

Theme	Response No. (persons)	Quote
Personal factors		
1. Unfamiliarity	6/28	*"I actually never touch it [EDC] before. Even my mobile I was not skillful with it……..this is the first time for me, (V3.4)".*
2. Lack of skill	4/28	*"For tablet, we need to be careful when we were holding……In some cases, we were not used it carefully, sometimes we accidentally touch the screen and everything was gone. We needed to start again (V2.2)"*
3.Negative attitude toward the new technology	3/28	*"In the future, the children in next generation will not write anymore. They will only click." (V1.1).*
	3/28	*"At first, I though tablet was difficult."(V3.7)*
4. Require reading skill	1/28	*"Once we click it will translate automatically, something like that. It has the letter for reading which was comfortable for those who can read. But for those who cannot read, it's quite difficult. It might be a barrier…….If they cannot read the topic, they cannot click precisely". (V3.4)*

Table 4.10 Theme and quote of the weaknesses by using the electronic data capture tool (EDC) for data collection. (cont.)

Theme	Response No. (persons)	Quote
Instrumental factors		
1.Device problem	1/28	*"When I went there to interview, I have not finished for one house yet. Battery run out", (V3.1).*
2. Application problems		
2.1) Lack of restore function	3/28	*"The data we have collected more than half. When we touch the screen, it will be deleted immediately. We need to start [to collect data] again." (V3.4)*
2.2) Voice translation feature	4/28	
- Mistranslation	2/4	*"Some words, they know but they did not understand clearly……some words we do not speak in this area."(V1.5).*
- Ambiguous sound	2/4	*"The sound was not too clear", (V.2.6).*
- Questions and answers were asked in one time	1/4	*"When we click the voice button, it might waste time. It told the question followed by the answers in one time. I only wait until the question finished then the interviewee answer immediately."(V3.5)*

Table 4.10 Theme and quote of the weaknesses by using the electronic data capture tool (EDC) for data collection. (cont.)

Theme	Response No. (persons)	Quote
Instrumental factors		
2.3) Screen format	1/28	*V1.5: "I think it (the letter) was too small. I need to wear the glasses" (smile).* *V1.6: "Cannot see it."*

Paper-based questionnaire

The results were also presented in two parts consisted of the strengths and weaknesses. All themes and quotes were presented in **Table 4.11-4.12.** The following described the summary of the results.

Strength of paper-based questionnaire

1) Easy to use

Eight out of 28 respondents noted that the paper questionnaire was easy to use. There were many reasons which made them feel easy when they used paper questionnaire such as they could speak their language (Karen language) and paper form was easy to write.

2) Good attitude toward paper

Five of the respondents showed the good attitude towards paper questionnaire. They believed that it could stimulate their writing skill.

3) Users' familiarity

Two of respondents brought up that they were familiar with paper questionnaire. Both of them have used paper questionnaire before regarding to malaria survey.

Weakness of paper-based questionnaire

The weakness of using paper-based questionnaire were also presented in two parts consisted of personal factors and instrumental factors. The details were explained as follows:

1) Personal factors

1.1) Translation problems

In the personal part, two of 28 respondents reported the issues regarding translation consisted of translation bias and mistranslation.

1.2) Data inaccuracy

According to the discussion among the group, two of the respondents reported that they did not go to the interviewees' house when they used paper questionnaire to interview. For the question regarding the brand of the net, they knew two types of bed net and they answered either one. It demonstrated that the data may not be accurate.

1.3) Lack of English skill

For the question asking about brand of bed net, there was a problem with the volunteer who were lack of reading and writing skills for English.

2) Instrumental factors

2.1) Physical problems

Five volunteers noted that they have to handle with the **physical problems** when they used paper questionnaire for interview such as the form got damaged, wrinkled and sometimes got wet.

2.2) Slow

Four out of 28 respondents felt that using paper questionnaire for data collection was slow. Some of them gave the reasons such as paper questionnaire required the time for reading, explanation and translation.

2.3) Self-explanation

Three of them demonstrated that they were not comfortable with paper questionnaire because they needed to explain all questions by themselves when they went to interview. Some of them compared between paper questionnaire and EDC.

2.4) Difficult to edit

The difficulty to edit when they used paper questionnaire was also reported by 3 out of 28 respondents. When they wrote something wrong in paper questionnaire, they needed liquid paper for edit.

Table 4.11 Theme and quote of the strengths by using paper-based questionnaire for data collection.

Theme	Response No. (persons)	Quote
1. Easy to use	8/28	*"Paper was also easy……. During the interview we read for them. We translated and they answered. We just checked." (V3.9).*
	1/8	*"Paper was also easy. However, we needed to speak our language [Karen language] which **we can speak**. So, it was easy."(V3.8).*
	2/8	*"It was **easy to write** when using paper questionnaire. When we arrived we read for them. Then, they answered." (V3.6)*
2.Positive attitude toward paper	5/28	*"If we use paper it will lead us to write" (V2.2).*
3.Familiarity	2/28	*"I often go to interview [using paper questionnaire] that the health care center ask me to do. I also interviewed about malaria many times."(V1.5).*

Table 4.12 Theme and quote of the weaknesses by using paper-based questionnaire for data collection.

Theme	Response No. (persons)	Quote
1. Personal factors		
1.1)Translation problems - translation bias - mistranslation	2/28	***M:*** *For Thai language that you read and explained, is it possible that you did not explain precisely? Suppose you have to explain the same questions to three or four persons. Is it possible that those who were interviewed they understood the same things? As you have to translate from Thai to Karen language.* ***V2.2:*** *The translations were different between those who were skillful in translation and those who were not skillful. If they were not, it was difficult to listen.* ***V2.10:*** *Especially the children in next generation, they cannot translate correctly.*
1.2) Lack of English skill	1/28	*"I did not know the brand of the bed net. Although I went there, I did not know. It was in English language, which I cannot read. If I wrote down, I was afraid that you could not read it (Laughs)." (V1.5).*

M = Moderator, ***V***= Volunteer

Table 4.12 Theme and quote of the weaknesses by using paper-based questionnaire for data collection. (cont.)

Theme	Response No. (persons)	Quote
1. Personal factors		
1.3) Data inaccuracy	2/28	***V1.6:*** *For paper we don't need to go to their houses. For instance, we work together; we can interview them [at the place where they work]. But for tablet we need to go to their houses.* ***M:*** *It's true.* ***V1.1:*** *For paper, we don't need to go to their houses, just sit and talk [wherever we meet]. Ask them about their family number, the number of bed net…something like this. That's it.* ***M:*** *How can you know the brand of bed net if you did not go to their houses?* ***V1.6*****:** *I don't know. I know only the treated net or untreated net.*

M = Moderator, ***V***= Volunteer

Table 4.12 Theme and quote of the weaknesses by using paper-based questionnaire for data collection. (cont.)

Theme	Response No. (persons)	Quote
2. Instrumental factors		
2.1) Physical problems	5/28	*"The problems (for paper questionnaire) were that it got wrinkled and wet."(V2.4).*
2.2) Slow	4/28	*"I think it was slow. (Pause) It was slow."(V2.6).* *"It was slow because we needed to read, explain and translate."(V1.4)*
2.3) Self-explanation	3/28	*"We needed to explain ourselves (paper questionnaire)". (V2.10)* *"For tablet, we just click and it will translate itself. They listened. Then we click the right answer. But for paper questionnaire, we needed to read for them [the interviewee] first."(V1.1)*
2.4) Difficult to edit	1/28	*"If we write something wrong in paper questionnaire, we need liquid paper. But this one [EDC] we only click new answers." (V2.3)*

There were strengths and weaknesses of both methods for collecting data. The summary of the strengths and weaknesses of both methods were presented in **Figure 4.6** and **Figure 4.7.** Training was also the important step for data collection in both methods. This topic was reported by 7 respondents. One of them stated, *"At first, I cannot use it [EDC], but I can use because I have been trained."(V3.3).* One out of 7 respondents was also said about how the training was important for the interview using paper questionnaire, *"In case that we understand the topics [questions, we can ask them [interviewees]. "If we do not understand, we cannot ask in each item or each topic."(V1.5).*

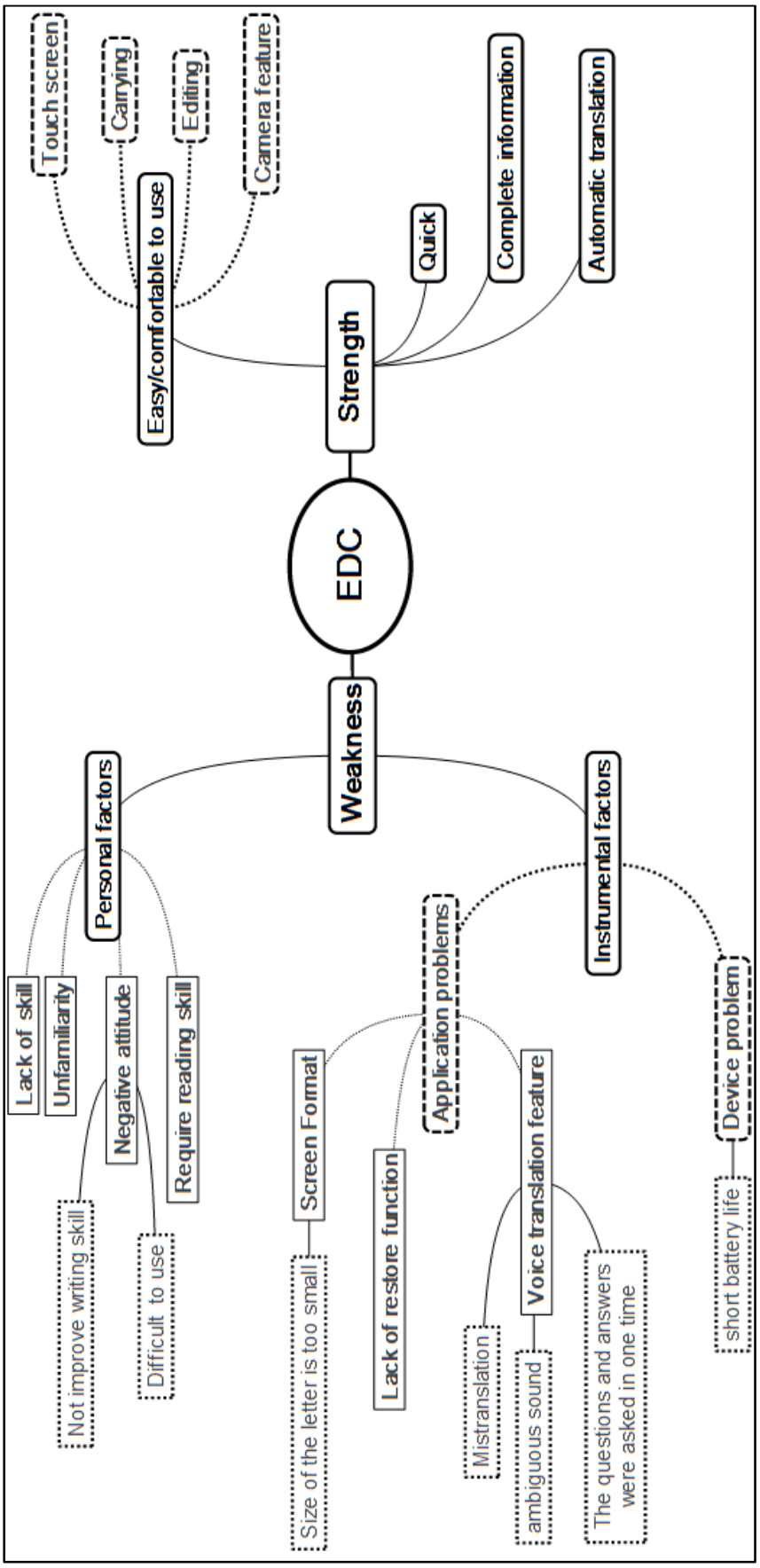

Figure 4.6 The summary of strengths and weaknesses of using the electronic data capture tool (EDC) for data collection.

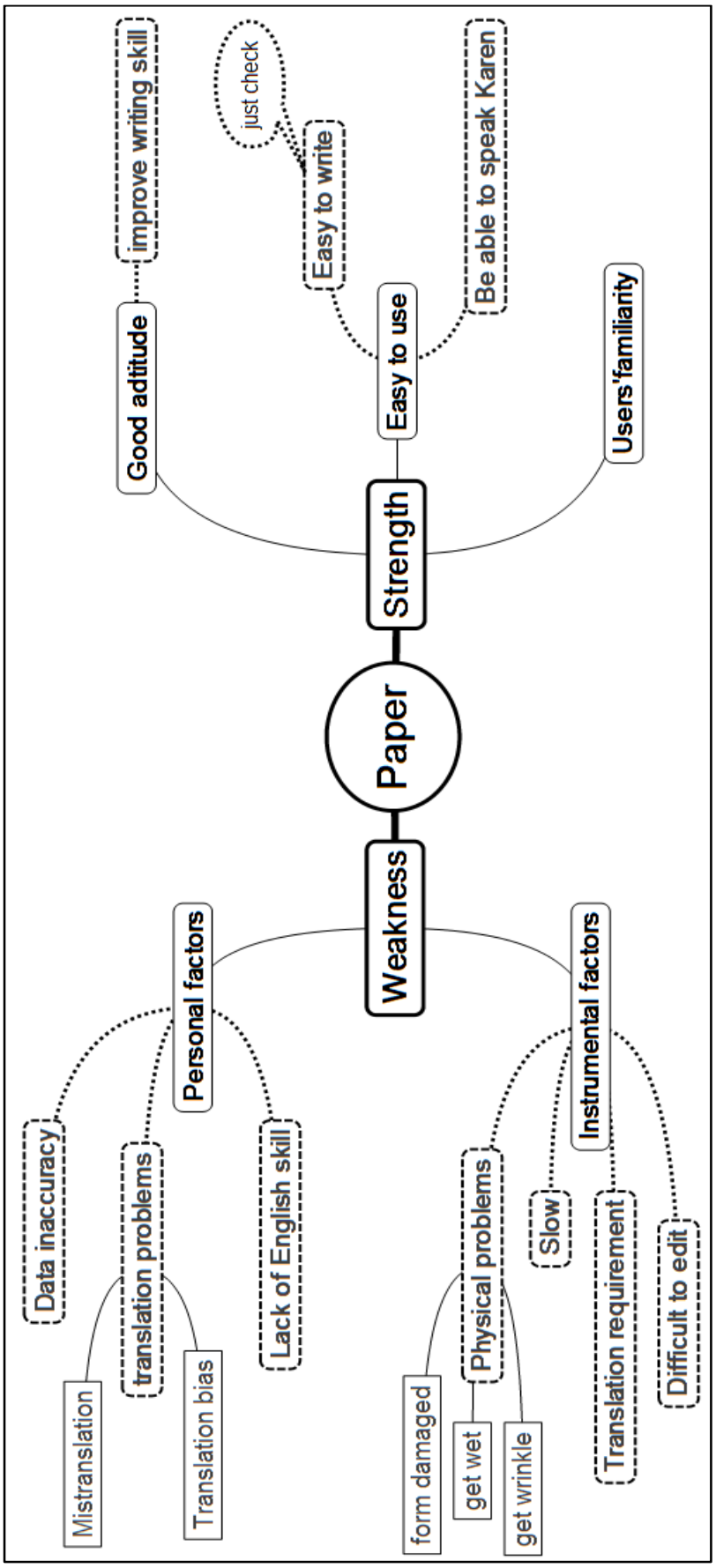

Figure 4.7 The summary strengths and weaknesses of using paper-based questionnaire for data collection.

CHAPTER V
DISCUSSION

The present study has developed and implemented the electronic data capture tool (EDC) for data collection among Karen hill tribe population. The comparison between the electronic data capture tool (EDC) and paper-based questionnaire was also investigated. The discussion of the findings was presented as follows:

5.1 Tool development and implementation

The electronic data capture tool (EDC) consisted of two main parts. First was the device for installing the application. This study selected tablet Samsung galaxy 7.0 plus and it showed the good performance. The second main part was the android application for data collection, which was common system in the present day.

During the design phase, there was an emphasis on the user interface, which was seen as the most important part of application design. For cross checking, the questions and answers were translated from Thai to Karen language twice by two different volunteers. The less confident volunteer, a 31 years- old woman was put to the first volunteer while the second translation was performed by a 56 years-old volunteer who lived in the study area for a long time. Particularly, he had a good skill of speaking, reading and writing in both Thai and Karen language. There were some disagreements with the two translations. The investigator decided to assign the second translator to be the verified one since he had language experience and translating confidence. The voice translations run well in the testing phase. All the volunteers understood the translated questions and answers.

During the workshop training, the technical problems were found. For example, the application stopped responding during data collection, the flashlight

couldn't be turned off after taking picture. Yet, the technical support team was there to help on the training day. Thus, all problems were fixed immediately by the programmer. The telephone number of the investigator was given to all volunteers such that the investigator could provide on-line support while collecting data. Training was the important step stated by the community health volunteers who had to use the EDC in their job.

In the implementation phase, each of the community health volunteers went to four different houses to interview. Only one out of thirty volunteers made a call for some technical support. On average, one to two days was spent for interview in the four houses. The EDC contained of three main features (i.e. voice translation, photo capture, GPS).

The community health volunteers were satisfied with voice translation feature. As it helped them to interview without their manual translation, *"Using tablet for me was better. Does not need for translation. Only click for the answers." (V3.9).*

However, mistranslation still occurred during the implementation of the EDC. This was reported by one respondent in the focus group discussion. Some words in the questions and answers, which were recorded since the EDC developed, were not correct. This problem may have occurred because of some culture differences. Karen language in the study area can be further divided into two groups i.e. Kareang and Karang. Although the speaking was similar, some words were different. Moreover, there were some mixtures with Thai language.

Some of the respondents reported that the sound in voice translation were ambiguous during the interview. It may have occurred because of two reasons i.e. the problem caused by the quality of the device or the characteristic of the Karen respondents who may be very old and cannot listen to the voice well. Moreover, the question was not separated from the answers and they were asked in one time. Therefore, it wasted time for interview. This caused by the application design since the design phase.

The photo capture feature was also favorable among the community health volunteers. They could just taking picture of the bed net brands in English without any effort of reading, writing or guessing. *"The paper needed to write, but tablet was only to take a picture. We just took picture and let them (Responsibility people) read*

themselves, (V 1.5). This feature allowed the local volunteers who could not read English to go to collect data. It also leaded to the completeness of information gained from the interview as we could see all data in the picture.

V1.5: *The advantage was that in case of the letter, we took a picture. So, we can see them in form of picture.*

V1.6: *It had the detail more than using paper.*

V1.5: *For the paper, we needed to write down but this [EDC] did not need any writing. We took a picture.*

V1.6: *In case of taking a picture of DDT [IRS], in paper form, it did not have this function [photo capture feature] but there was this function in tablet. The information in tablet was much more than paper.*

The last main feature was GPS feature, which was the additional function of EDC. Some of the community health volunteers reported that they needed to wait for GPS to capture the current position. The time for capture the position depended on the satellite signal, which might take time in some areas. However, with GPS feature, we could capture some improper data collection. We could check whether the interviewers actually went to the real place or not. It was available for cross check while in case of paper-based we could not check.

5.2 Tool assessment and comparison

5.2.1 General characteristics of the respondents

There were two groups of the respondents, i) 30 of community health volunteers and ii) 120 of Karen respondents. Regarding the community health volunteers who were the interviewers, more than half of them were female and completed primary or elementary school. The common age group was 30 years old or younger and almost half were employees. The demographic characteristics of community health volunteers in both group were not different when they were divided into two groups. In case of Karen respondent, the majority of the Karen respondents who were the interviewees were also female. Most of them were 40 years old or

younger. More than half of them were the employees. There was the main difference in education: most of Karen respondents were uneducated.

Because of the long establishment of The Rajanagarindra Tropical Disease International Centre (RTIC), the response rate for this study was 100% in both groups. The familiarity among the RTIC staffs and the local people and the willingness to participating in the study had made it possible to collect all the data required.

5.2.2 Comparison of time consumed of using an electronic data capture tool (EDC) and paper-based method for data collection.

The second objective of this study was to compare time consumed of the two methods for data collection. The result suggested that time consumed for data collection were different i.e. time consumed by using paper-based questionnaire was less than using an electronic data capture tool (EDC).

The findings in the current study are opposed to the finding from Thwin *et al*. The EDC in their study was computer-based automated menu-driven EDC system using Microsoft® Access 2000. They concluded that EDC helped to reduce the time during data collection process (46). The research conducted by Ruf H. D., 2012 in the educational field also concluded that using an electronic data collection was less time requirement for data collection compared with the traditional paper-based method (45).

On the other hand, Thriemer *et al*. also showed the higher performance of electronic method. They compared personal digital assistants (PDA) with paper-based data collection in a fever surveillance study. Importantly, they suggested that the benefits of using an electronic data collection were direct data entry and direct data transfer (21). I also agreed with them because EDC did not require double data entry and the data were transferred directly to the server. As opposed to paper-based, there was a need to enter data after the paper questionnaires was collected. This issue was also stated by Walther *et al*.: the duration for the interviews by using paper questionnaire was less than using EDC during the short period of EDC introduction. However paper questionnaire required double data entry and verification. Thus, using EDC was more time effective than the standard paper-based data collection method (22).

The result regarding time consumed in the present study can be effected from two main sides i.e. the interviewers and the interviewees. From observation on the

interviewers side (the community health volunteers), one possible explanation may be due to time spent on taking picture. As stated in the qualitative part, many had admitted that they were not familiar and not skillful with EDC. *"I actually never touch it [EDC] before even my mobile I was not skillful with it……this is the first time for me, (V3.4)".* Also, they were allowed to delete and re-take a picture more than one shot were taken in many cases. The issue of the voice translation may be related. For paper questionnaire, the interviewee can answer the question without listening to the answer from the interviewer. But for EDC, the questions and answer were asked in one time. Thus, they needed to wait until finished, this could be relatively time consuming. This point stated by one of the community health volunteers, *"When I click the voice button, it might waste time. The question was asked followed by the answers in one time. I only wait until the question finished then the interviewee answer immediately."(V3.5)*

The time consumed was also affected by the interviewees (Karen respondents). The findings suggested that time consumed of being interviewed by EDC was different between gender: the time consumed of female interviewees was less than male interviewees. The possible explanation from the observation was the culture of the Karen people in the study area. Female usually stays at their houses to take care of the children and does the household work while male goes out to work. Thus, the female interviewees may know the detail in her houses more than male, who always go out to work. For example, when they were asked to show their bed net, female may know more than male where it was kept.

When the time consumed by using two methods was compared within each groups of the respondents who gained the experience with two methods in reverse order, the difference of time consumed were not found in both groups. Based on the result in **Table 4.3**, the minimum time consumed of using EDC was only 2 minutes which it was too short. The finding after the raw data was checked was that there were four houses taking time 2 minutes collected by two of the community health volunteers. The first of the community health volunteers performed all tasks completely. But the second one did not take a picture from all houses although the numbers of the bed net were recorded. However, the positions collected by GPS were from four different places. The number of the bed net was also consistent with data in paper-based questionnaire. It was possible that either the community health volunteer was not allowed to take a picture in the

second round of data collection or the interviews were performed in another place where it was not the interviewees' houses. For example, they met each other at work and the interviews have done over there.

In paper-based questionnaire, one of the community health volunteer spent time only one minute to complete the questionnaire from one out of four houses under his responsibility. The numbers of bed net in paper-based questionnaire were consistent with EDC. Nevertheless, the brands of bed nets were not recorded in paper. The community health volunteer recorded only treated net instead of brand in paper, which was different from EDC that the brand of bed nets were kept in the pictures. This also showed one of the strength of EDC: it did not require English skill of the users and lead to more accurate data.

It is important to consider the time required to develop the EDC application. The time for programming, testing and modifying could be timely. For the current study, it took almost two months for the process mentioned above. Cost was also a significant issue to be considered.

5.2.3 Comparison of interviewers and interviewees' satisfaction of an electronic data capture tool (EDC) and paper-based questionnaire

Generally, both Karen respondents (the interviewees) and the community health volunteers (the interviewers) were satisfied with two methods for data collection. But, they were more satisfied with EDC than paper-based questionnaire in all dimensions (i.e. format, ease of use, system speed and the overall satisfactions).

In case of paper questionnaire, both sides of respondents were most satisfied with ease of use dimension. It showed that paper questionnaire was easy to use for interview either for the interviewers or the interviewees. During the focus group discussion, one of the community health volunteers also said, *"Paper was also easy……. During the interview we read for them. We translate and they answer. We just check." (V3.9).*

According to …., there were many projects having done in the study area and the interview using paper questionnaire was the most common way to study. So, both side of respondents may be familiar with traditional paper-based methods and felt that it was easy. The volunteers were also reported in the discussion that they have used

paper questionnaire many times. *"I often go to interview [using paper questionnaire] that the health care center ask me to do. I also interviewed about malaria many times."(V1.5).*

In contrast, both sides of the respondents were less satisfied with ease of use of EDC. The EDC was very new for them and it was possible that they were not familiar with EDC like one of the community health volunteer stated, *"I actually never touch it [EDC] before. Even my mobile I was not skillful with it……this is the first time for me, (V3.4)".* Thus, the EDC may difficult for them to become skillful compared with paper questionnaire.

Interestingly, system speed was the most satisfied dimension for the respondents. Even though during focus group discussion, almost half of the community health volunteers mentioned that using EDC was quick for interview. *"It was quick as I have been collected data. Using tablet for interview in four houses did not take too long. Just click and click."(V3.5).* Moreover, some of them reported that using EDC was quicker than paper questionnaire, *"Tablet was quicker than paper" (V1.1).* The possible explanation may be their attitude towards new technology. Most of the respondents in both groups have never seen tablet PC which used as EDC. They might feel it was better than using traditional paper method. Another possible reason may be the functions on EDC such as voice translation or camera feature. These might make them feel excited and entertained. Thus, time became less of an issue to them during the interview.

The satisfaction with system speed was also correlated with the overall satisfaction of the community health volunteers while the format and ease of use were not. The result were similar with some part of the prior research by Iliasa *et al*.(60), system speed was one of seven factors which correlated with the users' satisfaction of computerized accounting system (CAS). But, they were also found the relationship between formats and ease of use with the users' satisfaction which were different from the present study. Similar conclusion can be seen on user satisfaction regarding physician order entry (POE) in Brigham and Women's Hospital (BWH) in Boston (58). The finding also showed that the user satisfaction was correlated most strongly with system speed. Yet, the ease of use was also correlated with the user satisfaction which was unrelated with this study.

5.2.4 The user acceptance of an electronic data capture tool (EDC) among community health volunteers

The current study also applied the technology acceptance model (TAM). The model was used to investigate the current position of the acceptance of the community volunteers who have used EDC for interview. The result suggested that most of them recognized the usefulness of EDC and perceived that EDC was easy to use. Also, they were willing to use EDC in their job if they had an opportunity to use. These showed that the EDC was the acceptable method for the community health volunteers.

Similar results can be found in Wan et al.' research conducted in a health-related survey among a hard-to-reach population in China. The Chinese interviewers used handheld computers (PDA) for data collection (HCDC). The results suggested that HCDC was acceptable, and preferred method for Chinese interviewers although some technical problems have occurred during data collection process. (15). Consistently, Abernethy et al., 2008 conducted pilot study among 66 breast cancer patients in Primary/Duke Breast Cancer Clinic in United States. Data was collected using both paper based form and e/Tablet-based form. The findings also displayed the acceptability of using tablets PC for collecting data (14).

However, three of the community health volunteers were not agreed in some items. One out of three, 45 years old male, strongly disagreed with 2 items in perceived usefulness (PU) construct. During focus group discussion, he reported that using EDC for collecting data was quick. However, he faced the challenge regarding taking picture of bed net. In some cases, he was not allowed to take a picture of bed net due to the condition of bed net: *"Some houses, they did not want me to take a picture of bed net. They said their bed net were very old and dirty. So they did not want me to take a picture" (V1.9).*

His report was supported by the data in EDC that he collected. The picture of bed net from one out of four houses was very dirty which was shown in **Figure 5.1.** Also, another house, the Karen respondent answered that he or she had two bed nets but there was no picture in the EDC. Thus, it was possible that the Karen respondent did not allow him to take a picture of bed net and these might affect his feeling and made him think that using EDC was not useful for him.

Figure 5.1 Bed net condition

The second case was 46 years old female with no education. She answered disagree in three items within ease of use construct. As she was uneducated it might affect her skill when using EDC. From the observation during the training workshop, she was not assertive and could not use EDC skillfully. During the focus group discussion, she was so quiet. Importantly, her husband who participated in different group reported that she was not skillful using EDC due to her reading skill.

He said *"For tablet she did not help me, in contrast, I need to help her because she could not read proficiently……..for those who could not read well, they could not read the topic and they could not touch accurately."(V.2.8, Male, 50)*

Thus, the education might affect the reading skill. When she could not read well, it was difficult for her to use the EDC. It was shown that using EDC for data collection also required reading skill of the interviewer. These were the possible explanations on why she felt the EDC was not easy to use.

The last case who answered disagree in two items within ease of use construct was a 33 years old female who completed high school. All of her answers ranked between disagree, neutral and agree. From the discussion, she suggested that using EDC could get more detail, faster and easier to carry compare with paper-based questionnaire. The results from data collection by using EDC were good, which indicated that she could use it well. Yet, she also reported the weaknesses of EDC regarding the screen format.

She stated *"I cannot see it [the letter on the screen]"*. Moreover, she stated the inconvenience of going to interview in the Karen houses. As she mentioned *"using*

paper we don't need to go to their houses. For example we work together I can interview at work, but for tablet I need to go to their houses". V.1.6 (Female, 33). According to these weaknesses, she might perceive that EDC was not easy to use.

The relationship between three constructs (i.e. perceived usefulness (PU), perceived ease of use (PEOU) and intention to use (ITU)) were also investigated. The correlation was found only between perceived usefulness (PU) and perceived ease of use (PEOU). The finding was consistent with prior research (84), which was conducted among Biomedical Science students in two public universities in Malaysia. They also found strong relationships between perceived ease of use (PEOU) and perceived usefulness (PU). Additionally, the relationship between intention to use (ITU) and perceived ease of use (PEOU) and perceived usefulness (PU) were also found. Those relationships were not found in the existing study.

In this study, the community health volunteers felt that using EDC was useful and it was easy to use. Nonetheless, two constructs (i.e. perceived usefulness (PU) and perceived ease of use (PEOU)) were not correlated with their intention to use. The possible explanation was that the EDC was not the technology that they could use by themselves. It had to be someone giving the tool to them to use. In this study, they were forced to use the EDC. Thus, they do not have intention to use from their own. They did not intend to use this technology by themselves unless someone provided it to them. Another possi explanation was that there were three community health volunteers who answered disagree and strongly disagree in some items but answered either agree or strongly agree with intend to use item.

5.2.5 The strength and weakness of using an electronic data capture tool (EDC) and paper-based method

Since the sample size of the community health volunteers was small (n = 30) the qualitative study was performed in order to support the quantitative part. Most of the community health volunteers (28 of 30 persons) participated in one of the three focus group discussion. The main objective was to explore the strength and weakness of using an electronic data capture tool (EDC) and paper-based method for data collection.

In the discussion, the strengths and weaknesses of both methods were compared by topic, which gained from focus group discussion presented in **Table 5.1**. The first topic was related to **the ease of use and comfortable to use.** For EDC the community health volunteers impress with touch screen and photo capture feature which were special function of EDC. They also brought up that using EDC was easy to carry and edit. Hess *et al*., evaluated the ease of use with a self-administered tablet computer-based questionnaire among the patients in a university-based primary care practice. They also suggested that a self-administered tablet computer-based questionnaire was not difficult among the majority of patients (16). In terms of paper-based questionnaire, they also stated that it was easy to use but difficult to carrying and editing.

For the **speed of interview**, the community health volunteers reported that using EDC they could finish the interview quickly and quicker than using paper questionnaire. Some of them gave the reasons such as using paper questionnaire required time for reading, explanation and translation. This point supported the result in the satisfaction of the community health volunteers: they were most satisfied with the system speed of EDC. As discussed earlier, this could be due to their perspective and attitude towards EDC.

They also talked about the **translation** as using EDC the questions and answers were translated automatically but using paper questionnaire they needed to translate by themselves. This was one of the main features of EDC which was developed essentially for communicating with the Karen respondents. Once the interview was performed, the **translation bias** could be occurred when using paper questionnaire due to the different translation skill of each volunteer. Using EDC showed the strength of providing standard questions and answers every time. However, the weakness such as **mistranslation** was reported in both methods. The mistranslation of using paper questionnaire was effected by the interviewers' skill while in EDC it was affected by the voice translation feature design since the voice was recorded.

Although EDC was designed to translate the questions in Karen language, **reading skill** was reported as the barrier of using EDC: they needed to read the answers on the screen before they answered. However, using EDC could also **get more complete information** than using paper questionnaire. It was similar to Gallihe *et al.*'s study with EDC, tablet computers or cell phones which can link via a wireless network directly.

The study was conducted in an office-based patient interview survey. They were also concluded that it can produce more complete data than the paper method (17).

In the current study, this strength was affected directly by the photo capture feature. During the interview there were two questions which required some pictures taken (i.e. brand of bed net and indoor residual spraying (IRS) record). Thus, all details were kept in the picture. For the detail of IRS record, the purpose of taking picture was to count how many time they received IRS within the last 3 year. In case of the brand of bed net, the brand names were in English such as Permanet and Olyset, they needed to check the right answer in paper questionnaire. Since they used EDC they took a picture of bed net brand and IRS record instead of checking brand in the box or writing the number of receiving IRS. The point is that for IRS record, taking picture allowed the investigator to see more data in every year. For the brand of bed net, the interviewer did not need to read or guess the brand in English. Thus, it did **not require English reading skill** for the questions regarding brand of bed net. This strength of EDC could help the community health volunteers to overcome the barrier concerning English reading skill. Taking picture not only helped to gain more detail but also prevented the wrong answer. However, the skill for using camera to take a picture was also important. Some pictures from the study were not clear. So, they were useless and resulted in missing data or wrong information. The quality of the camera should also be considered because it could affect the quality of data in the picture. Another point leading to complete information was about the application design regarding the screen automatic locked. In case the user did not complete all questions in the current screen, the application would not allow the user to go to the next screen. So, the data was complete in all cases when using EDC.

Another issue was the **data accuracy**. For paper questionnaire, some of the interviewers did not go to the Karen's houses. In some cases, they met each other at work and conducted the interview. Thus, the information gained from the interview may be inaccurate particularly the information regarding brand of bed net and IRS receiving. Lack of English reading skill also made them difficult to record the answers regarding brand of bed net in the paper questionnaire. This point might be related to data accuracy as well. In contrast, using EDC showed the strength of getting more accurate data as the interviewer needed to go to the Karen's houses for taking pictures.

There were many strengths of EDC though the users were more **familiar** with paper questionnaire than tablet PC as they have used paper questionnaire before from the previous surveys. This point also influenced their skills for using ECD. For those who have never used EDC before, they were not familiar with it. So, it was hard for them to be **skilful with EDC**. Some of the respondents showed their negative **attitude towards EDC** since they have not used it. They thought it was difficult for them to use. They also thought that using tablet did not improve their writing skill compared to using paper questionnaire.

The common **physical problems** of paper questionnaire were reported such as form damaged, got wrinkled and wet. These were the true weaknesses of paper which inspired the investigator to develop a new instrument for data collection. For EDC, the problem with the tablet **hardware device** was the short battery life. This issue could be addressed by the device selection.

The problems due to the application of EDC were also reported. The popular finding was the lack of restore function in the application of EDC. If they switched to a different screen, the current screen in questionnaire could not be restored. The issues on voice translation feature were also found in EDC. The first issue was the mistranslation, which was introduced since the voice was recorded. The second was the ambiguous sound which occurred when the voice was opened during the interview. Lastly, the questions and answers were asked in one time. Moreover, size of the letter was too small on the screen format. All of challenges with the application were affected from the application design.

Training was also the important step for data collection stated by 7 of the respondents. Proper training could help the respondents to use both methods for data collection. This finding was consistent with Walther et al.'s conclusion (22). They compared the duration of data capture and accuracy among four electronic data capture (EDC) methods (i.e. PDA, Netbook, Tablet PC, telephone and paper-based approach). They suggested that, providing appropriate training and adequate support, the field workers and nurses would be able to use electronic devices and software for EDC.

Table 5.1 Comparison of the strengths and weaknesses of using EDC and paper-based questionnaire for data collection.

Topics	EDC		Paper	
	Strength	**Weakness**	**Strength**	**Weakness**
1.Easy/Comfortable to use				
- Touch screen	✓		N/A	N/A
- Photo capture feature	✓		N/A	N/A
- Carrying	✓			✓
- Editing	✓			✓
2.Speed of interview	Quicker			Slower
3. Translation	Auto			Manual
- translation bias	✓			✓
- mistranslation	✓			✓
4.Require reading skill		✓		✓
5.Complete information	✓			✓
6. English reading skill	Not require			require
7.Data accuracy	✓			✓
8. Users' familiarity		✓	✓	
9. Lack of skill to use		✓		
10. Attitude towards the tool				
- Improve writing skill		✓	✓	
- Difficult to use		✓		
11. Hardware/physical problem		short battery life		Get wet, Form damage
12. Application problems		✓	N/A	N/A
12.1) Lack of restore function			N/A	N/A
12.2)Voice translation feature			N/A	N/A
- Mistranslation		✓	N/A	N/A
- Ambiguous sound		✓	N/A	N/A
- Questions and answers were asked in one time		✓	N/A	N/A

Table 5.1 Comparison of the strengths and weaknesses of using EDC and paper-based questionnaire for data collection (cont.)

Topics	EDC		Paper	
	Strength	**Weakness**	**Strength**	**Weakness**
12.3) Screen format			N/A	N/A
- The letter was too small		✓	N/A	N/A

CHAPTER VI
CONCLUSION

6.1 Summary of the study

The development and implementation of the electronic data capture tool (EDC) in this study was successful. Filed testing was important as it helped in the improvement of tool design and the implementation process. The highlights of the study were summarized as follows:

The time consumed for data collection was significantly different between the two methods: time consumed for data collection by using paper-based questionnaire was less than using the electronic data capture tool (EDC). Both interviewers (the community health volunteers) and interviewees (Karen respondents) were, however, more satisfied with EDC than paper-based questionnaire in all aspects (i.e. format, ease of use, system speed and the overall satisfaction). Among the community health volunteers, the satisfaction with system speed was correlated with the overall satisfaction of using EDC. The overall satisfaction with paper-based questionnaire was associated with the format. As for Karen respondents, the overall satisfaction was associated with all aspects in both methods.

In terms of the user acceptance, it suggested that the EDC was an acceptable method for data collection by the community health volunteers as they were willing and intending to use the EDC in their job. Moreover, the perceive usefulness was associated with perceive ease of use but both constructs were not correlated with the intention to use. The evidence from the qualitative study pointed out that using the EDC for data collection was beneficial as it was easy, quick and guaranteed complete information. The special feature such as the automatic translation was considered as the main strength. However, the users complained about some technical problems they came across while operating the devices and running the application. Training was the important step in the implementation phase. Proper training helps the users overcome

these difficulties and increases their IT skill as well as confidence. Good attitudes toward the new tool can also be formed. Users were much more familiar paper-based methods as they have been traditionally used for data collection. However, the common weakness such as physical problem was widely known. The current study showed further weakness of paper-based in terms of requirement of language skill to communicate with the Karen hill tribe population during the survey. The finding suggested that using paper questionnaire in malaria vector control survey caused data inaccuracy.

This pilot study concluded that both methods had their strength and weaknesses. Choosing the appropriate data collection method should be considered in the planning step. The EDC proved to be more appropriate tool for the malaria vector control survey among Karen hill tribe population. Importantly, the tool could not be improved without the field testing and the implementation could not be successful without the proper training.

6.2 Limitation of the study

Although, the EDC was successful for data collection, the current study has done in the specific population. Since the EDC was designed to collect data in malaria vector control survey among Karen hill tribe population, it cannot be applied with the others ethnic minority groups. However, the concept of this study can be applied in the further study.

6.3 Implication and Recommendation

The development and implementation of the electronic data capture tool (EDC) in this study had main implications for the malaria vector control survey in field data collection process. The use of the EDC could set a good example for similar kinds of studies where population consisted of various tribes and nationalities. The developing of the EDC in the further study may include other languages of ethnic minority groups in difference areas in order to understand the situation comprehensively. Using different devices for collecting data in malaria vector control survey were also promising choices.

User's opinion was highly valuable for tool development. Thus, inviting the actual user to participate in the working team during the designing phase was also recommended. Regarding the users' satisfaction, system speed, device capacity and user interface were essential components to consider during the software or application design. During the development process, testing should always be performed. Finally, good training could lead to a successful implementation.

Direct comparison between the electronic and traditional paper-based methods as well as identifying their strengths and weaknesses can assist the decision maker when selecting appropriate data collection approach. Nevertheless, the measurement of the time consumed in this study was only a small part of data management. In order to understand widely, the measurement of total time consumed for data management starting from data collection until making the reports was recommended.

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APPENDICES

APPENDIX A
CERTIFICATE OF ETHICAL APPROVAL

MUTM 2013-056-01

CERTIFICATE OF ETHICAL APPROVAL
Ethics Committee of the Faculty of Tropical Medicine, Mahidol University
420/6 Ratchawithi Rd., Ratchatheewee, Bangkok 10400, Thailand

This Certificate of Ethical Approval (MUTM 2013-056-01) applies to the

Project entitled: Paper-based versus electronic data capture tool for malaria vector control survey among Karen hill tribe population

EC Submission No.: TMEC 13-058

with the following relevant documents:

1) Research proposal (FTM ECF-019-02); English version 2 date 15 October 2013
2) Participant Information Sheet (FTM ECF-020-00); Thai version (date not affixed)
3) Informed Consent Form (FTM ECF-021-02); Thai version (date not affixed)
4) Questionnaire; Thai version (date not affixed)
5) Questionnaire; English version (date not affixed)

Principal Investigator: Ms. Siriporn Monyarit

Advisor: Dr. Wirichada Pan-ngum

Affiliation: Department of Tropical Hygiene,
Faculty of Tropical Medicine, Mahidol University

This project has been approved for the period
from 18 October 2013 to 17 October 2014

The Ethics Committee of Faculty of Tropical Medicine certify that we are in compliance with Declaration of Helsinki, ICH Guidelines for Good Clinical Practice and other International Guidelines for Human Research Protection.

Signature .....
(Prof. Dr. Srisin Khusmith)
Chairperson (Panel 2)
Ethics Committee of the
Faculty of Tropical Medicine
Date 18 OCT 2013

Signature .....
(Mrs. Pornpimon Adams)
Member and Secretary
Ethics Committee of the
Faculty of Tropical Medicine
Date 18 OCT 2013

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APPENDIX B
PARTICIPANT INFORMATION SHEET FOR THE COMMUNITY HEALTH VOLUNTEERS

เอกสารชี้แจงผู้เข้าร่วมการวิจัย

(Participant Information Sheet)

ในเอกสารนี้อาจมีข้อความที่ท่านอ่านแล้วยังไม่เข้าใจ โปรดสอบถามหัวหน้าโครงการวิจัย หรือผู้แทนให้ช่วยอธิบายจนกว่าจะเข้าใจดี ท่านอาจจะขอเอกสารนี้กลับไปอ่านที่บ้านเพื่อปรึกษาหารือกับญาติพี่น้อง เพื่อนสนิท แพทย์ประจำตัวของท่าน หรือแพทย์ท่านอื่น เพื่อช่วยในการตัดสินใจเข้าร่วมการวิจัย

ชื่อโครงการ (ภาษาไทย) "แบบสอบถามรูปแบบกระดาษกับเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง"

ชื่อผู้วิจัย นางสาวสิริพร มนยฤทธิ์

สถานที่วิจัย หมู่บ้านในตำบลตะนาวศรี อำเภอสวนผึ้ง จังหวัดราชบุรี

ผู้ให้ทุน The Rockefeller Foundation และคณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล

โรคมาลาเรีย

โรคมาลาเรียเป็นโรคติดต่อ เมื่อยุงก้นปล่องมากัดคน ยุงจะปล่อยเชื้อมาลาเรียมาสู่คน ซึ่งยุงนี้เรียกว่าเป็นพาหะนำโรคอาการของโรคมาลาเรียไม่มีอาการเฉพาะ เริ่มแรกจะคล้ายกับเป็นหวัด คือ มีไข้ต่ำๆ ปวดหัว ปวดเมื่อตามตัวและกล้ามเนื้อ หรือคลื่นไส้ เบื่ออาหาร ต่อมาผู้ป่วยจะมีการจับไข้หนาวสั่นเป็นเวลา หากปล่อยไว้ไม่ได้รักษาอาจทำให้เสียชีวิตได้ ในประเทศไทยแหล่งของเชื้อมาลาเรียอยู่บริเวณป่าเขาชายแดนของประเทศ โดยเฉพาะบริเวณชายแดนไทยพม่า- การสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรีย เช่น การใช้มุ้งชุบสารเคมี หรือการฉีดพ่นสารเคมี เพื่อป้องกันยุงที่จะแพร่เชื้อมาลาเรีย เป็นการสำรวจที่ทำโดยทั่วไปตามพื้นที่ที่มีการแพร่เชื้อ

เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์

เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ คือ แบบสอบถามรูปแบบใหม่ที่ใช้ในการเก็บข้อมูล เครื่องมือนี้สามารถอ่านคำถามและคำตอบเป็นภาษากะเหรี่ยงได้ การใช้งานเพียงแค่ใช้นิ้วสัมผัสบนหน้าจอของเครื่อง บางข้อคำถามใช้การถ่ายรูปแทนการถามคำถาม นอกจากนี้ยังมีระบบบอกตำแหน่งที่ตั้ง

วัตถุประสงค์ของการวิจัย การศึกษานี้จัดทำขึ้นเพื่อสร้างเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ใช้ในการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรีย ในประชากรชาวเขาเผ่ากะเหรี่ยง ซึ่งถือว่ามีความเสี่ยงสูงในการเป็นโรคมาลาเรีย และการเก็บข้อมูลยังคงมีอุปสรรคทางด้านภาษาในการสำรวจและเก็บข้อมูล นอกจากนี้จะมีการเปรียบเทียบระหว่างการใช้แบบสอบถามกระดาษกับการใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ที่ได้ถูกสร้างขึ้นในการเก็บข้อมูล และค้นหาข้อดี ข้อเสียของวิธีการทั้งสอบแบบ ตลอดจนสอบถามความคิดเห็นของผู้ที่ใช้เครื่องมือแบบอิเล็กทรอนิกส์ ซึ่งยังถือเป็นเทคโนโลยีสมัยใหม่ การศึกษานี้มีประโยชน์ที่คาดว่าจะได้รับคือ เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ที่ถูกสร้างขึ้นจะเป็นจุดเริ่มต้นของการพัฒนาเครื่องมือที่มีประสิทธิภาพสำหรับเก็บข้อมูลเรื่องการควบคุมพาหะนำโรคมาลาเรียในประชากรกลุ่มชาติพันธุ์ในอนาคต และยังสามารถเป็นตัวอย่างให้กับการศึกษาอื่นๆ ที่มีผู้เข้าร่วมหลากหลายภาษา และชาติพันธุ์ ผลที่ได้จากการศึกษานี้ยังสามารถช่วยในการตัดสินใจเลือกวิธีการเก็บข้อมูลได้อย่างเหมาะสม นอกจากนี้ยังจะถูกนำไปใช้เพื่อปรับปรุงเครื่องมือให้ดียิ่งขึ้น

ท่านได้รับเชิญให้เข้าร่วมการวิจัยนี้เพราะ ท่านเป็นอาสาสมัครสาธารณสุขชุมชน ทำงานร่วมกับศูนย์โรคเมืองร้อนนานาชาติราชนครินทร์ มีความคุ้นเคยกับประชากรชาวเขาเผ่ากะเหรี่ยงในพื้นที่รับผิดชอบดูแล ซึ่งพื้นที่นี้มีความเสี่ยงต่อการเป็นโรคมาลาเรีย และยังได้รับการแจกมุ้งชุบสารเคมี พ่นสารเคมี เพื่อป้องกันยุงพาหะนำโรคมาลาเรีย

จะมีผู้เข้าร่วมการวิจัยนี้ทั้งสิ้น 150 คน ประกอบด้วยผู้ให้สัมภาษณ์ชาวเขาเผ่ากะเหรี่ยงซึ่งเป็นตัวแทนจากแต่ละครัวเรือนจำนวน 120 คน และอาสาสมัครเก็บข้อมูลจำนวน 30 คน ระยะเวลาที่จะทำการวิจัยทั้งสิ้น 2 เดือน

ขั้นตอนการปฏิบัติตัวหากท่านเข้าร่วมโครงการวิจัย

ถ้าท่านสมัครใจเข้าร่วมโครงการและลงนามในเอกสารยินยอมโดยได้รับการบอกกล่าวแล้ว ผู้วิจัยจะขอให้ท่าน เก็บข้อมูลจากบ้านที่ท่านรับผิดชอบดูแลอยู่ โดยให้ท่านเลือกเก็บข้อมูลเพียง 4 บ้าน จากตัวแทนที่มีอายุตั้งแต่ 18 ปีขึ้นไปเพียงคนเดียว ท่านจะไปเก็บข้อมูลทั้งหมด 3 ครั้ง จากตัวแทนคนเดียวกัน ครั้งแรก และครั้งที่สอง เป็นคำถามเดียวกัน (ทั้งหมด 18 ข้อ) แต่ใช้วิธีการเก็บข้อมูลคนละแบบ คือแบบสอบถามกระดาษ และแบบอิเล็กทรอนิกส์ ซึ่งคำถามมีทั้งหมด ใช้เวลาในการเก็บข้อมูลแต่ละครั้งประมาณ 20 นาที การตอบแบบสอบถามครั้งแรก กับครั้งที่สอง จะห่างกันประมาณ 2 สัปดาห์ ก่อนที่ท่านจะไปเก็บแบบสอบถามแต่ละครั้ง ทีมของผู้ทำวิจัยจะฝึกให้ท่านได้ทดลองใช้เครื่องมือก่อนเสมอ เมื่อท่านเก็บข้อมูลเสร็จโดยใช้เครื่องมือทั้ง 2 แบบ ถัดไปอีก 1 สัปดาห์ ผู้วิจัยจะขอให้ท่านเก็บข้อมูลจากตัวแทนคนเดิมอีกครั้ง เพื่อถามความพอใจเกี่ยวกับเครื่องมือทั้ง 2 แบบ ที่เขาได้ถูกสัมภาษณ์ คำถามมีทั้งหมด 4 ข้อ ใช้เวลาในการตอบประมาณ 15 นาที หลังจากนั้นผู้วิจัยจะรบกวนให้ท่านช่วยตอบแบบสอบถามเกี่ยวกับความพึงพอใจของท่านเอง ในการใช้เครื่องมือทั้ง 2 แบบ รวมทั้งความรู้สึกต่อเครื่องมือแบบอิเล็กทรอนิกส์ ซึ่งจะใช้เวลาในการตอบประมาณ 15 นาที สุดท้ายนี้ผู้วิจัยจะขอให้ท่านเข้าร่วมในการสนทนากลุ่ม

เพื่อพูดคุย แสดงความคิดเห็นเกี่ยวกับเครื่องมือทั้ง 2 แบบ ที่ท่านได้ใช้ในการเก็บข้อมูล โดยใช้เวลาประมาณ 1 ชั่วโมงครึ่ง

การเข้าร่วมในการวิจัยครั้งนี้ ท่านไม่ต้องเตรียมตัวใดๆ ผู้วิจัยจะอธิบายทุกขั้นตอนให้แก่ท่าน แต่ท่านต้องเสียเวลาและอาจรู้สึกอึดอัด เบื่อหน่าย ซึ่งท่านสามารถยุติการเข้าร่วมวิจัยได้ตลอดเวลา

ความเสี่ยงและ/หรือความไม่สบายที่อาจเกิดขึ้น

การเข้าร่วมการวิจัยในครั้งนี้ อาจทำให้ท่านรู้สึกเหนื่อย ต้องเสียเวลา หรือสร้างความลำบากให้กับท่าน เนื่องจากต้องเข้าร่วมกิจกรรมหลายๆครั้ง นอกจากนี้คำถามที่ถามท่านอาจยากเกินไป หรือกระทบต่อจิตใจของท่าน ซึ่งท่านมีสิทธิ์ที่จะไม่ตอบและสามารถยุติการการเข้าร่วมวิจัยได้ตลอดเวลาโดยไม่ต้องบอกเหตุผล และจะไม่มีผลใดๆกับท่านในภายหลังทั้งสิ้น

การเข้าร่วมโครงการวิจัยของท่านต้องเป็นไปด้วยความสมัครใจ

หากท่านไม่เข้าร่วมในโครงการวิจัยนี้จะไม่มีผลกระทบใด ๆ ทั้งในปัจจุบันและอนาคตด้านการรักษาพยาบาลของท่านโดยท่านก็จะได้รับการตรวจเพื่อการวินิจฉัยและรักษาโรคของท่านตามวิธีการที่เป็นมาตรฐาน

ระบุชื่อผู้วิจัยที่จะสามารถติดต่อได้ หากมีข้อข้องใจที่จะสอบถามเกี่ยวข้องกับการวิจัย ท่านสามารถติดต่อ นางสาวสิริพร มนยฤทธิ์ ที่อยู่ ภาควิชาสุขวิทยาเขตร้อน คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล 420/6 ถนนราชวิถี เขตราชเทวี กรุงเทพมหานคร 10400 โทรศัพท์มือถือ 085-7038850

ค่าตอบแทนที่จะได้รับ เนื่องจากท่านจะต้องเข้าร่วมกิจกรรมในการวิจัยหลายครั้ง ในการมีส่วนร่วมในงานวิจัยนี้ ท่านจะได้รับค่าตอบแทนตามกิจกรรมที่ท่านเข้าร่วม โดยในการเก็บข้อมูลในแต่ละรอบจาก 4 บ้าน ท่านจะได้รับค่าตอบแทนครั้งละ 120 บาท และสำหรับวันที่ท่านเข้าร่วมการสนทนากลุ่มจะมีการจัดอาหารว่างไว้บริการ รวมทั้งค่าตอบแทนเป็นจำนวน 100 บาท เมื่อท่านเดินทางมาฝึกใช้เครื่องมือแต่ละครั้งผู้วิจัยจะจัดเตรียมอาหารไว้สำหรับท่าน สำหรับค่าตอบแทนทั้งหมด ท่านจะได้รับเมื่อแต่ละกิจกรรมเสร็จสิ้น

หากมีข้อมูลเพิ่มเติม ทั้งด้านประโยชน์และโทษที่เกี่ยวข้องกับการวิจัยนี้ ผู้วิจัยจะแจ้งให้ทราบโดยรวดเร็วไม่ปิดบัง

การรักษาความลับ การบันทึกข้อมูลของการวิจัยครั้งนี้ จะใช้รหัสแทนชื่อและข้อมูลส่วนตัวของท่าน และมีการบันทึกข้อมูลในไฟล์อิเล็กทรอนิกส์ (ในคอมพิวเตอร์หรือแผ่นซีดี) ซึ่งข้อมูลดังกล่าวจะถูกจัดเก็บไว้ในคอมพิวเตอร์ส่วนตัวที่มีรหัสป้องกัน บุคคลอื่นไม่สามารถเปิดดูข้อมูลได้

ข้อมูลส่วนตัวของท่านจะถูกเก็บรักษาไว้ ไม่เปิดเผยต่อสาธารณะเป็นรายบุคคล แต่จะรายงานผลการวิจัยเป็นข้อมูลส่วนรวม ข้อมูลของผู้ร่วมการวิจัยเป็นรายบุคคลอาจมีคณะบุคลบางกลุ่มเข้ามาตรวจสอบได้ เช่น ผู้ให้ทุนวิจัย สถาบัน หรือองค์กรของรัฐที่มีหน้าที่ตรวจสอบ คณะกรรมการจริยธรรมฯ เป็นต้น

ท่านมีสิทธิ์ถอนตัวออกจากโครงการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้า และการไม่เข้าร่วมการวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้จะไม่มีผลกระทบต่อการบริการและการรักษาที่สมควรจะได้รับแต่ประการใด

หากท่านได้รับการปฏิบัติที่ไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงนี้ ท่านจะสามารถแจ้งให้ประธานคณะกรรมการจริยธรรมฯ ทราบได้ที่ ฝ่ายเลขานุการคณะกรรมการจริยธรรมการวิจัยในคน สำนักงานบริการการวิจัย ชั้น 4 อาคารเฉลิม พระเกียรติฉลองสิริราชสมบัติครบ 60 ปี คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล โทร. 0 2354 9100-4 ต่อ 1349, 1525

หมายเหตุ : 1. หากผู้เข้าร่วมวิจัยเป็นผู้เยาว์ (อายุต่ำกว่า 18 ปีบริบูรณ์) และเอกสารชี้แจงนี้ทำให้ผู้ปกครอง/ผู้แทนโดยชอบธรรมเป็นผู้อ่าน ให้เปลี่ยนสรรพนาม “ท่าน” เป็น “เด็กในปกครองของท่าน” ตามตำแหน่งที่เหมาะสม

2. ผู้วิจัยควรมอบสำเนาแบบยินยอมอาสาสมัครพร้อมแนบคำชี้แจงอาสาสมัครอย่างละ 1 ชุด ให้อาสาสมัครหรือผู้ปกครองด้วย

APPENDIX C
PARTICIPANT INFORMATION SHEET FOR THE KAREN PARTICIPANTS

เอกสารชี้แจงผู้เข้าร่วมการวิจัย

(Participant Information Sheet)

ในเอกสารนี้อาจมีข้อความที่ท่านอ่านแล้วยังไม่เข้าใจ โปรดสอบถามหัวหน้าโครงการวิจัย หรือผู้แทนให้ช่วยอธิบายจนกว่าจะเข้าใจดี ท่านอาจจะขอเอกสารนี้กลับ ไปอ่านที่บ้านเพื่อปรึกษาหารือกับญาติพี่น้อง เพื่อนสนิท แพทย์ประจำตัวของท่าน หรือแพทย์ท่านอื่น เพื่อช่วยในการตัดสินใจเข้าร่วมการวิจัย

ชื่อโครงการ (ภาษาไทย) "แบบสอบถามรูปแบบกระดาษกับเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง"

ชื่อผู้วิจัย นางสาวสิริพร มนยฤทธิ์

สถานที่วิจัย หมู่บ้านในตำบลตะนาวศรี อำเภอสวนผึ้ง จังหวัดราชบุรี

ผู้ให้ทุน The Rockefeller Foundation และคณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล

โรคมาลาเรีย

โรคมาลาเรียเป็นโรคติดต่อ เมื่อยุงก้นปล่องมากัดคน ยุงจะปล่อยเชื้อมาลาเรียมาสู่คน ซึ่งยุงนี้เรียกว่าเป็นพาหะนำโรคอาการของโรคมาลาเรียไม่มีอาการเฉพาะ เริ่มแรกจะคล้ายกับเป็นหวัด คือ มีไข้ต่ำๆ ปวดหัว ปวดเมื่อตามตัวและกล้ามเนื้อ หรือคลื่นไส้ เบื่ออาหาร ต่อมาผู้ป่วยจะมีการจับไข้หนาวสั่นเป็นเวลา หากปล่อยไว้ไม่ได้รักษาอาจทำให้เสียชีวิตได้ ในประเทศไทยแหล่งของเชื้อมาลาเรียอยู่บริเวณป่าเขาชายแดนของประเทศ โดยเฉพาะบริเวณชายแดนไทยพม่า- การสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรีย เช่น การใช้มุ้งชุบสารเคมี หรือการฉีดพ่นสารเคมี เพื่อป้องกันยุงที่จะแพร่เชื้อมาลาเรีย เป็นการสำรวจที่ทำโดยทั่วไปตามพื้นที่ที่มีการแพร่เชื้อ

เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์

เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ คือ แบบสอบถามรูปแบบใหม่ที่ใช้ในการเก็บข้อมูล เครื่องมือนี้สามารถอ่านคำถามและคำตอบเป็นภาษากะเหรี่ยงได้ การใช้งานเพียงแค่ใช้นิ้วสัมผัสบนหน้าจอของเครื่อง บางข้อคำถามใช้การถ่ายรูปแทนการถามคำถาม นอกจากนี้ยังมีระบบบอกตำแหน่งที่ตั้ง

วัตถุประสงค์ของการวิจัย การศึกษานี้จัดทำขึ้นเพื่อสร้างเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ใช้ในการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรีย ในประชากรชาวเขาเผ่ากะเหรี่ยง ซึ่งถือว่ามีความเสี่ยงสูงในการเป็นโรคมาลาเรีย และการเก็บข้อมูลยังคงมีอุปสรรคทางด้านภาษาในการสำรวจและเก็บข้อมูล นอกจากนี้จะมีการเปรียบเทียบระหว่างการใช้แบบสอบถามกระดาษกับการใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ที่ได้ถูกสร้างขึ้นในการเก็บข้อมูล และค้นหาข้อดี ข้อเสียของวิธีการทั้งสอบแบบ ตลอดจนสอบถามความคิดเห็นของผู้ที่ใช้เครื่องมือแบบอิเล็กทรอนิกส์ ซึ่งยังถือเป็นเทคโนโลยีสมัยใหม่ การศึกษานี้มีประโยชน์ที่คาดว่าจะได้รับคือ เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ที่ถูกสร้างขึ้นจะเป็นจุดเริ่มต้นของการพัฒนาเครื่องมือที่มีประสิทธิภาพสำหรับเก็บข้อมูลเรื่องการควบคุมพาหะนำโรคมาลาเรียในประชากรกลุ่มชาติพันธุ์ในอนาคต และยังสามารถเป็นตัวอย่างให้กับการศึกษาอื่นๆ ที่มีผู้เข้าร่วมหลากหลายภาษา และชาติพันธุ์ ผลที่ได้จากการศึกษานี้ยังสามารถช่วยในการตัดสินใจเลือกวิธีการเก็บข้อมูลได้อย่างเหมาะสม นอกจากนี้ยังจะถูกนำไปใช้เพื่อปรับปรุงเครื่องมือให้ดียิ่งขึ้น

ท่านได้รับเชิญให้เข้าร่วมการวิจัยนี้เพราะ ท่านเป็นประชากรชาวเขาเผ่ากะเหรี่ยง และอาศัยอยู่ในพื้นที่เสี่ยงต่อการเป็นโรคมาลาเรีย ที่ได้รับการแจกมุ้งชุบสารเคมี พ่นสารเคมี เพื่อป้องกันยุงพาหะนำโรคมาลาเรีย

จะมีผู้เข้าร่วมการวิจัยนี้ทั้งสิ้น 150 คน ประกอบด้วยผู้ให้สัมภาษณ์ชาวเขาเผ่ากะเหรี่ยง ซึ่งเป็นตัวแทนจากแต่ละครัวเรือนจำนวน 120 คน และอาสาสมัครเก็บข้อมูลจำนวน 30 คน ระยะเวลาที่จะทำการวิจัยทั้งสิ้น 2 เดือน

ขั้นตอนการปฏิบัติตัวหากท่านเข้าร่วมโครงการวิจัย

ถ้าท่านสมัครใจเข้าร่วมโครงการและลงนามในเอกสารยินยอมโดยได้รับการบอกกล่าวแล้ว ผู้วิจัยจะขอให้ท่าน ตอบแบบสอบถามจำนวน 3 ครั้ง ครั้งแรก และครั้งที่สอง เป็นคำถามเดียวกัน(มีทั้งหมด 18 ข้อ) แต่ใช้วิธีการเก็บข้อมูลต่างกัน คือใช้แบบสอบถามกระดาษ และใช้แบบสอบถามแบบอิเล็กทรอนิกส์ ใช้เวลาในการตอบแต่ละครั้งประมาณ 20 นาที อาสาสมัครสาธารณสุขชุมชนจะมาถามท่านที่บ้าน ระยะเวลาการตอบแบบสอบถามครั้งแรก กับครั้งที่สอง จะห่างกันประมาณ 2 สัปดาห์ และหลังจากการตอบแบบสอบถามครั้งที่สองเป็นเวลา 1 สัปดาห์ อาสาสมัครสาธารณสุขชุมชนจะมาถามความพอใจของท่านเกี่ยวกับเครื่องมือทั้ง 2 แบบ ที่ท่านได้ถูกสัมภาษณ์ คำถามมีทั้งหมด 4 ข้อ ใช้เวลาในการตอบประมาณ 15 นาที

การเข้าร่วมในการวิจัยครั้งนี้ ท่านเพียงแต่ตอบคำถามโดยไม่ต้องเตรียมตัวใดๆ แต่ท่านต้องเสียเวลาและอาจรู้สึกอึดอัด เบื่อหน่าย ซึ่งท่านสามารถยุติการตอบคำถามได้ตลอดเวลา

ความเสี่ยงและ/หรือความไม่สบายที่อาจเกิดขึ้น

ข้อคำถามในการวิจัยครั้งนี้ อาจยากเกินไป หรือส่งกระทบต่อจิตใจของท่าน ซึ่งท่านมีสิทธิ์ที่จะไม่ตอบคำถามนั้น และสามารถยุติการตอบคำถามได้ตลอดเวลาโดยไม่ต้องบอกเหตุผล และจะไม่มีผลใดๆกับท่านในภายหลัง

การเข้าร่วมโครงการวิจัยของท่านต้องเป็นไปด้วยความสมัครใจ

หากท่านไม่เข้าร่วมในโครงการวิจัยนี้จะไม่มีผลกระทบใด ๆ ทั้งในปัจจุบันและอนาคตด้านการรักษาพยาบาลของท่านโดยท่านก็จะได้รับการตรวจเพื่อการวินิจฉัยและรักษาโรคของท่านตามวิธีการที่เป็นมาตรฐาน

ระบุชื่อผู้วิจัยที่จะสามารถติดต่อได้ หากมีข้อข้องใจที่จะสอบถามเกี่ยวข้องกับการวิจัย ท่านสามารถติดต่อ นางสาวสิริพร มนยฤทธิ์ ที่อยู่ ภาควิชาสุขวิทยาเขตร้อน คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล 420/6 ถนนราชวิถี เขตราชเทวี กรุงเทพมหานคร 10400 โทรศัพท์มือถือ 085-7038850

ค่าตอบแทนที่จะได้รับ ท่านจะไม่มีภาระเสียค่าใช้จ่ายใดๆ และท่านจะได้รับของที่ระลึกจากการวิจัยครั้งนี้

หากมีข้อมูลเพิ่มเติม ทั้งด้านประโยชน์และโทษที่เกี่ยวข้องกับการวิจัยนี้ ผู้วิจัยจะแจ้งให้ทราบโดยรวดเร็วไม่ปิดบัง

การรักษาความลับ การบันทึกข้อมูลของการวิจัยครั้งนี้ จะใช้รหัสแทนชื่อและข้อมูลส่วนตัวของท่าน และมีการบันทึกข้อมูลในไฟล์อิเล็กทรอนิกส์ (ในคอมพิวเตอร์หรือแผ่นซีดี) ซึ่งข้อมูลดังกล่าวจะถูกจัดเก็บไว้ในคอมพิวเตอร์ส่วนตัวที่มีรหัสป้องกัน บุคคลอื่นไม่สามารถเปิดดูข้อมูลได้

ข้อมูลส่วนตัวของท่านจะถูกเก็บรักษาไว้ ไม่เปิดเผยต่อสาธารณะเป็นรายบุคคล แต่จะรายงานผลการวิจัยเป็นข้อมูลส่วนรวม ข้อมูลของผู้ร่วมการวิจัยเป็นรายบุคคลอาจมีคณะบุคลบางกลุ่มเข้ามาตรวจสอบได้ เช่น ผู้ให้ทุนวิจัย สถาบัน หรือองค์กรของรัฐที่มีหน้าที่ตรวจสอบ คณะกรรมการจริยธรรมฯ เป็นต้น ท่านมีสิทธิ์ถอนตัวออกจากโครงการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้า และการไม่เข้าร่วมการวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้จะไม่มีผลกระทบต่อการบริการและการรักษาที่สมควรจะได้รับแต่ประการใด

หากท่านได้รับการปฏิบัติที่ไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงนี้ ท่านจะสามารถแจ้งให้ประธานคณะกรรมการ จริยธรรมฯ ทราบได้ที่ ฝ่ายเลขานุการคณะกรรมการจริยธรรมการวิจัยในคน สำนักงานบริการการวิจัย ชั้น 4 อาคารเฉลิม พระเกียรติฉลองสิริราชสมบัติครบ 60 ปี คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล โทร. 0 2354 9100-4 ต่อ 1349, 1525

หมายเหตุ : 1. หากผู้เข้าร่วมวิจัยเป็นผู้เยาว์ (อายุต่ำกว่า 18 ปีบริบูรณ์) และเอกสารชี้แจงนี้ทำให้ผู้ปกครอง/ผู้แทนโดยชอบธรรมเป็นผู้อ่าน ให้เปลี่ยนสรรพนาม “ท่าน” เป็น “เด็กในปกครองของท่าน” ตามตำแหน่งที่เหมาะสม

2. ผู้วิจัยควรมอบสำเนาแบบยินยอมอาสาสมัครพร้อมแนบคำชี้แจงอาสาสมัครอย่างละ 1 ชุด ให้อาสาสมัครหรือผู้ปกครองด้วย

APPENDIX D
INFORMED CONSENT FORM

หนังสือแสดงเจตนายินยอมเข้าร่วมการวิจัย (Informed Consent Form)

วันที่.....เดือน.....พ.ศ. .....

ข้าพเจ้า (นาย /นาง /นางสาว).....นามสกุล.....อายุ.....ปี อยู่บ้านเลขที่.....หมู่.....ตำบล.....อำเภอ.....จังหวัด..... ขอแสดงเจตนายินยอมเข้าร่วมการวิจัย ในโครงการวิจัยเรื่อง

"แบบสอบถามรูปแบบกระดาษกับเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง"

ชื่อผู้วิจัย นางสาวสิริพร มนยฤทธิ์

ที่อยู่สำหรับติดต่อ ภาควิชาสุขวิทยาเขตร้อน คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล

420/6 ถนนราชวิถี เขตราชเทวี กรุงเทพมหานคร 10400

โทรศัพท์มือถือ 085-7038850

โดยข้าพเจ้าได้รับทราบถึงรายละเอียดของวัตถุประสงค์และระยะเวลาในการทำการวิจัย รายละเอียดของขั้นตอนต่างๆ ที่ตัวที่ข้าพเจ้าต้องปฏิบัติ ความเสี่ยง/ความไม่สะดวกสบาย ตลอดจนผลประโยชน์ที่ข้าพเจ้าจะได้รับจากการเข้าร่วมการวิจัยในครั้งนี้ ตลอดจนสิ่งตอบแทนที่จะได้รับ หรือค่าใช้จ่ายที่ข้าพเจ้าจะต้องรับผิดชอบจ่ายเอง

ข้าพเจ้าได้ทราบรายละเอียดในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด และได้รับคำอธิบายจนเข้าใจเป็นอย่างดีแล้ว ข้าพเจ้าจึงสมัครใจเข้าร่วมในการวิจัยครั้งนี้

ข้าพเจ้ามีสิทธิ์ถอนตัวจากการวิจัยเมื่อใดก็ได้ตามประสงค์ โดยไม่ต้องแจ้งเหตุผลจากการถอนตัวนั้น รวมทั้งมีสิทธิ์ที่จะไม่ตอบคำถามใดๆที่กระทบต่อความรู้สึกหรือส่งผลต่อจิตใจของข้าพเจ้า ซึ่งจะไม่มีผลกระทบใดๆทั้งสิ้นต่อตัวข้าพเจ้า รวมทั้งจะไม่มีการสูญเสียประโยชน์อันพึงได้รับ และยังมีสิทธิ์ได้รับการบริการดูแลรักษาสุขภาพตามปกติ

และข้าพเจ้ายินยอมให้ผู้วิจัยใช้ข้อมูลส่วนตัวของข้าพเจ้าที่ได้รับจากการวิจัย โดยให้นำเสนอเป็นข้อมูลโดยรวมจากการวิจัยนั้นแต่จะไม่เผยแพร่ ต่อสาธารณะเป็นรายบุคคล ทั้งนี้ข้าพเจ้าสามารถถอนตัว

หรือองดเข้าร่วมการวิจัยได้ทุกเมื่อ โดยจะไม่มีผลกระทบและไม่เสียสิทธิ์ใดๆ ในการรับการบริการและการรักษาพยาบาลที่ข้าพเจ้าจะได้รับต่อไปในอนาคต

หากข้าพเจ้าได้รับการปฏิบัติไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย ข้าพเจ้าสามารถติดต่อกับคณะกรรมการจริยธรรมการวิจัยในคน ชั้น 4 อาคารเฉลิมพระเกียรติฉลองสิริราชสมบัติครบ 60 ปี คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล โทรศัพท์ 0 2354 9100-4 ต่อ 1349, 1525

ข้าพเจ้า เข้าใจข้อความในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และหนังสือแสดงเจตนายินยอมนี้โดยตลอดแล้ว จึงได้ลงนามยินยอมเข้าร่วมโครงการ

ลายมือชื่อผู้เข้าร่วมโครงการวิจัย .....

(.....)

วันที่.....เดือน.....พ.ศ.....

ลายมือชื่อผู้อธิบาย/ผู้แปล/อ่านข้อความ/ผู้ขอความยินยอม

.....

(.....)

วันที่.....เดือน.....พ.ศ.....

<u>**ในกรณีที่ผู้เข้าร่วมโครงการวิจัยไม่สามารถอ่านหนังสือ/ ลงลายมือชื่อได้ ให้ใช้การประทับลายมือนิ้วแทนดังนี้</u>

ข้าพเจ้าไม่สามารถอ่านหนังสือได้ แต่ผู้วิจัยได้อ่านข้อความในแบบยินยอมนี้ให้แก่ข้าพเจ้าฟังจนเข้าใจดี ข้าพเจ้าจึงประทับลายนิ้วมือของข้าพเจ้าในแบบยินยอมนี้ด้วยความเต็มใจ

ลายมือชื่อผู้อธิบาย/ผู้แปล/อ่านข้อความ/ผู้ขอความยินยอม

.....

(.....)

วันที่.....เดือน.....พ.ศ.....

พยาน(ไม่ใช่ผู้อธิบาย)

.....

(.....)

วันที่.....เดือน.....พ.ศ.....

ประทับลายนิ้วมือของผู้เข้าร่วมโครงการวิจัย

หมายเหตุ (1) ในกรณีที่ผู้เข้าร่วมโครงการวิจัยเป็นเด็กโตอายุ ถึง 13ก่อน 18 ปี สามารถตัดสินใจเองได้ ให้ลงลายมือชื่อทั้งผู้เข้าร่วมโครงการวิจัย (เด็ก) และผู้ปกครองด้วย

(2) พยานต้องไม่ใช่แพทย์ผู้รักษา

(3) ผู้ให้ข้อมูลหรือผู้อ่านข้อความต้องไม่เป็นแพทย์ผู้รักษาเพื่อป้องกันการเข้าร่วมโครงการด้วยความเกรงใจ

(โปรดมอบสำเนาเอกสารฉบับนี้ให้ผู้เข้าร่วมวิจัย/ผู้ปกครอง 1 ฉบับ)

APPENDIX E

QUESTIONNAIRES

QUESTIONNAIRE 1 (English version) **ID** ☐☐☐

PAPER-BASED VERSUS ELECTRONIC DATA CAPTURE TOOL FOR MALARIA VECTOR CONTROL SURVEY AMONG KAREN HILL TRIBE POPULATION

DETAIL OF INTERVIEW FORM

This interview form is developed to assess the bed nets and indoor residual spraying (IRS) coverage as well as the factors associated with bed nets utilization among Karen hill tribe population in Tanaosri sub-district, Suan Phueng district, Ratchaburi province, Thailand.

The interview form consists of 4 pages and divide into 4 parts as follows:

Part1 : Socio-Demographic information of representative in a household

Part2 : Household information

Part3 : Bed Nets utilization

Part 4: Receiving of indoor residual spraying (IRS) information

Started time _____

Part1 : Socio-demographic information

1.1 Gender

- ○ 1) Male
- ○ 2) Female

1.2 Age _____ Years

1.3 Marital status

- ○ 1) Single
- ○ 2) Married
- ○ 3) Widowed
- ○ 4) Divorced
- ○ 5) Separated

1.4 The highest complete level of education

- ○ 1) Uneducated
- ○ 2) Primary School / Elementary School
- ○ 3) High School/ Technical Certificate
- ○ 4) University or higher
- ○ 5) Other please identify.....

1.5 Main occupation

- ○ 1) Unemployed
- ○ 2) Agriculturist
- ○ 3) Business /Trading
- ○ 4) Employed
- ○ 5) Government officer
- ○ 6) Other please identify.....

Part2 : Household information

2.1 Type of wall (partition)

- ○ 1) Bamboo
- ○ 2) Wood
- ○ 3) Concrete/Cement blocks
- ○ 4) Soil/Clay/Mud
- ○ 5) Other please identify.....

2.2 The number of family member_____ person(s)

2.3 Do you have a child age ≤ 5 years in your house?

- ○ 1) Yes.
- ○ 2) No.

2.4 Do you have a pregnant woman in your house?

- ○ 1) Yes.
- ○ 2) No.

2.5 Have your family member ever got malaria?) including you(

- ○ 1) Yes.
- ○ 2) No.

Part3 : Bed Nets utilization

3.1 Do you have the bed nets in your house, if yes how many?

- ○ 1) Yes. Number_____
- ○ 2) No. (skip to 4.1)

3.2 Which brand of bed nets do you have in your house and how many per brand?

- ○ 1) LLIN- Olyset Number_____
- ○ 2) LLIN- Permanet Number_____
- ○ 3) LLIN-Royal sentry Number_____
- ○ 4) LLIN-Yorkool Number_____
- ○ 5) Hammock net Number_____
- ○ 6) Conventionally treated net (ITN) Number_____
- ○ 7) Untreated net Number_____
- ○ 8) Other please identify.....

3.3 Typically, which season do you use bet net?

- ○ 1) summer
- ○ 2) rainy season
- ○ 3) winter
- ○ 4) all seasons

3.4 Did your household member sleep under bed nets last night, if yes, how many?

- ○ 1) No. (answer question 3.5 and skip to 4.1)
- ○ 2) Yes, Number_____ (skip to 3.6)

3.5 What are the reasons of not using bet net last night? (can check more than one answer)

- ○ 1) net is poor condition
- ○ 2) do not have enough area for spread out the net
- ○ 3) bad smell of net
- ○ 4) hot / I feel not comfortable
- ○ 5) do not have any mosquitoes
- ○ 6) get allergic from using net
- ○ 7) Other please identify.....

3.6 Did the net that was used last night having a hole?

- ○ 1) Yes.
- ○ 2) No.

Part 4: Receiving of indoor residual spraying (IRS) information

4.1 Has your house ever received the indoor residual spraying (IRS)?

- ○ 1) No. (finishing interview)
- ○ 2) Yes. (please answer the next question)

4.2 How many time did you receive the indoor residual spraying (IRS) in the last 3 years?

Spray……Time

Finished time_____

QUESTIONNAIRE 1 (Thai version) **ลำดับที่** ❑ ❑ ❑

แบบสอบถาม

แบบสอบถามรูปแบบกระดาษ กับ เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง

คำชี้แจง

แบบสอบถามชุดนี้จัดทำขึ้นเพื่อประเมินความครอบคลุมของการมีมุ้ง และการพ่นสเปรย์สารเคมีฤทธิ์ตกค้าง รวมทั้งพฤติกรรมการใช้มุ้งเพื่อป้องกันยุงพาหะนำโรคมาลาเรีย ในประชากรชาวเขาเผ่ากะเหรี่ยง ตำบลตะนาวศรี อำเภอสวนผึ้ง จังหวัดราชบุรี

แบบสอบถามประกอบด้วย 4 ส่วน ดังนี้

ส่วนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

ส่วนที่ 2 ข้อมูลภายในครัวเรือนของผู้ตอบแบบสอบถาม

ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน

ส่วนที่ 4 ข้อมูลเกี่ยวกับการพ่นสเปรย์สารเคมีฤทธิ์ตกค้าง

เวลาเริ่มทำแบบสอบถาม..... น.

<u>คำชี้แจง</u> โปรดทำเครื่องหมาย / ตามคำตอบของผู้ให้สัมภาษณ์หรือเติมข้อความลงในช่องว่าง

<u>ส่วนที่ 1</u> ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

1.1 เพศ

- ○ 1) ชาย
- ○ 2) หญิง

1.2 ปีนี้ท่านมีอายุเท่าใด_____ปี

1.3 สถานภาพสมรส

- ○ 1) โสด
- ○ 2) คู่ / แต่งงาน
- ○ 3) หม้าย
- ○ 4) หย่าร้าง
- ○ 5) แยกกันอยู่

1.4 ระดับการศึกษาสูงสุด

- ○ 1) ไม่มีวุฒิการศึกษา
- ○ 2) ประถมศึกษา
- ○ 3) มัธยมศึกษา/ อาชีวศึกษา
- ○ 4) ปริญญาตรี หรือสูงกว่า
- ○ 5) อื่นๆ โปรดระบุ.....

1.5 อาชีพหลักในปัจจุบัน

- ○ 1) ไม่ได้ประกอบอาชีพ
- ○ 2) เกษตรกร
- ○ 3) ค้าขาย/ธุรกิจส่วนตัว
- ○ 4) รับจ้างทั่วไป
- ○ 5) รับราชการ
- ○ 6) อื่นๆ โปรดระบุ.....

<u>ส่วนที่ 2</u> ข้อมูลภายในครัวเรือนของผู้ตอบแบบสอบถาม

2.1 วัสดุหลักของฝาบ้าน (ผู้สัมภาษณ์สังเกต)

- ○ 1) ไม้ไผ่/ใบจาก (วัสดุในท้องที่)
- ○ 2) ไม้
- ○ 3) อิฐ/ปูน
- ○ 4) ดิน
- ○ 5) อื่นๆ ระบุ.....

2.2 จำนวนสมาชิกในบ้านของท่านอาศัยอยู่กันทั้งหมด_____คน

2.3 มีเด็กอายุ 5 ปี หรือต่ำกว่าอาศัยอยู่ในบ้านหรือไม่

- ○ 1) มี
- ○ 2) ไม่มี

2.4 มีหญิงตั้งครรภ์อาศัยอยู่ในบ้านหรือไม่

- ○ 1) มี
- ○ 2) ไม่มี

2.5 เคยมีสมาชิกในบ้านป่วยด้วยโรคมาลาเรียหรือไม่ (รวมทั้งผู้ตอบ)

- ○ 1) เคย
- ○ 2) ไม่เคย

<u>ส่วนที่ 3</u> ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน

3.1 ขณะนี้ในบ้านของท่านมีมุ้งหรือไม่ ถ้ามีจำนวนกี่หลัง

- ○ 1) มี จำนวน_____หลัง
- ○ 2) ไม่มี (ข้ามไปตอบข้อ 4.1)

3.2 มุ้งแต่ละหลังยี่ห้ออะไรบ้าง และมีจำนวนกี่หลัง (ดูฉลากที่ขอบมุ้งประกอบ)

- ○ 1) LLIN- Olyset จำนวน_____หลัง
- ○ 2) LLIN- Permanet จำนวน_____หลัง
- ○ 3) LLIN-Royal sentry จำนวน_____หลัง
- ○ 4) LLIN-Yorkool จำนวน_____หลัง
- ○ 5) มุ้งคลุมเปล จำนวน_____หลัง
- ○ 6) มุ้งธรรมดาที่ชุบน้ำยา จำนวน_____หลัง
- ○ 7) มุ้งธรรมดา จำนวน_____หลัง
- ○ 8) อื่นๆ ระบุ.....

3.3 ส่วนใหญ่ใช้มุ้งในฤดูกาลใด

- ○ 1) ฤดูร้อน
- ○ 2) ฤดูฝน
- ○ 3) ฤดูหนาว
- ○ 4) ทุกฤดู

3.4 เมื่อคืนที่ผ่านมามีคนนอนในมุ้งทั้งหมดกี่คน

- ○ 1) ไม่มีเลย (ตอบคำถามข้อ 3.5 แล้วข้ามไปตอบ 4.1)
- ○ 2) มี จำนวน_____คน ข้ามไปตอบข้อ)3.6(

3.5 เหตุผลที่ไม่ใช้มุ้งเมื่อคืนที่ผ่านมา (ตอบได้มากกว่า 1 ข้อ)

- ○ 1) มุ้งสภาพไม่ดี
- ○ 2) ไม่สะดวก พื้นที่ไม่พอกาง
- ○ 3) เหม็นกลิ่นน้ำยา
- ○ 4) ร้อน อึดอัด
- ○ 5) ไม่มียุง
- ○ 6) ผื่น/คัน,ผิวหนังแสบร้อน
- ○ 7) ไม่อยู่บ้าน
- ○ 8) อื่นๆ ระบุ.....

3.6 มุ้งที่นอนเมื่อคืนมีรอยขาดหรือไม่

- ○ 1) มี
- ○ 2) ไม่มี

<u>ส่วนที่ 4</u> ข้อมูลเกี่ยวกับการพ่นสเปรย์สารเคมีฤทธิ์ตกค้าง

4.1 ท่านได้รับการพ่นสเปรย์สารเคมีฤทธิ์ตกค้างหรือไม่ (สารเคมีที่พ่นที่ฝาผนังบ้านเพื่อป้องกันยุงที่ก่อโรคมาลาเรีย)

- ○ 1) ไม่ได้รับ (จบการให้สัมภาษณ์)
- ○ 2) ได้รับ (ตอบคำถามข้อ 4.2)

4.2 ตั้งแต่ปี 2554 ท่านได้รับการพ่นสเปรย์สารเคมีฤทธิ์ตกค้างทั้งหมดกี่ครั้ง (สังเกตจากบันทึกการพ่นสเปรย์บริเวณฝาผนัง หรือเสาบ้าน)

จำนวน_____ครั้ง

บันทึกเวลาเมื่อทำแบบสอบถามเสร็จ_____น.

QUESTIONNAIRE 2 (English version) **ID** ❑ ❑ ❑

PAPER-BASED VERSUS ELECTRONIC DATA CAPTURE TOOL FOR MALARIA VECTOR CONTROL SURVEY AMONG KAREN POPULATION

DETAIL OF INTERVIEW FORM

This interview form is developed to assess the satisfaction of being interviewed by two methods consists of electronic data collection tool and paper-based questionnaire. The participants in this study are the Karen population who were interviewed in malaria vector control survey by using electronic data collection tool and paper-based questionnaire.

This interview form consist two parts as follows:

Part 1: The satisfaction of being interviewed by Electronic Data Capture Tool

Part 2: The satisfaction of being interviewed by paper-based questionnaire

The questions will be asked in four dimensions:

(1.) Format
(2.) Ease of use
(3.) System speed
(4.) Overall satisfaction

Listed below are the questions about your satisfaction of being interviewed by two methods consists of electronic data collection tool and paper-based questionnaire. Please rate your satisfaction according to the following items on the scale from 1-3.

1 = Not too satisfied 2 = moderately satisfied 3 = Very satisfied

Electronic Data Collection Tool (EDC)				**Paper-based questionnaire**		
Not too (1)	**moderately (2)**	**Very (3)**	**How would you satisfied with the following items?**	**Not too (1)**	**moderately (2)**	**Very (3)**
			1. The format of asking questions and record the answers.			
			2. The ease of understanding the questions and answer.			
			3. The speed during interview.			
			4. Overall of being interviewed by each method.			

QUESTIONNAIRE 2 (Thai version) **รหัส** ❑ ❑ ❑

แบบสอบถามรูปแบบกระดาษ กับ เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง

<u>คำชี้แจง</u>

แบบสอบถามชุดนี้จัดทำขึ้นเพื่อประเมินความพึงพอใจของผู้ถูกสัมภาษณ์ชาวกะเหรี่ยงโดยใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ และแบบสอบถามกระดาษ เกี่ยวกับการสำรวจข้อมูลควบคุมพาหะนำโรคมาลาเรีย

แบบสอบถามนี้ประกอบด้วย 3 ส่วน ดังนี้

ส่วนที่ 1 ความพึงพอใจในการถูกสัมภาษณ์ด้วยเครื่องมือเก็บข้อมูลอิเล็กทรอนิกส์

ส่วนที่ 2 ความพึงพอใจในการถูกสัมภาษณ์ด้วยแบบสัมภาษณ์กระดาษ

คำถามในแบบสอบถามเกี่ยวกับความพึงพอใจของผู้ถูกสัมภาษณ์ใน 4 ด้าน ได้แก่

(1) ความพึงพอใจในรูปแบบการสัมภาษณ์
(2) ความพึงพอใจในความยากง่ายของการให้สัมภาษณ์
(3) ความพึงพอใจในความรวดเร็วของการสัมภาษณ์
(4) ระดับความพึงพอใจโดยรวม

ข้อคำถามต่อไปนี้เกี่ยวกับระดับความพึงพอใจของท่านจากการถูกสัมภาษณ์โดยเครื่องมือที่ใช้ในการเก็บข้อมูลทั้ง 2 รูปแบบ โปรดให้คะแนนความพึงพอใจของท่านเปรียบเทียบระหว่างเครื่องมือทั้ง 2 แบบ ตามหัวข้อต่อไปนี้ ตั้งแต่ 1-3 โดยที่

1 = พอใจน้อย 2 = พอใจปานกลาง 3 = พอใจมาก

เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์				**แบบสอบถามกระดาษ**		
น้อย **(1)**	ปานกลาง **(2)**	มาก **(3)**	**ท่านพึงพอใจมากเพียงใดกับเครื่องมือในการสัมภาษณ์แต่ละแบบ?**	น้อย **(1)**	ปานกลาง **(2)**	มาก **(3)**
			1. รูปแบบในการถามคำถาม และบันทึกคำตอบ			
			2. ความง่ายในการเข้าใจคำถามและคำตอบ			
			3. ความรวดเร็วในการสัมภาษณ์			
			4. ความพึงพอใจโดยรวมในการถูกสัมภาษณ์ด้วยเครื่องมือแต่ละแบบ			

QUESTIONNAIRE 3 (English version) **ID** ❑❑

PAPER-BASED VERSUS ELECTRONIC DATA CAPTURE TOOL FOR MALARIA VECTOR CONTROL SURVEY AMONG KAREN POPULATION

DETAIL OF INTERVIEW FORM

This interview form is developed to assess the satisfaction of community health volunteers (CHVs) who using two methods consists of electronic data collection tool and paper-based questionnaire for collecting data regarding malaria vector control survey among Karen population. Also, assess their acceptance in electronic data collection tool (EDC).

The interview form consists of 3 pages and divide into 3 parts as follows:

Part1 : Socio-demographic information

Part2 : The satisfaction of using two methods for data collection consists of 4 dimensions;

1. Format
2. Ease of use
3. System peed
4. Overall user satisfaction

Part 3: The user acceptance in electronic data collection tool (EDC) consists of 3 constructs;

ID ❑ ❑

PART1 : Socio-demographic information

1.6 Gender

❑ Male ❑ Female

1.7 Age _____Years

1.8 The highest complete level of education

❑ 1) Uneducated
❑ 2) Primary School / Elementary School
❑ 3) High School/ Technical Certificate
❑ 4) University or higher
❑ 5) Other please identify _____

1.9 Main occupation

❑ 1) Unemployed
❑ 2) Agriculturist
❑ 3) Business /Trading
❑ 4) Employed
❑ 5) Government officer
❑ 6) Other please identify _____

Part 2 Listed below are the questions about your satisfaction of using two methods consists of electronic data collection tool and paper-based questionnaire for data collection. Please rate your satisfaction according to the following items on the scale from 1-3.

1 = Not too satisfied 2 = moderately satisfied 3 = Very satisfied

Electronic Data Collection Tool (EDC)				Paper-based questionnaire		
Not too (1)	**Moderately (2)**	**Very (3)**	**How would you satisfied with the following items?**	**Not too (1)**	**Moderately (2)**	**Very (3)**
			a. The format of the tool.			
			b. The ease of using the tool.			
			c. The speed during interview.			
			d. Overall satisfaction of using each method for interviewed.			

Part 3 The users acceptance in electronic data collection tool (EDC)

Questions	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Perceived usefulness					
3.1) Using EDC enable me to accomplish the tasks more quickly.					
3.2) Using EDC Improve my job performance.					
3.3) Using EDC increase my productivity.					
3.4) Using EDC make it easier to do my job.					
3.5) Overall, I find EDC useful in my job.					
Perceived Ease of use					
3.6) Learning to operate the EDC is easy for me					
3.7) I find it easy to get the EDC to do what I want to do					
3.8) My interaction with EDC in clear and understandable.					
3.9) It would be easy for me to become skillful at using the EDC.					
3.10) Overall, I find the EDC easy to use.					
Intention to use					
3.11) If I have an opportunity to use EDC, I would use it in my job.					

QUESTIONNAIRE 3 (Thai version) **ลำดับที่** ❑❑

แบบสอบถามรูปแบบกระดาษ กับ เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์
เพื่อการสำรวจข้อมูลการควบคุมพาหะนำโรคมาลาเรียในประชากรชาวเขาเผ่ากะเหรี่ยง

<u>คำชี้แจง</u>

แบบสอบถามชุดนี้จัดทำขึ้นเพื่อประเมินความพึงพอใจของอาสาสมัครชุมชนหลังจากใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ และแบบสอบถามกระดาษ ในการเก็บข้อมูลการควบคุมและป้องกันพาหะนำโรคมาลาเรียในประชากรชาวกะเหรี่ยง นอกจากนี้ยังมีการประเมินการยอมรับในเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ที่ถูกสร้างขึ้นเพื่อช่วยในกระบวนการเก็บข้อมูล

<u>แบบสอบถามประกอบด้วย 3 ส่วน ดังนี้</u>

ส่วนที่ 1 ข้อมูลทั่วไปของผู้ให้สัมภาษณ์

ส่วนที่ 2 ระดับความพึงพอใจของผู้ใช้เครื่องมือทั้ง 2 แบบ แบ่งเป็น 4 ด้าน ดังนี้

1. ความพึงพอใจในรูปแบบของเครื่องมือ
2. ความพึงพอใจในความง่ายของการใช้เครื่องมือ
3. ความพึงพอใจในความรวดเร็วของการสัมภาษณ์
4. ระดับความพึงพอใจโดยรวม

ส่วนที่ 3 ระดับการยอมรับในเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ แบ่งเป็น 3 ด้าน ดังนี้

1. การรับรู้ประโยชน์
2. การรับรู้ความง่ายในการใช้งาน
3. แนวโน้มในการใช้

ลำดับที่ ☐☐

ส่วนที่ 1 ข้อมูลทั่วไปของผู้ให้สัมภาษณ์

1.6 เพศ

☐ 1) ชาย ☐ 2) หญิง

1.7 อายุ (นับตั้งแต่ต้นปี)_____ปี

1.8 ระดับการศึกษาสูงสุด

☐ 1) ไม่มีวุฒิการศึกษา
☐ 2) ประถมศึกษา
☐ 3) มัธยมศึกษา /อาชีวศึกษา
☐ 4) ปริญญาตรีหรือสูงกว่า
☐ 5) อื่นๆ โปรดระบุ.....

1.9 อาชีพหลักในปัจจุบัน

☐ 1) ไม่ได้ประกอบอาชีพ
☐ 2) เกษตรกร
☐ 3) ค้าขาย/ธุรกิจส่วนตัว
☐ 4) รับจ้างทั่วไป
☐ 5) รับราชการ
☐ 6) อื่นๆ โปรดระบุ.....

<u>ส่วนที่ 2</u> ข้อคำถามต่อไปนี้เกี่ยวกับระดับความพึงพอใจของท่านจากการใช้เครื่องมือทั้งแบบกระดาษและอิเล็กทรอนิกส์ในการสัมภาษณ์และเก็บข้อมูล

โปรดให้คะแนนความพึงพอใจของท่านเปรียบเทียบระหว่างเครื่องมือทั้ง 2 แบบ ตามหัวข้อต่อไปนี้ ตั้งแต่ 1 - 3 คะแนน โดยที่

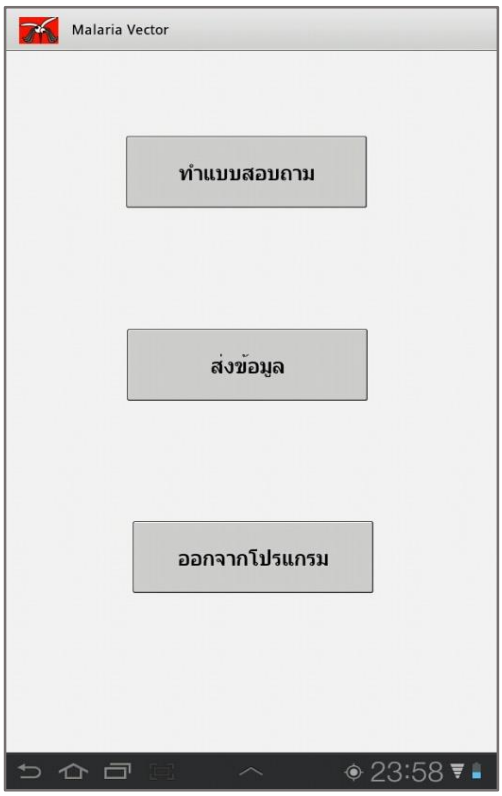
1 = พอใจน้อย 2 = พอใจปานกลาง 3 = พอใจมาก

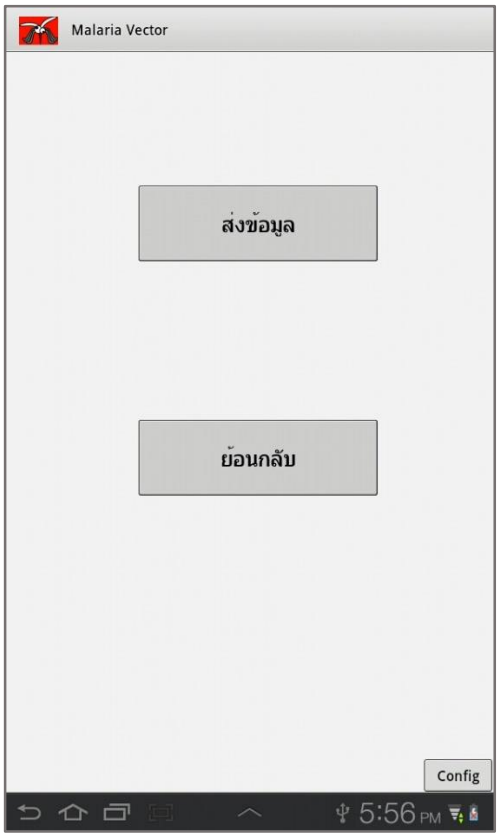
เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์				แบบสอบถามกระดาษ		
น้อย (1)	ปานกลาง (2)	มาก (3)	ท่านพึงพอใจมากเพียงใดกับการใช้เครื่องมือในการสัมภาษณ์แต่ละแบบ?	น้อย (1)	ปานกลาง (2)	มาก (3)
			a. รูปแบบ และลักษณะของเครื่องมือ			
			b. ความง่ายในการใช้เครื่องมือ			
			c. ความรวดเร็วที่ใช้ในการสัมภาษณ์			
			d. ความพึงพอใจโดยรวม			

ส่วนที่ 3 ระดับการยอมรับในเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์

คำถาม	ไม่เห็นด้วยอย่างมาก (1)	ไม่เห็นด้วย (2)	เฉยๆ (3)	เห็นด้วย (4)	เห็นด้วยอย่างมาก (5)
3.1) ใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ช่วยให้ฉันทำงานเสร็จเร็วขึ้น					
3.2) ใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ช่วยให้ฉันทำงานได้สะดวกขึ้น					
3.3) ใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ช่วยให้ฉันทำงานได้อย่างถูกต้องแม่นยำขึ้น					
3.4) ใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ช่วยให้ฉันเก็บข้อมูลได้ง่ายขึ้น					
3.5) โดยภาพรวมฉันพบว่าเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์มีประโยชน์ต่อการเก็บข้อมูล					
3.6) การเรียนรู้ในการใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ง่ายสำหรับฉัน					
3.7) ฉันพบว่ามันง่ายที่จะใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ทำในสิ่งที่ฉันต้องการจะทำ					
3.8) วิธีการใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ระบุไว้อย่างชัดเจน และเข้าใจได้					
3.9) มันเป็นเรื่องง่ายที่ฉันจะสามารถใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์อย่างคล่องแคล่ว					
3.10) โดยภาพรวมฉันพบว่าเครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ใช้ง่าย					
3.11) ถ้ามีโอกาสฉันจะใช้เครื่องมือเก็บข้อมูลแบบอิเล็กทรอนิกส์ในงานของฉัน					

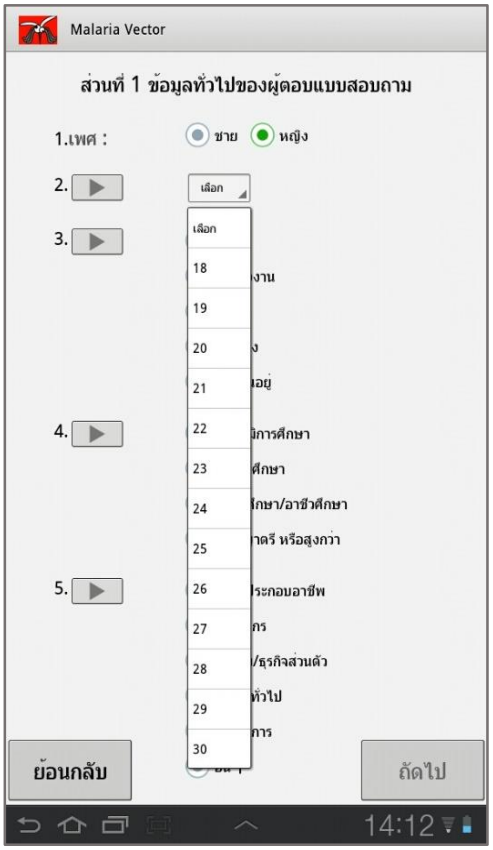
APPENDIX F
SCREEN SHOT OF THE ELECTRONIC DATA CAPTURE TOOL



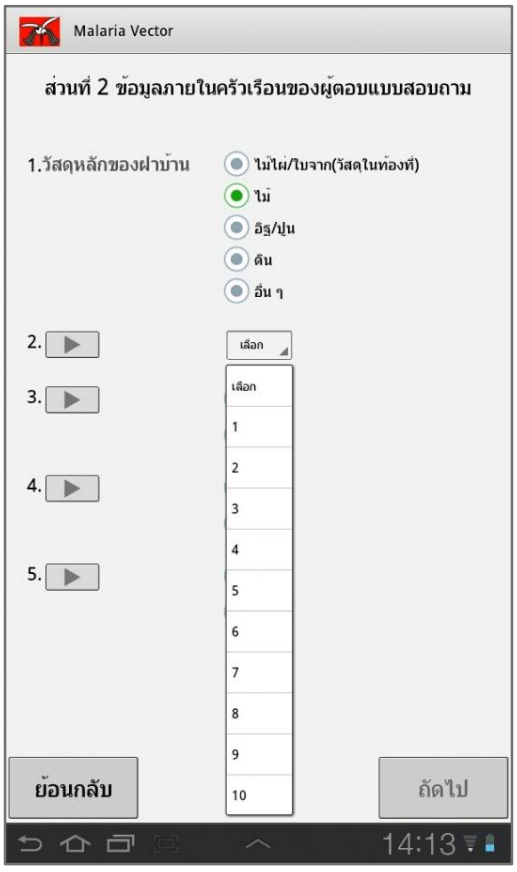

Malaria Vector
ส่งข้อมูล
ย้อนกลับ
Config
5:56 PM

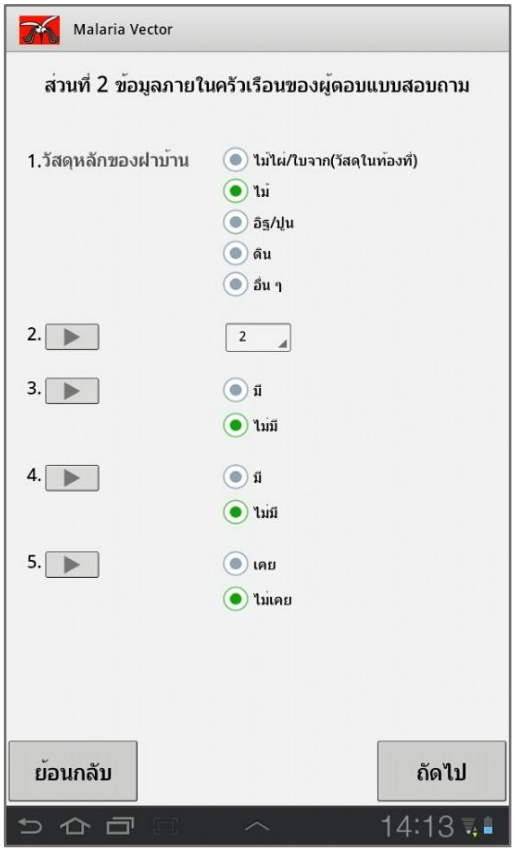

Malaria Vector
แบบสอบถามการควบคุมพาหะนำโรคมาลาเรีย
Total: 1 case
รหัส
วันที่บันทึกข้อมูล
สถานะส่งข้อมูล
20131015213283330206
15-Oct-2013
ย้อนกลับ
เริ่มต้น
14:12


Malaria Vector
แบบสอบถามการควบคุมพาหะนำโรคมาลาเรีย
Total: 1 case
รหัส
วันที่บันทึกข้อมูล
สถานะส่งข้อมูล
20131015213283330206
15-Oct-2013
ย้อนกลับ
เริ่มต้น
14:12


Malaria Vector
ส่วนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม
1.เพศ :
ชาย
หญิง
2.
3.
4.
5.
เลือก
18
19
20
21
22
23
24
25
26
27
28
29
30
ย้อนกลับ
ถัดไป
14:12


Malaria Vector
ส่วนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม
1.เพศ :
ชาย
หญิง
2.
20
3.
โสด
คู่/แต่งงาน
หม้าย
หย่าร้าง
แยกกันอยู่
4.
ไม่มีวุฒิการศึกษา
ประถมศึกษา
มัธยมศึกษา/อาชีวศึกษา
ปริญญาตรี หรือสูงกว่า
5.
ไม่ได้ประกอบอาชีพ
เกษตรกร
ค้าขาย/ธุรกิจส่วนตัว
รับจ้างทั่วไป
รับราชการ
อื่น ๆ
ย้อนกลับ
ถัดไป
14:13

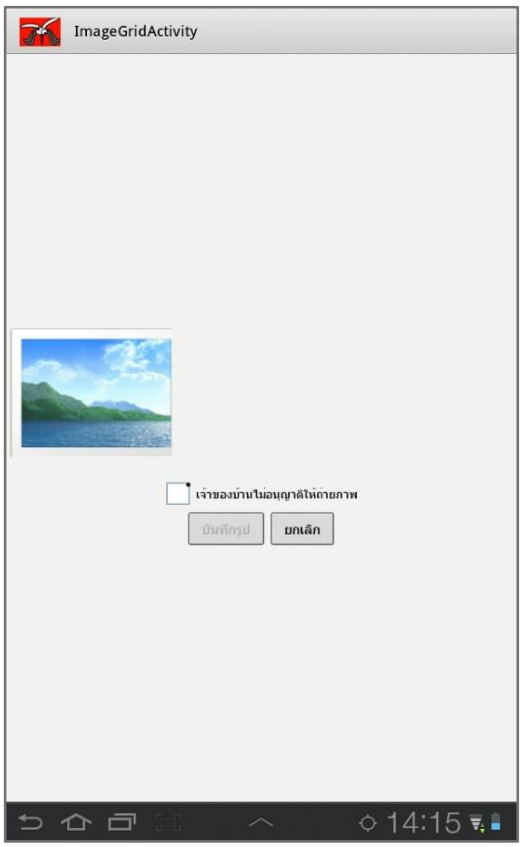

Malaria Vector
ส่วนที่ 2 ข้อมูลภายในครัวเรือนของผู้ตอบแบบสอบถาม
1.วัสดุหลักของฝาบ้าน
ไม้ไผ่/ใบจาก(วัสดุในท้องที่)
ไม้
อิฐ/ปูน
ดิน
อื่น ๆ
2.
เลือก
3.
4.
5.
เลือก
1
2
3
4
5
6
7
8
9
10
ย้อนกลับ
ถัดไป
14:13


Malaria Vector
ส่วนที่ 2 ข้อมูลภายในครัวเรือนของผู้ตอบแบบสอบถาม
1.วัสดุหลักของฝาบ้าน
ไม้ไผ่/ใบจาก(วัสดุในท้องที่)
ไม้
อิฐ/ปูน
ดิน
อื่น ๆ
2.
2
3.
มี
ไม่มี
4.
มี
ไม่มี
5.
เคย
ไม่เคย
ย้อนกลับ
ถัดไป
14:13


Malaria Vector
ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน
1.
มี
ไม่มี
กด ถัดไป เพื่อดำเนินการต่อ
ย้อนกลับ
ถัดไป
14:13


Malaria Vector
ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน
1.
มี
ไม่มี
2.
เลือกจำนวนมุ้งทั้งหมด
ย้อนกลับ
ถัดไป
14:14


Malaria Vector
ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน
1.
มี
ไม่มี
2.
1
ย้อนกลับ
ถัดไป
14:15

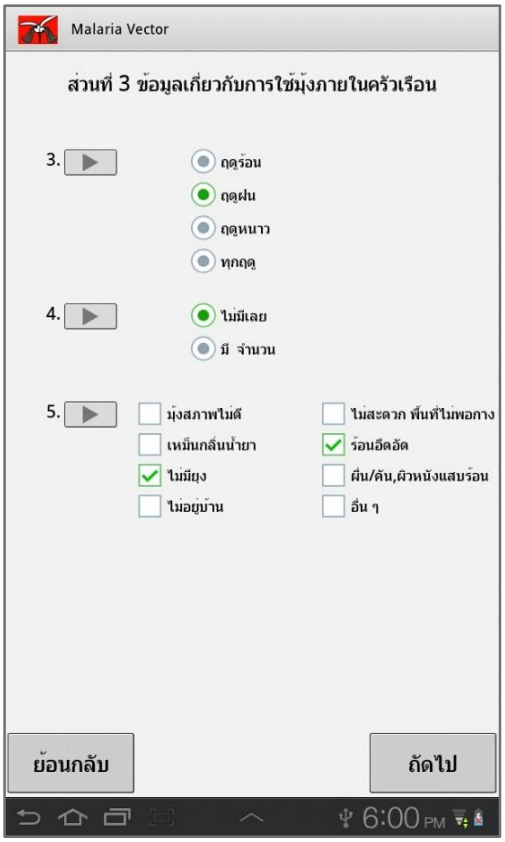

ImageGridActivity
เจ้าของบ้านไม่อนุญาตให้ถ่ายภาพ
ยกเลิก
14:15

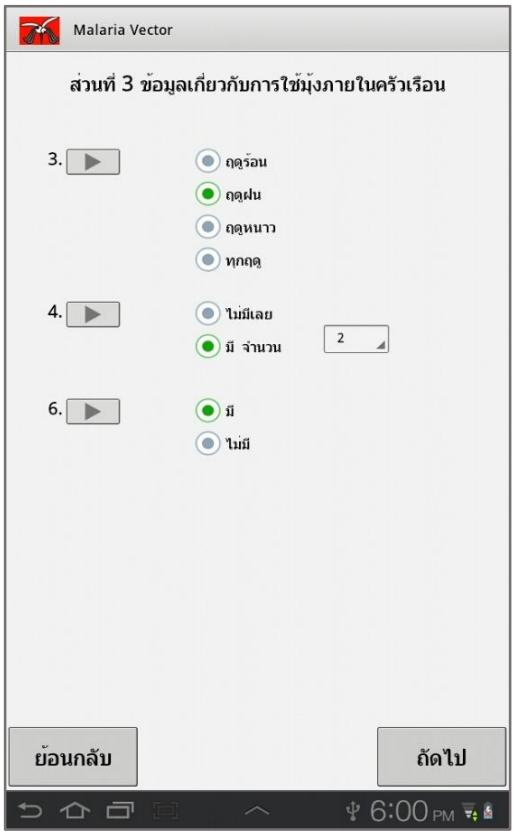

TakePhotoActivity
ถ่ายรูป
ยกเลิก
5:58 PM

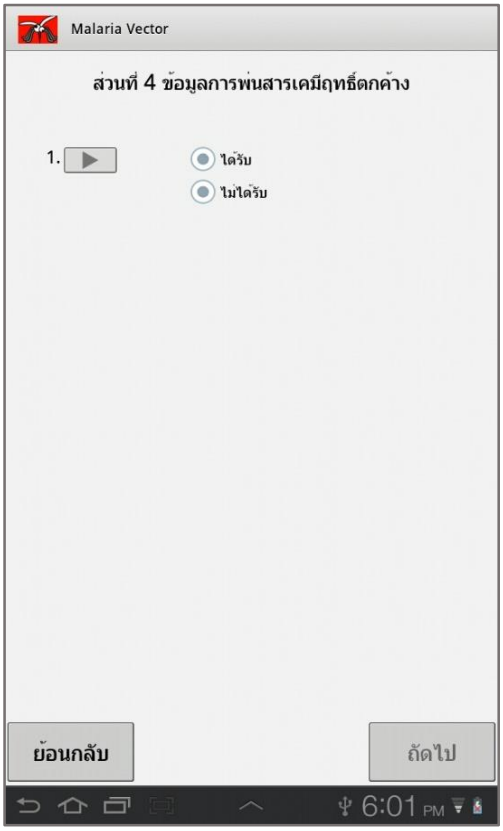

ViewActivity
กลับรูป
ตกลง
ยกเลิก
5:59 PM


ImageGridActivity
ท่านไม่ต้องการบันทึกรูปถ่าย ?
ใช่
ไม่ใช่
เจ้าของบ้านไม่อนุญาตให้ถ่ายภาพ
บันทึกรูป
ยกเลิก
6:00 PM

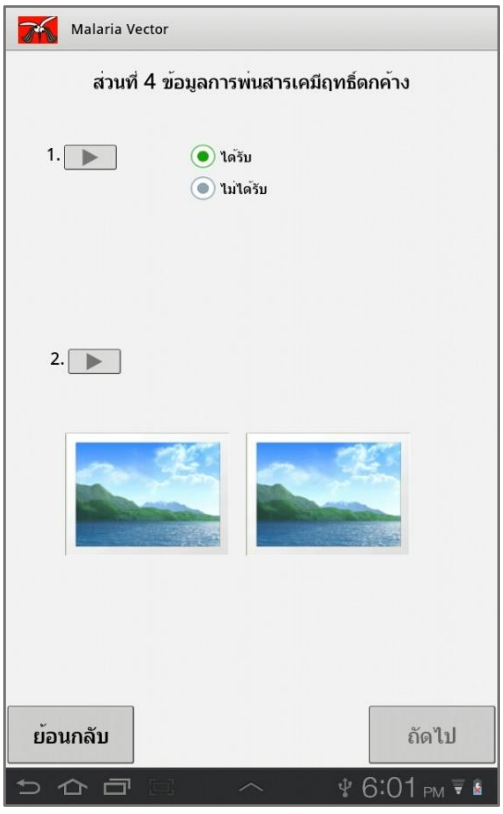

Malaria Vector
ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน
1.
มี
ไม่มี
บันทึกรูปเสร็จสิ้น
ย้อนกลับ
ถัดไป
6:00 PM

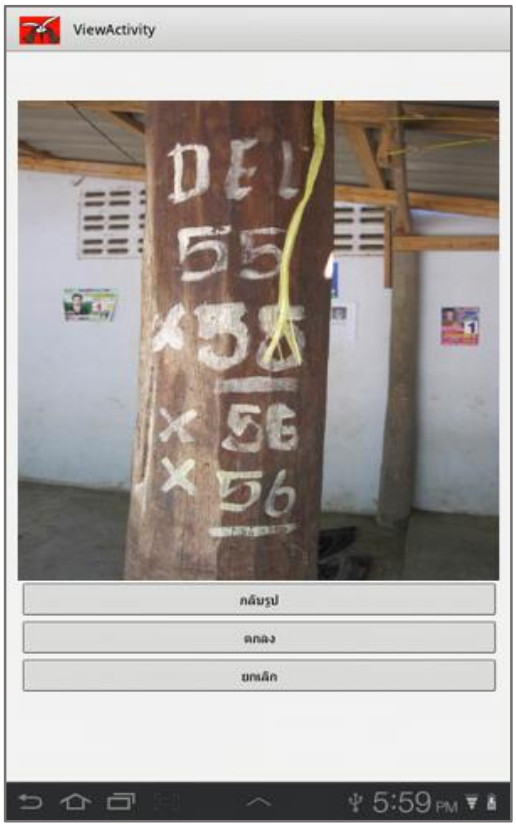

Malaria Vector
ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน
3.
ฤดูร้อน
ฤดูฝน
ฤดูหนาว
ทุกฤดู
4.
ไม่มีเลย
มี จำนวน
5.
มุ้งสภาพไม่ดี
เหม็นกลิ่นน้ำยา
ไม่มียุง
ไม่อยู่บ้าน
ไม่สะดวก พื้นที่ไม่พอกาง
ร้อนอึดอัด
ผื่น/คัน,ผิวหนังแสบร้อน
อื่น ๆ
ย้อนกลับ
ถัดไป
6:00 PM


Malaria Vector
ส่วนที่ 3 ข้อมูลเกี่ยวกับการใช้มุ้งภายในครัวเรือน
3.
ฤดูร้อน
ฤดูฝน
ฤดูหนาว
ทุกฤดู
4.
ไม่มีเลย
มี จำนวน
2
6.
มี
ไม่มี
ย้อนกลับ
ถัดไป
6:00 PM


Malaria Vector
ส่วนที่ 4 ข้อมูลการพ่นสารเคมีฤทธิ์ตกค้าง
1.
ได้รับ
ไม่ได้รับ
ย้อนกลับ
ถัดไป
6:01 PM


Malaria Vector
ส่วนที่ 4 ข้อมูลการพ่นสารเคมีฤทธิ์ตกค้าง
1.
ได้รับ
ไม่ได้รับ
เสร็จสิ้นการตอบคำถาม
ย้อนกลับ
ถัดไป
6:01 PM


Malaria Vector
ส่วนที่ 4 ข้อมูลการพ่นสารเคมีฤทธิ์ตกค้าง
1.
ได้รับ
ไม่ได้รับ
2.
ย้อนกลับ
ถัดไป
6:01 PM


ViewActivity
กลับรูป
ตกลง
ยกเลิก
5:59 PM


Malaria Vector
การเก็บข้อมูลเสร็จสิ้น
Latitude :
Longitude :
ยืนยันตำแหน่งบ้าน
ย้อนกลับ
ตกลง
6:01 PM


Malaria Vector
การเก็บข้อมูลเสร็จสิ้น
Latitude : 13.767766299566233
Longitude : 100.53457868989904
ยืนยันตำแหน่งบ้าน
ย้อนกลับ
ตกลง
6:03 PM


Malaria Vector
แบบสอบถามการควบคุมพาหะนำโรคมาลาเรีย
Total: 2 case
รหัส
วันที่บันทึกข้อมูล
สถานะส่งข้อมูล
20131015213283330206
15-Oct-2013
20131020235613340696
20-Oct-2013
ย้อนกลับ
เริ่มต้น
23:58

BIOGRAPHY

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PUBLICATION	Kongsin S, Jiamton S, Kanoksak Wongpeng K, Prom-On K, Rongsumlee S, Boonruang N, Boonyai S, Tachapetpaiboon K, Youngviset B, **Monyarit S**. Comparison of Adherence of Antiretroviral Therapy between Community Hospitals and Regional Hospitals under the Universal Coverage. Journal of Health Systems Research. Oct.-Dec. 2011;5(4):485-94.