FACTORS INFLUENCING THE ACCEPTANCE FOR ADOPTION OF INNOVATIVE MEDICAL SELF-TEST

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ปัจจัยที่มีอิทธิพลต่อการยอมรับการใช้นวัตกรรมการตรวจวิเคราะห์ทางการแพทย์ด้วยตนเอง

น.ส.สุมนธิดา สายาจักร

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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สุมนธิดา สายาจักร : ปัจจัยที่มีอิทธิพลต่อการยอมรับการใช้นวัตกรรมการตรวจวิเคราะห์ทางการแพทย์ด้วยตนเอง. (FACTORS INFLUENCING THE ACCEPTANCE FOR ADOPTION OF INNOVATIVE MEDICAL SELF-TEST) อ.ที่ปรึกษาหลัก : ผศ.ดนุพล หุ่นโสภณ, อ.ที่ปรึกษาร่วม : รศ.ภาวพันธ์ ภัทรโกศล

การดูแลสุขภาพตนเองยังคงมีปัญหาอุปสรรคหลายประการ การใช้ชุดตรวจด้วยตนเองและ เทคโนโลยีสารสนเทศทางด้านสุขภาพอาจช่วยเพิ่มอัตราการเข้าถึงและศักยภาพในการดูแลสุขภาพตนเองรวมถึงความก้าวหน้าของอุตสาหกรรมทางการแพทย์ นอกจากนี้ยังอาจช่วยลดปัญหาเรื่องภาระค่าใช้จ่ายทางด้านสาธารณสุขของประเทศ ในปัจจุบันการศึกษาวิจัยทางด้านเทคโนโลยีสารสนเทศที่เกี่ยวข้องกับเรื่องการดูแลสุขภาพและความเชื่อของผู้ใช้สินค้าทางการแพทย์ในประเทศไทยนั้นยังมีข้อจำกัด การศึกษาครั้งนี้เป็นการพัฒนาแบบจำลองที่ผสมผสานและนำไปต่อยอดในการพัฒนาซอฟต์แวร์เพื่อเข้าใจลักษณะเฉพาะของแต่ละบุคคลและปัจจัยที่มีอิทธิพลต่อการยอมรับการใช้ชุดตรวจทางการแพทย์ด้วยตนเอง ซึ่งการศึกษาครั้งนี้เป็นการศึกษาภาคตัดขวางโดยใช้แบบสอบถามที่สร้างขึ้นจากแบบจำลองความเชื่อทางด้านสุขภาพ (HBM) ทฤษฎีรวมของการยอมรับและการใช้เทคโนโลยี (UTAUT2) รวมถึงปัจจัยทางจิตวิทยาที่สำคัญ ได้ทำการเก็บแบบสอบถามจำนวน 1,000 ชุด ครอบคลุมภาคเหนือ ภาคกลาง ภาคตะวันออกเฉียงเหนือ และ ภาคใต้ รวม 18 จังหวัดในประเทศไทย ในระหว่างเดือนกุมภาพันธ์ ถึง เดือนพฤศจิกายน 2562 ทำการวิเคราะห์ข้อมูลจำนวน 979 ชุดแบบสอบถามที่สมบูรณ์ ด้วยการวิเคราะห์องค์ประกอบของโมเดล การวิเคราะห์โมเดลสมการโครงสร้าง การจัดกลุ่มตัวอย่างด้วยเทคนิคคลัสเตอร์ การวิเคราะห์ความถดถอยโลจิสติค ผลจากการศึกษาในครั้งนี้ พบว่าปัจจัยอิทธิพลทางสังคม มีผลต่อการยอมรับการใช้ชุดตรวจด้วยตนเองมากที่สุด รองลงมาคือ แบบแผนความเชื่อด้านสุขภาพ ผู้ใช้งาน ประสบการณ์ ลักษณะบุคลิกภาพ ลักษณะผลิตภัณฑ์ และ อายุ ซอฟต์แวร์ที่พัฒนาขึ้นจากการศึกษาในครั้งนี้จะอำนวยความสะดวกให้กับบริษัทด้านเครื่องมือแพทย์ในการระบุหาผู้ที่มีลักษณะเฉพาะที่มีโอกาสเป็นลูกค้าที่จะใช้ชุดทดสอบด้วยตนเองสำหรับการตรวจคัดกรองสุขภาพ เพื่อการตรวจหาโรคในระยะเริ่มต้น เพื่อเป็นการป้องกันค่าใช้จ่ายจากการรักษาเป็นระยะเวลานาน ลดอัตราความเสี่ยงในการเสียชีวิต

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Sumontida Sayachak : FACTORS INFLUENCING THE ACCEPTANCE FOR ADOPTION OF INNOVATIVE MEDICAL SELF-TEST. Advisor: Asst. Prof. DANUPOL HOONSOPON, Ph.D. Co-advisor: Assoc. Prof. PARVAPAN BHATTARAKOSOL, Ph.D.

There are multiple barriers of health self-care. Self-testing and information technology would empower self-care and medical industry. In addition, it may reduce the country's public health burden cost. However, there is very limited research on IT related to health care and customer belief in Thailand. This study, alternate innovative mixed models in software was developed to understand individual's characteristics and influencing factors for the adoption of medical self-testing.

A cross-sectional survey was conducted using self-administrated questionnaires that constructed based on Health belief model (HBM), Extending the unified theory of acceptance and use of technology (UTAUT2) including related significant psychological determinants. 1,000 questionnaires were sent out in four regions (18 provinces) during February-November 2019. Total 979 completed data set were analyzed using confirmatory factor analysis (CFA), Structural Equation Modeling (SEM), Cluster analysis and Logistic regression.

The results demonstrated that Social influence was the most psychological determinants significantly impact for adoption intention on home Self-test kit followed by Health belief, User-centricity, Experience, Personality trait, Product feature and Age. The developed software from this study would facilitate medical company to identify potential customers to access self-testing kit for health screening, early disease detection, and prevention of chronic therapeutic costs and mortality.

Field of Study:	Technopreneurship and Innovation Management	Student's Signature .....
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		Co-advisor's Signature .....

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Six years ago, innovation was far away from my thought. Then, I somehow have been entering into the world of innovation for development through my Ph.D learning program that pushing me out of the comfort zones. Working and study are special and challenging moment in my life. Load of intensive course works, many program activities, classmates, teachers from this program and extra knowledge from special guest speakers opening my sight to see the wider whole picture of innovation and management. The picture is more crystallizing my idea and I realized that innovation is already and every day embedded in my life.

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CHAPTER I
INTRODUCTION

1.1 Statement of the problem

Health screening aims to identify the risk of illness and disease in asymptomatic individuals. Early detection increases the chances of successful treatment, declining the severity and complications of the diseases and reducing the burden of long-term health costs. Several non-communicable and asymptomatic diseases such as diabetes, cervical cancer and colorectal cancer are an example of serious problem that has been increasing trended and leading to dramatically high cost of treatment. The prevalence of diabetes in adults (> 20 years) increased from 7% to 9% in 2009 (Aekplakorn et al., 2011) and in the year of 2014 (Aekplakorn et al., 2018) respectively. Management of diabetes is an important issue. About 43% of diabetes patients have not been diagnosed due to asymptomatic of diabetes in the initially stage. Although, some symptomatic patients already had complications and being diagnosed such as diabetic retinopathy, diabetic nephropathy and diabetic ulcers. Importantly, diabetes has a significant high risk for coronary heart disease and stroke. Cervical cancer causes by the infection of high-risk human papillomavirus (HPV) which is the third most common female cancer worldwide. It is approximately 569,847 cases of new women with cervical cancer reported every year and more than 311,365 reported deaths (Bruni L, 2019). In Thailand, it is the second most common female cancer with about 8,622 new cervical cancer cases diagnosed and 5,015 death annually (Bruni L, 2018). The colorectal cancer, age-standardized incident rate (ASR) ranks as the fifth rank of cancer found (Bray et al., 2018). The incidence rate is a significantly increased. It might be due to Thai people's lifestyle and their behavior consumptions shifted from of eating fruits and vegetables to consume higher animal products, fats and sugar consumptions (Kosulwat, 2002) In 2025, ASR of colorectal cancer is expected to be increased to 12.9% in female and 20.8% in male, respectively (Virani et al., 2017) S). From National Health Security Office (NHSO) data during 2016-2018, UHCS has to cover 26,679 million Baht for cancer patients' treatment. Particularly in 2018, 234,116 cancer patients accessed to 9,557 million baht for treatment compensation. The top 5 cancer were reported as follows: breast cancer, liver cancer and gallbladder cancer, colorectal cancer, lung cancer and cervical cancer. Health Technology and Policy Assessment Project develops a set of health screening benefits that are suitable for Thai people. Diseases or health problems prevention is

important to Thai people and health check-up would improve earlier disease detection for diabetes, ischemic heart disease (IHD), stroke, malnutrition, anemia, HIV /AIDS, liver cancer and gallbladder, cervical cancer, breast cancer and colorectal cancer. To reduce incidence rate of public health disease, screening methods for fasting blood sugar, Pap smear, Total and HDL cholesterol and fecal occult blood test should be screened to detect the risk groups. However, there were some barriers for under-screened people for entering screening programme such as lacking of time, low-income people, no related symptoms, too busy to go to hospital, responsibility for housekeeping tasks, feel frightened from vaginal speculum and embarrassment as well as cost concern/lack of insurance coverage and privacy. (Arrossi, Ramos, Straw, Thouyaret, & Orellana, 2016; Ford et al., 2004; R. M. Jones, Devers, Kuzel, & Woolf, 2010; Rungrueang P, 2015). These barriers causes delaying of detection, delaying of treatment, prolong of recovery, poor prognosis and increasing more disease transmission.

Thailand is entering to aging society. World population ageing (2019) (United Nations, 2019) estimated that it will be about 20% of population aged 65 years or over in 2030, and predicted that healthcare cost would be a challenging increased. In addition, the density of health care providers (doctors, nurses and midwives) in Thailand during 2007-2013 were 25 persons per 10,000 populations which was lower than the threshold suggested by the International Labor Organization (Scheil-Adlung, 2013) as 35 workers per 10,000 population. Moreover, Nursing and Working Life Research project (Thai Nurse Cohort) (Sawaengdee et al., 2016) found that the impermanent duration of staying in nursing career has major affected for nurse shortages. Approximately 11% of participants intended to discontinue their nursing career in 2009 and the percentage increased up to 15% in the year 2012. Therefore, high demand of the society of the elderly and chronic diseases care is an important factor causing the need for numbers of health workforce and challenging risk of health profession shortage in the future. Furthermore, a satisfaction survey with the UHCS by an independent agency (National Health Security Office) remarked that the main concern from patients included a long waiting time and quality of services, and the main concerning of health care service providers were about lacking of staff and insufficient budgets for quality of services delivery to meet patient's expectations. Facing imbalanced between medical work forces, resource and patient quality of care, therefore, improving early disease detection process and preventive health care by self-monitoring will be one supportive modality in near future of healthcare industry.

Self-testing is categorized as in vitro diagnostic (IVD) medical devices; provide new opportunities for consumers to take responsibility for monitoring their health status. Users will involve with activity of specimen collection, perform the testing and interpret self-tester result at home with simple instruction process as same as pregnancy test or blood sugar monitoring using glucometer. The generally advantage of using Self-testing provide convenience, privacy, without long waiting queue and get quick result. Self-testing has been used in several countries. For example, a cross-sectional survey, which examined the frequency of self-test used in Netherland. The results presented that 18.1% (799/4,416) of respondents reported experiences of used a self-testing. The most frequently self-testing modality used were diabetes (5.3%), kidney disease (4.9%) and cholesterol (4.5%) (Ickenroth et al., 2011). Ryan surveyed (A. Ryan, Wilson, & Greenfield, 2010b) in the UK found about 13% (678/5,025) of participants had used self-testing. One in one hundred of the adult population applied self-testing for cancer screening in UK (Wilson et al., 2008) and 8.5% of 2527 participants in Germany had ever used at least one time of self-test (Kuecuekbalaban, Schmidt, Beutel, et al., 2017). The two most frequently reasons of 505 German self-testers for using self-testing were reassurance the good health status and reduce risk perception (Kuecuekbalaban, Schmidt, & Muehlan, 2017). Another survey from Qatar indicated that 71% of respondents (N=297) had used home test kit. The result showed that 44% had ever used blood sugar test and 8% used others test (El Hajj, El-Ajez, Al-Ismail, & Sawaftah, 2012). In Thailand, besides pregnancy test and blood glucose monitoring, using self-testing is a new plate form for self-care approach. Recently, Thailand's Food and Drug Administration (FDA) collaborates with Department of Disease Control and Thai Red Cross AIDS Research Centre to unlock home HIV-self testing approach, which is before tested only by medical professionals. On 9 April 2019, by public private partnership, FDA approved HIV self-testing kit to be available access at pharmacies shop in Thailand by public users. This indicated that self-screening approach for infectious screening using self-testing kit has been increasing wider with more possibility to detect virus in early stage and this could improve case earlier detection. Self-tester with positive result can get immediate result and seek early treatment and care. Using self-testing is probably becoming a new perception and will be one alternative solutions to reduce high burden of cost, decrease prevalence of many public health diseases in Thailand. Self-testing modality is involving directly with consumers, understanding their belief, their concern and other factors identification would help both producers and customers to get through obstacle of self-screening approach.

Fishbein and Ajzen developed the Theory of reasoned action (TRA) in 1975 (Fishbein & Ajzen, 1975), comprised of two major determinants are attitude and subjective norm as a predictor of behavior intention. Later, Ajzen (Ajzen, 1991) extended TRA in order to deal with people behavior and added a third element named perceived behavior control into the assumption. Thus, the developed theory named the Theory of planned behavior (TPB). These two major theories have been explained and predicted in health-related behaviors such as cancer screening practices, HIV/AIDS-related behavior and emergency contraception uses (Godin & Kok, 1996), (Sable, Schwartz, Eleanor, & Lisbon, 2006). Health belief model (HBM), a theoretical framework was developed to explain health-related behavior by Rosenstock and his college (Rosenstock, 1974). HBM was most successful to be a predictor of preventive health behavior like X-ray screening for TB, Pap test and vaccination in early HBM studied. Subsequent literature, HBM has applied to explain sick role behaviors such as smoking, alcohol use and exercise and extended to examine condom use as well as screening behavior such as colorectal cancer, fecal occult blood and breast self-examination(Abraham & Sheeran, 2005). This theory also applied to explain why consumer perform home Self-testing such as diabetes, cholesterol and HIV Infection, (Ickenroth et al., 2011; Jamil et al., 2017). The mechanism and or process of individual's technology use and evaluate the psychological factors, HBM has been used to explain health related technology adoption behavior by integrating with Technology Acceptance Model (TAM) like mobile health service and health-related internet use (Ahadzadeh, Pahlevan Sharif, Ong, & Khong, 2015; Deng, 2013; Zhao, Ni, & Zhou, 2017). From integrating between HBM and TAM, the results provided more insight and understandable the role of psychological determinants, which act as a mediator on technology acceptance (Ahadzadeh et al., 2015). Therefore, understanding the internal beliefs, attitudes, individual intention and influencer behavior including technology adoption, several developed theoretical models from original social psychology model and theories are important and would predict and explain a significant human behavior in adoption of self-testing.

Theory of Technology acceptance model (TAM) was introduced in 1986 by Davis. The goal of the theory was to provide understanding of computer acceptance behavior. TAM has been applied to explain the behavior of the physician, nurse and medical staff's for acceptability and usage of health IT, electronic health care record (EHCR) systems, information and communication technology (ICT) in health care context (Melas, Zampetakis, Dimopoulou, & Moustakis, 2011; Ortega Egea & Román González, 2011; Yarbrough & Smith, 2008). Next, unified theory of acceptance and

use of technology (UTAUT) was proposed by Venkatesh (2003) (Venkatesh, Morris, Davis, & Davis, 2003) to have more understanding of explanation of the variance in user's behavior and intention to use technology. This theoretical model was formulated from integrating elements across eight previously established models. The model consists of four core determinants of user acceptance and usage behavior, explaining more details in term of performance expectancy, effort expectancy, social influence, facilitating conditions and four key moderators (gender, age, experience and voluntariness of use). UTAUT was able to explain for 70% of the variance in behavior intention and usage decision in organization to adopt and to use new systems. Later, Venkatesh (2012) (Venkatesh, Thong, & Xu, 2012) applied the unified theory of acceptance and use of technology to investigate the acceptance and intention to use technology in the aspect of consumer. Three constructs were corporated into UTAUT comprise of hedonic motivation, price value and habit named UTAUT2. Moreover, the modified UTAUT explained variance in behavior intention and technology use as much as 74% and 52%, respectively. In the study, 1512 mobile internet consumers were compared to UTAUT. It was found that there was accounted for 56% and 40%, respectively. The study in Iran showed that measure factors in accepting electronic portal and technology were including price value, hedonic motivation, habit and usability that significant associated with intention to use the medical laboratory website (R. Ravangard, Z. Kazemi, S. Z. Abbasali, R. Sharifian, & H. Monem, 2017). Regarding of original extended UTAUT study, the model was tested on only one type of technology, which was mobile internet. Hence, other relevant factors could help UTAUT to expand the range of consumer technology usage. Then, a study of Dwivedi (Dwivedi, Shareef, Simintiras, Lal, & Weerakkody, 2016) examined extend UTAUT2 model by adding items of waiting time and social concept to explain adoption behavior in ICT-based mobile for health service. The results indicated that less waiting time had direct positively effect on user's behavior intention to adopt the mobile healthcare system. There was a health related studied using UTAUT construct to identify factor of patients 'intention to use diabetes management application by adding perceived disease threat and perceived privacy risk. The results showed that there were two determinants (mediated by performance expectancy) added which had direct effects on behavior intention. This model could explain up to 57.1% of the variance in behavior intention (Zhang et al., 2019). Therefore, what psychological factors related health behavior and the effect on consumer's adoption are important elements to be incorporated and explain user's belief on technology acceptance.

As earlier theories and models approaches, this study aimed to innovate alternative mixed models to provide a better understanding of user context of which accepting factors that influencing the adoption of medical self-testing by integrating key health behavior theories, technology acceptance theories and significant psychological determinants. The developed model will be evaluated and further developed as application software for intervening medical self-testing feature of potential user's adoption. Therefore, this study included four main specified objectives as follows.

1.2 Objectives

1. To study the psychological factors influencing the acceptability of innovative medical self-testing.
2. To develop a mixed model for examining psychological factors influencing the acceptability of innovative medical self-testing.
3. To develop application software as innovative evaluation tools for customer's acceptability in innovative medical self-testing approach.
4. To piloting evaluation the acceptability and identifying medical self-testing intention for potential further product commercialization using developed innovative model.

1.3 Scope of participants and timeframe for model evaluation and field-testing

Individuals aged above 18 years old from eighteen provinces of Thailand were participated in the study. The study population was purposive sampling based on monthly income averaged, which was provided by National Statistical Office database. There were representative from four different regions as follow: North (Lamphun, Chiangmai, Phayao, Phitsanulok and Phichit), Central (Nakhon Pathom, Chonburi, Lopburi and Pathum Thani), Northeast (Chaiyaphum, Nongbualamphu, Nakhon ratchasima, Burirum and Kalasin) and South (Phuket, Chumphon, Trang and Pattani) provinces. The study was conducted after the Ethics Committee of the institutional review board of the Faculty of Medicine, Chulalongkorn University, Bangkok approved IRB No.755/61. The data collection was conducted between February-November 2019.

1.4 Research methodology

A cross-sectional survey based on paper-based questionnaire was conducted. The research-developed guidelines for investigation were described on table below.

Table 1.1 Research objectives and research methodology classification

Objective	***Methodology***
1. To study the factors influencing the acceptability of medical self-testing.	1.1 Literature review of relevant documents.
2. To develop methods for examining factors influencing the acceptability of medical self-testing.	2.1 Create a questionnaire and check the reliability of the questionnaire by preliminary tested of 60 participants.
	2.2 Data collection from four regions of 18 provinces.
3. To develop innovative evaluation tool for medical self-testing intention.	3.1 Develop innovative evaluation Tool for testing medical self-testing.
4. To translate the acceptability of innovative evaluation tool for medical self-testing adoption	4.1 Test innovative evaluation tool for evaluation of innovative medical self-testing.
	4.2 Acceptability testing using developed innovative developed software in specified target group.

1.5 Expected outcome

1. The finding from this study will be used for developing of educational materials and or programs to facilitate self-testing for a future development of public health disease screening for prevention program.
2. The researchers and producers could clearly understand the values and norms in the aspect of the psychological factors and barriers of target users for medical self-testing kits. Then, they can produce test kits to meet their target user's expectation, especially Thai people.
3. The form of software would be developed for friendly use and comfortably facilitate the acceptability of innovative medical self-testing kit. It can be used to determine the level of targeted customer expectation and need and to support specific evidence based information for decision on producing, planning, import and distributing products to the right specified target groups.
4. For encouraging self-testing kits innovators to develop and create products in need available in the country and further expanding market of self-testing kits to countries where there is similar values and beliefs.

1.6 Terminology

(กองควบคุมเครื่องมือแพทย์ สำนักงานคณะกรรมการอาหารและยา, 2558)

1.6.1 **Innovation** means something that is not only newly created, developed or practiced which is created from knowledge, expertise, skills, experiences and creativity but also disseminated and implemented to society, and it can be used for commercialization and or social assistance (Hoonsopon & Ruenrom, 2012)

1.6.2 **Medical device** means that an instrument, apparatus, implement, machine, contrivance, implant, or in vitro reagent or other similar article that is intended for use in the diagnosis of disease or other conditions, or in the care, mitigation, treatment, or prevention of disease.

1.6.3 **Home medical device** means a device intended for use in a non-clinical or transitory environment [that] is managed partly or wholly by the user, requires adequate labeling for the user, and may or may not require training for the user by a health care professional in order to be used safely and effectively.

1.6.4 **In Vitro Diagnostic (IVD) medical devices** means that any reagent, reagent product, calibrator, control material, kit, instrument, apparatus, equipment or system, whether used alone or used together or used in conjunction with other medical devices that producer intended users utilize it for detecting the specimens from the human body (blood and organs donation) for the purpose of providing information of concerning a physiological or pathological state or a congenital abnormality.

1.6.5 **IVD medical device for self-testing** means any IVD medical device intended for lay persons users.

1.6.6 **Reagent** means that any chemical, biological or immunological components, solutions or preparations intended by the product owner to be used as IVD medical devices.

1.6.7 **Specimen** means samples obtained from a human, e.g. plasma, serum, blood, oral fluids, urine and spinal fluid.

1.6.8 **Self-testing** means that testing performed by lay persons.

1.6.9 **Lay person** means that any individual who does not have formal training in a relevant field or disciplines.

CHAPTER II
LITERATURE REVIEW

In this chapter, literature will cover medical device, innovation, healthcare innovation, diffusion of innovation and key stakeholder in healthcare in the first section. Next, we will go through the most widely used health behavior theory and technology acceptance theory. Summary studies of healthcare adoption, conceptual framework and research hypotheses were the last section.

2.1 In Vitro Diagnostic (IVD) medical devices

(กองควบคุมเครื่องมือแพทย์ สำนักงานคณะกรรมการอาหารและยา, 2558)

From Thai Food and Drug Administration notification on 1 April 2015, medical devices are classified according to risky to ensure the use of medical devices is safe and the protection of consumers is appropriate. By categorizing according to the level of risk per person and public health as following:

1. Medical device type 1 (Class A): a medical device with low Individual risk and low public health risk.
2. Medical device type 2 (Class B): a medical device that are at risk Moderate to individuals and/or low risk to public health.
3. Medical device type 3 (Class C): a medical device that is at high risk to a person and/or moderate risk to public health.
4. Medical device type 4 (Class D): a medical device that has a high risk for individuals and public health.

Definition of terms

"Medical device" means that the machine tools, equipment, machinery, objects used to enter the human body including reagents which are used in the laboratory, calibrators, software, materials or similar or related things. The owner of the product intends to use it by himself/herself or shared for other humans with one specific purpose or more as follows:

(A) Diagnose, prevent, follow up, treat, relieve or cure human diseases.

(B) Diagnose, follow, treat, relieve or compensate for human injury.

(C) Examine, replace, modify, support anatomy or Physiological processes of the human body.

(D) Support or save human life.

(E) Human contraception.

(F) destroy or disinfect for medical devices.

(G) Provide information from the examination of the specimens from the human body For medical or diagnostic purposes.

"In Vitro Diagnostic (IVD) medical devices" means that any reagent, reagent product, calibrator, control material, kit, instrument, apparatus, equipment or system, whether used alone or Used together or used in conjunction with other medical devices that the owner of the product intended for detecting the specimens from the human body Including blood and organs donation for the purpose of providing information of concerning a physiological or pathological state or a congenital abnormality. Also, to consider the safety and compatibility of tissues of those who have the opportunity to receive organs or treatment monitoring including specimen storage containers.

"Instrument" means that equipment or apparatus intended by the product owner to be used as IVD medical device.

"IVD medical device for self-testing" means that any IVD medical device intended by the product owner for use by lay persons.

"Lay person" means that any individual who does not have formal training in a relevant field or disciplines.

"Near patient testing" means that any testing performed outside a laboratory environment by a healthcare professional not necessarily a laboratory professional, generally near to, or at the side of, the patient. Also known as Point of Care (POC).

"Reagent" means that any chemical, biological or immunological components, solutions or preparations intended by the product owner to be used as IVD medical devices.

"Self-testing" means that testing performed by lay persons.

Specimen receptacle means that an IVD medical device, whether vacuum type or not, specifically intended by their product owner for the primary containment of specimens derived from the human body.

"Transmissible agent" means that an agent capable of being transmitted to a person, as a communicable, infectious or contagious disease.

"Transmission" means that the conveyance of disease to a person.

2.2 Risk Classification Rules for IVD Medical Devices

RULE 1: IVD medical devices intended for the following purposes are classified as Class D:

- medical devices intended to be used to detect the presence of, or exposure to, a transmissible agent in blood, blood components, blood derivatives, cells, tissues or organs in order to assess their suitability for transfusion or transplantation, or
- medical devices intended to be used to detect the presence of, or exposure to, a transmissible agent that causes a life-threatening, often incurable, disease with a high risk of propagation.

Rationale: The application of this rule as defined above should be in accordance with the rationale that follows: IVD medical devices in this Class are intended to be used to ensure the safety of blood and blood components for transfusion and/or cells, tissues and organs for transplantation. In most cases, the result of the test is the major determinant as to whether the donation/product will be used. Serious diseases are those that result in death or long-term disability, which are often incurable or require major therapeutic interventions and where an accurate diagnosis is vital to mitigate the public health impact of the condition.

Examples: Tests to detect infection by HIV, HCV, HBV, HTLV. This Rule applies to first-line assays, confirmatory assays and supplemental assays.

RULE 2: IVD medical devices intended to be used for blood grouping, or tissue typing to ensure the immunological compatibility of blood, blood components, cells, tissue or organs that are intended for transfusion or transplantation, are classified as Class C, except for ABO system [A (ABO1), B (ABO2), AB (ABO3)], rhesus system [RH1 (D), RH2 (C), RH3 (E), RH4 (c), RH5 (e)], Kell system [Kel1 (K)], Kidd system [JK1 (Jka), JK2 (Jkb)] and Duffy system [FY1 (Fya), FY2 (Fyb)] determination which are classified as Class D.

Rationale: The application of this rule as defined above should be in accordance with the following rationale: A high individual risk, where an erroneous result would put the patient in an imminent life threatening situation places the medical device into Class D. The rule divides blood-grouping IVD medical devices into two subsets, Class C or D, depending on the nature of the blood group antigen the IVD medical device is designed to detect, and its importance in a transfusion setting.

Examples: HLA, Duffy system (other Duffy systems except those listed in the rule as Class D) are in Class C.

RULE 3: IVD medical devices are classified as Class C if they are intended for use:

- in detecting the presence of, or exposure to, a sexually transmitted agent (e.g. Sexually transmitted diseases, such as Chlamydia trachomatis, Neisseria gonorrhoeae).
- in detecting the presence in cerebrospinal fluid or blood of an infectious agent with a risk of limited propagation (e.g. Neisseria meningitidis or Cryptococcus neoformans).
- in detecting the presence of an infectious agent where there is a significant risk that an erroneous result would cause death or severe disability to the individual or fetus being tested (e.g. diagnostic assay for CMV, Chlamydia pneumoniae, Methycillin Resistant Staphylococcus aureus).
- in pre-natal screening of women in order to determine their immune status towards transmissible agents (e.g. Immune status tests for Rubella or Toxoplasmosis).
- in determining infective disease status or immune status, and where there is a risk that an erroneous result will lead to a patient management decision resulting in an imminent life-threatening situation for the patient (e.g. Enteroviruses, CMV and HSV in transplant patients).

- in screening for selection of patients for selective therapy and management, or for disease staging, or in the diagnosis of cancer (e.g. personalized medicine).
- in human genetic testing (e.g. Huntington's Disease, Cystic Fibrosis).
- to monitor levels of medicines, substances or biological components, when there is a risk that an erroneous result will lead to a patient management decision resulting in an immediate life threatening situation for the patient (e.g. Cardiac markers, cyclosporin, prothrombin time testing).
- in the management of patients suffering from a life-threatening infectious disease (e.g. HCV viral load, HIV Viral Load and HIV and HCV geno- and subtyping).
- in screening for congenital disorders in the fetus (e.g. Spina Bifida or Down Syndrome).

Rationale: The application of this rule as defined above should be in accordance with the rationale for this rule which is as follows: IVD medical devices in this Class present a moderate public health risk, or a high individual risk, where an erroneous result would put the patient in an imminent life-threatening situation, or would have a major negative impact on outcome. The IVD medical devices provide the critical, or sole, determinant for the correct diagnosis. They may also present a high individual risk because of the stress and anxiety resulting from the information and the nature of the possible follow-up measures.

RULE 4: IVD medical devices intended for self-testing are classified as Class C, except those medical devices from which the result is not determining a medically critical status, or is preliminary and requires follow-up with the appropriate laboratory test in which case they are Class B. IVD medical devices intended for blood gases and blood glucose determinations for near-patient testing would be Class C. Other IVD medical devices that are intended for near patient should be classified in their own right using the classification rules.

Rationale: The application of this rule as defined above should be in accordance with the rationale for this rule which is as follows: In general, these IVD medical devices are used by individuals with no technical expertise and thus the labelling and instructions for use are critical to the proper outcome of the test.

Example for Self-Testing Class C: Blood glucose monitoring.
Example for Self-Testing Class B: Pregnancy self-test, Fertility testing, Urine test strip.

RULE 5: The following IVD medical devices are classified as Class A:

- reagents or other articles that possess specific characteristics, intended by the product owner to make them suitable for in-vitro diagnostic procedures related to a specific examination.
- instruments intended by the product owner specifically to be used for in-vitro diagnostic procedures.
- specimen receptacles.

Rationale: The application of this rule as defined above should be in accordance with the rationale for this rule which is as follows: These IVD medical devices present a low individual risk and no or minimal public health risk.

Examples: Selective/differential microbiological media (excluding the dehydrated powders which are considered not to be a finished IVD medical device), identification kits for cultured microorganisms, wash solutions, instruments and plain urine cup.

RULE 6: IVD medical devices not covered in Rules 1 through 5 are classified as Class B.

Rationale: The application of this rule as defined above should be in accordance with the rationale for this rule which is as follows: These IVD medical devices present a moderate individual risk as they are not likely to lead to an erroneous result that would cause death or severe disability, have a major negative impact on patient outcome or put the individual in immediate danger. The IVD medical devices give results that are usually one of several determinants. If the test result is the sole determinant however other information is available, such as presenting signs and symptoms or other clinical information that may guide a physician, such that classification into Class B may be justified. Other appropriate controls may also be in place to validate the results. This Class also includes those IVD medical devices that present a low public health risk because they detect infectious agents that are not easily propagated in a population.

Examples: Blood gases, H. pylori and physiological markers such as hormones, vitamins, enzymes, metabolic markers, specific IgE assays and celiac disease markers.

RULE 7: IVD medical devices that are controls without a quantitative or qualitative assigned value will be classified as Class B.

Rationale: For such controls, the user, not the product owner, assigns the qualitative or quantitative value.

2.3 Innovation

2.3.1 Definition of innovation and healthcare innovation

Table 2.1 Definition of innovation

Author/Organization	***Definition***
(Schumpeter, 1950)	Schumpeter is the Godfather of Innovation (Tidd J. & Bessant J., 2014) explained that innovation will make a lot of money or to get strategic advantage called 'monopoly profits'. However, other entrepreneurs will see try to imitate it – with the result that other innovations emerge, and the resulting 'swarm' of new ideas chips away at the monopoly profits until an equilibrium is reached. Schumpeter also, mentioned about a process of 'creative destruction' where there is a constant search to create something new which simultaneously destroys the old rules and established new ones – all driven by the search for new sources of profits.
(Drucker, 1985)	Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced.
(Rogers, 1995)	An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption.
(Rothwell & Gardiner, 1985)	Innovation does not necessarily imply the commercialization of only a major advance in the technological state of the art (a radical innovation) but it includes also the utilization of even small-scale changes in technological know-how (an improvement or incremental innovation).
(OECD, 2005)	Innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.

From the literature review, academic and well known organization have various views on the meaning of innovation and healthcare innovation. It could be summarized as in Table 1as follow.

From definition of innovation presented in Table 2.1 can conclude that "Innovation" is new thing could derive from idea, concept, process or improve the existing problems, which is further continuous development until bring economic and social benefits.

Innovation typology

Innovation can be categorized in different ways such as form, types of innovation and the degree of novelty. Based on the form of innovation, three principle applications of innovation are described as follows.

Product Innovation is defined as new tangible physical objects. It could be used as a part of the act of consumption by the consumers (Smith, 2009). The things which are represented by new products or services, resulted from organization to offer to meet customer's need in the market (Abernathy & Utterback, 1978; Tidd & Bessant, 2014)

Process Innovation means utilization of a new or improved manufacturing process, also include in service delivery method. Changing are for example, equipment, process, technique and/or software (ÖZer, 2012; Smith, 2009).

Service Innovation refers to provide new intangible things or significantly improved service that is different from the way customer use and perceive service delivered. That service has not previously available before, may resulting from new technology or new methods of working (Smith, 2009; Tidd & Bessant, 2014).

Table 2.2 Definition of healthcare innovation

Author/Organization	***Definition***
(Schumpeter, 1939)	Innovation as a driving force of change in healthcare.
(Drucker, 1985)	Innovation in the healthcare industry is far more than something new, but rather innovation in healthcare has the power to redefine it and change its potential to affect health and life in both good and bad ways.
(Weberg, 2009).	Innovation is something new, or perceived new by the population experiencing the innovation, that has the potential to drive change and redefine healthcare's economic and/or social potential.
(Omachonu & G Einspruch, 2010)	The definition of Healthcare innovation can be the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long-term goals of improving quality, safety, outcomes, efficiency and costs.
(World Health Organization, 2019)	Health innovation identifies new or improved health policies, systems, products and technologies, and services and delivery methods that improve people's health and wellbeing. Health innovation responds to unmet public health needs by creating new ways of thinking and working with a focus on the needs of vulnerable populations. It aims to add value in the form of improved efficiency, effectiveness, quality, sustainability, safety and/or affordability.

As presented in Table 2.2, definition of healthcare innovation can be describes as something new or improved product, process, service, system as well as technologies which aimed to improve quality of life, safety, better outcome, cost efficiency and sustainability in long-term goal.

Health care innovation

Innovation in healthcare typically are related to product innovation, process innovation and structural innovation (Varkey, Horne, & Bennet, 2008)

Table 2.3 Types of innovation in healthcare

Type of innovation	***Definition***	***Examples***
Product innovation	Goods or service that customer pays for.	Magnetic resonance imaging (MRI), Computerized tomography (CT) scan
Product innovation	A new change of producing or delivering method that present a significantly deliver product to stakeholders.	Telemedicine, tissue engineering
Structure innovation	A major change in the way of healthcare delivering and will affect both internal and external infrastructure.	Group practice, Minute Clinics

2.3.2 Diffusion of innovation

Roger (Rogers, 2003) described diffusion as a kind of the process in which an innovation is communicated through certain channels over time among the members of social system. The delivered massage is special because the mostly of the message concerned about new ideas. There are four keys components (innovation, communication channels, time and social system) in the diffusions of innovation.

Innovation diffusion in healthcare

The decision to adopt the innovation in individual is not immediately happen but it is a process, which occur overtime and consist of a different action. The process called innovation-diffusion process or an uncertainty reduction process. This process is an information seeking and processing activity that help to decrease about uncertainty of innovation. Roger (Rogers, 2003) mentioned five attributes of innovations include characteristic of innovation that help to reduce uncertainty about innovation. Five attribute of innovation, as perceived by individual consists of relative advantage, compatibility, complexity, trialability, and observability. Based on diffusion of innovation theory by Roger, Cain, M and Mittman R (Cain & Mittman, 2002; Rogers, 2003) proposed dynamics of new medical and technologies in the healthcare industry. Ten critical elements are explored as relative advantage, compatibility, trialability, observability, communication channels, homophilous groups, pace of innovation/reinvention, norms, roles and social networks, opinion leaders, infrastructure.

Relative Advantage

Relative advantages is defined by Roger (Rogers, 2003) as "the degree to which an innovation is perceived as being better than the idea it supersedes" It promotes a technology if it give more advantage compare the previous method. The adoption of Technology will out weight between the benefits and the risk of using it by judgement of a potential adopter. In addition, it is influenced by how easily to use the innovation than the existing method. As Rogers mentioned "the degree of relative advantage can be expressed as economic profitability, social prestige, or other benefits." Technology in the term of relative advantage acknowledge understanding the end user of the technology, considering of return on investment will helps potential adopter perceived the benefit and weight in on using technology.

Compatibility

Compatibility examine how an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2003). A new medical technologies which are less require learning new behavior, the consumers know how to use it and more pleasant to use will enhance its compatibility lead to adopt that technology without hesitating. Plug and play technology such as palm based prescription program is an example of technology require no more put effort to learn than the new software and diminish human error, is likely to adopt rapidly. Facilitated factor such as financial reimbursement program has an effect on adopting the technology. Without clarity of reimbursement method, even new technology perceived as a solution for healthcare professional or hospital, the technology would be invisible and lead to limited diffusion.

Trialability

Trialability means the degree to which an innovation may be test with on a limited basis, defined by Roger (Rogers, 2003). The innovation can be tested or tried out without a commitment to adopt it. Even though, the innovation has an evidence support, hands-on experience by themselves could overcome the paper and reduce their uncertainty risks. For example, Pharmaceutical sales representative providing free sample to the physician offices. Sales representative from medical device company show easily to operate the device without extensive training. If the innovation fits into the complex system, try to divided the whole process into a component part. Some of which may be trialable.

Observability

According to Rogers (Rogers, 2003), observability refers to the degree to which the results of an innovation are visible to others. Manufactures or vendor conducts or demonstrate a new medical technology to their targeted clinician, hospital's director and key stakeholder in order to encourage them to adopt the technology. Some innovation, which is difficult to demonstrate or improve long-term outcome but no significantly change in results, may diffuse slowly such as implanted cardiac defibrillator. Therefore, provider has to make non-observable medical technology to hand-on experience.

Communication channels

Diffusion is a special type of communication in which one individual deliver new ideas message to the other who does not know it until a mutual understanding is reach. Currently, the internet is one of the most important channel to disseminate medical information to clinician or healthcare professional. However, educated consumers who are responsible for their own health care are seeking for medical knowledge. They become a communication channel to inform physician about medical innovation. Publication is the reference source of scientific medical knowledge. Online e-journal or open access journal now provide speed new released finding. Interpersonal contact for a complex of medical device is seem to be the powerful way to understand the customer's point of view.

Homophilous groups

Homophily means the degree to which two or more individuals who interact are similar in certain attributes. For instance, beliefs, social status, common interest, etc. When two or more are homophilous, they will share common meaning, attitude and new ideas that lead to more communication that is effective (Rogers, 2003). Majority of clinician participate professional association during their professional careers. Associations offer them a service such as conference, special medical meeting and outstanding certification because associations count on homophily group to communicate and exchange new information with each other. In addition, most associations always public a latest advanced results of clinical trial and laboratory research via scientific publication, especially in specialty journals. Both researcher and reader are considering a member of homophilous group. However, there are other homophilous groups such as specialty nurse, patient group and hospital strategic planner. Provide them an updated medical information within these groups may help speed up dissemination of innovation.

Pace of innovation/reinvention

Reinvention is defined as the degree to which an innovation is changed or modified by a user in the process of adaptation and implementation (Rogers, 2003). Some innovations are stable and rapidly diffuse without any reinvention. On the other hand, some innovation are processing reinvented to be greater use than was intended. Consumer will find the new application for existing medical technology. Off-label uses of medical device and prescription drugs are gradually increased common. Manufacture and Pharmaceutical provider must closely monitoring medical technologies for potentially dangerous, particular users employ work-around to adapt a technology work and track that severe adverse side effect are not miss observed in drugs after FAD approved and being in used widely. Reinvention may be a sign that the innovation probably be adapted and reinvented to diffuse faster than the original design.

Norms, Roles, and Social network

Norms refer to a range of tolerable and serve as a guide or standard for the behavior of members of a social system (Rogers, 2003). In the aspect of medicine, the norms, roles and social network could be either slow the diffusion or act as a promoter. Physician's practice are hardly to change because norms is absorbed during their medical school. However, physician who regularly participate training or join conference may learn the others way to handle their patient's health problems. Others medical and professional societies are a key impact in disseminate innovation in healthcare's networks. An endorsement of practice guideline by a professional society could drive diffusion more rapidly and hold a practice in. Patient with cancer, diabetes and other disease are support each other in their group and connect via online communities. Frequently, these societies have been a dissemination channel to diffuse updated medical technologies to other professional healthcare communities.

Opinion leaders

Opinion leadership is the degree to which an individual is able to influence other individuals' attitudes or overt behavior informally in a desired way with relative frequency (Rogers, 2003). Opinion leaders are classified as a key factor of medical and information technologies diffusion. After they have been informed, convinced and some experience about the innovation, they become early adopters. Celebrity and influencer who have been infected or with a disease are another form of opinion leadership because they could share by their experience and point to what the technologies are used to detect or prevent. With the real experience of influencer will be easily attack toward consumers.

Infrastructure

The adoption of some innovation, require existing infrastructure to support it. For example, CT scan required computer, which is different feature from administrative function for digital image storage and image display. A limited resource of display infrastructure could be a barrier for technology diffusion. Both pharmaceutical and medical device manufacture need to get approval from regulatory in their development or product selling in the country. The prolonged time line for additional information, evaluation and inspection is one of hindrance lead to delay innovation contribution in healthcare system. Revising of shorten process to overcome this barrier would an exceptional consequence. In some innovation diffusion, cell phone is the case that get away from infrastructure. It is widespread in Asia where the telephone line is rare.

2.4 Adopter Categories

Adopter categories is defined as the classification of members of a social system based on innovativeness by Roger (Rogers, 2003). He described the innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system. Therefore, five categorization of adopters based on innovativeness are innovators, early adopters, early majority, late majority, and laggards. The details in each categories as presented as below.

Innovators

The characteristic of innovators are willing to take risks and want to be the leading level who experience with the new ideas. They are young in age and tend to have a great financial support. They also be a member of the highest social class but they are tend to be a little an introvert person. Roger mentioned that innovators are the gatekeepers introducing the innovation from outside to the system. Innovators comprises of 2.5% of the population.

Early adopters

Early adopters are the next group to adopt innovation, comprising of 13.5% of the population. They are more integrate into local social system when compared with the innovators. Early adopter is considered be a person who could advice and provide information regarding of new ideas to potential adopters. Therefore, early adopters 'opinion or attitude about the innovation could influence or retard to adopt in the next move.

Early majority

Rogers mentioned the early majority that they are willingness to adopt the innovation on purpose even they are relatively take longer time to make a decision than innovators and the early adopters. They interact with their interpersonal networks frequently however; they do not provide opinion as a leader in the system. The percentage of 34 is the number of early majority in adopting innovation with the concept be not the first while the new ideas is trying, but not the last to adopt it.

Late majority

Late majority reluctant to adopt the innovation because they are having doubts that a claim or statement about innovation is true or not or something will happen instead. A willingness of adopting in this group will occur when they feel that it is safe. To reduce the uncertainty about a new idea, interpersonal network or peer pressure could motivate their decision in adopting an innovation rapidly. The late majority make up one-third of all members of the social system, comprising of 34% as same as early majority.

Laggards

Laggards are the last group in social system represent 16% to adopt innovation because they are much more skeptical and have a conservative view. They seem to be an isolate person from a social network. They interact with the interpersonal network who are mainly from the same point of view. The innovation decision period of individual belong to this group is relative long because they want to make sure that innovation is definitely working before they adopting.

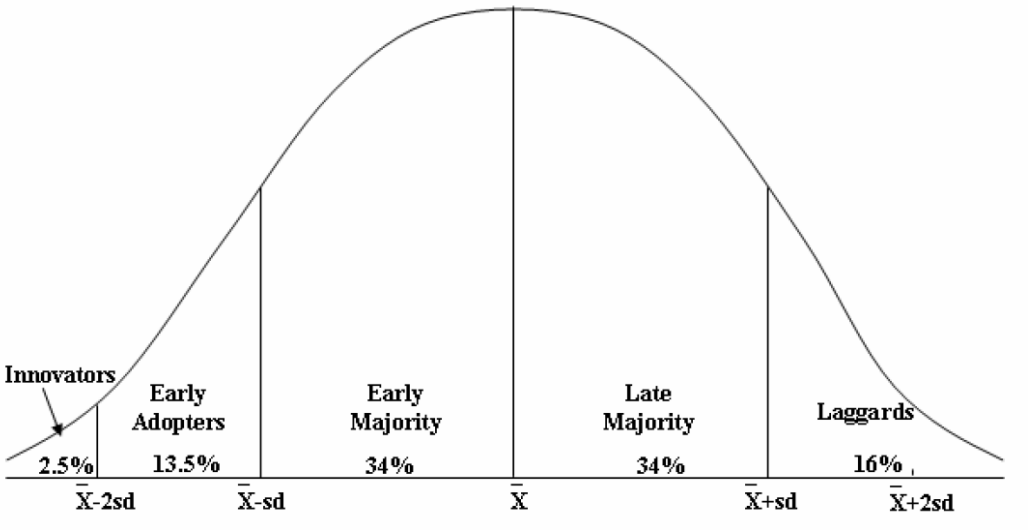

Figure 2.1 Adopter Categorization on the basis of innovativeness (Source: Diffusion of Innovations, fifth edition by Everett M. Rogers.2003)

2.5 Key Stakeholders involved in the healthcare innovative process

There were various definitions for stakeholder in academic literature. Broadly defined was "stakeholder as any group or individual who can affect or is affected by the achievement of the firm's objectives" Freeman (Freeman, 1984). Next, Max (Max, 1995) extends the definition of stakeholder as a person or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future (Brailsford, Bolt, Connell, Klein, & Patel, 2010). Stakeholders could be categorized in many ways such as primary user (patients, care professionals), secondary user (operators) and other stakeholders (health ministries, regional and general governments) (Boru, Joore, Smulders, Dijkstra, & Goossens, 2015) or internal stakeholder (nonprofessional staff, hospital management), interface stakeholder (medical staff, corporate office, medical school officials) and external stakeholder (patients, third party payers, other hospitals) (Fottler, Blair, Whitehead, Laus, & Savage, 1989). In 2010, Omachonu (Omachonu & G Einspruch, 2010) classified five key stakeholders involved in the healthcare innovative process. Each stakeholder was described needs, wants and expectations as table bellows.

Table 2.4 Illustrate the expectation outcome in each stakeholder

Key stakeholders	***Expectation outcome***
Medical professionals	Clinical outcome better, diagnosis correctly and improve treatment.
Individual patients	Patients has a good experience while they are on treating process at hospital, having good mental health, reduce long waiting queue and reduce delay responding time to meet a doctor.
Organizations	Increase more productivity and quality, reduce unnecessary cost and provide knowledge and tools to increase ability of internal operations.
Innovator company/Provider	Improve quality and outcome of the product. Ensuring that the product has no adverse effect after get FDA approval and distribute to the market. Earn profitability.
Regulatory Agencies	Minimize risks from technologies innovation and increase patients' safety by using new product.

Even though medical professional has a power position to facilitate or block the innovation, however, the other participants such as patients, government officials, insurers and regulatory are increasingly involve with new technologies. This has shifted from clinical evidence base to cost effectiveness and involving with others stakeholders in consideration to make a decision in processing of innovation adoption. Particularly, patients now have an ethical responsibility in the decision-making about their own health, control healthcare cost and access to new way service. (World Health Organization, 2010). Therefore, understanding of patients' expectation, their characterization and factors influence their intention towards performing behavior will enhance innovation adoption, especially innovation that directly involve with consumer's decision.

2.6 Health behavior theories

The theory of reasoned action (TRA)

The theory of reasoned action (TRA) developed by Fishbein & Ajzen (1975) (Fishbein & Ajzen, 1975), postulate attitude and social norm as a predictors of behavior intentions. According the model, behavior intention (BI) is held to be determined by attitude toward behavior, which defined as individual's perception in negative or positive feeling to engage the target behavior. Subjective norm, which is refer to the perception of individual about significant referents think he or she should perform the behavior or not. TRA has been widely applied to explain health behavior of a person such as cervical cancer screening, mammography, condom use, and breast self-examination (Cooke & French, 2008). Regarding of cervical cancer screening as predicted by TRA, Regression analysis in this study demonstrated that more positive attitudes and stronger social norms were a key predictor of women's intention to engage in a Pap screening test within the next two years (Barling & Moore, 1996). In the study of intention to perform breast self-examination (BSE), TRA could explained 45.8% of the variance in undergraduate students for breast self-examination intention. The research findings indicated that attitude and subjective norms were a significant factors to predict student's intention of performing BSE (Dewi & Zein, 2017). For predicting of condom use, attitude and subjective were statically significant for condom use intention. Nevertheless, attitude has shown to be a better construct than subjective norm for prediction of condom use (Gomes & Nunes, 2018) which is consistent with finding from Beadnell (Beadnell et al., 2008). However, the limitation of TRA is well applied to behavior that is under volitional control. To deal with TRA's limitation, Theory of planned behavior (TPB) was developed by adding inclusion of perceived behavior control (PBC) to overcome predicting in which individual's behavior have incomplete volitional control.

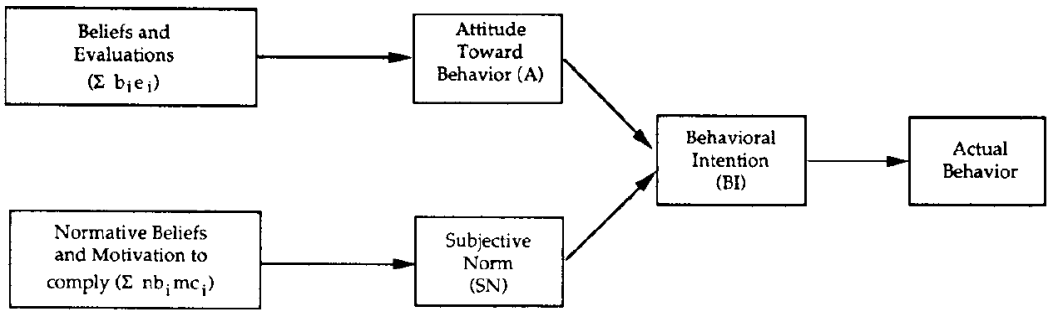

Figure 2.2 A Theory of Reasoned Action (TRA)

Source: Fishbein, M., & Ajzen, I. (1975)

The theory of planned behavior (TPB)

An expectancy-value model named the theory of planned behavior is well-known theory to predict behavioral intention. Follow the theory, three independent variables are used to accounted for intentions, consist of attitude which refer to the overall of favorable or unfavorable evaluation to perform the behavior whereby associated with desirable or undesirable consequences. The next predictor, subjective norm is based on the perception of individual from social pressure whether approve or disapprove them to perform the behaviors. Perceived behavior control (PBC), the third determinant of intention refer to the individual's perception of ease of difficulty to perform the behavior of interest. It reflects beliefs how much resource and opportunities and obstacles they anticipate (Ajzen, 1991). This social psychological theory has been succeeding to predict behavior. In health related behavior, TPB has been used to understand the behavior of condom uses among students, drug use, dietary change and self-monitoring of blood glucose levels with patients with type I diabetes (Godin & Kok, 1996; E. A. Montanaro & Bryan, 2014). In addition, TPB used to predict intention to attend screening program and actual attendance behavior like cervical Pap smear test. Result of the studied revealed that the strongest predictor of intention to attend cervical cancer programe was perceived behavior control (Walsh, 2005). TPB model was applied to gain more understanding what was women think for Chlamydia screening. Attitude, subjective norm and perceived behavior control were used to group finding factors from various perception-identified affect to

women's intention or refuse to perform Chlamydia screening (Pavlin, Gunn, Parker, Fairley, & Hocking, 2006). From the study about prediction of patients self-monitoring compliance in relation to three chronic disease, TPB applied to predict patients who will comply with medical guideline, self-monitoring for blood sugar level and prescription drug intake. Subjective norm and perceived behavior control were the important predictors of self-monitoring behavior intention in chronic obstructive pulmonary disease (COPD), diabetes and asthma (McGuckin, Prentice, McLaughlin, & Harkin, 2012). Moreover, there was study an application of TPB to predict prenatal screening for Down syndrome. The result presented attitude towards testing was more strongly predictive of intention to attend screening, particularly when screening was part of a routine visit (Michie, Dormandy, French, & Marteau, 2004).

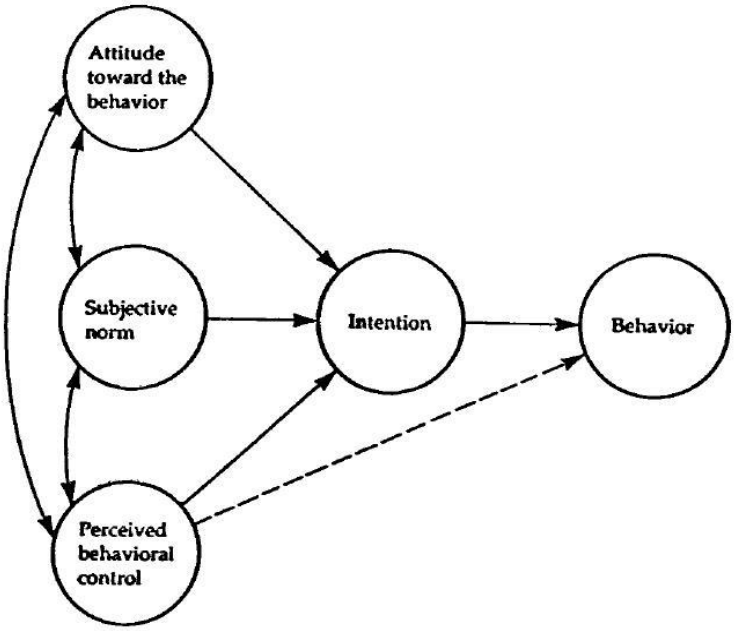

Figure 2.3 Theory of planned behavior (TPB)

Source: I. Ajzen (1991)

Health belief Model (HBM)

Rosenstock and his college developed health belief model, aim to explain and be a predictor of preventive health behavior and Health education (Rosenstock, 1974), 1974). The theory was created to understand the behavior of people why they action to avoid, screen and prevent the disease. This model comprised of six dimensions: (1) perceived susceptibility refers to individual's belief possibility of contracting a given disease or condition. (2) perceived severity means the degree of seriousness of health disease that person's beliefs will create an effects on his or her daily life such as death, disability and mental functioning including social complications (job, family life, social relation etc.). (3) perceived benefits is defined as people's beliefs about availability and effectiveness of particular action will reduce one's susceptibility or seriousness of an illness. (4) perceived barriers refers to beliefs about negative aspects such as inconvenient, cost and painful may act as obstacle for performing recommended actions. (5) cues to action means factors that trigger people to do appropriate action. It could be internal (e.g., perception of symptom or bodily state) or external such as advertisement, medical brochure and dentist's appointment card. (6) self-efficacy was next to be incorporated to the model, means one's perceived whether he/she has ability to perform or maintain a given action or eliminate negative effect successfully or not. Health belief model has been modified and adapted for health promoting behavior, health educational and health technology acceptance studied. For example, studied of Louis (Louis, 2019) determine which of the Health belief model construct are a predictor of prostate cancer screening of Haitian men. After the hypotheses were tested, perceived benefits emerged as a predictor to increase the Haitian men's acceptance level of prostate cancer screening. To find factors of Pap smear screening behavior in rural area of Iran, based on HBM instrument showed that perceived benefit and age had a significantly impact for performing Pap smear test (Babazadeh et al., 2019) which in line with the study by Costa (A. R. Costa et al., 2017). In addition, HBM was applied to explain intention to use Self-testing such as cholesterol, glucose, albuminuria, HIV and dengue fever (Grispen, Ronda, Dinant, de Vries, & van der Weijden, 2011; Ickenroth et al., 2011; Jamil et al., 2017; Kuecuekbalaban, Muehlan, & Schmidt, 2016; Wong, Atefi, &

AbuBakar, 2016). From the result, perceived benefits, perceived barriers, perceived susceptibility, perceived severity and self-efficacy were associated with the likelihood to perform self-testing which depends on test specific. For health-related technology acceptance, HBM was also integrated to TAM model to better understanding of mobile health service adoption and health-related internet use. The result demonstrated that perceived benefit and perceived barriers positively influence to user attitude to adopt mobile health service (Deng, 2013) while perceived usefulness of the internet and attitude toward internet for health information purposes were the mediators on health-related internet use (Ahadzadeh et al., 2015).

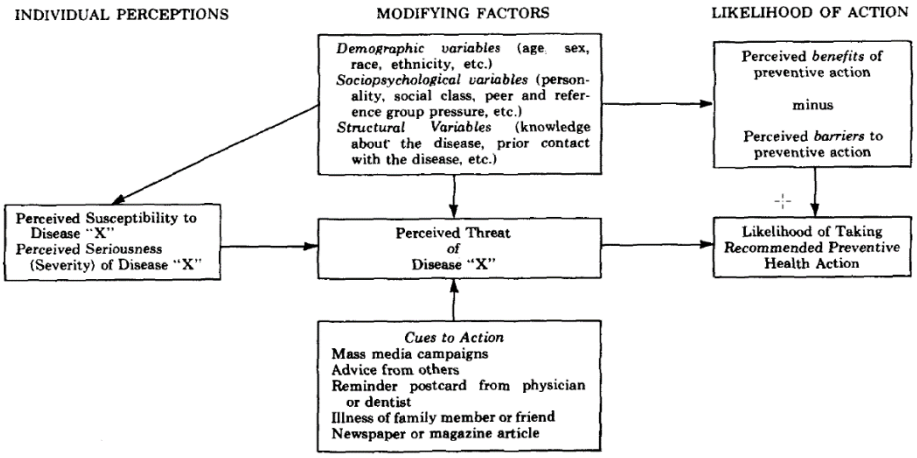

Figure 2.4 Health belief Model (HBM)

Source: Rosenstock IM. (1974)

2.7 Technology acceptance theory

Technology acceptance model (TAM)

Technology acceptance model (TAM) was developed by Davis (Davis, Bagozzi, & R. Warshaw, 1989), adaptation from theory of reasoned action (TRA). TAM was designed to predict and explain the acceptability of end user of computer-based technology. According to TAM model, three main determinants are perceived usefulness which is defined as "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context" whereas perceived ease of use refer to "the degree to which the prospective user expects the target system to be free of effort" (Davis et al., 1989). Usage behavior can be predicted reasonable well by behavior intention to use (BI). The attitude toward using is jointly determined by perceived usefulness and perceived ease of use. TAM proposes that external factors has affect actual use through mediated impact on internal belief, attitude and intention. In healthcare sector, acceptability of health information technology, telemedicine, electronic healthcare records including medical device has been studied based on TAM model. In study of applying TAM to understand factors influencing user's intention to use healthcare information system, the analysis indicated that information, service and system quality were positively affected user's intention through the mediating constructs like perceived usefulness and perceived ease of use (Pai & Huang, 2011). Personal health device (PHDs) can help chronic patients to take medicine on a schedule, monitor their health and communicate with their physician. Therefore, main factors that predict chronic patient's device usage intention was explored. Influencing factors to predict intention to use PHDs were attitude toward technology, perceived ease of learning and availability as well as perceived usefulness, perceived pressure and social support (Sun & Rau, 2015). In the study of identify factors determining patients' intention to use portable coagulometer medical device for self-testing, result demonstrated that patient's willingness to monitor blood-coagulation on their own were affected by patient's perception of technology which are comprising of perceived ease of use and technological self-efficacy, cost and age of the patient (S. G. Shah, J. Barnett, J. Kuljis, K. Hone, & R. Kaczmarski, 2013). To discover predictive factors of

telemedicine adoption, TAM used to evaluate satisfaction among physicians, nurses and healthcare administrators who are associating with telemedicine service. From this, perceived usefulness and perceived ease of use were significantly influence on behavior intention (Kissi, Dai, Dogbe, Banahene, & Ernest, 2019).

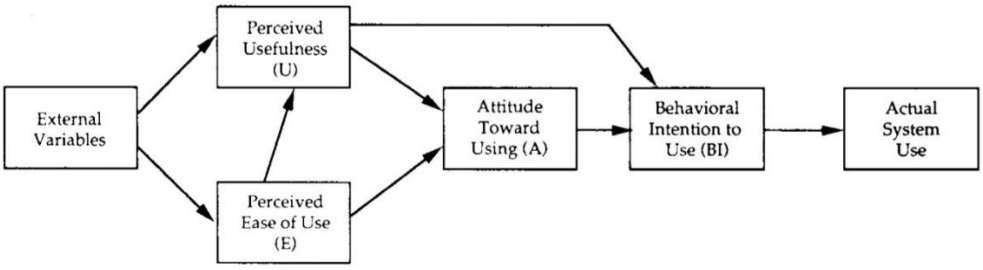

Figure 2.5 Technology Acceptance Model (TAM)

Source: Fred D. Davis (1989)

Unified Theory of Acceptance and Use of Technology (UTAUT)

According to Venkatesh 2003 (Venkatesh et al., 2003) , the acceptance model named unified theory of acceptance and use of technology (UTAUT) was established by integrated the essential construct of eight previously models such as Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), Motivational Model (MM), Combined TAM and TPB (C-TAM-TPB) Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), and the Innovation Diffusion Theory (IDT). The UTAUT model contains four key determinants of behavior intention to use and usage behavior. Four main elements comprise of performance expectancy, which is defined as the degree to which a person believes that the use of system will help to improve him or her performance. Secondly, effort expectancy is defined as the degree ease of use associated in the new technology. Thirdly, social influence is defined as the degree to which a person perceives that it is important for others to believe that he or she should use the new technology. The lastly determinant labeled facilitating conditions, defined as the degree to which an individual believes that an organizational and technical

infrastructure exists to support use of the system. Four moderators composed of gender, age, experience and voluntariness of use. UTAUT model claimed to explain up to 70% of the variance in usage intention. For healthcare discipline, UTAUT model discovered factors influencing the acceptability of mobile health monitoring services between users and non-users. Result presented that performance expectancy, effort expectancy, social influence and facilitating conditions were significantly difference between users and non-users (Lee & Rho, 2013). The study of Zhang (Zhang et al., 2019) aimed to identify factors influencing patients' intention to adopt diabetes management Apps based on UTAUT. From result analysis, performance expectancy and social influence were the key determinants on behavior intention to use diabetes management Apps. Regarding to Hoque (R. Hoque & G. Sorwar, 2017) studied; a research model based on UTAUT was developed to explore factors influencing adoption of mobile health (mHealth) services. The study revealed that performance expectancy, effort expectancy, social influence, technology anxiety, and resistance to change had a significantly effect to elderly users' behavioral intention to adopt mHealth services. Moreover, UTAUT was employed to determine factor affecting adult patients with chronic cardiac disease's acceptance and perceived an effective use of a web-based consumer health information technologies (CHITs). Measured by behavior intention, the result indicated that performance expectancy, effort expectancy, subjective norm and healthcare knowledge together could explain most of the total variance in patient's acceptance of web-based self-management technology (C. K. Or et al., 2011).

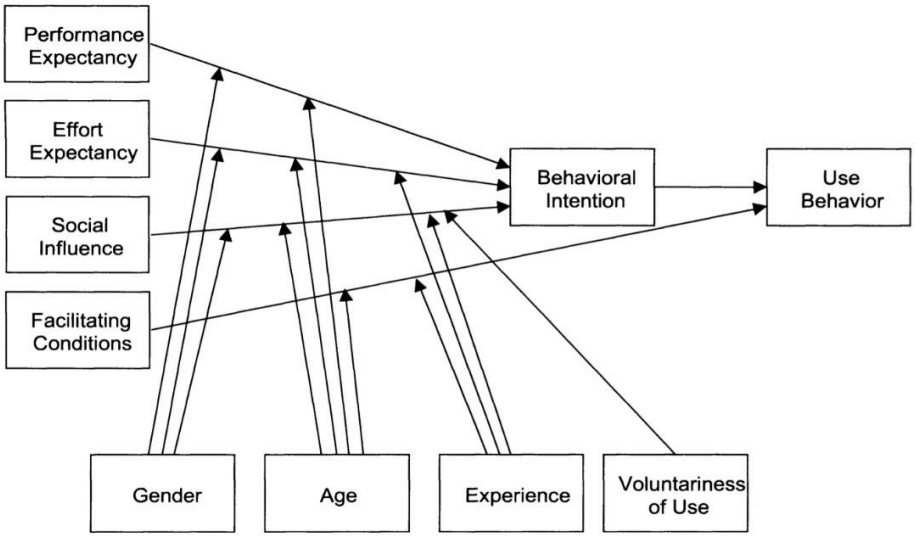

Figure 2.6 Unified Theory of Acceptance and Use of Technology (UTAUT)

Source: Venkatesh et al. (2003)

Extending the Unified Theory of Acceptance and Use of Technology (UTAUT2)

Due to UTAUT was developed to explain behavior intention to use technology and usage technology behavior in organizational context, Venkatesh (Venkatesh et al., 2012) established a new prediction of technology and usage behavior model namely, UTAUT2 for understanding consumer technology acceptance and use context. The UTAUT2 framework has seven keys construct, consisting of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit. The definition of each construct for individual technology acceptance context will be introduced. performance expectancy means the extent to which using a new technology could provide consumers the benefits in performing specific activities. For effort expectancy definition, the degree of easy to use associated with consumers' usage of new technology. Social influence refers to consumers perceive that key person who are you respect or care such as family and friends believe that you should use a particular technology. Facilitating conditions element means the degree to which an individual believes that the resources are adequate and promptly support to perform a behavior. Hedonic motivation is defined as the degree of willing to do something without enforcing but entertaining, which is derived from

using a technology. Price value construct has been defined as a person' cognitive tradeoff between benefits and the monetary cost of using a particular technology. Habit is defined as the degree to which consumer tend to perform behaviors automatically because of learning. In addition, three determinants namely age, gender and experience are incorporated in order to moderate various extended UTAUT model relationships. In healthcare sector, UTAUT2 has been applied to investigate the factors influence user's intention to adopt wearable technology in healthcare. This studied found customer's decision to adopt medical wearable device is effected by perceived expectancy, effort expectancy, self-efficacy and perceived severity while fitness wearable device users care more about hedonic motivation, functional congruence and perceived vulnerability (Gao, Li, & Luo, 2015). In the studied by Dwivedi (Dwivedi et al., 2016), investigated adoption behavior for an ICT-based mobile health service among citizens of USA, Canada and Bangladesh using UTAUT2 model was carried out. The result concluded that effort expectancy, performance expectancy, facilitating conditions, social influence, price value and waiting time were the significantly factors impact on citizen's behavior intention to adopt mobile health or not. Moreover, hedonic motivation was a significant factor for Bangladeshi citizens, which was not common in USA, and Canadian citizens. This result could implied that cultural difference has an effect to desire in adoption behavior. There was a studied to measure the acceptance in patients' use of medical diagnosis laboratories 'electronic portals based on UTAUT2. From data analysis using structural equation modeling (SEM), four constructs that had a significantly effect to patient's intention to use this software were price value, hedonic motivation, habit and usability. Therefore, inform patients the benefit of using these portals, design portal to be attractive, simple and understandable would increase rate of using portals by the patients, were a recommendation from this study (R. Ravangard et al., 2017). To understand patients' individual adoption of electronic health Record portals (EHR), this study applied UTAUT2 to find factors that drive patients. By testing with this acceptance model, the result demonstrated that performance expectancy, effort expectancy, social influence and habit were statistically significant determinant driver of behavior intention whether to adopt or not adopt EHR portals (Tavares, Goulão, & Oliveira, 2018).

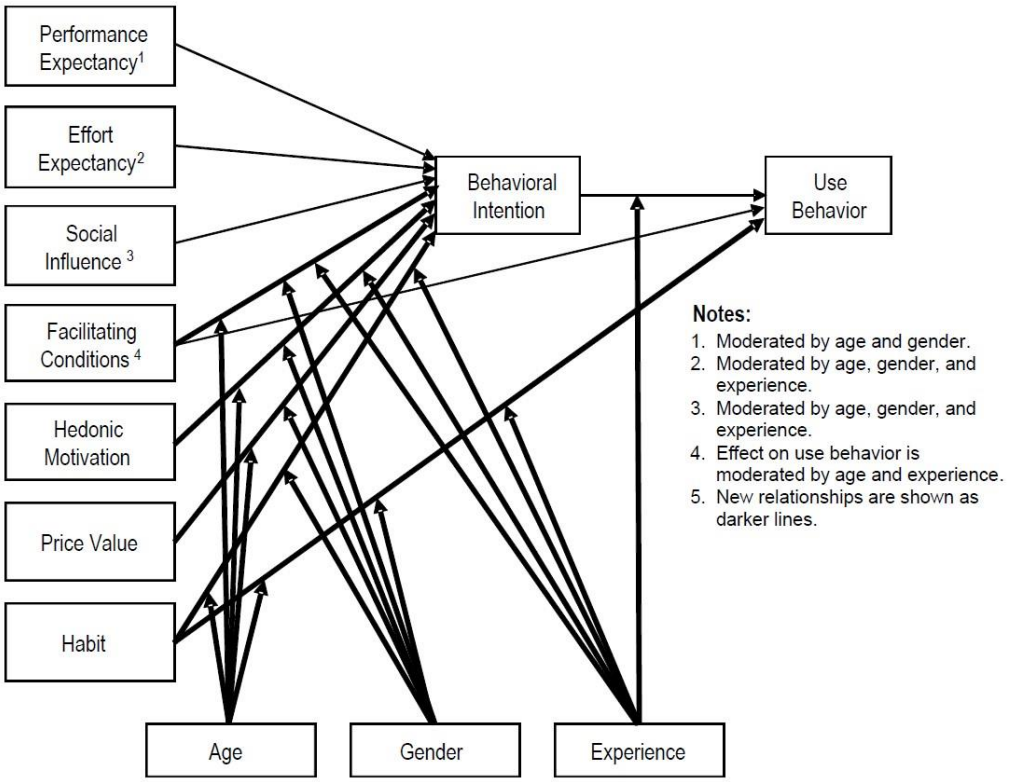

Figure 2.7 Extending the Unified Theory of Acceptance and Use of Technology (UTAUT2)

Source: Venkatesh et al. (2012)

2.8 Big - Five Factor Model (FFM)

The big five personality trait or know as five factor model is considered to be a comprehensive model of personality (P. Costa & McCrae, 1992a) , originally discovered by Tupes and Christal 1961 and has been developed an assessment to measure five trait (P. Costa & McCrae, 1992a; Goldberg, 1992; McCrae & John, 1992). This powerful personality model has been widely used to examine the relationship in various domain such as environmental (Abdollahi et al., 2017) health behavior, (Cheng, Weiss, & Siegel, 2015; S. E. Hampson, Andrews, Barckley, Lichtenstein, & Lee, 2006) and technology acceptance (Devaraj, Easley, & Crant, 2008; Prayoga & Abraham, 2016). In the study of relationship between personality and health behavior as well as intention to adopt technology, there was previously studied found that personality trait associated with older adult's use of acute and long

term health care service. Higher neuroticism was greater healthcare for emergency department use, nursing home use and skilled nursing facility days (SNF) for SNF-users. Patients who are greater than openness to experience trait more willing to being cared for at home more than in a nursing home (Friedman, Veazie, Chapman, Manning, & Duberstein, 2013). Molosky's studied (Molosky, 2019) revealed that moderated by extraversion, Performance expectancy showed a significantly influence a nurse's intention to use wireless implantable medical devices (WIMDs). In addition, study of Rahman (Rahman, 2017) indicated that personality like conscientiousness, had a significantly predictor influencing patients' healthcare technology adoption decision. According to definition and associated personality trait defined by Costa and McCrea (1992), Big five personality trait has presented in Table 2.5

Table 2.5 Definition of Big Five-factor model (P. Costa & McCrae, 1992a)

Factor	Trait facets
Neuroticism	Individual is perceived as being Anxiety, Depression, Hostility, Self-Consciousness, Instability, Vulnerability and Impulsiveness.
Extraversion	Person is rated as being Assertiveness, Gregariousness, Positive emotions, Warmth, stimulation, High activity and Excitement seeking.
Openness to experience	Individual is described as being Open, Ideas, Feelings Active fantasy, Actions, Aesthetics, Values and Emotions.
Agreeableness	Individual is described as being trusting, sympathetic and cooperative
Conscientiousness	Individual is described as being scrupulous, well organized and punctual.

2.9 Summary of review studied of healthcare adoption

The core model, some variables of the model and non-core variable model have been applied to explain individual behavior intention in healthcare related area.

Table 2.6 Summary of review studied of healthcare adoption

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Kuecuekbalaban, Rostalski, Schmidt, & Muehlan, 2017)	Intention to use a self-test.	208 university students age 18 to 52 years. (Germany)	HBM , Technological affinity	·Perceived severity and outcome expectancy were significantly predicted intention to be self-tested. ·Technological affinity was statically non-significant
(Louis, 2019)	Intention for prostate cancer screening.	200 Haitian men age 45 to 75 years. (Haiti)	HBM	·Perceived benefits
(Powell, Pattison, & Marriott, 2016)	Perceptions of Self-Testing for Chlamydia.	18 university students participated in semi-structured interviews. (UK)	TPB, PMT	· Perceived benefits, self-efficacy and response efficacy
(Babazadeh et al., 2019)	Evaluate the determinants of Pap smear screening	220 rural women in Tabriz, Iran.	HBM	· Perceived benefits was a significant among the rural women

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Grispen et al., 2011)	Psychological determinants of self-test use for cholesterol, glucose, and HIV.	1,113 participants from Internet users. (Netherlands)	HBM,TPB and PMT	• Perceived benefits and self-efficacy were significantly with self-testing for all three tests. • Perceived barriers, subjective norm, and moral obligation were impact on test-specific
(Wong et al., 2016)	Identify factors associated with acceptance of a home self-test kit for dengue fever.	2,512 individuals of the Malaysian aged 18–60 years old	HBM	• Perceived barriers, Dengue fever knowledge and education level were significant factors to use the dengue home-test kit. • Ease of usability and easy to understand instructions followed by the price were the most important factors influence the decision to use the dengue home-test kit.
(Krause, Subklew-Sehume, Kenyon, & Colebunders, 2013)	Assessed the acceptability of HIV self-testing.	Systematic literature review	Attitudes and opinions on HIV self-testing.	• HIV self-testing was perceived value the privacy and confidentiality.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(von Wagner et al., 2019)	Intention and subsequent attendance of flexible sigmoidoscopy screening	1,555 registered patients aged between 54 years 10 months and 55 years 2 months. (UK)	HBM	• Perceived benefits and perceived barriers were important predictors.
(Ickenroth et al., 2011)	Explored consumers' experiences with self-testing for cardiovascular risk factors.	20 consumers who had performed a self-test for glucose, cholesterol or albuminuria. (Netherlands)	HBM	• Perceived susceptibility and perceived severity of the disease were reasons for self-testing.
(Jamil et al., 2017)	Identify factors associated with HIV testing frequency and the likelihood to self-test.	354 HIV-negative Gay and bisexual men (GBM) aged more than 18 years old. (Australia)	Self-efficacy	• Self-efficacy was significantly factor associated with the likelihood to self-test for HIV in the future.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Kuecuekbalaban et al., 2016)	Investigated core concepts of HBM can predict the use of self-tests or not.	512 non-self-testers and 505 self-testers. (Germany)	HBM, outcome expectancy, technological affinity and anticipated affect.	• Self-testing was predicted by perceived severity, perceived susceptibility, outcome expectancy and self-efficacy. • Included technological affinity and anticipated affect showed significantly improved the predictive value of the use of self-tests.
(Kuecuekbalaban, Schmidt, & Muehlan, 2017)	Investigated the personal reasons for using a self-test.	505 self-testers, with age ranging from 19 to 88 years. (Germany)	Uncertainty, Risk perception, Practical advantages and subjective norm	• Uncertainty/reassurance and risk perception (perceived susceptibility) are the most personal reasons for self-testing.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Pavlin et al., 2006)	Summarized literature examining the views, attitudes and opinions of women screened, tested and diagnosed with Chlamydia trachomatis.	A systematic review of the literature.	TPB	• Encourage attitudes that women will be more in favor of chlamydia testing and screening. • Subjective norms: encourage women to see chlamydia screening as responsible behavior to her partner. • Perceived behavior control: encourage women with a sense of control over testing, access to free test, home-testing options and feel confident that privacy and confidentiality will be kept.
(Ford et al., 2004)	Elicited attitudes, beliefs, and feelings about testing for curable sexually transmitted disease (STDs) outside of clinic setting.	120 black, Latino, and white young adults aged 18 to 25 years. (USA)	Attitudes and beliefs	• Perceived advantage (privacy, convenience and lower cost) was the Important factor that people their age would use urine STD self-test kits if available.

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Figueroa, Johnson, Verster, & Baggaley, 2015)	Attitudes and Acceptability on HIV Self-testing (HIVST).	A Literature Review among key population such as men who have sex with men (MSM), female sex worker (FSW) and transgender people (TG)	Attitudes and acceptability	• Perceived benefit (convenience, privacy, painlessness and easiness to use; prefer oral fluid-based HIVST) was the most frequently reported of using HIVST.
(Frye et al., 2015)	Understanding of facilitators of and barriers to HIV self-testing.	30 young black MSM and transgender women between 16-29 years old, residing in the New York City (USA).	Facilitators of and barriers to HIV self-testing.	• Perceived benefit (convenience, privacy and confidential) emerged in terms of the facilitators of using self-test. • Major barriers to self-testing were cost and self-efficacy around test operation.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Katz, Zimmermann, Moore, Paskett, & Reiter, 2017)	Gained insights into the perceived acceptability of HPV self-test at home.	28 providers (physicians, nurse practitioners, nurses) and 15 women (age range: 32–62 years) in Appalachian Ohio, USA	Beliefs and attitudes	• Both groups raised differences reasons about the perceived advantages and barriers of using an HPV self-test. Providers thought HPV self-testing would increase under-screened women return to healthcare system whereas women thought completed HPV self-testing at home could eliminate logistic barriers such as lack of time to go to health center as well as psychological barriers like embarrassment.
(Arrossi et al., 2016)	Identified why women prefer self-collection.	2616 self-collection accepter and 433 non-accepters. (Argentina)	Reasons for choosing self-collection	• The most reason among 2616 women who choose self-collection was gaining time (perceived benefit) by doing it at their homes-without interfering in their domestic responsibilities.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Wirtz et al., 2017)	Explored factors on participants' opinion and perceptions about HIV self-testing	25 interviewees (12 men who have sex with men (MSM) and 13 transgender women (TW) and 35 people for focus group discussions (MSM, TW, and community key informants) (Myanmar).	Influencing variables	• Perceived benefit (privacy, confidentiality, convenience and non-invasive option) was the most salient perception reported among interviews and discussion in focus group.
(Nangendo et al., 2017)	Determined the diagnostic accuracy and acceptability of rapid HIV oral testing.	440 participants with a median age of 30 years. (Uganda)	Reason for acceptability	• Perceived benefit of HIV oral test was mainly due to attributes of painlessness, convenience, privacy and easy process of sample collection.
(Vincze, Barner, and Lopez, 2004)	Factors associated with adherence to Self-monitoring of blood glucose (SMBG) among people with diabetes.	933 adults with diabetes, age 18 years or older. (Texas, USA)	Self-efficacy, Outcome expectations, Physical influence and Environmental barriers.	• Patients who perceived fewer environmental barriers, such as lifestyle interference, inconvenience, painfulness, and cost were significantly adherent to SMBG.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Abdullah and Othman, 2011)	Explored the influence of self-home blood pressure monitoring (HBPM) on primary care patients with hypertension	24 primary care patients with hypertension, age 30-75 years old. (Malaysia)	Positive and negative influences of HBPM.	• Positive influences (adherence to diet and exercise and provided reassurance) lead to improved patient's self-efficacy. • Feeling confused and concerned the reliability of the HBMP seemed to be the negative influences.
(Phoolcharoen et al., 2018)	Explored attitudes and feelings regarding the self-collection HPV testing.	247 women aged 30–70 years who visited the colposcopy clinic at Chulabhorn Hospital, Bangkok, Thailand	Attitudes and feeling	• The acceptability of self-sample HPV testing was perceived as very good to excellent for convenient, comfortable, and safe. • The feelings about the self-sampling considered no pain or discomfort.
(Gottschlich et al., 2019)	Assessed willingness to use and acceptability of self-collection HPV between Buddhist and Muslim women.	267 women (132 Buddhist; average age was 51.3 years and 135 Muslim with average age of 49.6 years), Songkla Province in Southern Thailand.	Acceptability aspect	• Comfortable and easy were reported from 98% of women from both groups. • Self-screening was acceptable and preferred, in women from both religious groups.

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Phoolcharoen et al., 2018)	Explored attitudes and feelings regarding the self-collection HPV testing.	247 women aged 30–70 years who visited the colposcopy clinic at Chulabhorn Hospital	Attitudes and feeling	• The acceptability of self-sample HPV testing was perceived as very good to excellent for convenient, comfortable, and safe. • The feelings about the self-sampling considered no pain or discomfort.
(Oranratanaphan, Termrungruanglert, & Khemapech, 2014)	Evaluated the acceptability of self-sampling HPV testing.	100 women aged 30-65 years who attending for cervical cancer screening at clinic of King Chulalongkorn Memorial Hospital, Bangkok, Thailand	Acceptability aspect	• The acceptability of self-sampling HPV testing is good (easily to use, felt less pain however, the reliability of the test was not satisfied.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Sarkar et al., 2016)	Explored the acceptability of supervised oral fluid-based HIV self-testing among pregnant who are attend an antenatal clinic of a rural hospital.	202 pregnant women, median age was 23 years old. (India)	Acceptability aspect	• Factors influencing acceptability of self-testing were easy to conduct the test, quick results, convenience of testing, time-efficiency and non-invasiveness.
(Angela Ryan, Ives, Wilson, & Greenfield, 2010a)	Investigated factors that influenced members of the public to use self-tests.	23 interviewees, aged from 15-64 years. (UK)	Influencing variables	• Motivations for self-testing (diagnosis, perceived benefits, doctor being uninterested and responsibility for their own health) and experience of self-testing (opportunistic awareness and access, the test easy to use and impact on their life) were the influencing factors to use self-tests.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Grispen et al., 2014)	Examined consumers' use of and needs for information about self-testing.	305 respondents who had ever used a home test, with age mean 41.8 (Netherlands).	Quality and use of consumer information provided with home test kits.	• A large majority of the respondents indicated having read the consumer information like on the packaging and in the instruction leaflet before bought the test. • Checklist to assess the quality of consumer information leaflets for self-tests comprised of product description, content and information source. • The information in the instruction leaflets was perceived as being of moderate to good quality.
(S. G. S. Shah et al., 2013)	Identify factors patients' intentions to use coagulometer devices for self-testing of the international normalized ratio (INR).	125 (age 18 to over 80 years old) outpatients anticoagulation services in London, UK.	TAM	• Perceived ease of use (PEOU) and Technological self-efficacy (TSE) were the main determinants of patients' intention to use INR self-testing. • Trust the doctor was significantly negative.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Sun & Rau, 2015)	Chronic patient's acceptance of personal health device (PHDs).	9 peoples participated in the interviews, ages ranged from 26 to 79. (China)	TAM,TPB and IDT	• Attitude toward technology (trust, privacy, willingness to learn new technology), Product feature (perceived usefulness, ease of learning and availability) and Social influence (social support and perceived pressure) were influencing factors to predict use intention of PHDs.
(C. K. L. Or et al., 2011)	Measure patients' acceptance of consumer health information technologies (CHITs)	101 home care patients with chronic cardiac disease. (USA)	UTAUT	• Perceived usefulness, perceived ease of use, subjective norm, and healthcare knowledge together influenced on behavior intention.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Lee and Rho, 2013)	Investigated the perception of factors influencing the acceptance of mobile health monitoring services between users and non-users.	219 respondents, age 20 to older than 60 years. (User = 106, non- user = 113). (South Korea)	UTAUT	• Perceived benefit (performance expectancy, effort expectancy, social influence and facilitating conditions) showed significant differences between users and non-users.
(Rakibul Hoque and Golam Sorwar, 2017)	Colorectal cancer. User's behavioral intention to adopt mHealth services	274 participants of age 60 years and above. (Bangladesh)	UTAUT	• Performance expectancy, effort expectancy, social influence, technology anxiety, and resistance to change were significant predictors.
(Ramin Ravangard et al., 2017)	Measured the acceptance of medical laboratory portals by patients	170 patients who at least one time, used the electronic lab services in Shiraz, Iran	UTAUT2	• Hedonic motivation, price value, habit and usability were significant impact on using lab portals.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
Hsieh et al., 2016)	Explored the personal health record (PHR) usage behaviors to identify the decisive factors to accept PHR.	223 participants with age between 60 to over 70 years. (Taiwan)	PMT, UTAUT	• The significant factors that influence the behavioral intention of using the PHR system were perceived ease-of-use, perceived usefulness, self-efficacy, response efficacy, and subjective norm. • Social support from medical staff, family, and community perceived as a powerful factor.
(Dwivedi et al., 2016)	Investigated the citizens' adoption behavior for mobile health (m-health)	387 patients from USA, 359 patients from Canada and 375 patients from Bangladesh	UTAUT, UTAUT2	• The significant determinants on citizens' behavior perception to adopt m-health in three countries were effort expectancy, performance expectancy, facilitating conditions, social influence, price value and waiting time.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Tavares, Goulão, and Oliveira, 2018)	Understanding of factors that drive individuals to adopt Electronic Health Record (HER) portals.	386 respondents, with ages 18 to over 31 years old. (Portugal)	UTAUT, UTAUT2	• Performance expectancy, effort expectancy, social influence and habit are statistically significant drivers of behavioral intention. • Habit was the most important construct that effect on behavioral intention.
(Gao, Li, and Luo, 2015)	Investigated the factors about consumer's intention to adopt wearable technology in healthcare.	462 participants ranges from 17 to 61 years old. (China)	UTAUT2, PMT	• Performance expectancy, effort expectancy, social influence, technology anxiety, and resistance to change were significant predictors. • Perceived expectancy, effort expectancy, self-efficacy, and perceived severity were significant factors that influence consumer's intention to adopt a medical wearable device.

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Tina Jones et al., 2008)	Identified factors predictive of adults' healthcare behavior.	100 undergraduate students (USA)	Childhood healthcare experience, healthcare attitudes, and Optimism	• Childhood healthcare experience, attitudes about healthcare and optimism are associated with current healthcare behavior.
(Pate et al., 1996)	Examined the relation of childhood medical experience and adult procedural behavior.	147 undergraduate students with ages ranged from 17-21 years. (USA)	Childhood medical experience	• Adults' medical fear, pain and avoidance in medical situation were significantly predicted by having medical experience more pain and fear during childhood.
(Kosterman et al., 2011)	Examined positive childhood experiences if predict positive adult functioning and adolescent substance use.	429 participants from age 11 to 22 years. (USA)	Positive childhood experiences	• Positive childhood experiences emerged as significantly factor to predict adult functioning and consistently predicted less adolescent substance use.

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Bethell et al., 2019)	Evaluated associations between positive childhood experiences and adult depression or poor mental health.	Adults 18 years and older (n=6188) (USA)	Positive childhood experiences	• The relational of childhood experiences are associated with adult social and relational health and skills. • Positive childhood experiences demonstrated a greater response to adult mental and relational health, even exposure to adverse childhood experiences. • Including of positive childhood experiences for children would reduce risk for adult depression or poor mental health and support adult relational health.
(Bixler, Floyd, and Hammitt, 2002)	Tested the relationship between childhood play experience in wild environment and later environmental preference in the life.	Middle and high school students (N=1,787) (USA)	Childhood experiences	• Childhood play in wildlands environment influences later environmental preferences, outdoor recreation activities, and outdoor occupational environments.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Hackworth & McMahon, 1991)	Explored factors mediate children's healthcare attitudes.	55 children ranged from 6 to 15.5 years of age. (USA)	Factors affect children's healthcare attitudes.	• Children with family member's experienced with chronic illness reported being more avoidant of healthcare. • Significant correlation between mothers' health belief and their children. That is, children whose mother dislike healthcare more tend to view healthcare as more painful.
(Bachanas and Roberts, 1995)	Explored factors affecting children's healthcare attitudes.	95 children between the age of 6 and 11. (USA)	Factors influence children's healthcare attitudes.	• Health locus of control and mothers' healthcare attitudes were significant predictors and related to children's view of healthcare.
(Eagles and Demare, 1999)	Identified factors Influencing children's environmental attitudes.	72 sixth-grade students (Canada).	Childhood attitudes	• Talking about the environment at home, watching environmental TV or movie, and reading book or magazine about the environment were the key influence students' attitudes.

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Eagles and Demare, 1999)	Identified factors Influencing children's environmental attitudes.	72 sixth-grade students (Canada).	Childhood attitudes	• Talking about the environment at home, watching environmental TV or movie, and reading book or magazine about the environment were the key influence students' attitudes.
(Asah et al., 2018)	Examine whether, and to what extent, the mechanisms through which children experience nature is associated with adulthood environmental citizenship.	236 employees of the Department of Agriculture, United States.	Childhood experiences	• Childhood exposure to nature by themselves and with friends showed a positively predicts both adulthood environmental citizenship and commitment to nature-based activities. • Childhood experience nature with their family was a significant positive predictor of adulthood commitment to nature-based activities

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(O'Cleirigh et al., 2018)	Identified relationships between personality domains and living with HIV.	18 years old MSM, living with HIV (N=60) (USA)	Personality trait	• Conscientiousness was significantly associated with having fewer sexual partner. • Extraversion was positively having accessed prevention service. • Neuroticism (negatively) and Conscientiousness (positively) were significantly associated with state of health (perceived health).
(Turiano et al., 2011)	Examined Personality Trait and personality change if predict health outcome over 10-year span.	7,108 noninstitutionalized English-speaking adults, aged 25–74 years. (USA)	Personality trait	• Conscientiousness (lower) and Neuroticism (higher) were significant predictors of self-reported blood pressure. • Higher levels of conscientiousness predicted better health outcomes while, higher levels of Neuroticism reflected poorer outcomes.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Chapman et al., 2006)	Examined the associations between personality traits and perceived Health in Older Adults.	266 primary care patients who were 65 years of age or older in New York, USA	Personality trait	• Higher level of Neuroticism and lower of Extraversion and Conscientiousness scores were associated with poor perceived health. • Neuroticism was reported to be a significant predictor of poor perceived health.
(Sarah E. Hampson et al., 2006)	Examined Personality traits and risk perceptions if, were predictors of changes in smoking behavior.	697 households (USA)	Personality trait	• High and moderate levels of Extraversion, perceived risk was a significant as predicted a reduction in number of cigarettes smoked indoors. • Perceived risk predicted quitting for women who were highly or moderately conscientiousness.
(Shivarathre et al., 2014)	Identified the association of psychological factors and personality traits in patients with chronic foot and ankle disorders.	45 patients with chronic foot and ankle pain and 45 healthy volunteers as a control group. (UK.)	Personality trait	• Patients showed significantly higher neurotic score (neurotic trait) than the control group.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
Zarbo et al., 2016)	Investigated the role of personality traits as possible predictors of health-related quality of life (HRQoL) in multiple sclerosis (MS).	195 patients with MS, aged 41.7±10.2 years. (Italy)	Personality trait	• MS's perception of quality of life in their health status is largely influenced by personality traits, especially neuroticism and extraversion.
(Zambrano-Cruz et al., 2018)	Investigates the perception of risk as a mediating between personality and perception of health.	398 Colombians, age ranged 18-60 years. (Columbia)	Personality trait	• Neuroticism, a personality trait is a mediating factor in the perception of health. • Perception of health is worse when perception of risk is higher. • Perception of risk does not seem to mediate between personality and health perception.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Hampson et al., 2000)	Examined if risk perception affect changes in smoking behavior.	343 Participants from an Oregon community (USA)	Perceived risk and Conscientiousness	• Higher level of Conscientiousness respondents with higher of perceived risk were associated with reduction of the number of cigarettes smoked in the home.
(Cheng, Weiss, and Siegel, 2015)	Examined the relative contributions of personality trait and health behaviors to subjective wellbeing.	599 participants, age of 18-25 years. (USA)	Personality trait	• Extraverted person reported feelings that are more positive and higher quality of life whereas Neuroticism was associated with negative feelings, poorer health, and lower quality of life.
Kuo, Liu, and Ma, 2013)	Investigated nurses' personality traits regarding to mobile electronic medical record systems (MEMR) acceptance.	665 full-time registered nurses. (Taiwan)	Personality trait	• Optimism has a significant effect on perceived ease of use (PEOU) and perceived usefulness (PU) toward MEMR. • Innovativeness trait revealed a significant effect on PEOU but not on PU.

Author	***Study***	***Population studied***	***Theory/ Variables***	***Findings***
(Trobst, Herbst, Masters, & Costa, 2002)	Examined personality trait and HIV risk behavior.	201 participants with age range 18-62 years old. (USA)	Personality trait	• Higher level of Neuroticism scores (emotional distress) and lower level of Conscientious scores (less organized) were associated with HIV risk behaviors. • The high-risk group differed from the medium and low risk group on the Neuroticism in the aspect of Impulsiveness, indicating that Neurotic person has an inability to resist a strong desire for something.
(Prayoga & Abraham, 2016)	Seek to find variables that could predict user's intention to use IoT health device.	186 college student, ages range 12-30 years old (Indonesia).	Perceived usefulness and Personality trait	• Factor perceived usefulness could predict intention to use IoT health device. • Personality trait plays an insignificant role in predicting perceived usefulness.

Author	*Study*	*Population studied*	*Theory/ Variables*	*Findings*
(Walczuch, Lemmink, & Streukens, 2007)	Measured the relation between technology readiness (TRIs) personality trait and Technology acceptance (TAM)	810 employee of a multi-site financial service provider. (Belgium)	Personality trait	• Personality traits had a significant effect on technology adoption. • Optimism showed the strongest impact on perceived ease of use and perceived usefulness, therefore employees who are optimism trait seem to deal with IT more positively and most frequently used IT.
(Rahman, 2017)	Explored personality traits and health emotional states in the context of patient portal system.	251undergraduate students at a university (USA)	Personality trait	• Person who has consciousness trait are more likely to use healthcare technologies for responding their healthcare needs. • Person with health issues have their health emotion greater than all other factors in making decisions to adopt healthcare technology.

2.10 Research model and hypotheses

This study aimed to explore factors influence the adoption intention on medical Self-testing. The model was developed for the purpose of this study by integrating the Health belief model, Personality Trait and the Technology acceptance model to provide a better understanding of lay person's adoption on medical Self-testing. The conceptual model for acceptance of medical home testing was purposed in Figure 2.8. Based on literature reviewed previously, the hypotheses were formulated as shown in Table 2.7. Gender, Age and Education were reported as one of the factors associated with people's willingness to use home self-testing such as Wilson's studied (Wilson et al., 2008) revealed that the mean age of participant who are cancer self-test user was 59 years (range 30 to 87 years) and 60% were male. However, for the future self-test user of a hematuria test related with male gender and younger as well as a bowel cancer self-test was associated with male and younger age. In a survey for a self-testing for blood pressure studied presented the mean age of people who had self-monitored for blood pressure was 58 years. Moreover, logistic regression indicated that significant factor for predicting blood pressure self-test use will be increasing age, female and having a university degree (McManus et al., 2007). A study of factors to use home self-test kit for dengue fever in Malaysia revealed that respondents with a tertiary educational level were more likely to use home self-testing dengue kit than participants with primary and secondary educational levels when the kit were available (Wong et al., 2016). A cross-sectional survey of self-testing for cholesterol, glucose and HIV found that female gender was a significant to be a self-tester of cholesterol self-testing than male whereas glucose or HIV-self-test was not associated with the gender (Grispen et al., 2011). Therefore, researcher included theses variables as control variables into research model.

From literature review which are summarized in Table 2.6 researcher purposed conceptual framework for adoption intention to use home Self-testing as shown in Figure 2.8

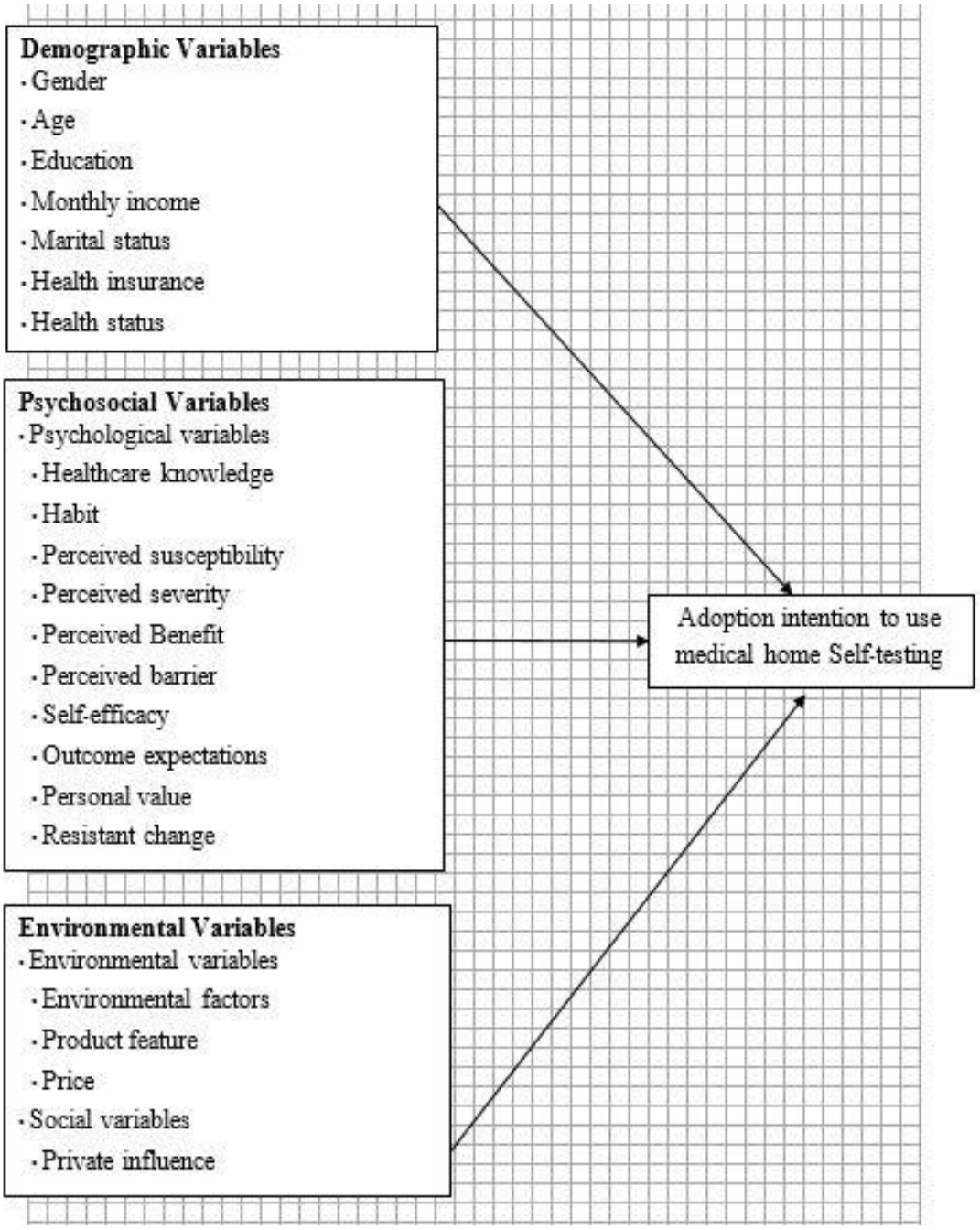

Figure 2.8 Conceptual framework for adoption intention to use medical home Self-testing.

Source: Researcher

Table 2.7 Research hypotheses for the acceptability of medical home testing

Research hypotheses	***Path diagram***
H1: User Centricity comprising of healthcare knowledge, habit, outcome expectancy, resistant change and personal value will have a positively influence on adoption intention to use medical home Self-testing.	User-Centricity → Adoption intention to use medical home Self-testing
H2: Health Belief consisted of perceived susceptibility, perceived severity, perceived benefit, perceived barrier and self-efficacy will have a positive impact on adoption intention to use medical home Self-testing.	Health Belief → Adoption intention to use medical home Self-testing
H3: Experience composed of childhood experience and adulthood citizenship will have a positive effect on adoption intention to use medical home Self-testing.	Experience → Adoption intention to use medical home Self-testing.
H4: Personality Trait comprising of extraversion, agreeableness, Neuroticism, optimistic and innovativeness will have a significant impact on adoption intention to use medical home Self-testing.	Personality Trait → Adoption intention to use medical home Self-testing.
H5: Social Influence consisted of private influence and public influence will have a significant influence on adoption intention to use medical home Self-testing.	Social Influence → Adoption intention to use medical home Self-testing.
H6: Product Feature will have a positive impact on adoption intention to use medical home Self-testing.	Product Feature → Adoption intention to use medical home Self-testing.
H7: Gender will has a positive effect on adoption intention to use medical home Self-testing.	Sex → Adoption intention to use medical home Self-testing.

Research hypotheses	*Path diagram*
H8: Age will has a significant effect on adoption intention to use medical home Self-testing. The effect on adoption is positively effect for younger	Age → Adoption intention to use medical home Self-testing.
H9: Education will has a positive impact on adoption intention to use medical home Self-testing.	Education → Adoption intention to use medical home Self-testing.

Summary

This chapter presented a literature review of innovation, healthcare innovation including health behavior theories, technology acceptance theories, personality trait model and significant psychological determinants, which were involved and supported research conceptual framework. Furthermore, nine of research hypotheses were developed to investigate proposed conceptual model.

CHAPTER III
RESEARCH METHODOLOGY

This chapter included instrument designs, population, sample size, sampling procedure and data analysis technique as well as Ethics approval and financial support were described. There were four parts as following:

3.1 Part I: Study of construct and indicators that affected to adoption intention in medical home Self-testing

Based on literature review and theory associated with health screening test, home healthcare and Self-testing, we purposed a conceptual framework on how Thai people's adoption intention in medical home testing and we examined what influencing factors for acceptability of Self-testing. Core construct of Health belief model, comprising of Perceived susceptibility, Perceived severity, Perceived Benefit, Perceived barrier and Self-efficacy, measurement items were adapted for this elaboration of home testing context. (Champion, 1984; E. Montanaro & Bryan, 2013; Rawl et al., 2001). As the aspect of User-centricity, healthcare knowledge question was created based on disease knowledge, which associated with screening and test monitoring. Personal value or moral norm was one of the factor that describes health related behavior, and measurement items was derived from Grispen (Grispen et al., 2011) while the measure items of Resistant change was adapted from Oreg (Rakibul Hoque & Golam Sorwar, 2017; Oreg, 2003). A part of study reviewed, Childhood experience was accounted on environmental attitude. Adolescent who reported having played in wild environment, showed high positive perception of natural environment (Bixler et al., 2002). Activities about environment such as watching nature film, reading book or talking about the environment influenced on environmental attitudes in children (Eagles & Demare, 1999). There was a positive relationship in American women who concerned environmental were also attract more personal healthcare activities (Gifford & Nilsson, 2014). In addition, Jones's study (2008) indicated that

childhood related healthcare experience had a relation with adult healthcare attitudes (T. Jones, DeMore, Cohen, O'Connell, & Jones, 2008). Therefore, this study, researcher developed childhood items associated with attitudes and health behavior in the context of Thai culture. As the aspect of adulthood healthcare citizenship, the measurement items were modified from Asah and his colleague (Asah et al., 2018). For Personality trait, measurement items of extraversion, agreeableness and neuroticism trait was derived from big five factors model, which was well known as a comprehensive model of personality (P. Costa & McCrae, 1992a; Goldberg, 1992). Whereas optimistic were from hierarchical personality inventory developed by Mervielde & De Fruyt (Mervielde & De Fruyt, 1999) and innovativeness items was borrowed from Lin Trisha (T. Lin, Chiu, & Lim, 2011), originated by Lin Carolyn (C. Lin, 1998).

Regarding Social influence including habit and outcome expectancy based on theory of UTAUT2, TRA and TPB were modified to fit for Self-testing context. (Ajzen, 1991; Kuecuekbalaban, Rostalski, et al., 2017; Venkatesh et al., 2012; Zhang et al., 2019). In term of product features like ease of testing, non-invasiveness of the test were provided by their motivation and experience of self-tester (Ickenroth et al., 2011; Sarkar et al., 2016; Wirtz et al., 2017).

3.2 Part II: Development and examination of synthesized instrument with empirical data

3.2.1 Research design, population and sampling

We conducted a cross-sectional survey based on paper-based questionnaire. The interviews were carried out by trained research assistant at four regions of Thailand from February 2019 to November 2019. The Inclusion criteria of participant included Thai people, aged above 18 years old, living in Thailand at least 5 years. The exclusion criteria included participants who refused to enroll in the study, who aged under of 18 years, who had mental disease and inability to read and write. The purposive provincial selection in each region was based on monthly income averaged

that was collected from National Statistical Office database. The questionnaires were distributed to difference income levels: the highest averaged income, middle and the lowest average income to different regions: the North (5 provinces), Central (4 provinces), Northeast (5 provinces), and South (4 provinces). Questionnaires from eighteen provinces were obtained. Details of which province and the number of respondents from calculation in each area was presented in Table 3.1. A non-probability convenience sampling technique on the basic of accessibility from researcher to the participants was used to collect the information (Saunders M, 2009).

Table 3.1 Provincial in each region and total amount of respondent

Statement	**Respondent**	**Percentage**
4 Region (18 provinces)		
North/5 provinces		
Chiang Mai	51	5.2
Phayao	53	5.4
Phitsanulok	50	5.1
Lamphun	52	5.3
Phichit	40	4.1
Total	246	25.1
Central/4 provinces		
Nakhon Pathom	69	7.0
Chonburi	48	4.9
Lopburi	58	5.9
Pathum Thani	60	6.1
Total	235	23.9
Northeast/5 provinces		
Chaiyaphum	50	5.1
Nong Bua Lamphu	68	6.9
Nakhon Ratchasima	51	5.2
Buriram	50	5.1

Statement	Respondent	Percentage
Kalasin	50	5.1
Total	269	27.4
South/4 provinces		
Phuket	71	7.3
Chumphon	52	5.3
Trang	55	5.6
Pattani	51	5.2
Total	229	23.4
Grand total	**979**	**100.0**

3.2.2 Sample size

To select the adequate estimation method like maximum likelihood estimation (MLE), one of the important criteria is sample size. A sample size of 200 was a basis for estimation (Hair, Black, Babin, & Anderson, 2014). For model with non-normally distributed, large sample sizes of at least 400 required (Schermelleh-Engel, Moosbrugger, & Müller, 2003) In addition, the number of indicator variable also included considering for a sufficient large sample size. Boomsma (Boomsma, 1985) recommended a sample size of 100 if indicators per factor was 3-4 whereas 2 indicators per factor a sample size which required more than or equal to 400 (Boomsma & Hoogland, 2001).Therefore, calculating estimation of sample size of 979 in this study was sufficient for data analysis using MLE method in structural equation model (SEM).

3.2.3 Questionnaires design, validity and reliability

The questionnaire used for this study comprised of three parts. The first part was the respondent's demographic data (gender, age, education, occupation, monthly income, marital status, health insurance, health status and experience on self-testing). The second part contained indicator regarding User-centricity, Health belief, Personality trait, Childhood experience, Social influence, Product feature including Environmental factor, Channel to buy and Adoption intention. The last part was the opened-ended question about affected factors of why respondent ignore using medical home Self-testing. The entire construct designed was determining a five – point Likert scale as follows. 5 = strongly agree, 4= agree, 3= mean, 2= disagree and 1 for strongly disagree.

To examine content validity of measurement items, designed questionnaire was confirmed using the Index of Item-Objective Congruence (IOC). For the processing of questionnaire review, five experts who were experienced working in this field that were consist of one dissertation advisor and four practitioner who are working in the field of medical devices and providing significant comments and checking all measurement items. All items of questionnaires were evaluated for consistency, validity and congruencies of the items based on the score ranging from -1 to +1.

Not Understand or not congruent or related to this study = -1

Uncertain or not sure whether item related to the study = 0

Congruent with clear understanding = +1

IOC score was calculated as equation below.

$$IOC = \frac{\sum R}{N}$$

IOC = Item-Objective Congruence Index

R = Point given by specialists

ΣR = Total points of each specialist

N = Numbers of specialists

Each of item must have IOC score equal to or above 0.50 to be considered and included in questionnaire. Whereas the item that had IOC score lower than 0.50 was unqualified and been removed from the instrument. After confirmed the content validity, preliminary questionnaire involved 59 samples was evaluated the reliability by Cronbach's alpha (α).

3.2.4 Data collection and statistical analysis method

About 1000 questionnaires were distributed to four regions covering eighteen provinces in Thailand. Of all sent questionnaire, 21 questionnaires (2.1%) was excluded from data analysis due to missing value >30%. The remaining of 979 responses were further analysis. Program SPSS, Predictive Analytics Software Statistics version 22 (IBM corporation, Armonk, NY, USA) was used for data analysis. The characteristic of demographics, respondent was analyzed by descriptive frequency statistic. Construct reliability and internal consistency was checked by evaluating of Cronbach's alpha (α). To measure the construct validity and to confirm the model fits the data, confirmatory factor analysis (CFA) was conducted to ensure all constructs were reliable and valid. This study employed structural equation modeling (SEM) to determine how well the overall construct fits the observed data. IBM-AMOS version 21 software was used to perform confirmatory factor analysis (CFA) and structural equation modeling (SEM) was used. To classify user based on a set of specified variables in adoption intention of medical home Self-testing, K-Means cluster analysis procedure was performed to cluster user into subgroups with similar demographic or response pattern. Logistic regression method was used to determine the relationship between independent and dependent variables and to predict dependent variables and means adoption intention in medical home Self-testing. The Odds ratio (OR) was

calculated with 95% confidence intervals. The mean was compared using ANOVA analysis to see if there was the difference between specified variables and to characterize adopter and non-adopter respondents for medical Self-testing.

3.2.5 Ethical approval

Ethics approval for this study was obtained from board reviewed Ethics Committee, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand (Study trial No.755/61)

3.3 Part III: Development of software prototype for predicting adoption intention using medical home testing

After structural equation model was evaluated with model fit index, and it demonstrated reliability and validity, then the equation from model will be further tested to confirm validity with observed samples. Equal to new 246 samples were collected with convenience sampling procedure and they were entered to equation. The percentage of correct classification was calculated. Hair (Hair et al., 2014) suggested the criterion of classification accuracy that should be at least one-fourth greater than achieved by chance. If the chance of accuracy is 50%, then the classification accuracy should be 62.5%, which is from the calculation of 1.25x50%. By using validated equation from SEM to predict adoption intention rate, the percentage of classification accuracy was 69.1%, which higher than recommended level of predictive accuracy. Therefore, the equation of this study was a correct with classification rate of 50 percent. Next step, software prototype contained measuring algorithm to predict adoption rate can be developed. Software prototype was already designed to display adoption results in various dimensions including identify factors affecting in individual.

3.4 Part IV: The acceptability of innovative software tool for predicting adoption intention on medical home Self-testing

To test the acceptability of prototype software, the measurement items based on Technology Acceptance Model (TAM) was created to investigate factors affecting user's acceptance of this software. Core determinants of behavior intention were Perceived usefulness and Perceived ease of use. Researcher selected the target group using purposive sampling procedure. Total 22 representative from private company, private laboratory and government agency were sampling as potential users. Perception's result analysis of innovative software tool was presented in descriptive statistic. Software is a copyright to innovator and university, utilization and how to protect and manage Intellectual property have been described and discussed.

In the light of the earlier literature review mentioned in Chapter II, the conceptual model was presented as Figure 3.1 and the following hypotheses were purposed.

Hypothesis 1: User-Centricity will have a positively influence on adoption intention to use medical home Self-testing.

Hypothesis 2: Health Belief will have a positive impact on adoption intention to use medical home Self-testing.

Hypothesis 3: Experience will have a positive effect impact on adoption intention to use medical home Self-testing.

Hypothesis 4: Personality Trait will have a significant impact on adoption intention to use medical home Self-testing.

Hypothesis 5: Social Influence will have a significant influence on adoption intention to use medical home Self-testing.

Hypothesis 6: Product Feature will have a positive impact on adoption intention to use medical home Self-testing.

Hypothesis 7: Gender will has a positive effect on adoption intention to use medical home Self-testing.

Hypothesis 8: Age will has a significant effect on adoption intention to use medical home Self-testing

Hypothesis 9: Education will has a positive impact on adoption intention to use medical home Self-testing.

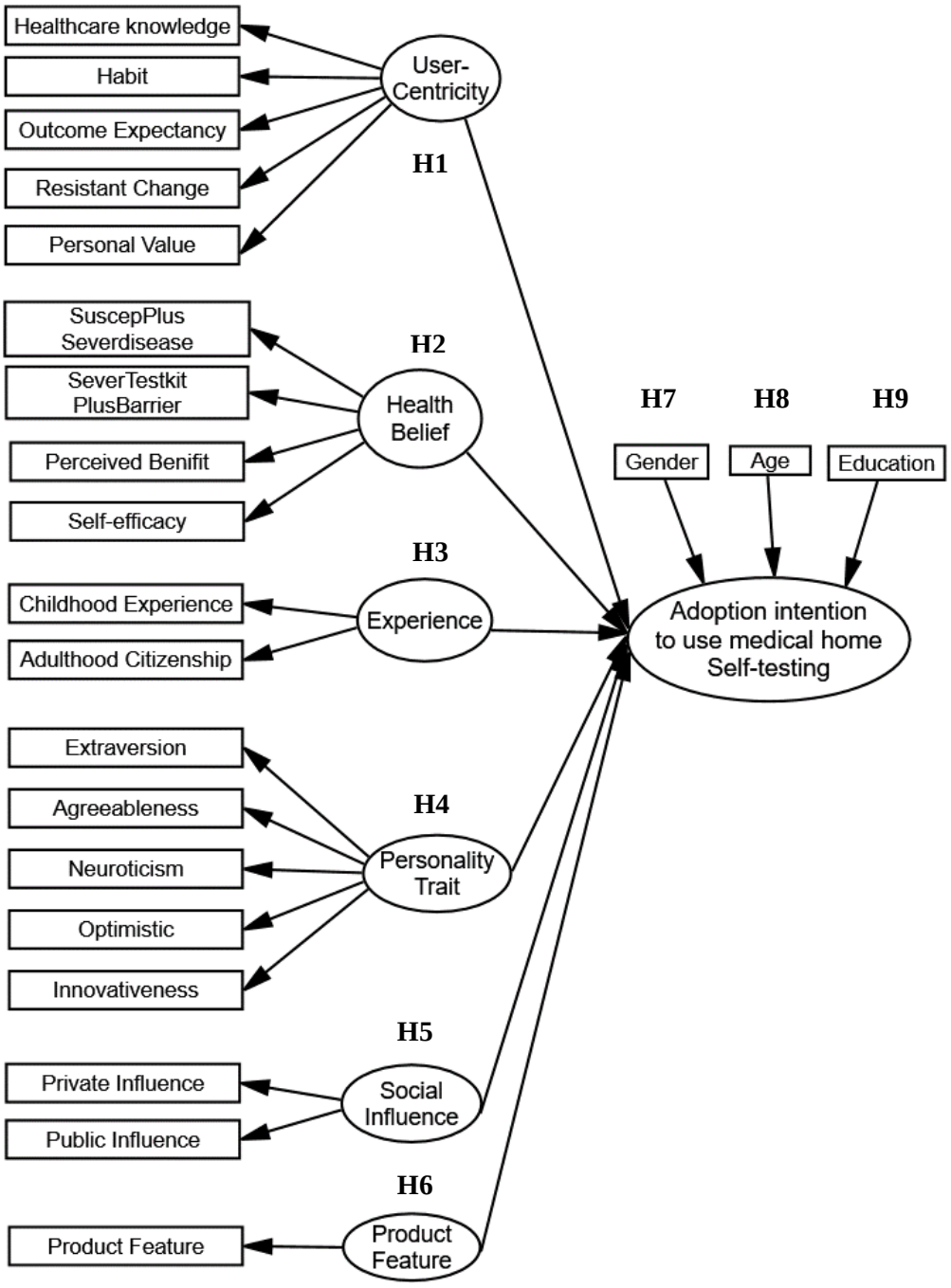

Figure 3.1 Research Model for adoption intention to use medical home Self-testing

Source: Researcher

Summary

This chapter reviews research methodology, data collection and purposed conceptual framework together with research hypotheses. Followed this, the questionnaire which shown in Appendix was reviewed by the expertise and evaluated the internal consistency via Cronbach's alpha (α). After questionnaire received official approval from board reviewed Ethics Committee, one thousand questionnaires were distributed to four regions covering eighteen provinces in Thailand based on monthly income averaged. About 21 questionnaires (2.1%) were desired to exclude from data analysis due to missing value >30%. Total 979 completed questionnaire (97.9%) were further analyzed by using SPSS program. Lastly, CFA is used to examine construct validity and test how fit of measurement model. The structure model validity and relationship among construct is tested using AMOS software.

CHAPTER IV
DATA ANALYSIS

The study of "factor influencing the acceptance for adoption of innovative medical self-test" was carried out to measure factors influencing the acceptability of medical home testing. The results were reported as follows.

4.1 Respondents' demographic profile

4.2 Descriptive statistic

4.3 Measurement model assessment

4.3.1 Construct reliability (Cronbach's alpha)

4.3.2 Construct validity (Confirmatory Factor Analysis)

4.3.3 First Order Confirmatory Factor Analysis. (First Order CFA)

4.4 Structural model assessment

4.5 Cluster analysis

4.6 Logistic regression analysis

4.7 One-way ANOVA analysis

The symbols for data analysis and abbreviations of all seventy-nine observed variables were presented in this Chapter. Seventy-five observed variables were exogenous variable, whereas four observed variables were endogenous variables. The exogenous variables were formed into major six constructs, comprised of user-centered, health belief, experience, personality trait, social influence and product feature. Four variables were grouped for one endogenous construct named adopt intention. The details in each construct and observed variables has been shown in Table 4.1.

Symbol and Abbreviations for data analysis

Symbol	Meaning
N	Population
n	Samples size
X	Mean
S.D.	Standard Deviation
S.E.	Standard Error
$\chi 2$	Model Chi-Square
df	Degree of freedom
CMIN/DF	Relative Chi-Square
RMSEA	Root Mean Square Error of Approximation
GFI	Goodness of Fit Index
NFI	Normed Fit Index
CFI	Comparative Fit Index
IFI	Incremental Fit Index
C.R.	Critical Ratio
R^2	Square Multiple Correlation
F	F test
Knowledge	Health Knowledge
Outcome	Outcome Expectancy
SuscepPlusSeverdisease	Perceived Susceptibility and Perceived Severity of disease
SeverTestKitPlusBarrier	Perceived Severity of Test Kit and Perceived Barrier
PerceivedBenni	Perceived Benefit
SelfEfficacy	Self-efficacy
ChilhoodEx	Childhood Experience
adultHoodCiti	Adulthood Citizenship
PrivateInflu	Private Influence
PublicInfluence	Public Influence
ProductFeature	Product Feature

Table 4.1 Abbreviation of exogenous and endogenous constructs and variables

Construct	Abbreviation	
1. User-Centricity	Construct	Observed Variable
	Knowledge	Knowledge1, Knowledge2, Knowledge3 and Knowledge4
	Habit	Habit1, Habit2, Habit3 and Habit4
	Outcome	OutcomeExpectancy1 and OutcomeExpectancy3
	PersonalValue	PersonalValue1and PersonalValue3
2. Health Belief	SuscepPlus Severedisease	Susceptibility1, Susceptibility2, PerceivedSeverity1, PerceivedSeverity2, PerceivedSeverity3, PerceivedSeverity4 and PerceivedSeverity5
	SeverTestKit PlusBarrier	PerceivedSeverityTestKit1, PerceivedSeverityTestKit2, PerceivedSeverityTestKit3, Perceived Barrier1, Perceived Barrier2 and Perceived Barrier3
	PerceivedBenni	Perceived Benefit1, Perceived Benefit2, Perceived Benefit3, Perceived Benefit4 and Perceived Benefit5
	SelfEfficacy	Self- Efficacy1, Self- Efficacy2 and Self-Efficacy3
3. Experience	ChildhoodExp	ChildhoodEx2, ChildhoodEx3, ChildhoodEx4, ChildhoodEx5 and ChildhoodEx6
	adulthoodCiti	AdulthoodCitizenship1, AdulthoodCitizenship2, AdulthoodCitizenship3, AdulthoodCitizenship4 and AdulthoodCitizenship8
4. Personality Trait	Construct	Observed Variable
	Extraversion	Extraversion1 and Extraversion2
	Agreeableness	Agreeableness1and Agreeableness3
	Neuroticism	Neuroticism2 and Neuroticism3
	Optimistic	Optimistic1, Optimistic3 and Optimistic4
	Innovativeness	Innovativeness1, Innovativeness2, Innovativeness3 and Innovativeness4

Construct	Abbreviation	
5. Social Influence	PrivateInflue	PrivateInfluence1, PrivateInfluence2, PrivateInfluence3 and PrivateInfluence5
	PublicInfluence	PublicInfluence1, PublicInfluence2, PublicInfluence3, PublicInfluence4, PublicInfluence5 and PublicInfluence6
6. Product Feature	ProductFeature	ProductFeature1, ProductFeature2, ProductFeature3, ProductFeature4, ProductFeature5, ProductFeature6, ProductFeature7, ProductFeature8, and ProductFeature9
7. Adopt Intention	Adopt Intention	Interested, Considering, Want and Introduce

4.1 Respondents' demographic profile

From the 1,000 questionnaires distributed to four region (North, Central, Northeast and South) of Thailand, there were twenty-one of questionnaires was considered incomplete with some missing data that could have potential impact on data analysis, especially multivariate analysis (Hair et al., 2014), therefore, they were excluded from the study. Total of 979 completed questions were included for analysis and demographic characteristics were showed in Table 4.2.

Table 4.2 Respondents' demographic characteristics

Statement	**Number of sample**	**Percentage**
Gender		
Men	273	27.9
Women	706	72.1
Total	979	100.0
Age		
18-25 years old	237	24.2
26-35 years old	294	30.0
36-45 years old	214	21.9
46-55 years old	142	14.5
56-65 years old	67	6.8
> 65 years old	25	2.6
Total	979	100.0
Education		
Primary School	91	9.3
Lower Secondary School	74	7.6
High school	144	14.7
Diploma	124	12.7
Bachelor degree	485	49.5
Master degree or higher	61	6.2
Other	1	0.1
Total	979	100.0
Occupation		
Student	174	17.8
Private employee	119	12.2
Housewife	90	9.2
Worker	178	18.2

Statement	Number of sample	Percentage
Government / State Enterprises	225	23.0
Private business	112	11.4
University staff	53	5.4
Others	28	2.9
Total	979	100.0
Income		
< 10,000 baht	218	22.3
10,001-15,000 baht	251	25.6
15,001-30,000 baht	254	25.9
30,001-45,000 baht	129	13.2
> 45,000 baht	127	12.9
Total	979	100.0
Marital status		
Single	460	47.0
Married	460	47.0
Divorced, widowed or separated	59	6.0
Total	979	100.0
Health insurance		
Private insurance	215	22.0
Social Security	331	33.8
UHCS	184	18.8
Insurance group	3	0.3
Public servant	158	16.1
None	88	9.0
Total	979	100.0

Statement	Number of sample	Percentage
Health condition		
Very healthy	629	64.2
Average	310	31.7
Need care	40	4.1
Total	979	100.0
Experience with Self-testing		
Never use	503	51.4
Using (glucometer/pregnancy test)	476	48.6
Total	979	100.0
Price for self-testing		
Free	24	2.5
100-200 baht	295	30.1
201-300 baht	282	28.8
301-400 baht	170	17.4
401-500 baht	103	10.5
501-700 baht	105	10.8
Total	979	100.0
Channel preferred for buying		
Medical device Shop	331	33.8
Pharmacy Shop	327	33.4
Hospital	212	21.7
Online/Internet	105	10.7
Others	4	0.4
Total	979	100.0

Statement	Number of sample	Percentage
Facilitating conditions to use self-testing	Frequency	
Fast results	747	76.3
Response to myself	567	57.9
Privacy	472	48.2
Thai FDA approved	384	39.2
Receive for free	300	30.6
Reimbursement from NHSO	247	25.2
Doctor refuse to do	107	10.9
Region (18 provinces)		
North/5 provinces		
Chiangmai	51	5.2
Phayao	53	5.4
Phitsanulok	50	5.1
Lamphun	52	5.3
Phichit	40	4.1
Total	246	25.1
Central/4 provinces		
Nakhonpathom	69	7.0
Chonburi	48	4.9
Lopburi	58	5.9
Pathumthani	60	6.1
Total	235	23.9
Northeast/5 provinces		
Chaiyaphum	50	5.1
Nongbualamphu	68	6.9
Nakhonratchasima	51	5.2

Statement	Number of sample	Percentage
Buriram	50	5.1
Kalasin	50	5.1
Total	269	27.4
South/4 provinces		
Phuket	71	7.3
Chumphon	52	5.3
Trang	55	5.6
Pattani	51	5.2
Total	229	23.4
Grand total	979	100.0

Total of 979 eligible respondents, aged ≥ 18 years, participated in the study. There were woman 706 (72.1%) and majority of participants were aged between 26-35 years (294; 30%), 485 (49.5%) holding Bachelor degree, 225 (23%) working for Government / State Enterprises, followed by 178 (18.2%) worker and 174 (17.8%) student. For family monthly income, 218 (22.3%) of respondents belonged to the category of lower than 10,000 baht, 251 (25.6%) to the 10,001-15,000 baht and 254 (25.9%) to the 15,001-30,000-baht category. Regarding marital status, both single and married participants was equally to 460 (47%) and 59 (6%) was divorced/widowed or separated. 331 (33.8%) had social security**,** 215 (22%) had private insurance and 184 (18.8%) had UHCS. 629 (64.2%) reported that they were healthy, only 40 (4.1%) needed care. More than half of respondent (503; 51.4%) had never used home Self-testing while 476 (48.6%) reported that they had experienced glucometer/pregnancy test. In term of price for Self-testing, participants preferred the cost of 100-200 baht (30.1%), 201-300 baht (28.8%) and 301-400 baht (17.4%), respectively. The lowest percentage was they given free (2.5%). Not surprisingly for health seeking care, 331 (33.8%) and 327 (33.4%)

of respondents were more likely to buy Self-testing at medical device shop and pharmacy shop, respectively. With respect to facilitating conditions, most participants agree that self-testing generated the fast result (76.3%), therefore, it was the most reason for Self-testing adoption. Self-tester want to see the result as soon as possible. Additionally, 57.9% of participants reported that they wanted to take care of their own health and 48.2% respondents preferred the privacy. Participants were equally distributive recruitment from four region (18 provinces); consist of North (five provinces: Chiangmai, Phayao, Phitsanulok, Lamphun and Phichit), Central (four provinces: Nakhonpathom, Chonburi, Lopburi and Pathumthani), Northeast (five provinces: Chaiyaphum, Nongbualamphu, Nakhonratchasima, Buriram and Kalasin,) and South (four provinces: Phuket, Chumphon, Trang and Pattani) as demonstrated as Table 4.2

4.2 Descriptive statistic

For assessment of normality, Skewness, S.E. skewness, Kurtosis and S.E. Kurtosis value were used before further analysis steps (Table 4.3).

Table 4.3 Descriptive Statistic of Adoption Intention for home self-testing

Construct	$\bar{X}$	Median	S.D.	Skewness	S.E. Skewness	Kurtosis	S.E. Kurtosis
Knowledge	4.10	4.00	0.655	-0.553	0.078	0.429	0.156
• Knowledge1	4.16	4.00	0.820	-0.694	0.078	0.030	0.156
• Knowledge2	4.05	4.00	0.808	-0.494	0.078	-0.060	0.156
• Knowledge3	3.98	4.00	0.858	-0.503	0.078	-0.283	0.156
• Knowledge4	4.22	4.00	0.796	-0.696	0.078	-0.106	0.156
Habit	4.01	4.00	0.607	-0.423	0.078	0.761	0.156
• Habit1	4.08	4.00	0.741	-0.530	0.078	0.271	0.156
• Habit2	4.02	4.00	0.723	-0.430	0.078	0.265	0.156
• Habit3	4.01	4.00	0.740	-0.547	0.078	0.625	0.156
• Habit4	3.94	4.00	0.770	-0.399	0.078	-0.087	0.156
Perceived Susceptibility	3.30	3.50	0.921	-0.287	0.078	-0.190	0.156
• Susceptibility1	3.11	3.00	1.098	-0.210	0.078	-0.455	0.156
• Susceptibility2	3.50	4.00	1.004	-0.400	0.078	-0.278	0.156

Construct	$\bar{X}$	Median	S.D.	Skewness	S.E. Skewness	Kurtosis	S.E. Kurtosis
Perceived Severity disease	4.09	4.00	0.644	-0.736	0.078	1.132	0.156
• PerceivedSeverity1	4.24	4.00	0.783	-0.916	0.078	0.848	0.156
• PerceivedSeverity2	3.95	4.00	0.859	-0.700	0.078	0.535	0.156
• PerceivedSeverity3	4.09	4.00	0.840	-0.712	0.078	0.218	0.156
• PerceivedSeverity4	4.00	4.00	0.927	-0.885	0.078	0.610	0.156
• PerceivedSeverity5	4.19	4.00	0.813	-0.926	0.078	0.876	0.156
Perceived Severity Test Kit	3.18	3.33	1.003	-0.277	0.078	-0.618	0.156
• PerceivedSeverityTestKit1	3.43	4.00	1.052	-0.416	0.078	-0.431	0.156
• PerceivedSeverityTestKit2	3.02	3.00	1.202	-0.079	0.078	-0.962	0.156
• PerceivedSeverityTestKit3	3.10	3.00	1.181	-0.177	0.078	-0.849	0.156
Perceived Benefit	3.79	3.80	0.732	-0.552	0.078	0.689	0.156
• Perceived Benefit1	3.81	4.00	0.957	-0.743	0.078	0.351	0.156
• Perceived Benefit2	3.69	4.00	0.990	-0.694	0.078	0.126	0.156
• Perceived Benefit3	3.80	4.00	0.924	-0.739	0.078	0.499	0.156
• Perceived Benefit4	3.83	4.00	0.926	-0.599	0.078	0.038	0.156
• Perceived Benefit5	3.81	4.00	0.903	-0.614	0.078	0.189	0.156
Outcome Expectancy	3.87	4.00	0.733	-0.377	0.078	0.140	0.156
• OutcomeExpectancy1	3.97	4.00	0.794	-0.414	0.078	-0.112	0.156
• OutcomeExpectancy3	3.77	4.00	0.916	-0.527	0.078	0.170	0.156
Self- Efficacy	3.76	4.00	0.778	-0.442	0.078	0.432	0.156
• Self- Efficacy1	3.87	4.00	0.848	-0.561	0.078	0.482	0.156
• Self- Efficacy2	3.64	4.00	0.911	-0.287	0.078	-0.195	0.156
• Self- Efficacy3	3.78	4.00	0.926	-0.664	0.078	0.307	0.156
Perceived Barrier	3.37	3.33	0.833	-0.063	0.078	-0.434	0.156
• Perceived Barrier1	3.01	3.00	1.267	-0.093	0.078	-1.054	0.156
• Perceived Barrier2	3.51	4.00	0.991	-0.390	0.078	-0.152	0.156
• Perceived Barrier3	3.61	4.00	0.852	-0.103	0.078	-0.231	0.156
Childhood Experience	3.85	3.80	0.634	-0.428	0.078	0.508	0.156
• ChildhoodEx2	3.79	4.00	0.862	-0.681	0.078	0.402	0.156
• ChildhoodEx3	3.93	4.00	0.795	-0.638	0.078	0.620	0.156
• ChildhoodEx4	3.91	4.00	0.806	-0.572	0.078	0.355	0.156
• ChildhoodEx5	3.89	4.00	0.788	-0.536	0.078	0.351	0.156
• ChildhoodEx6	3.74	4.00	0.848	-0.336	0.078	-0.193	0.156
Adulthood Citizenship	3.66	3.80	0.718	-0.595	0.078	0.728	0.156
• AdulthoodCitizenship1	3.70	4.00	0.992	-0.823	0.078	0.513	0.156
• AdulthoodCitizenship2	3.31	3.00	1.122	-0.376	0.078	-0.600	0.156
• AdulthoodCitizenship3	3.87	4.00	0.846	-0.700	0.078	0.784	0.156
• AdulthoodCitizenship4	3.67	4.00	0.983	-0.746	0.078	0.356	0.156
• AdulthoodCitizenship8	3.74	4.00	0.933	-0.609	0.078	0.104	0.156

Construct	$\bar{X}$	Median	S.D.	Skewness	S.E. Skewness	Kurtosis	S.E. Kurtosis
Extraversion	4.10	4.00	0.646	-0.448	0.078	0.206	0.156
• Extraversion1	4.10	4.00	0.746	-0.603	0.078	0.402	0.156
• Extraversion2	4.10	4.00	0.711	-0.442	0.078	-0.027	0.156
Agreeableness	3.90	4.00	0.634	-0.446	0.078	0.515	0.156
• Agreeableness1	4.15	4.00	0.720	-0.723	0.078	1.002	0.156
• Agreeableness3	3.64	4.00	0.908	-0.504	0.078	0.144	0.156
Neuroticism	3.78	4.00	0.752	-0.183	0.078	-0.239	0.156
• Neuroticism2	3.72	4.00	0.876	-0.295	0.078	-0.156	0.156
• Neuroticism3	3.84	4.00	0.819	-0.396	0.078	0.051	0.156
Optimistic	3.92	4.00	0.606	-0.278	0.078	0.227	0.156
• Optimistic1	4.02	4.00	0.781	-0.611	0.078	0.384	0.156
• Optimistic3	3.90	4.00	0.769	-0.506	0.078	0.548	0.156
• Optimistic4	3.83	4.00	0.856	-0.753	0.078	0.817	0.156
Innovativeness	3.97	4.00	0.638	-0.218	0.078	-0.132	0.156
• Innovativeness1	4.05	4.00	0.720	-0.586	0.078	0.681	0.156
• Innovativeness2	4.07	4.00	0.730	-0.455	0.078	-0.029	0.156
• Innovativeness3	4.04	4.00	0.777	-0.498	0.078	-0.087	0.156
• Innovativeness4	3.73	4.00	0.903	-0.390	0.078	-0.092	0.156
Personal Value	3.93	4.00	0.837	-0.462	0.078	-0.051	0.156
• PersonalValue1	3.93	4.00	0.917	-0.734	0.078	0.512	0.156
• PersonalValue2	3.93	4.00	0.882	-0.534	0.078	-0.067	0.156
Private Influence	3.64	3.75	0.738	-0.123	0.078	0.006	0.156
• PrivateInfluence1	3.67	4.00	0.894	-0.294	0.078	0.026	0.156
• PrivateInfluence2	3.70	4.00	0.861	-0.185	0.078	-0.216	0.156
• PrivateInfluence3	3.60	4.00	0.912	-0.266	0.078	-0.149	0.156
• PrivateInfluence5	3.59	4.00	0.898	-0.336	0.078	0.148	0.156
Public Influence	3.85	3.83	0.582	-0.316	0.078	0.809	0.156
• PublicInfluence1	3.98	4.00	0.793	-0.676	0.078	0.631	0.156
• PublicInfluence2	3.86	4.00	0.815	-0.628	0.078	0.577	0.156
• PublicInfluence3	3.83	4.00	0.780	-0.570	0.078	0.726	0.156
• PublicInfluence4	3.36	3.00	1.018	-0.317	0.078	-0.292	0.156
• PublicInfluence5	3.81	4.00	0.841	-0.844	0.078	1.252	0.156
• PublicInfluence6	4.22	4.00	0.765	-0.877	0.078	0.766	0.156
Product Feature	4.03	4.00	0.635	-0.684	0.078	1.079	0.156
• ProductFeature1	3.98	4.00	0.815	-0.659	0.078	0.662	0.156
• ProductFeature2	4.02	4.00	0.824	-0.635	0.078	0.318	0.156
• ProductFeature3	4.09	4.00	0.786	-0.675	0.078	0.450	0.156
• ProductFeature4	4.15	4.00	0.819	-0.690	0.078	0.053	0.156
• ProductFeature5	3.99	4.00	0.834	-0.544	0.078	0.067	0.156
• ProductFeature6	3.79	4.00	0.919	-0.821	0.078	0.867	0.156
• ProductFeature7							

Construct	$\bar{X}$	Median	S.D.	Skewness	S.E. Skewness	Kurtosis	S.E. Kurtosis
• ProductFeature8	3.96	4.00	0.796	-0.514	0.078	0.127	0.156
• Productfeature9	4.13	4.00	0.795	-0.734	0.078	0.440	0.156
	4.20	4.00	0.848	-0.970	0.078	0.745	0.156
Adoption Intention	3.74	4.00	0.803	-0.515	0.078	0.438	0.156
• Interested	3.86	4.00	0.901	-0.651	0.078	0.307	0.156
• Considering	3.70	4.00	0.885	-0.485	0.078	0.217	0.156
• Want	3.72	4.00	0.913	-0.448	0.078	-0.057	0.156
• Introduce	3.70	4.00	0.920	-0.395	0.078	-0.115	0.156

Mean of seventy-nine variables had ranged from 3.01-4.24 and mean of all construct range from 3.18-4.10 as shown in Table 4.3. In general, assumption in the conduct of SEMs, the data should have normal distribution. From the result of this study, median of all variable were equally to their means. From descriptive statistic, three variables (PerceivedSeverityTestKit2, Perceived Barrier1 and Perceived Barrier3) had normal distribution and their value of skewness were within two times of standard error whereas the others variable had left skewness. For kurtosis result, forty out of seventy-nine variables that value of kurtosis within two times of standard error that was represented normal distribution. Six and thirty-three variables reported positive kurtosis (Leptokurtic) and negative kurtosis (Platykurtic), respectively. From result analysis, the data showed non-normal distribution. To overcome this problem, maximum likelihood method with large samples size at least of 400 and frequently were used for parameter estimation in SEMs to reduce the deviation, it was the properly solution to apply in this as suggested by Boomsma and Hoogland (Boomsma & Hoogland, 2001). Therefore, the result from adoption intention of medical Self-testing model was considered reliable.

4.3 Measurement model assessment

4.3.1 Construct reliability (Cronbach's alpha)

To evaluate internal reliability, Cronbach's alpha (α) (Cronbach 1951) was used to estimate the internal consistency reliability in this study. The reliability value was ranged from zero to one. Good indicator reliability if variables in construct was measured in unidimensional, agreed on lower limit of 0.7, with level of 0.60, which was considered to be used in exploratory research (Hair et al., 2014). From the results of construct reliability testing, the calculated Cronbach's alpha (α) was ranged from 0.513-0.917 in pretesting questionnaire (n=59). To increase the reliability scored, some items were removed from the instrument before collecting samples. From the result, the entire construct except personality trait and perceived susceptibility showed Cronbach's alpha values ranged from 0.704-0.913 (n=979), which supported adequately internal consistency. For personality trait and perceived susceptibility, these constructs were brought to further investigation to include in the construct with confirmatory factor analysis technique in the next section. The results of Cronbach's alpha values in each construct were presented in Table 4.4.

Table 4.4 Construct reliability using Cronbach's Alpha

No	Construct	Number of variables	Cronbach's Alpha n= 59	Alpha n=979
1	Health care knowledge	4	0.520	0.810
2	Habit	4	0.513	0.833
3	perceived susceptibility	3	0.564	0.613
4	Perceived Severity	8	0.696	0.742
5	Perceived Benefit	5	0.755	0.837
6	Outcome expectancy	3	0.755	0.772
7	Self-efficacy	3	0.543	0.837
8	Perceived barrier	3	0.747	0.704
9	Resistant to change	4	0.746	0.753
10	Childhood experience	9	0.740	0.802
11	Adulthood citizenship	8	0.808	0.814
12	Extraversion trait	3	0.668	0.674
13	Agreeableness trait	3	0.513	0.546
14	Neuroticism trait	5	0.560	0.665
15	Optimistic trait	4	0.664	0.568
16	Innovativeness	4	0.739	0.828
17	Personal value	2	0.782	0.844
18	Private influence	5	0.834	0.821
19	Public influence	6	0.664	0.784
20	Product feature	9	0.906	0.913
21	Adopt intention	4	0.917	0.910

4.3.2 Construct validity (Confirmatory Factor Analysis)

Construct validity determined the extent to which how well the set of observed items reflecting the theoretical latent variables. A good fit of the model provided confidence of the variable item that represented the true score which taken from the exist population (Hair et al., 2014). Confirmatory factor analysis (CFA) technique was used to test the validity.

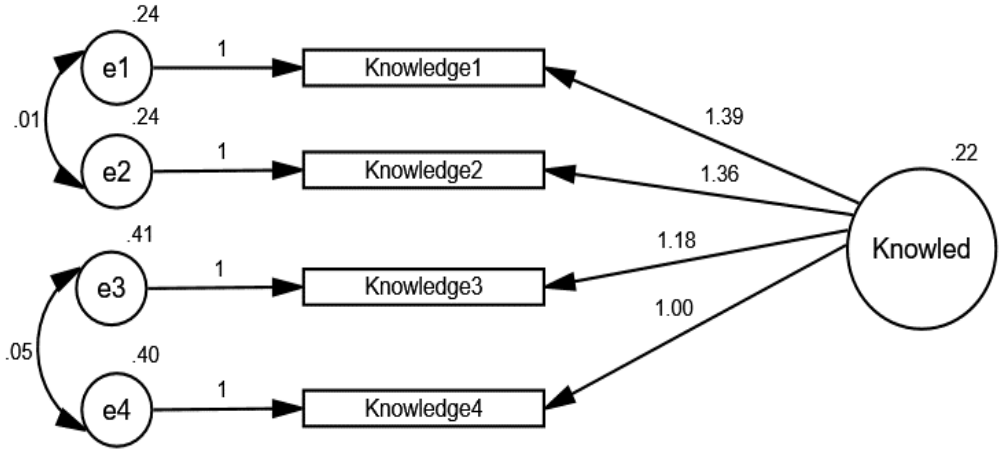

Figure 4.1 The Result of CFA of Knowledge Model

Table 4.5 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Health knowledge model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Knowled	Knowledge1	0.802	0.077	17.963	0.643
	Knowledge2	0.799	0.076	17.898	0.638
	Knowledge3	0.657	0.069	17.077	0.432
	Knowledge4	0.599	-	-	0.359
$\chi2 = 0.863$ df = 4 $\chi2$ /df = 0.216 $p = 0.930$ RMSEA = 0.000					

The result of Confirmatory factor analysis (CFA) of Health Knowledge model showed in Figure 4.1 and Table 4.5. From the Figure 4.1, knowledge4 variables were appropriately fixed value to 1 as the factor loading, it was termed as reference variable of the construct because it was the lowest factor loading. Table 4.5 presented the Standardized Factor Loading, Critical ratio, squared multiple correlation and Model fit index. The standardized factor loading value in each variable (Knowledge1-Knowledge 4) was ranged from 0.599-0.802 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). Squared multiple correlation (R^2) indicates the variance of construct which explained or predicted by the group of predictor variables. In this model, R^2 was a range of 0.359-0.643. Chi-square test ($\chi 2 = 0.863$, $p = 0.930$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. Root mean square error of approximation (RMSEA) was 0.000 (□ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

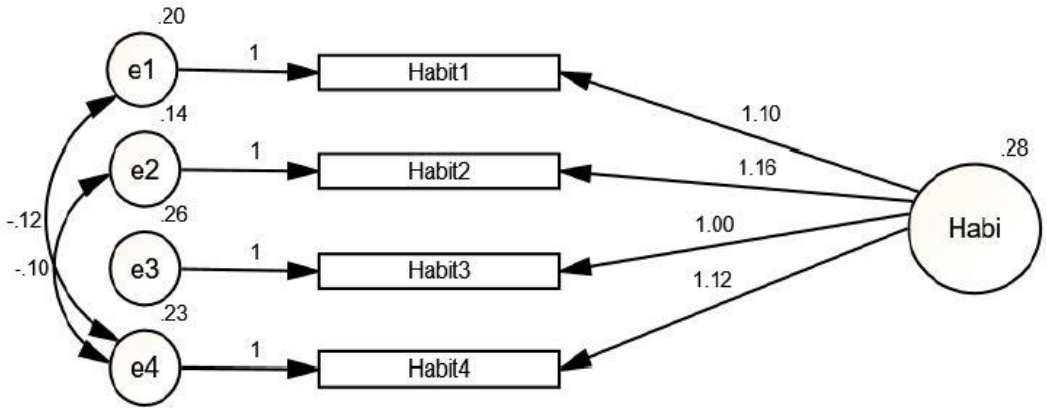

Figure 4.2 The Result of CFA of Habit Model

Table 4.6 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Habit model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R	
Habi	Habit1	0.796	0.050	22.101	0.633
	Habit2	0.861	0.047	24.758	0.741
	Habit3	0.721	-	-	0.521
	Habit4	0.780	0.073	15.345	0.609
$\chi2 = 0.278$ df = 1 $\chi2$ /df= 0.278 p = 0.598 RMSEA = 0.000					

The finding of CFA were shown in Figure 4.2 and Table 4.6. In Figure 4.2, Habit3 parameter was fixed to 1 as a reference variable of the construct because it was the lowest factor loading. Standardized factor loading value in Habit1-Habit4 variable were ranged from 0.721-0.861 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96) and R^2 has a range of 0.521-0.741 as presented in Table 4.6 . From inspection of fit indices, Chi-square test ($\chi2 = 0.278$, $p = 0.598$) showed statistically insignificant different ($p > 0.05$) and RMSEA was 0.000 (≤ 0.08). This model was interpreted as a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

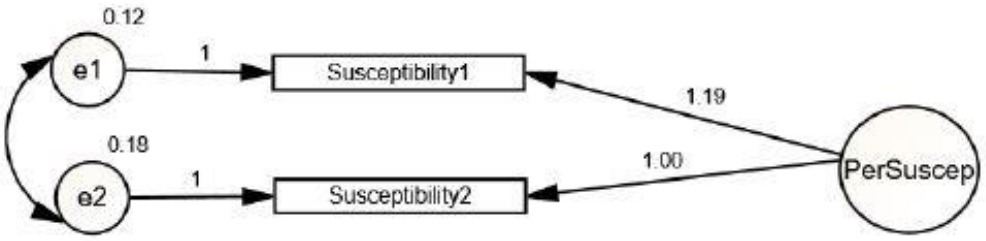

Figure 4.3 The Result of CFA of Perceived Susceptibility Model

Table 4.7 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Perceived Susceptibility model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PerSuscep	Susceptibility1	0.950	-	-	0.903
	Susceptibility2	0.903	-	-	0.815
$\chi2 = 1.513$ df = 1 $\chi2$ /df= 1.513 $p = 0.219$ RMSEA = 0.023					

The values of CFA result of Perceived Susceptibility model showed in Figure 4.3 and Table 4.7. From the Figure 4.3, Susceptibility2 variable was appropriately fixed value to 1 as the factor loading as a reference variable of the construct because it was the lowest factor loading. Table 4.5 provided standardized factor loading value in variables (Susceptibility1- Susceptibility2), which were 0.950 and 0.903, respectively. In this model, R^2 was a range of 0.815-0.903. Chi-square test ($\chi2 = 1.513$, $p = 0.219$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.023 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

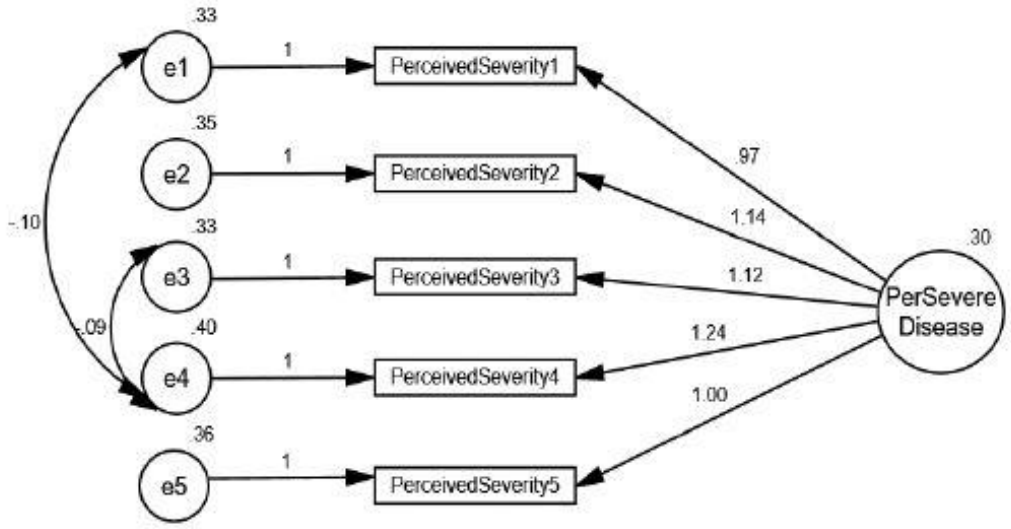

Figure 4.4 The Result of CFA of Perceived Severity disease Model

Table 4.8 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Perceived Severity disease model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PerSevereDisease	PerceivedSeverity1	0.679	0.056	17.398	0.461
	PerceivedSeverity2	0.729	0.058	19.741	0.532
	PerceivedSeverity3	0.729	0.061	18.314	0.531
	PerceivedSeverity4	0.730	0.073	16.977	0.533
	PerceivedSeverity5	0.675	-	-	0.455
$\chi 2 = 3.241$ df = 3 $\chi 2$ /df= 1.080 $p = 0.356$ RMSEA = 0.009					

The CFA result of Perceived severity disease model showed in Figure 4.4 and Table 4.8. From the Figure 4.4, PerceivedSeverity5 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.8 provided standardized factor loading value in variables (PerceivedSeverity1- PerceivedSeverity5), which was ranged from 0.675-0.730 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was ranged 0.455-0.533. Chi-square test ($\chi 2 = 3.241$, $p = 0.356$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.009 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

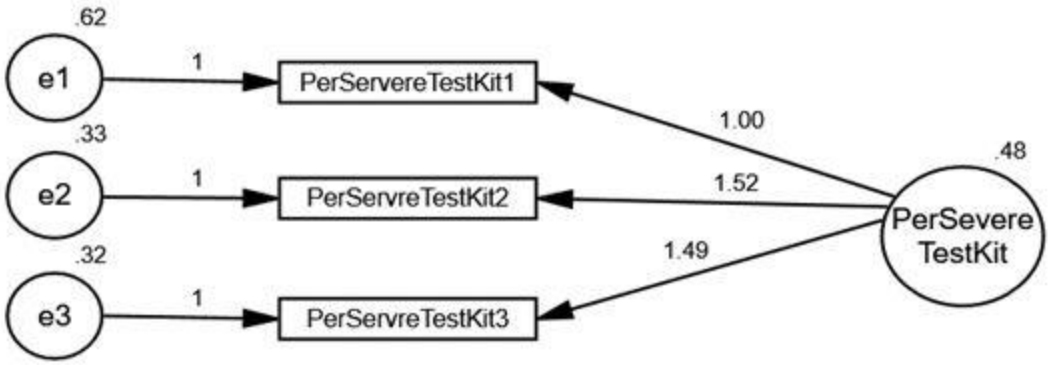

Figure 4.5 The Result of CFA of Perceived severity Test kit Model

Table 4.9 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Perceived Severity test kit model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PerSevereTestKit	PerSevereTestKit1	0.661	-	-	0.437
	PerSevereTestKit2	0.880	0.069	22.133	0.774
	PerSevereTestKit3	0.878	0.067	22.133	0.771
$\chi 2 = 0.000$ df = 1 $\chi 2$ /df= 0.000 $p = 0.994$ RMSEA = 0.000					

The result of CFA of Perceived Severity test kit model showed in Figure 4.5 and Table 4.9. From the Figure 4.5, PerSevereTestKit1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.9 provided standardized factor loading value in variables (PerSevereTestKit1- PerSevereTestKit3), which was ranged from 0.661-0.880 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was ranged of 0.437-0.774. Chi-square test ($\chi 2 = 0.000$, $p = 0.994$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

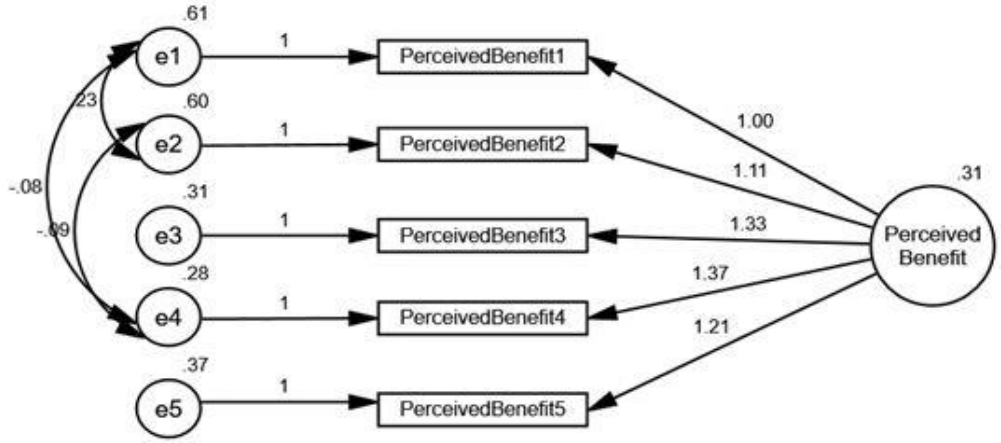

Figure 4.6 The Result of CFA of Perceived Benefit Model

Table 4.10 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Perceived Benefit model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Perceived Benefit	PerceivedBenefit1	0.578	-	-	0.334
	PerceivedBenefit2	0.619	0.062	17.969	0.383
	PerceivedBenefit3	0.795	0.084	15.781	0.632
	PerceivedBenefit4	0.819	0.086	15.931	0.670
	PerceivedBenefit5	0.742	0.078	15.640	0.551
$\chi2 = 2.774$ df = 2 $\chi2$ /df= 1.387 $p = 0.250$ RMSEA = 0.020					

The result of CFA of Perceived Benefit model showed in Figure 4.6 and Table 4.10. From the Figure 4.6, PerceivedBenefit1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.10 provided standardized factor loading value in variables (PerceivedBenefit1- PerceivedBenefit5), which was ranged from 0.578-0.819 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was ranged of 0.334-0.670. Chi-square test ($\chi 2 = 2.774$, $p = 0.250$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.020 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

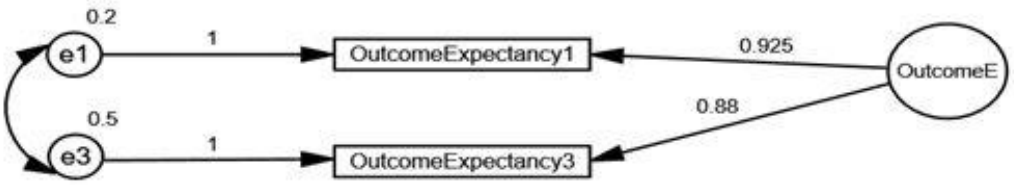

Figure 4.7 The Result of CFA of Outcome Expectancy Model

Table 4.11 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Outcome Expectancy model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
OutcomeE	OutcomeExpectancy1	0.925	-	-	0.430
	OutcomeExpectancy3	0.880	-	-	0.675
$\chi2 = 1.488$ df = 1 $\chi2$ /df= 1.488 $p = 0.223$ RMSEA = 0.022					

The result of CFA of Outcome Expectancy model showed in Figure 4.7 and Table 4.11. From the Figure 4.7, OutcomeExpectancy1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.11 provided standardized factor loading value in OutcomeExpectancy1 observed variable and OutcomeExpectancy3 variable in equal to 0.880 and 0.925, respectively. In this model, R^2 was ranged of 0.430-0.675. Chi-square test ($\chi2 = 1.488$, $p = 0.223$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.022 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

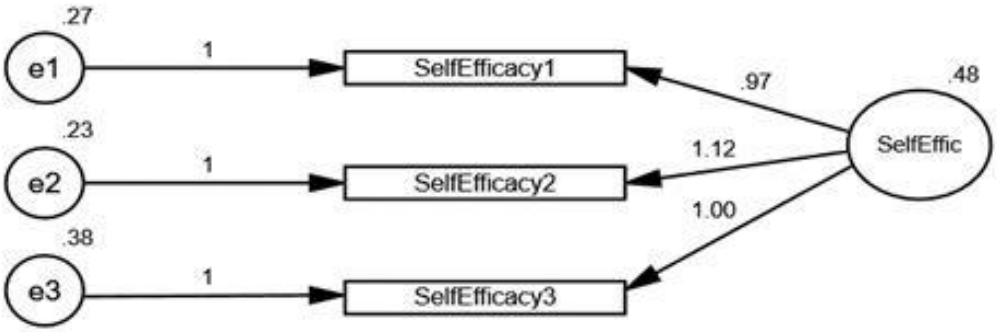

Figure 4.8 The Result of CFA of Self-Efficacy Model

Table 4.12 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Self-efficacy model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
SelfEffic	SelfEfficacy1	0.793	0.041	23.650	0.630
	SelfEfficacy2	0.847	0.043	22.988	0.717
	SelfEfficacy3	0.747	-	-	0.559
$\chi2 = 0.001$ df = 1 $\chi2$ /df= 0.001 $p = 0.982$ RMSEA = 0.000					

The result of CFA of Self-efficacy model showed in Figure 4.8 and Table 4.12. From the Figure 4.8, SelfEfficacy3 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.10 provided standardized factor loading value in variables (SelfEfficacy1- SelfEfficacy3), which was ranged from 0.747-0.847 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a ranged of 0.559-0.717. Chi-square test ($\chi2 = 0.001$, $p = 0.982$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

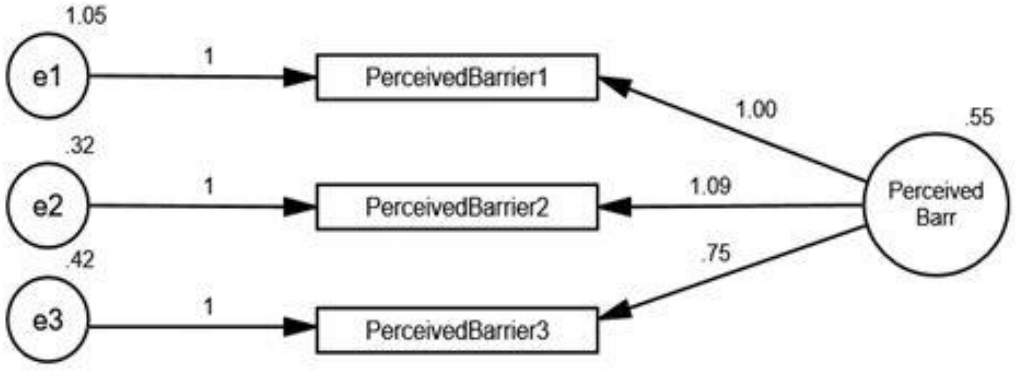

Figure 4.9 The Result of CFA of Perceived Barrier Model

Table 4.13 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Perceived barrier model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PerceivedBarr	PerceivedBarrier1	0.586	-	-	0.343
	PerceivedBarrier2	0.818	0.064	16.961	0.670
	PerceivedBarrier3	0.651	0.051	14.696	0.424
$\chi 2 = 0.000$ df = 2 $\chi 2$ /df= 0.000 $p = 1.000$ RMSEA = 0.000					

The CFA result of Perceived barrier model showed in Figure 4.9 and Table 4.13. From the Figure 4.9, PerceivedBarrier1 variable was appropriately fixed value to1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.13 provided standardized factor loading value in variables (PerceivedBarrier1- PerceivedBarrier3), which was ranged from 0.586-0.818 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a ranged of 0.343-0.670. Chi-square test ($\chi 2 = 0.000$, $p = 1.000$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the

model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

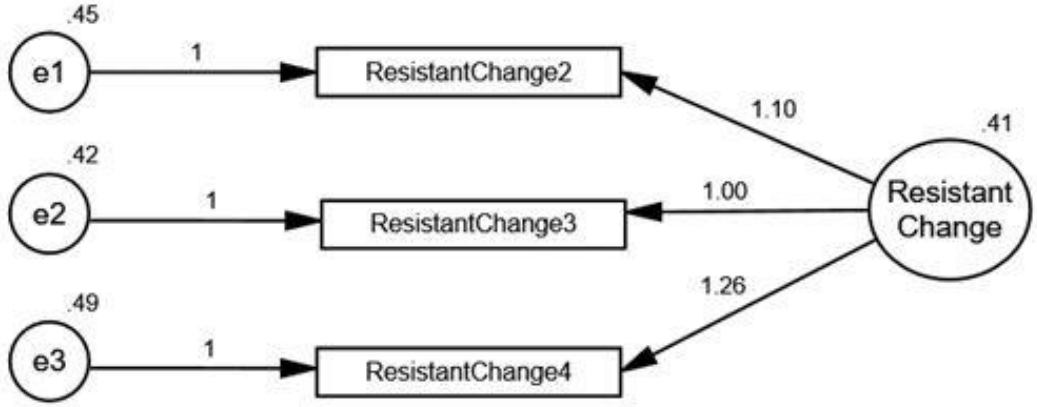

Figure 4.10 The Result of CFA of Resistant Change Model

Table 4.14 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Resistant Change model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
ResistantChange	ResistantChange2	0.725	0.056	19.782	0.526
	ResistantChange3	0.702	-	-	0.493
	ResistantChange4	0.754	0.061	20.567	0.569
$\chi2 = 0.000$ df = 3 $\chi2$ /df= 0.000 $p = 1.000$ RMSEA = 0.000					

The CFA result of Resistant Change model showed in Figure 4.10 and Table 4.14. From the Figure 4.10, ResistantChange3 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.14 provided standardized factor loading value in variables (ResistantChange2 – ResistantChange4), which was ranged from 0.702-0.754 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.493-0.569. Chi-square test ($\chi 2$ = 0.000, p = 1.000) showed statistically non-significant different (p > 0.05), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables

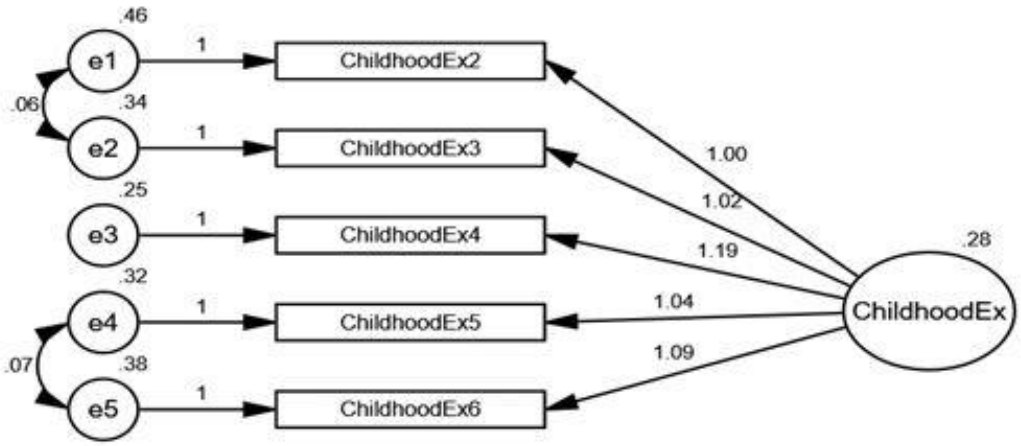

Figure 4.11 The Result of CFA of Childhood Experience Model

Table 4.15 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Childhood experience model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
ChildhoodEx	ChildhoodEx2	0.616	-	-	0.379
	ChildhoodEx3	0.682	0.058	17.628	0.464
	ChildhoodEx4	0.783	0.071	16.779	0.613
	ChildhoodEx5	0.701	0.066	15.715	0.491
	ChildhoodEx6	0.683	0.071	15.402	0.466
$\chi2 = 1.065$ df = 3 $\chi2$ /df= 0.355 $p = 0.786$ RMSEA = 0.000					

The result of CFA of Childhood experience model showed in Figure 4.11 and Table 4.15. From the Figure 4.11, ChildhoodEx2 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.15 provided standardized factor loading value in variables (ChildhoodEx2 – ChildhoodEx6), which was ranged from 0.616-0.783 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.379-0.613. Chi-square test ($\chi2 = 1.065$, $p = 0.786$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

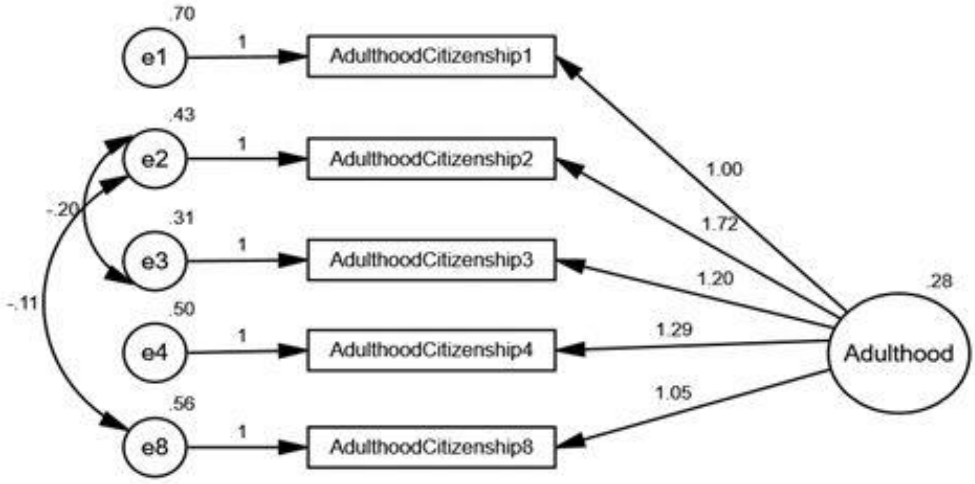

Figure 4.12 The Result of CFA of Adulthood Citizenship Model

Table 4.16 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Adulthood Citizenship model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Adulthood	AdulthoodCitizenship1	0.535	-	-	0.286
	AdulthoodCitizenship2	0.814	0.125	13.779	0.662
	AdulthoodCitizenship3	0.754	0.084	14.370	0.568
	AdulthoodCitizenship4	0.695	0.082	15.709	0.483
	AdulthoodCitizenship8	0.597	0.080	13.116	0.357
$\chi2 = 2.876$ df = 3 $\chi2$ /df= 0.959 $p = 0.411$ RMSEA = 0.000					

The CFA result of Adulthood Citizenship model was in Figure 4.12 and Table 4.16. From the Figure 4.12, AdulthoodCitizenship1 variable was appropriately fixed value to 1 as the factor loading, is termed a reference variable of the construct because it was the lowest factor loading. Table 4.16 provided standardized factor loading value in variables (AdulthoodCitizenship1-4, AdulthoodCitizenship8), which was ranged from 0.535-0.814 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.286-0.662. Chi-square test ($\chi 2 = 2.876$, $p = 0.411$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

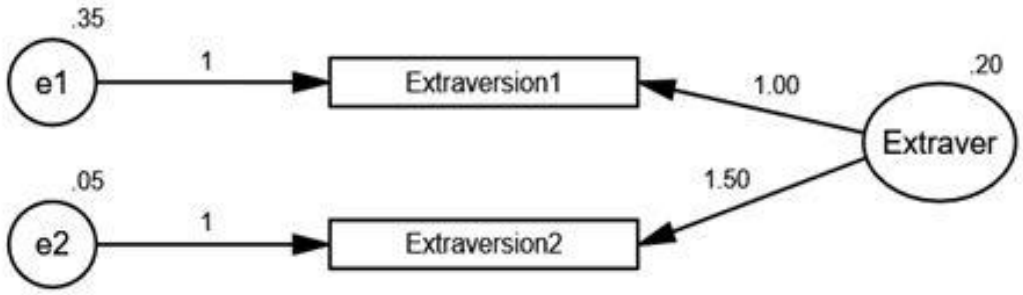

Figure 4.13 The Result of CFA of Extraversion Model

Table 4.17 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Extraversion model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Extraver	Extraversion1	0.602	-	-	0.362
	Extraversion2	0.949	0.069	21.771	0.901
$\chi 2 = 0.000$ df = 1 $\chi 2$ /df= 0.000 $p = 0.984$ RMSEA = 0.000					

The CFA result of Extraversion model showed in Figure 4.13 and Table 4.17. From the Figure 4.13, Extraversion1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.17 provided standardized factor loading value in Extraversion1and Extraversion2 variable, were 0.602 and 0.949 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96), respectively. In this model, R^2 was a range of 0.362 and 0.901. Chi-square test ($\chi 2 = 0.000$, $p = 0.984$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

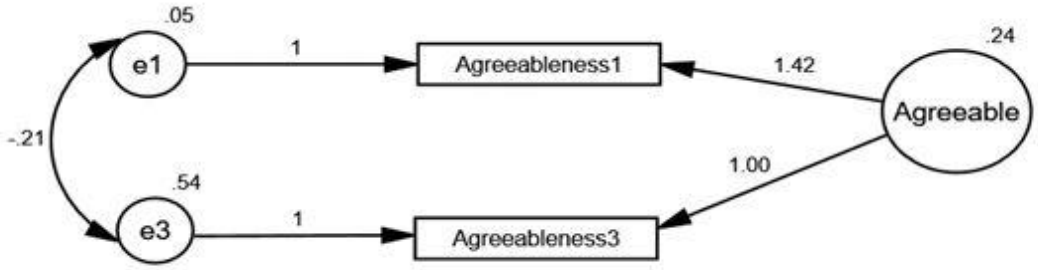

Figure 4.14 The Result of CFA of Agreeableness Model

Table 4.18 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Agreeableness model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Agreeable	Agreeableness1	0.951	-	-	0.905
	Agreeableness3	0.552	-	-	0.305
$\chi 2 = 1.896$ df = 1 $\chi 2$ /df= 1.896 $p = 0.169$ RMSEA = 0.030					

The CFA result of Agreeableness model showed in Figure 4.14 and Table 4.18. From the Figure 4.14, Agreeableness1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.18 provided standardized factor loading value in Agreeableness1and Agreeableness3 variable, were 0.552 and 0.951, respectively. In this model, R^2 was a range of 0.305 and 0.905. Chi-square test ($\chi 2 = 1.896$, $p = 0.169$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.030 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

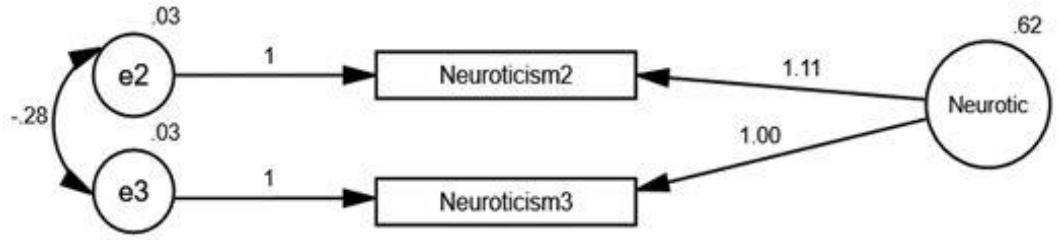

Figure 4.15 The Result of CFA of Neuroticism Model

Table 4.19 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Neuroticism model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Neurotic	Neuroticism2	0.981	-	-	0.962
	Neuroticism3	0.977	-	-	0.954
$\chi 2 = 1.523$ df = 1 $\chi 2$ /df= 1.523 $p = 0.217$ RMSEA = 0.023					

The CFA result of Neuroticism model showed in Figure 4.15 and Table 4.19. From the Figure 4.15, Neuroticism2 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.19 provided standardized factor loading value in Neuroticism2 and Neuroticism3 variable, were 0.981 and 0.977, respectively. In this model, R^2 was a range of 0.962 and 0.954. Chi-square test ($\chi 2 = 1.523$, $p = 0.217$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.023 (≤ 0.08), considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

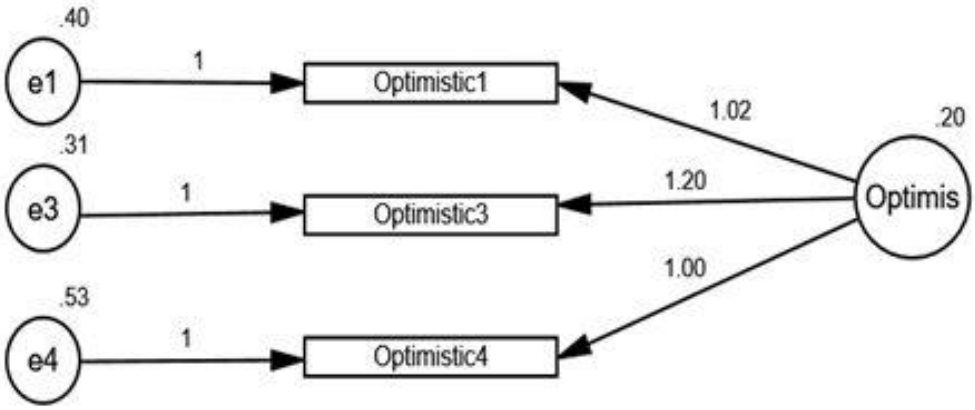

Figure 4.16 The Result of CFA of Optimistic Model

Table 4.20 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Optimistic model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Optimis	Optimistic1	0.580	0.095	10.637	0.337
	Optimistic3	0.694	0.115	10.455	0.482
	Optimistic4	0.521	-	-	0.271
$\chi 2 = 0.000$ df = 1 $\chi 2$ /df= 0.000 $p = 0.989$ RMSEA = 0.000					

The CFA result of Optimistic model showed in Figure 4.16 and Table 4.20. From the Figure 4.16, Optimistic4 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.20 provided standardized factor loading value in each variable (Optimistic1, Optimistic3 and Optimistic4), which was ranged from 0.521-0.694 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.271-0.482. Chi-square test ($\chi 2 = 0.000$, $p = 0.989$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

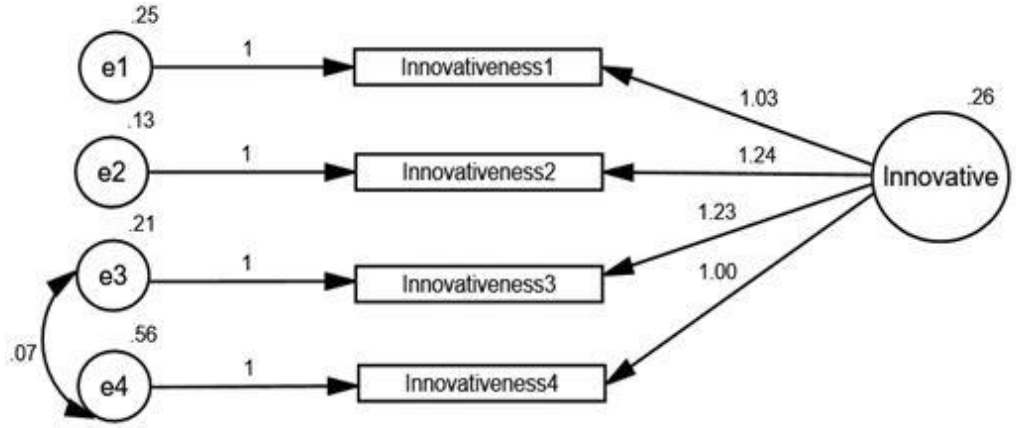

Figure 4.17 The Result of CFA of Innovativeness Model

Table 4.21 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Innovativeness model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
Innovative	Innovativeness1	0.723	0.065	15.747	0.523
	Innovativeness2	0.865	0.077	16.163	0.748
	Innovativeness3	0.803	0.066	18.646	0.645
	Innovativeness4	0.562	-	-	0.316
$\chi 2 = 1.080$ df = 1 $\chi 2$ /df= 1.080 $p = 0.299$ RMSEA = 0.009					

The CFA result of Innovativeness model showed in Figure 4.17 and Table 4.21. From the Figure 4.17, Innovativeness4 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.21 provided standardized factor loading value in each variable (Innovativeness1- Innovativeness4), which was ranged from 0.562-0.865 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.316-0.748. Chi-square test ($\chi 2 = 1.080$, $p = 0.299$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.009 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

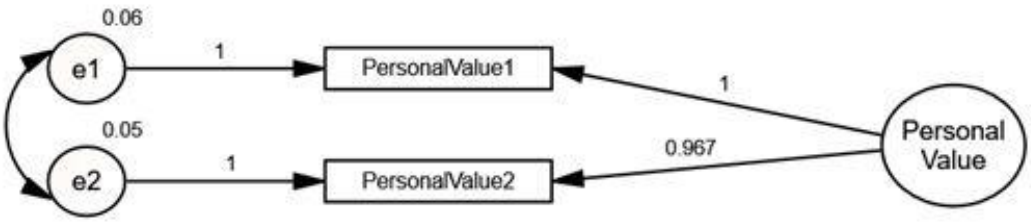

Figure 4.18 The Results of CFA of Personal value Model

Table 4.22 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Personal Value model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PersonalValue	PersonalValue1	0.964	-	-	0.928
	PersonalValue2	0.967	-	-	0.936
$\chi2 = 0.003$ df = 1 $\chi2$ /df= 0.003 $p = 0.956$ RMSEA = 0.000					

The CFA result of Personal Value model showed in Figure 4.18 and Table 4.22. From the Figure 4.18, PersonalValue1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.22 provided standardized factor loading value in PersonalValue1 and PersonalValue2 variable, were 0.964 and 0.967, respectively. In this model, R^2 was a range of 0.928 and 0.936. Chi-square test ($\chi2 = 0.003$, $p = 0.956$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.000 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

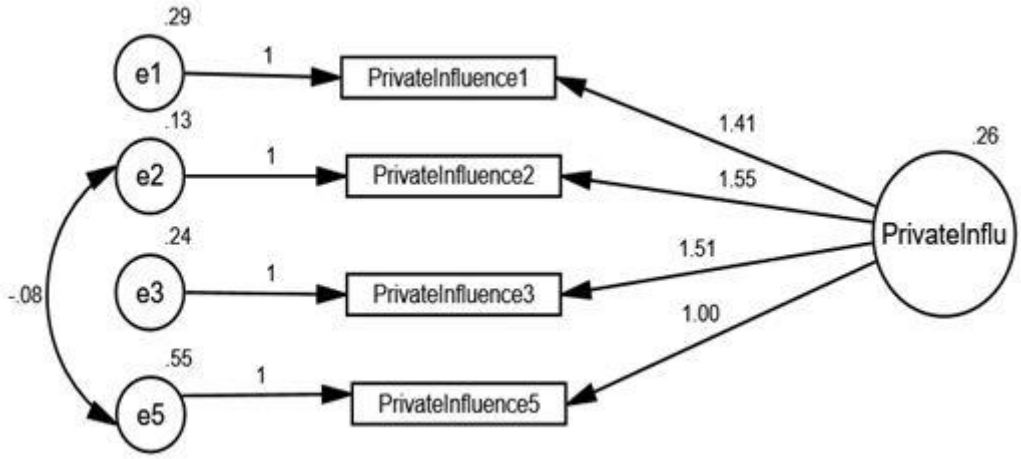

Figure 4.19 The Results of CFA of Private Influence Model

Table 4.23 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Private Influence model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PrivateInflu	PrivateInfluence1	0.798	0.082	17.114	0.637
	PrivateInfluence2	0.911	0.090	17.162	0.830
	PrivateInfluence3	0.841	0.087	17.364	0.706
	PrivateInfluence5	0.564	-	-	0.318
$\chi2 = 2.079$ df = 2 $\chi2$ /df= 1.039 $p = 0.354$ RMSEA = 0.006					

The CFA result of Private Influence model showed in Figure 4.19 and Table 4.23. From the Figure 4.19, PrivateInfluence5 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.23 provided standardized factor loading value in each variable (PrivateInfluence1-3, PrivateInfluence5), which was ranged from 0.564-0.911 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.318-0.830. Chi-square test ($\chi2 = 2.079$, $p = 0.354$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the

covariance data. RMSEA was 0.006 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

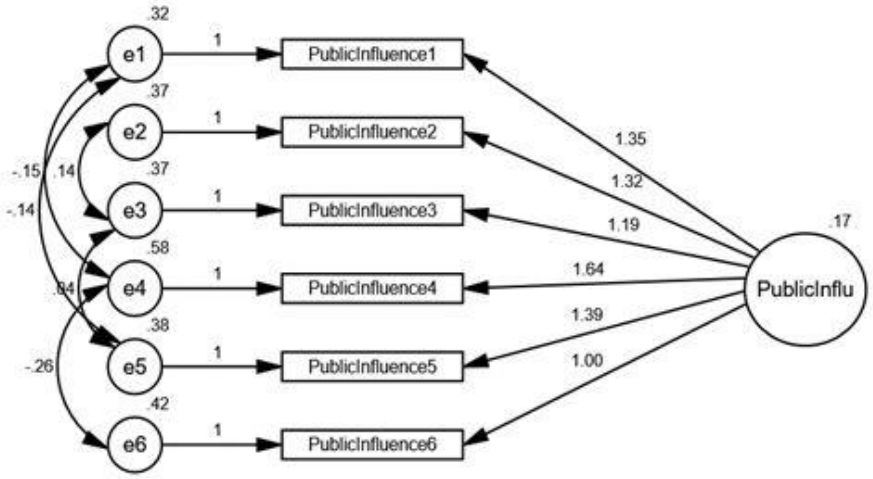

Figure 4.20 The Results of CFA of Public Influence Model

Table 4.24 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Public Influence model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
PublicInflu	PublicInfluence1	0.699	0.096	14.055	0.489
	PublicInfluence2	0.664	0.092	14.259	0.441
	PublicInfluence3	0.628	0.088	13.531	0.394
	PublicInfluence4	0.661	0.146	11.227	0.436
	PublicInfluence5	0.680	0.105	13.195	0.462
	PublicInfluence6	0.537	-	-	0.289
$\chi2 = 8.655$ df = 5 $\chi2$ /df= 1.731 $p = 0.124$ RMSEA = 0.027					

The CFA result of Public Influence model showed in Figure 4.20 and Table 4.24. From the Figure 4.20, PublicInfluence6 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.24 provided standardized factor loading value in variables (PublicInfluence1- PublicInfluence5), which was ranged from 0.537-0.699 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.289-0.489. Chi-square test ($\chi 2 = 8.655$, $p = 0.124$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.027 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

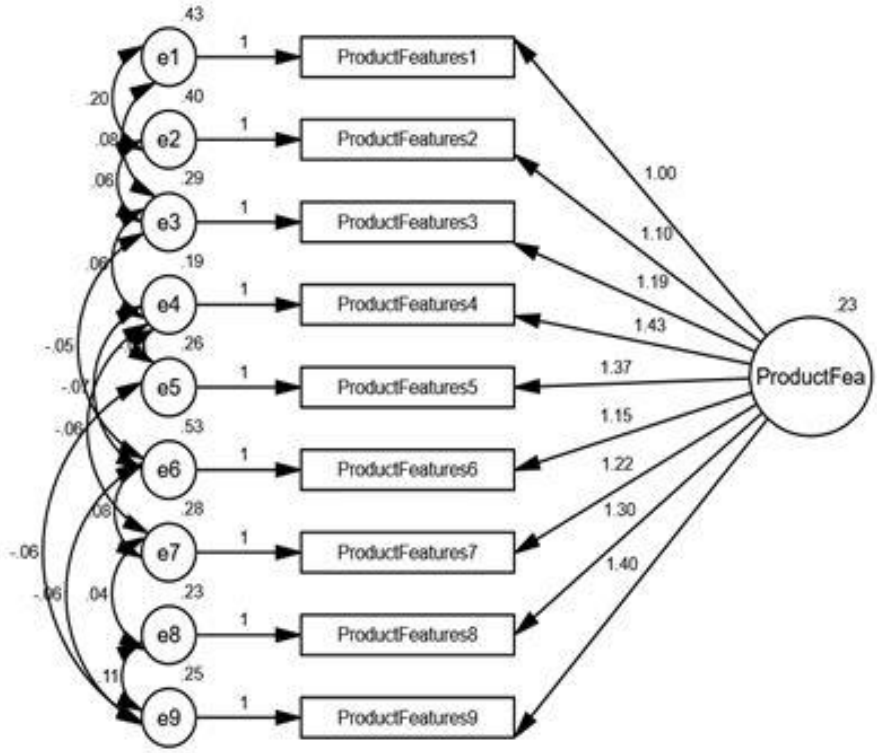

Figure 4.21 The Result of CFA of Product Feature Model

Table 4.25 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Product Features model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
ProductFea	ProductFeature1	0.594	-	-	0.353
	ProductFeature2	0.646	0.047	23.197	0.417
	ProductFeature3	0.733	0.059	20.247	0.538
	ProductFeature4	0.847	0.072	19.900	0.717
	ProductFeature5	0.794	0.073	18.751	0.630
	ProductFeature6	0.607	0.076	15.144	0.369
	ProductFeature7	0.742	0.068	18.015	0.550
	ProductFeature8	0.792	0.067	19.245	0.628
	ProductFeature9	0.804	0.073	19.313	0.646
$\chi 2 = 25.525$ df = 16 $\chi 2$ /df= 1.595 $p = 0.061$ RMSEA = 0.025					

The CFA result of Product Features model showed in Figure 4.21 and Table 4.25. From the Figure 4.21, ProductFeature1 variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.25 provided standardized factor loading value in variables (ProductFeature1- ProductFeature9), which was ranged from 0.594-0.847 with the level of statistical significance at 0.05 (C.R.≥ ± 1.96). In this model, R^2 was a range of 0.353-0.717. Chi-square test ($\chi 2 = 25.525$, $p = 0.061$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis. RMSEA was 0.025 (≤ 0.08), and considered as a good fit. From the model fit indices,

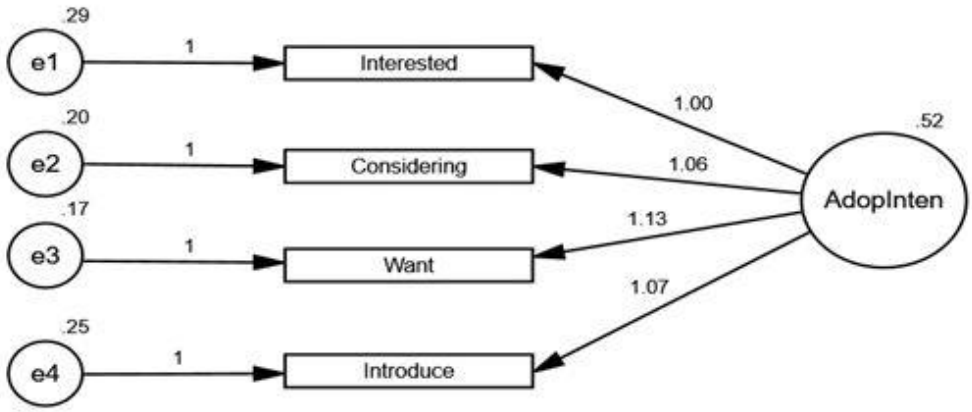

Figure 4.22 The Result of CFA of Adoption Intention Model

Table 4.26 Standardized Factor Loading, Critical ratio (C.R.), squared multiple correlation and Model fit index of Adoption Intention model

Variable	Observed variable	Factor Loading			R^2
		λ	S.E.	C.R.	
AdopInten	Interested	0.800	-	-	0.641
	Considering	0.860	0.035	30.509	0.739
	Want	0.890	0.036	31.603	0.793
	Introduce	0.839	0.036	29.354	0.704
$\chi 2 = 2.627$	df = 2	$\chi 2$ /df= 1.313	$p = 0.269$	RMSEA = 0.018	

The CFA result of Adoption Intention model showed in Figure 4.22 and Table 4.26. From the Figure 4.22, interested variable was appropriately fixed value to 1 as the factor loading, as a reference variable of the construct because it was the lowest factor loading. Table 4.26 provided standardized factor loading value in variables (Interested, Considering, Want and Introduce), which was ranged from 0.800-0.890 with the level of statistical significance at 0.05 (C.R. $\geq \pm$ 1.96). In this model, R^2 was a range of 0.641-0.793. Chi-square test ($\chi 2 = 2.627$, $p = 0.269$) showed statistically non-significant different ($p > 0.05$), the model was regarded as consistent with the covariance data. RMSEA was 0.018 (≤ 0.08), and considered as a good fit. From the model fit indices, it revealed a goodness of fit between observed data and the estimated model. Therefore, all observed variables were included to further analysis.

4.3.3 First Order Confirmatory Factor Analysis. (First Order CFA)

Confirmatory Factor Analysis (CFA) was appropriately used to test how well a series relationship of observed variable represent a specified latent construct that a researcher's a prioritization based on theoretical knowledge or based on empirical research or both. Thus, we determined the extent hypothesized structure whether it was consistent with the actual data. The evaluative process aimed to obtain estimate of individual parameter like factor loadings was carried out to assess a goodness of fit of the model by using First Order CFA model.

Table 4.27 Standardized factor loading of a measurement model

Latent Variable	Observed Variable	Factor loading
User-Centricity	Healthcare knowledge	0.60
	Habit	0.51
	Outcome expectancy	0.52
	Resistant change	0.34
	Personal value	0.53
Health Belief	Perceived susceptibility	0.29
	Perceived severity disease	0.43
	Perceived severity test kit	0.37
	Perceived benefit	0.74
	Perceived barrier	0.33
	Self-efficacy	0.79
Experience	Childhood experience	0.70
	Adulthood citizenship	0.62
Personality Trait	Extraversion	0.72
	Agreeableness	0.61
	Neuroticism	0.58
	Optimistic	0.66
	Innovativeness	0.77
Social Influence	Private influence	0.72
	Public influence	0.71
Product Feature	Product feature	0.36
Adopt Intention	Interested	0.80
	Considering	0.86
	Want	0.89
	Introduce	0.84

Table 4.27 presented standardized factor loadings (λ) of a measurement model. As the result, sub-construct of a seven major latent construct had factor loadings ranged from 0.29-0.89. Factor loading on observed variable indicated the converge on identical point of latent construct. Therefore, standardized factor loading estimates was 0.5 or higher as good rules of thumb (Hair et al., 2014). From First order CFA model, all variable except Resistant change, Perceived susceptibility, Perceived severity disease, Perceived severity test kit, Perceived barrier and Product feature had a factor loading lower than 0.5. To improve the model, resistant change was excluded from the model. Perceived susceptibility that shared common point with Perceived severity about seriousness disease was considered to combine to be a new construct as named SuscepPlusSeverdisease. In addition, SeverTestkitPlusBarrier variable was grouped between Perceived severity about test kit and Perceived barrier that mentioned how difficulty of using home testing kit. Finalized measurement model of CFA in Figure 4.23 revealed that standardized factor loading ranged from 0.50-0.54 for User-Centricity, Health Belief was ranged from 0.54-0.81, Experience was ranged from 0.65-0.69 and Personality trait as ranged from 0.56-0.79. Social influence showed standardized factor loading ranged 0.65-0.69 while Product Feature was 0.52. Adoption Intention was a high correlation ranged 0.80-0.89. The result showed that all variable in this finalized measurement model was ≥ 0.50 cut off value as recommended by Hair (Hair et al., 2014)

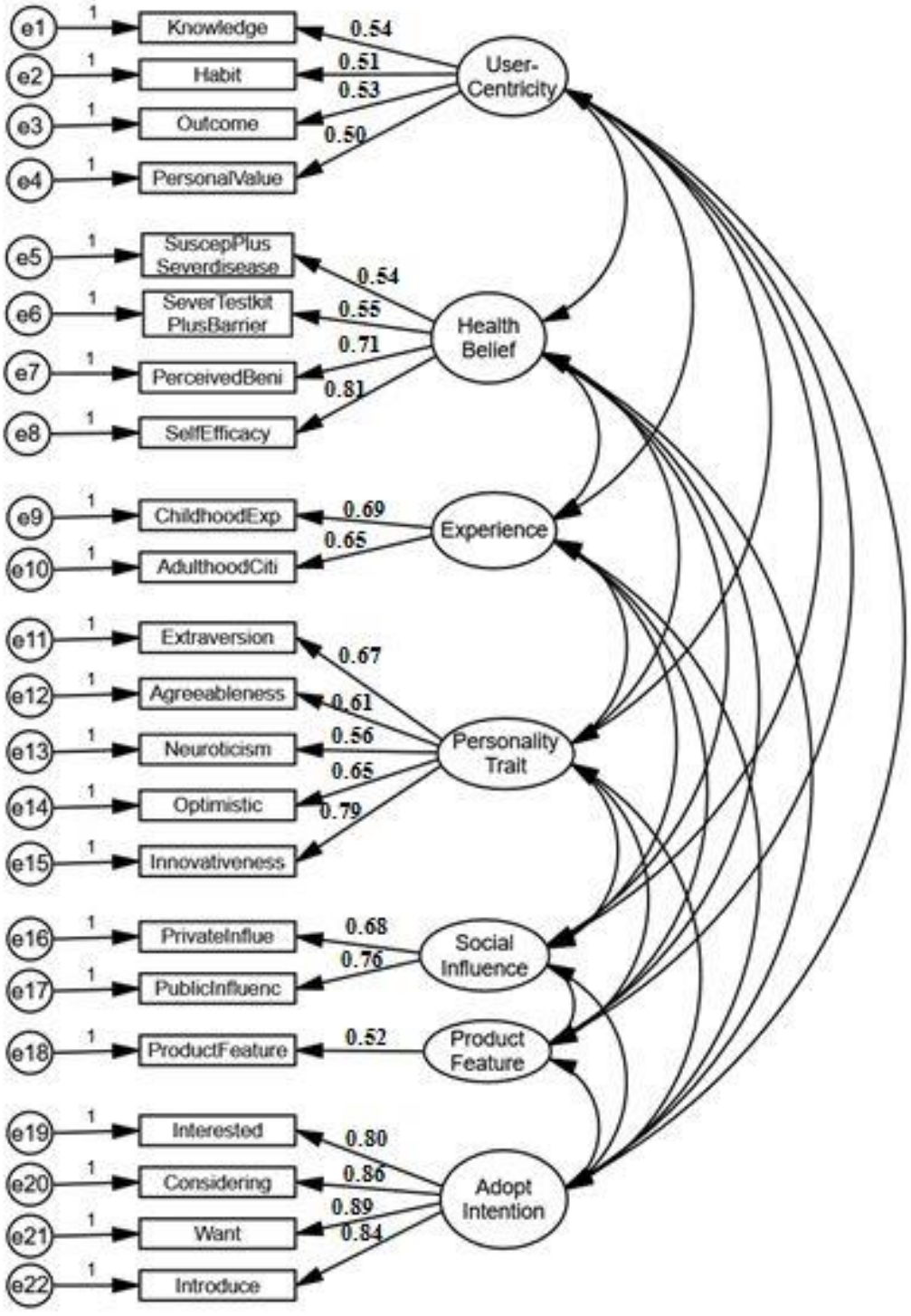

Figure 4.23 Finalized measurement model of Adoption Intention for medical home Self-test kit.

Table 4.28 Fit Indices for testing measurement model of adoption intention for home Self-test kit

The Goodness of fit measures	Acceptable fit	Value
$\chi 2$	$0 \leq \chi 2 < \infty$	237.677
CMIN/DF	1-5	1.787
p-value	$0.01 \leq p \leq 0.05$	0.000
RMSEA	≤ 0.08	0.028
GFI	> 0.90	0.979
NFI	> 0.90	0.974
CFI	> 0.90	0.988
IFI	> 0.90	0.988

To evaluate the good fit of the model, several goodness of fit indices such as Chi-square ($\chi 2$), Relative Chi-square (CMIN/DF), Root mean square error of approximation (RMSEA), Goodness-of-fit index (GFI), Normed fit index (NFI), Comparative fit index (CFI) and Incremental fit index (IFI) were considerable used for model evaluation. From the result of Table 4.28, measurement model of adoption intention for home self-test kit had a relative Chi-square of 1.787. A good fit score was lower than 2 that estimated model matches with the observed data (Schermelleh-Engel et al., 2003). The *p-value* was 0.000 (less than 0.01), the null hypothesis was rejected as indicated the unfit between data and hypothesized model. One of the factor impact the Chi-square test was sample size (Jöreskog & Sörbom, 1993). Due to Chi-square test was overly sensitive when sample size was large, *p-value* associated with the $\chi 2$ value would be decreased. Therefore, Hair (Hair et al., 2014) suggested that researcher might consider and combined a compliment with other goodness of fit indices. RMSEA was 0.028, considered as a good fit (Browne & Cudeck, 1993). Moreover, GFI, NFI, CFI and IFI were 0.979, 0.974, 0.988 and 0.988, respectively. These fit indices value was

exceed a cut off criterion (> 0.90) (L.-t. Hu & Bentler, 1998; L. t. Hu & Bentler, 1999). From overall model fit index, a finalized measurement model of adoption intention for home self-test kit was corresponded to the empirical data and became the baseline model for the next analyses.

4.4 Structural model assessment

The CFA provided validity of individual parameter and evidence of construct validity by evaluate the model's fit, which was well within an acceptable criterion. Next step was to examine the relationship between construct by assessing overall the structure model fit. To evaluate the structure model, goodness of fit indices was assessed as same as CFA model fit.

Table 4.29 Model fit index for assessing structure model of adoption intention

The Goodness of fit measures	Criteria	Value
$\chi 2$	$0 \leq \chi 2 < \infty$	752.835
CMIN/DF	1-5	4.92
p-value	$0.01 \leq p \leq 0.05$	0.000
RMSEA	≤ 0.08	0.063
GFI	> 0.90	0.942
NFI	> 0.90	0.922
CFI	> 0.90	0.936
IFI	> 0.90	0.937

Table 4.29 presented the goodness of fit statistic related to structure equation model. From reviewing theses fit indices, it was demonstrated that the structure model was adequately well fitting as indicated by CMIN/DF of 4.92, which was within the recommended range by Schumacker and Lomax (Schumacker & Lomax, 2004). Given known sample size issue, *p-value* associated with $\chi 2$ was less than 0.001 because the $\chi 2$ statistic was sensitive with increasing *sample* size. For this reason, Jöreskog and Sörbom (Jöreskog & Sörbom, 1993) suggested to use $\chi 2$ as a descriptive goodness-of-fit index, not being used as the sole model fit measure. Therefore, researcher would consider alternative measure of fit such as RMSEA, GFI, NFI, CFI and IFI when sample size become large. Estimation of this model resulted in a RMSEA value of 0.063. GFI (0.942), NFI (0.922), CFI (0.936) and IFI (0.937) were above cut off acceptability (> 0.90). As evidence from the goodness of fit indices, it could be concluded that the final structure model represented a good fit to the data. The finalized structure model and path coefficients between variables and construct of adoption intention for home self-test kit shown in Figure 4.24.

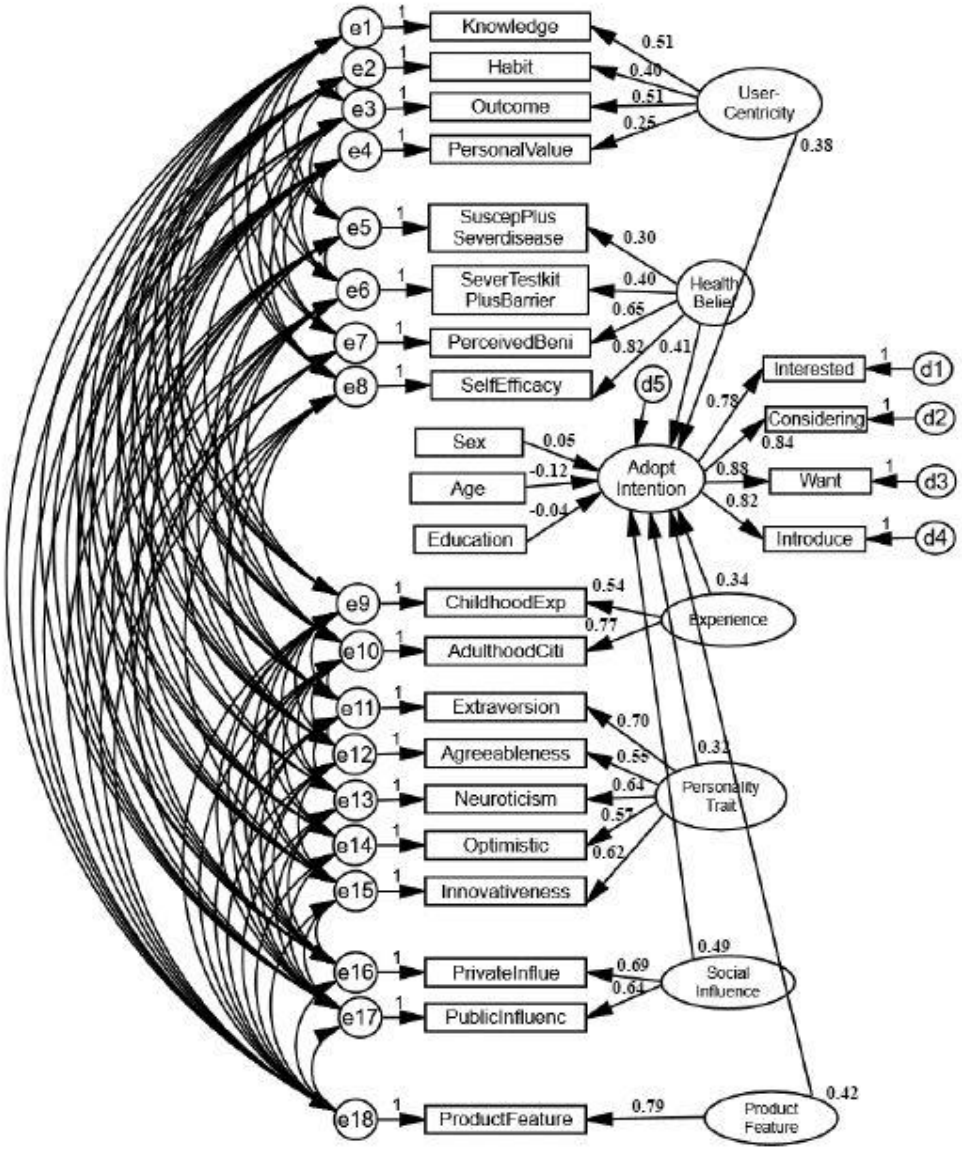

Figure 4.24 Structural equation model and path diagram of adoption intention for home Self-test kit

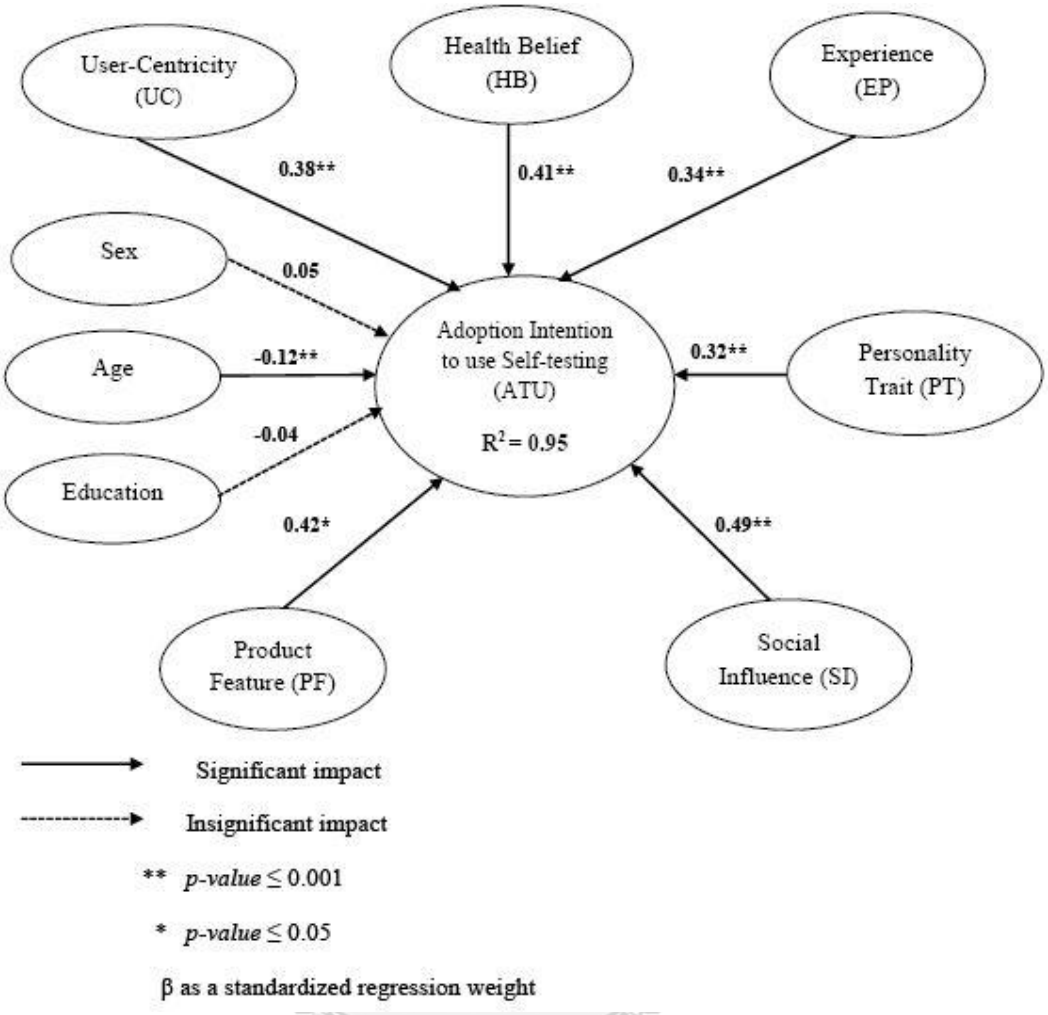

Figure 4.25 Structural Model of Adoption Intention for home Self-test kit with Standardized Parameter Estimates and Statistical Significance

Table 4.30 Hypothesized results

Hypothesis	Model path	Critical ratio (C.R.)	p-value	Test result
H1	UC→ ATU	6.938	**	Supported
H2	HB→ ATU	6.745	**	Supported
H3	EP→ ATU	7.452	**	Supported
H4	PT→ ATU	8.552	**	Supported
H5	SI→ ATU	9.411	**	Supported
H6	PF→ ATU	1.993	*	Supported
H7	Sex→ ATU	1.904	NS	Not supported
H8	Age→ ATU	-3.690	**	Supported
H9	Edu→ ATU	-1.204	NS	Not supported

UC: User-Centricity, HB: Health Belief, EP: Experience, PT: Personality Trait, SI: Social Influence, PF: Product Feature, Edu: Education, ATU: Adoption Intention to use medical Self-testing

** $p\text{-value} \leq 0.001$, * $p\text{-value} \leq 0.05$, NS: Non-significant

From the structure model result and Hypothesized result as showed in Figure 4.25 and Table 4.30, it revealed that the major factor influential on adoption intention to use Self-testing was Social influence (β=0.49**). In addition, Health Belief (β=0.41**), User-Centricity (β=0.38**), Experience (β=0.34**), Personality trait (β=0.32**) and Product Feature (β=0.42*) were a positive direct effect and statically significant on adoption intention to perform a specific behavior. Therefore, Hypotheses H1-H6 were confirmed as presented the results of hypothesis testing as Table 4.30. For variable control, Age (β= -0.12**) was a significantly negative effect, which was supporting the hypothesis (H8) while education (β= -0.04; $p > 0.05$) and sex (β= 0.05; $p > 0.05$) proved to be a non-significant influencers on adoption intention for home self-testing lead to H7

and H9 were not supported. Overall, the model illustrated that the identified predictors accounted for 95% (R^2= 0.95) of the variance in the adoption intention for use medical Self-testing.

4.5 Cluster analysis

Cluster analysis could separate individuals or objects into two or more groups (clusters) that based on the similarity of the objects. Therefore, the object within cluster exhibited high internal homogeneity than the objects in other clusters or groups. In this analysis, K-means algorithm, using centroid distance to measure the similarity and dissimilarity between clusters was used to distinguish sample's similarities based on set of variables. K-mean cluster was preferred to use if the sample was more than or equal to 200. (กัลยา วานิชย์บัญชา, 2554)

Table 4.31 The number of cases in each Cluster

Number of Cases in each Cluster		
Cluster	1	146
	2	322
	3	511
Valid		979

Table 4.31 presented the number of samples in each cluster by Cluster analysis. From the table, 146 samples were assigned to the first cluster, 322 to the Cluster 2 and 511 was in the Cluster 3.

Table 4.32 Demographics ·respondent classification by K-mean cluster

Variable/Cluster	**1 (Low) (n=146)**	**2 (High) (n=322)**	**3 (Medium) (n=511)**	**Total (N=979)**
	n (%)			
Gender				
Men	53 (36.3)	82 (25.5)	138 (27.0)	273 (27.9)
Women	93 (63.7)	240 (74.5)	373 (73.0)	706 (72.1)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Age				
18-25 years old	33 (22.6)	95 (29.5)	109 (21.3)	237 (24.2)
26-35 years old	29 (19.9)	98 (30.4)	167 (32.7)	294 (30.0)
36-45 years old	28 (19.2)	63 (19.6)	123 (24.1)	214 (21.9)
46-55 years old	21 (14.4)	49 (15.2)	72 (14.1)	142 (14.5)
56-65 years old	18 (12.3)	15 (4.7)	34 (6.7)	67 (6.8)
> 65 years old	17 (11.6)	2 (0.6)	6 (1.2)	25 (2.6)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Education				
Primary School	31 (21.2)	26 (8.1)	34 (6.7)	91 (9.3)
Lower Secondary School	19 (13.0)	28 (8.7)	27 (5.3)	74 (7.6)
High school	26 (17.8)	45 (14.0)	73 (14.3)	144 (14.7)
Diploma	18 (12.3)	43 (13.4)	63 (12.3)	124 (12.7)
Bachelor degree	46 (31.5)	163 (50.6)	276 (54.0)	485 (49.5)
Master degree or higher	6 (4.1)	17 (5.3)	38 (7.4)	61 (6.2)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Occupation				
Student	26 (17.8)	78 (24.2)	70 (13.7)	174 (17.8)
Private employee	14 (9.6)	47 (14.6)	59 (11.5)	120 (12.3)
Housewife	14 (9.6)	42 (13.0)	36 (7.0)	92 (9.4)
Worker	34 (23.3)	50 (15.5)	95 (18.6)	179 (18.3)
Government/State Enterprise	19 (13.0)	56 (17.4)	150 (29.4)	225 (23.0)
Private business	17 (11.6)	27 (8.4)	69 (13.5)	113 (11.5)
University staff	7 (4.8)	18 (5.6)	28 (5.5)	53 (5.4)
Others	15 (10.3)	4 (1.2)	4 (0.8)	23 (2.3)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Income				
< 10,000 baht	57 (39.0)	73 (22.7)	88 (17.2)	218 (22.3)
10,001-15,000 baht	51 (34.9)	86 (26.7)	114 (22.3)	251 (25.6)
15,001-30,000 baht	18 (12.3)	87 (27.0)	149 (29.2)	254 (25.9)
30,001-45,000 baht	9 (6.2)	39 (12.1)	81 (15.9)	129 (13.2)

Variable/Cluster	1 (Low) (n=146)	2 (High) (n=322)	3 (Medium) (n=511)	Total (N=979)
	n (%)			
45,001-60,000 baht	3 (2.1)	22 (6.8)	43 (8.4)	68 (6.9)
> 60,000 baht	8 (5.5)	15 (4.7)	36 (7.0)	59 (6.0)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Marital status				
Single	80 (54.8)	149 (46.3)	231 (45.2)	460 (47.0)
Married	49 (33.6)	165 (51.2)	246 (48.1)	460 47.0)
Divorced/widowed/separated	17 (11.6)	8 (2.5)	34 (6.7)	59 (6.0)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Health insurance				
Private insurance	44 (30.1)	76 (23.6)	95 (18.6)	215 (22.0)
Social Security	39 (26.7)	128 (39.8)	164 (32.1)	331 (33.8)
Gold Card	23 (15.8)	59 (18.3)	102 (20.0)	184 (18.8)
Insurance group	0 (0.0)	1 (0.3)	2 (0.4)	3 (0.3)
Public servant	11 (7.5)	32 (9.9)	115 (22.5)	158 (16.1)
None	29 (19.9)	26 (8.1)	33 (6.5)	88 (9.0)
Total	146 (100)	322 (100)	511 (100)	979 (100)
Health status				
Strong	101 (69.2)	224 (69.6)	304 (59.5)	629 (64.2)
Average	41 (28.10)	88 (27.3)	181 (35.4)	310 (31.7)
Look after	4 (2.70)	10 (3.1)	26 (5.1)	40 (4.1)
Total	146 (100)	322 (100)	511 (100)	979 (100)

Table 4.32 presented demographic of participants in each cluster. Women was majority of population in all three clusters. Additionally, mostly of participants were aged between 18-35 years. Nearly 50% of people completed Bachelor degree. The most respondent's job in Cluster 1 was worker (23.3%), Cluster 2 was student (24.2%) and Cluster 3 was Government/State Enterprise (29.4%). Most people, who belong to low adoption rate group, had income less than 10,000 baht while potential people who preferred to adopt Self-testing had higher monthly income between 15,001-30,000 baht. Married people (51.2%) expressed higher intention of using Self-testing than single (48.1%). In addition, approximately 54.8% of respondents in low level of adoption

were single. For health insurance, participants had social security showed interested in adoption of home Self-testing for both of medium (39.8%) and high group (32.1%) whereas private insurance was notable in low intention group (30.1%). Most people in all three clusters responded that they were healthy person.

Table 4.33 ANOVA

	Cluster		Error		F	*p- value*
	Mean Square	df	Mean Square	df		
Zscore: Knowledge	111.788	2	0.773	976	144.620	0.000
Zscore: Habit	102.106	2	0.793	976	128.789	0.000
Zscore: PerceivedBeni	144.155	2	0.707	976	203.998	0.000
Zscore: Outcome	122.253	2	0.752	976	162.671	0.000
Zscore: SelfEfficacy	170.823	2	0.652	976	261.998	0.000
Zscore: ChildhoodExp	130.601	2	0.734	976	177.828	0.000
Zscore: adultHoodCiti	124.299	2	0.747	976	166.322	0.000
Zscore: Extraversion	155.614	2	0.683	976	227.782	0.000
Zscore: Agreeableness	132.889	2	0.730	976	182.106	0.000
Zscore: Neuroticism	122.366	2	0.751	976	162.872	0.000
Zscore: Optimistic	128.051	2	0.740	976	173.124	0.000
Zscore: Innovativeness	169.748	2	0.654	976	259.471	0.000
Zscore: PersonalValue	90.141	2	0.817	976	110.287	0.000
Zscore: PrivateInflue	171.005	2	0.652	976	262.427	0.000
Zscore: PublicInfluenc	195.133	2	0.602	976	324.041	0.000
Zscore: ProductFeature	164.281	2	0.665	976	246.887	0.000
Zscore: SuscepPlusSeverdisease	100.192	2	0.797	976	125.753	0.000
Zscore: SeverTestkitPlusBarrier	59.522	2	0.880	976	67.632	0.000
Zscore (Intention)	151.544	2	0.692	976	219.151	0.000

The analysis of variance (1-Way ANOVA) from Table 4.33 showed mean square between clusters and within cluster. The F tests was used for describing the difference in each of the variables among clusters. According to the results, statistic F test of all nineteen variables was high and observed significant was 0.000. From this, it could be concluded that all specific nineteen variables might cause different groups. Mean of Private influence variable was the most different between group because the highest F value of 262.427 whereas SuscepPlusSeveredisease factor was the least (F=67.632).

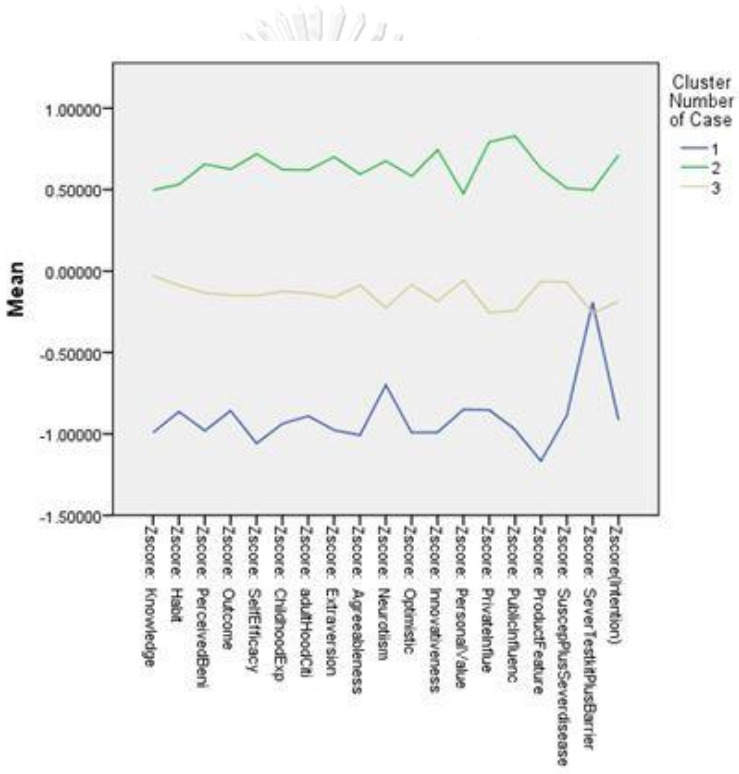

Figure 4.26 Profile of three clusters from K-Mean cluster analysis

From K-Mean cluster analysis, Cluster profile (19 variables) was able to classify samples into three clusters in term of identifying adoption intention rate for home Self-testing as shown in Figure 4.26. From the results, Cluster 1 represented individual who had low in adoption intention on home Self-testing and showed a lower mean score almost all nineteen variables than Cluster 2 and 3, which had higher with moderate mean score, respectively.

Table 4.34 ANOVA analysis the mean of the nineteen cluster variables

Cluster number of Case		*Knowledge*	*Habit*	*Per.Benefit*	*Outcome Ex.*	*Self-Efficacy*	*Childhood E*	*Adultho.Citi*	*Extraversion*	*Agreeable*	*Neuroticism*	*Optimistic*	*Innovative*	*Person.Valu*	*Private Influ*	*Public Influ*	*Product Fea*	*Suscep.SeDi*	*SeveTes.Bar*	*Adopt Intent*	*Average scor*
1 (Low)	Mean	3.45	3.49	3.07	3.24	2.94	3.26	3.02	3.47	3.26	3.25	3.31	3.3	3.22	3.01	3.28	3.30	3.36	3.12	3.00	3.23
	n	146	146	146	146	146	146	146	146	146	146	146	14(	146	146	146	146	146	146	146	146
	SD	0.598	0.686	0.577	0.582	0.628	0.619	0.657	0.660	0.668	0.688	0.51	0.55	0.777	0.564	0.556	0.566	0.527	0.480	0.690	0.610
2 (High)	Mean	4.43	4.33	4.27	4.33	4.32	4.24	4.10	4.55	4.27	4.29	4.27	4.4	4.33	4.23	4.33	4.43	4.16	3.69	4.32	4.28
	n	322	322	322	322	322	322	322	322	322	322	322	32	322	322	322	322	322	322	322	322
	SD	0.527	0.487	0.588	0.641	0.602	0.554	0.597	0.500	0.530	0.651	0.54	0.47	0.795	0.614	0.432	0.450	0.511	0.911	0.638	0.585
3 (Med)	Mean	4.08	3.96	3.69	3.76	3.65	3.77	3.56	4.00	3.84	3.61	4.45	3.8	3.88	3.45	3.70	3.99	3.83	3.07	3.59	3.78
	n	511	511	511	511	511	511	511	511	511	511	511	51	511	511	511	511	511	511	511	511
	SD	0.598	0.525	0.641	0.645	0.644	0.512	0.625	0.514	0.508	0.641	0.50	0.53	0.725	0.594	0.431	0.542	0.516	0.740	0.680	0.581
Total	Mean	4.10	4.01	3.79	3.87	3.76	3.85	3.66	4.10	3.90	3.78	3.92	3.9	3.93	3.64	3.85	4.03	3.87	3.28	3.74	3.84
	n	979	979	979	979	979	979	979	979	979	979	979	97	979	979	979	979	979	979	979	979
	SD	0.655	0.607	0.732	0.733	0.778	0.634	0.718	0.646	0.634	0.752	0.60	0.63	0.837	0.738	0.582	0.635	0.578	0.821	0.803	0.691
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

To examine if there was a significant difference between three clusters and if it was depending on the nineteen clustering variables, the dependent variables were verified by one-way ANOVA. The result showed in Table 4.34, that presented mean statically significant difference with the *p-value* lower than 0.05. Cluster 1 had mean average of 3.23 (Low), whereas mean average scores of Cluster 2 was (High) and Cluster 3 was (Medium) 4.28 and 3.78, respectively. This significant confirmed that each of the three clusters was dominance. Therefore, all nineteen variables were further used to predict adoption intention for medical home Self-testing.

Figure 4.27 Factors association of Adoption intention on Home Self-testing

To identify if adoption intention and which factors would effect to adoption intention rate on home Self-testing, a cutoff of score at 75% in each variable (mean 3.75) was determined. From figure 4.27, it indicated that low adoption rate group (Cluster 1) had the percentage of mean in all nineteen variables less than 75% (blue line). The acceptability in moderate level (Cluster 3) reveled that some variables in construct health belief (Perceived benefit and Self-efficacy) and social influence (Private influence and Public influence) had a lower percentage than cut off value. However, Optimistic variable showed the highest score in all three clusters. Moreover, Perceived severity and barriers in using test kit were found in the lowest score group. It might be potential barriers had not much effect of using Self-test as shown as orange line. Thus, this potential group would become a high adoption group if they have been motivated and supported from family and society. The highest adoption rate group (Cluster 2) showed the percentage in all factors (except SeveTestPlusBar) above cutoff as represented by gray line.

4.6 Logistic regression analysis

Table 4.35 Demographics' participants for adoption of medical home Self-testing: Univariate and Multivariate analysis

Parameter	Variable	N=979	Univariate Analysis			*p-value*	Multivariate Analysis			*p-value*
			Crude OR	95% CI	*p-value*		Adjusted OR	95% CI	*p-value*	
Gender	Female (Ref)	706				0.28				
	Male	273	0.8	(0.617-1.148)	0.28					
Age	>35 (Ref)	448				**0.00**				**0.001**
	<35	531	1.9	(1.295-2.663)	**0.00**		1.782	(1.259-2.521)	**0.001**	
Marital status	Divorced (Ref)	59				**0.015**				**0.009**
	Single	460	1.2	(0.663-2.317)	0.50		1.192	(0.640-2.222)	0.579	
	Married	460	1.9	(1.033-3.387)	**0.04**		1.869	(1.035-3.378)	**0.038**	
Education	Master degree (Ref)	61				0.435				
	Primary school	91	2.2	(0.908-5.547)	0.08					
	Lower high school	74	1.4	(0.607-3.388)	0.41					
	Upper high school	144	1.3	(0.630-2.808)	0.45					
	Diploma	124	1.1	(0.534-2.376)	0.76					
	Bachelor degree	485	1.4	(0.739-2.605)	0.31					
Occupation	Other (Ref)	23				**0.000**				**0.001**
	Student	174	6.6	(2.046-21.195)	**0.00**		4.576	(1.507-13.892)	**0.007**	
	Private employee	120	3.0	(0.920-9.604)	0.07		2.243	(0.719-7.003)	0.164	
	Housewife	92	5.1	(1.624-15.940)	**0.01**		4.423	(1.437-13.611)	**0.010**	
	Worker	179	4.5	(1.470-13.726)	**0.01**		3.437	(1.161-10.177)	**0.026**	
	Government/Enterprise	225	2.6	(0.813-8.356)	0.11		1.939	(0.629-5.977)	0.249	

Parameter	Variable	N=979	Univariate Analysis			p-value	Multivariate Analysis			p-value
			Crude OR	95% CI	p-value		Adjusted OR	95% CI	p-value	
	Private business/trader	113	3.4	(1.079-10.979)	**0.04**		2.472	(0.811-7.532)	0.111	
	University staff	53	10.5	(2.763-40.094)	**0.00**		6.983	(1.987-25.540)	**0.002**	
Income (Baht)	>60,000 (Ref)	59								
	<10,000	218	1.0	(0.469-1.953)	0.90	0.170	1.092	(0.564-2.116)	0.793	0.115
	10,001-15,000	251	1.5	(0.768-2.851)	0.24		1.619	(0.869-3.015)	0.129	
	15,001-30,000	254	1.5	(0.834-2.851)	0.17		1.689	(0.928-3.077)	0.087	
	30,001-45,000	129	1.2	(0.650-2.400)	0.50		1.310	(0.687-2.498)	0.412	
	45,001-60,000	68	0.9	(0.440-1.916)	0.82		0.938	(0.452-1.948)	0.864	
Health insurance	No insurance (Ref)	88								
	Private	215	1.8	(1.032-3.054)	**0.04**		1.684	(0.982-2.886)	0.058	
	Social security	331	1.9	(1.116-3.288)	**0.02**	0.213	1.807	(1.061-3.077)	**0.029**	0.312
	Goal card	184	1.4	(0.809-2.387)	0.23		1.388	(0.809-2.379)	0.233	
	Group insurance	3	0.7	(0.055-7.743)	0.73		0.598	(0.051-7.077)	0.683	
	Public servant	158	1.9	(0.947-3.724)	0.07					
Health status	Low (Ref)	40								
	High	629	1.9	(0.943-3.881)	0.07	0.181	1.885	(0.932-3.811)	0.078	0.19
	Moderate	310	1.9	(0.948-3.969)	0.07		1.919	(0.942-3.908)	0.072	

The stepwise method used in the Logistic regression presented the univariate and multivariate analysis of demographic variable to predict adoption intention in medical home Self-testing. As presented in Table 4.35, the result of univariate analysis demonstrated a significant between Self-test kit adoptions and age, marital status as well as occupation and health insurance ($p < 0.05$). According to multivariate analysis, participants with aged less than 35 years and had married showed a significantly adopt to home Self-testing with odds ratio of 1.782 and 1.869, respectively. Moreover, some careers like student, housewife, worker and staff in University as well as people who hold social security as health insurance showed statically significant in acceptability of medical Self-testing with *p-value* < 0.05.

4.7 One-way ANOVA analysis

Table 4.36 Adoption intention on medical home Self-testing by age groups

Factors	*Variables*	*Adoption Intention, Scores (5)*									*p-value**
		18-35 (n=531)			**36 (n=448)**			**Total (N=979)**			
		Mean	**SD**	**%**	**Mean**	**SD**	**%**	**Mean**	**SD**	**%**	
User-Centricity	Knowledge	4.10	0.65	82.09	4.10	0.66	81.95	4.10	0.65	82.03	0.870
	Habit	3.98	0.61	79.64	4.04	0.60	80.89	4.01	0.61	80.21	0.108
	Outcome Expectancy	3.91	0.75	78.14	3.83	0.71	76.58	3.87	0.73	77.43	0.099
	Personal value	3.97	0.82	79.45	3.88	0.86	77.61	3.93	0.84	78.61	0.086
Health Belief	Perc. Susc. Severity Dis	3.89	0.59	77.85	3.84	0.57	76.76	3.87	0.58	77.35	0.141
	Perc. Test.Severity. Barrier	3.31	0.83	66.23	3.24	0.81	64.78	3.28	0.82	65.56	0.169
	Perceived Benefit	3.81	0.71	76.26	3.76	0.76	75.24	3.79	0.73	75.79	0.280
	Self-Efficacy	3.84	0.74	76.75	3.68	0.81	73.53	3.76	0.78	75.27	**0.001**
Experience	Childhood Experience	3.92	0.60	78.38	3.77	0.67	75.37	3.85	0.63	77.00	**0.000**
	Adulthood Citizenship	3.68	0.73	73.66	3.63	0.70	72.58	3.66	0.72	73.17	0.239
Personality trait	Extraversion	4.11	0.64	82.26	4.08	0.65	81.70	4.10	0.65	82.00	0.497
	Agreeableness	3.97	0.65	79.34	3.81	0.61	76.25	3.90	0.63	77.93	**0.000**
	Neuroticism	3.78	0.77	75.67	3.77	0.73	75.47	3.78	0.75	75.58	0.836
	Optimistic	3.95	0.61	79.07	3.88	0.60	77.51	3.92	0.61	78.36	**0.045**
	Innovativeness	4.04	0.64	80.88	3.89	0.63	77.80	3.97	0.64	79.47	**0.000**
Social influence	Private Influence	3.69	0.74	73.72	3.59	0.73	71.81	3.64	0.74	72.84	**0.044**
	Public Influence	3.93	0.56	78.63	3.74	0.59	74.87	3.85	0.58	76.91	**0.000**
Product Feature	Product Feature	4.10	0.61	82.03	3.95	0.65	79.09	4.03	0.63	80.68	**0.000**
	Adoption Intent	3.85	0.75	76.93	3.62	0.85	72.44	3.74	0.80	74.88	**0.000**
	Average score	3.89	0.68	77.74	3.80	0.69	75.91	3.84	0.69	76.90	

* The *p-value* are derived from ANOVA

Table 4.37 Adoption intention on medical home Self-testing by marital status

Factors	*Variables*	*Adoption Intention, Scores (5)*												*p-value**
		Single (n=460)			**Married (n=460)**			**Divorced/Widow or Separate (n=59)**			**Total (N=979)**			
		Mean	**SD**	**%**	**Mean**	**SD**	**%**	**Mean**	**SD**	**%**	**Mean**	**SD**	**%**	
User-Centricity	Knowledge	4.08	0.64	81.58	4.14	0.66	82.80	3.97	0.71	79.49	4.10	0.65	82.03	0.112
	Habit	3.96	0.64	79.21	4.06	0.57	81.15	4.04	0.58	80.76	4.01	0.61	80.21	**0.049**
	Outcome Expectancy	3.82	0.75	76.48	3.93	0.72	78.67	3.75	0.67	75.08	3.87	0.73	77.43	**0.034**
	Personal value	3.92	0.81	78.43	3.96	0.85	79.26	3.75	0.94	74.92	3.93	0.84	78.61	0.164
Health Belief	Perc. Susc. Severity Dis	3.84	0.61	76.73	3.92	0.54	78.46	3.68	0.59	73.61	3.87	0.58	77.35	**0.003**
	Perc. Test.Severity. Barrier	3.28	0.81	65.55	3.29	0.84	65.75	3.21	0.74	64.18	3.28	0.82	65.56	0.787
	Perceived Benefit	3.72	0.75	74.37	3.88	0.70	77.50	3.67	0.74	73.49	3.79	0.73	75.79	**0.002**
	Self-Efficacy	3.72	0.80	74.33	3.84	0.75	76.83	3.53	0.78	70.51	3.76	0.78	75.27	**0.003**
Experience	Childhood Experience	3.85	0.67	77.08	3.87	0.59	77.33	3.69	0.67	73.83	3.85	0.63	77.00	0.134
	Adulthood Citizenship	3.59	0.76	71.76	3.74	0.68	74.84	3.56	0.62	71.12	3.66	0.72	73.17	**0.003**
Personality trait	Extraversion	4.04	0.68	80.74	4.17	0.60	83.33	4.08	0.64	81.53	4.10	0.65	82.00	**0.009**
	Agreeableness	3.92	0.69	78.43	3.90	0.58	78.02	3.66	0.53	73.22	3.90	0.63	77.93	**0.012**
	Neuroticism	3.73	0.78	74.70	3.83	0.73	76.59	3.73	0.68	74.58	3.78	0.75	75.58	0.141
	Optimistic	3.89	0.63	77.75	3.96	0.57	79.17	3.84	0.61	76.72	3.92	0.61	78.36	0.116
	Innovativeness	3.98	0.67	79.63	4.02	0.58	80.33	3.58	0.64	71.53	3.97	0.64	79.47	**0.000**
Social influence	Private Influence	3.56	0.75	71.16	3.77	0.71	75.45	3.28	0.70	65.68	3.64	0.74	72.84	**0.000**
	Public Influence	3.86	0.59	77.11	3.88	0.55	77.54	3.52	0.67	70.34	3.85	0.58	76.91	**0.000**
Product Feature	Product Feature	4.02	0.65	80.30	4.08	0.60	81.59	3.83	0.75	76.57	4.03	0.63	80.68	**0.011**
	Adoption Intent	3.74	0.78	74.93	3.78	0.83	75.57	3.45	0.79	69.07	3.74	0.80	74.88	**0.014**
	Average score	3.82	0.71	76.33	3.90	0.67	77.90	3.67	0.69	73.49	3.84	0.69	76.90	

* The *p-value* are derived from ANOVA

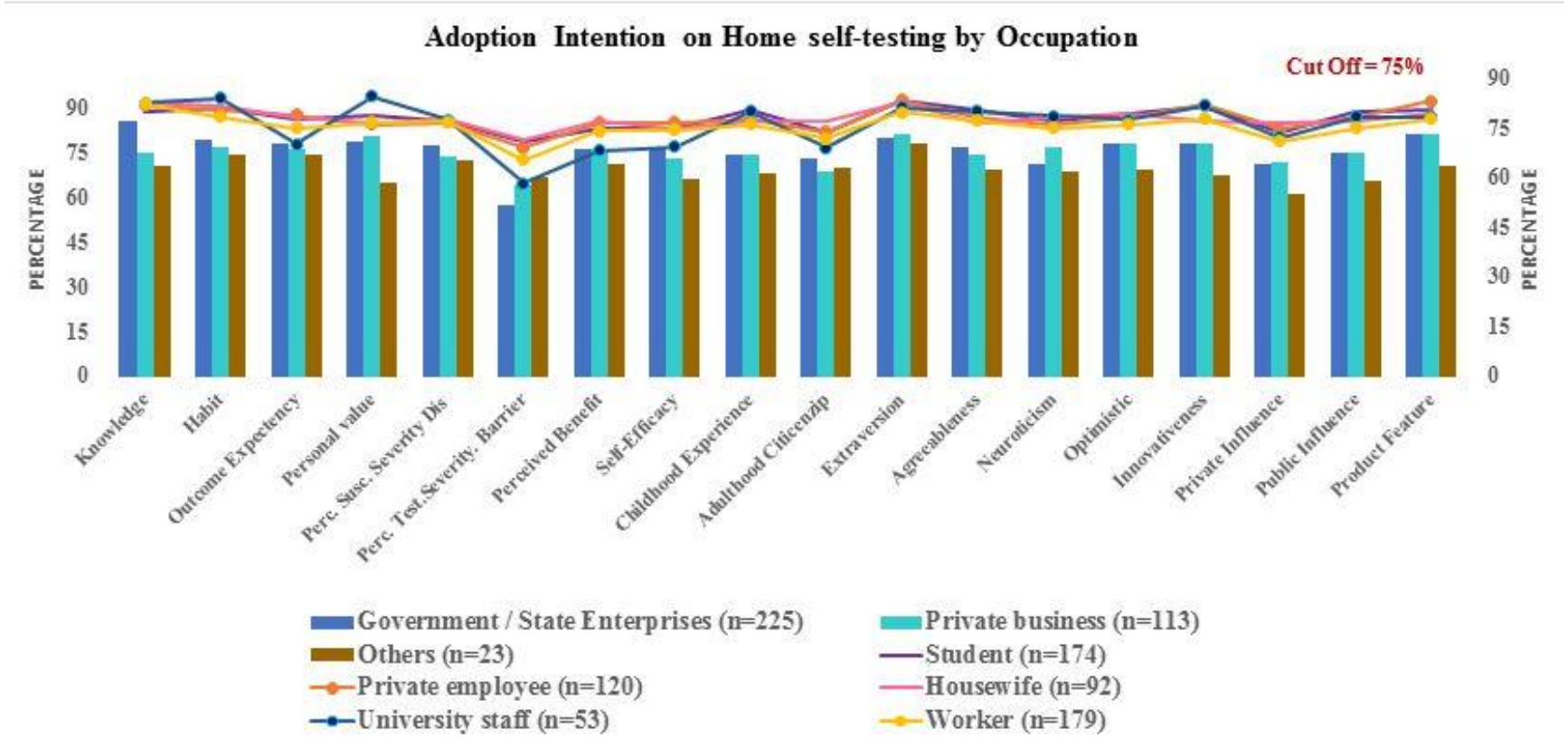

Figure 4.28 Adoption intention on medical home Self-testing by occupation

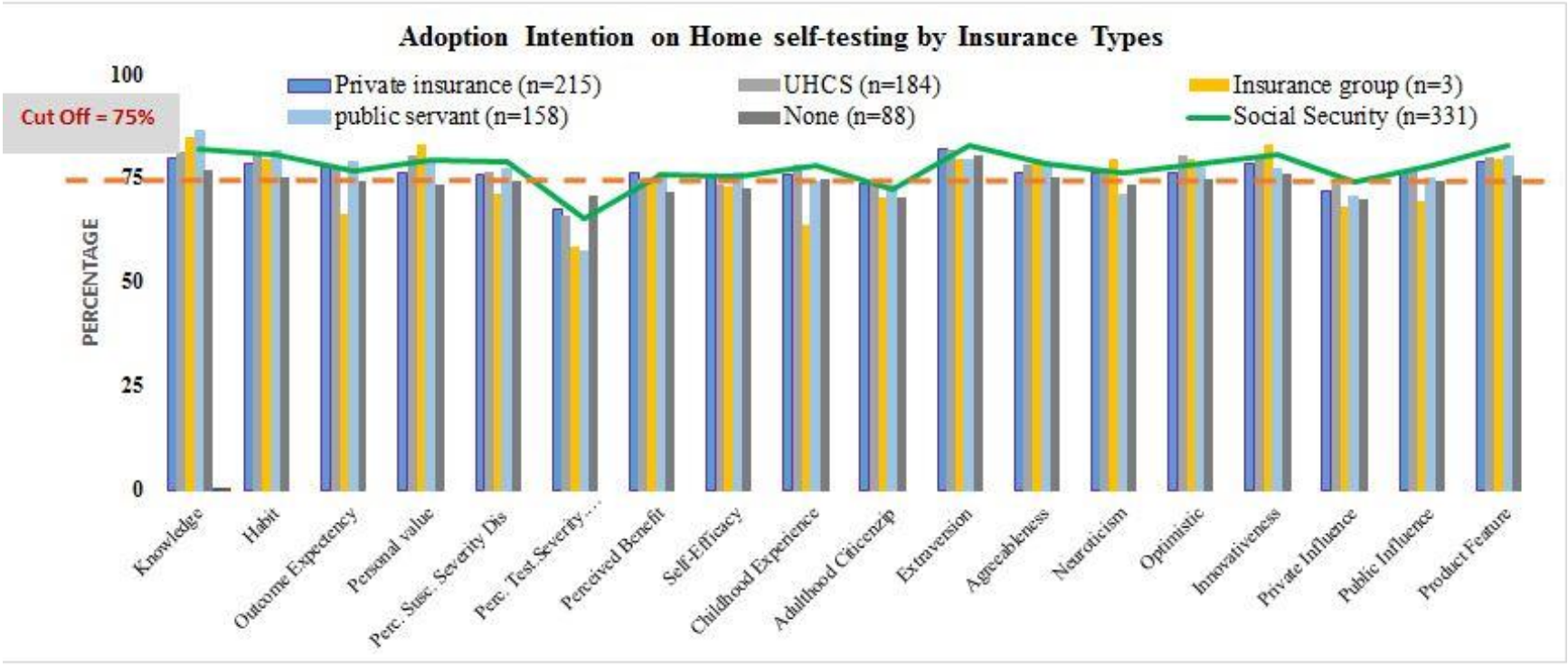

Figure 4.29 Adoption intention on medical home Self-testing by insurance types

Table 4.36 presented factor affecting adoption intention of medical home Self-Testing among people aged 18-35 and ≥ 36. The result revealed that there was a statically significant between people aged 18-35 and ≥ 36 in factor Self-Efficacy, Childhood Experience, Agreeableness, Optimistic, Innovativeness, Product Feature and Social influence group. The most value factor affected to adopt home Self-testing in aged 18-35 was Extraversion with having the highest mean scored (Mean=4.11) and followed by Knowledge (Mean=4.10) and Product Feature (Mean=4.10) while Perceived Barriers showed the least (Mean=3.31). For age ≥ 36 group, the value factors that were most concerned was Knowledge and Extraversion with the mean scored of 4.10 and 4.08, respectively. Refer to 75% cutoff, adopters had mean of 3.85 (76.93%) for adoption intention in Self-testing were more likely to be younger, innovative, positive attitude and rely on family and social opinion than non-adopters (Mean= 3.62; 72.44%).

Based on Table 4.37, ANOVA analysis showed a significant difference between single, married and divorced groups in factors of Habit, Outcome Expectancy, Perceived susceptibility plus severity, Perceived Benefit, Self-efficacy, Adulthood Citizenship, Extraversion, Agreeableness, Innovativeness Product Feature and Social influence group. Extraversion trait was the most important factor with the highest mean scored of 4.17 (83.33%), followed by Knowledge (Mean=4.14; 82.80%) whereas Perceived Barrier showed the lowest scored (Mean=3.21; 64.18%). Comparisons of single and divorced, and married people, we found a higher scored of adoption (Mean=3.78; 75.57%) in medical home Self-Testing than the other groups (3.74; 74.93%, 3.45; 69.07%). From the result, they were trending to be adopters in using home Self-testing.

In term of occupation, there was a significant difference between student, private employee, housewife, worker, Government/Enterprise, private business/trader, university staff and others job in almost factors except Perceived susceptibility plus severity in disease (*p-value* < 0.05). The percentage on each of factor was reported in Figure 4.28. The overall result indicated that the percentage of mean in the career of

student, private employee, housewife, worker and university staff which was represented by line showed value above cutoff in most factors when compared to people who were working in private business, Government/Enterprise and others job. Additionally, these group had mean adoption intention scored $\geq 75\%$ while Government/Enterprise, private business, and others job had lower score of 3.64 (72.76%), 3.62 (72.43%) and 3.26 (65.22%) respectively.

There were a difference in factors to examine adoption intention regarding of Insurance type as shown in Figure 4.29. The findings showed a significantly difference between type of insurance in factors of Knowledge, Habit, Personal value, Perceived susceptibility plus severity in disease, Perceived Barrier, Childhood Experience, Neuroticism, Optimistic, Innovativeness, Public Influence and Product Feature with *p-value* less than 0.05. Private insurance and Social security showed high willingness to adopt medical home Self-Testing with mean scored of 3.77 (75.49%) and 3.83 (76.68%), respectively while the others type of insurance had willingness lower than cutoff. Moreover, people with social security had the highest scored of adoption (Mean=3.83; 76.68%) and mean averaged slightly higher than the other groups (3.89; 77.85%) as represented by green line. From the result, it was showed that respondents who had social security were likely to use medical home Self-testing if it available.

Summary

This chapter revealed the results analysis, which explored psychological factors influencing consumer adoption intention to use medical home Self-testing followed research methodology. Preliminary results from 59 questionnaires was evaluated the reliability by Cronbach's alpha (α) and received approval by Ethics Committee before 1000 paper based questionnaires were distributed. Total 979 respondent's characteristic was analyzed in descriptive statistic. The construct reliability and validity of measurement and structure model were confirmed reliable and valid by using Cronbach's Alpha for reliability, Confirmatory factor analysis

(CFA) and structure equation models (SEM). Path analysis reaffirmed the research hypotheses H1-H6 and H8 were supported, demonstrated by User-Centricity, Health Belief, Experience, Personality trait, Social influence and Product Feature had a positive direct effect and statically significant on adoption intention to perform medical home testing while education and gender were insignificant. Furthermore, K-mean cluster analysis separated participants into three clusters based on set of research specific nineteen variables. One-way ANOVA confirmed a significant difference between three clusters, which represented individual who had low, high and medium in adoption intention on medical home Self-testing. The respondent who belong to high adoption rate group were married people, had monthly income between 15,001-30,000 baht and hold social security for health insurance. Univariate and multivariate logistic regression analysis demonstrate that age, marital status, occupation and health insurance were associated intention to adopt medical home testing ($p < 0.05$).

CHAPTER V
SOFTWARE APPLICATION DEVELOPMENT

This chapter describes about software application development using as innovative tools for predicting customer's acceptability on medical self-testing. The application consisted of customer's data; requirements of analyzing system and how the software is developed.

We identified psychological determinants, which are influencing on medical self-testing, and then we confirmed reliability and validity using factors analysis and structural equation modeling analysis. The equation regression analysis was also used as a part of software application development for prediction of consumer adoption intention to use home medical Self-testing.

5.1 Collecting of target customer's information

Currently, the availability of home medical Self-test kit in Thailand included pregnancy test, glucometer test, cholesterol home kit and recently HIV self-testing of which in Thai FDA approval processes. Existing products such as glucometer and cholesterol home kit have been distributed outside hospital in diabetic's clinic, and to big pharmacy shops where located nearby the provincial hospitals. It seems to be that consumers have a limitation of access to the products. Sales manager from diabetes departments said that even we wanted to sell more our products, however, product is available in many pharmacy shops with less income, but high operation cost. Although, marketing team create awareness campaigns to asymptomatic or risk groups by adding advertisement or promotion to media like Facebook and diabetes fan page, however, the marketers know only the quantitative results such as how many people reach the advertisement and average time that people spent on it. Very limited information of customers gave feed back into the system. For new product launching like HPV self-sample collection, product manager said that this product will

be directly sale to consumers. Therefore, they need to know more about customer's perception and attitude on the product, and what characteristics of people to be a potential adopter, who and where they are. Without this information, even we provide customers free kit trial, they would not collect the sample or even try it. The data generated from this application will save more budget, less time consuming and can make a better decision to test new product in pilot phases for further product feature development.

5.2 Analyze system requirements

From the customer's point of views, researcher designed the software application system with the following functions: (1) Assessment Management System for Administrators (Admin), (2) Evaluation system, (3) Report system

5.2.1 Assessment Management System for Administrators (Admin)

5.2.1.1 Assessment Management System

1) The system includes categorizing questions.
2) The system includes adding, deleting, and editing questions.
3) The system includes adding questions in each category.
4) The system includes adding more the Likert scale.
5) The system allows multiple choice or open-end question to formulate responses.

5.2.1.2 System user management

1) The system requires user to register before using.
2) The system is able to set user authority.

5.2.2 Evaluation system

1) The question can be modified, added, deleted and edited as appropriate following the type of home Self-testing.

2) The user select the type of Self-testing before evaluating the acceptability of test kit.

5.2.3 Report

1) The system will generate the results of risk score and interpretation for user who did register to perform evaluation and the system showed the nearby pharmacy shop location.

2) The system will generate the overview of user's acceptability by type of Self-testing. Geographic behavior represented by sequential color in each region and the percentage of psychological factor, which will be presented by bar graph and spider graph with recommendation.

5.3 Software development

The software development process includes system overview, workflow of the system, software and hardware specification and software operation

5.3.1 System overview

The system development aimed to store the database of consumer's acceptability on medical home Self-testing. The technology for system developing comprises of php codeigniter framework, My SQL, jQuery, Java script, Wamp Server, Chart.js and HTML. This technology is currently used to develop Web application, which is installed in hosting Server. The system will be used to collect, analyses, report and can provide recommendation to the users.

5.3.2 Workflow of the system

The system has five steps of working process: input, processing, storage output and recommendation, as presented in Figure 5.1. The operator's workflow and administrator's workflow were shown in Figure 5.2 and Figure 5.3, respectively.

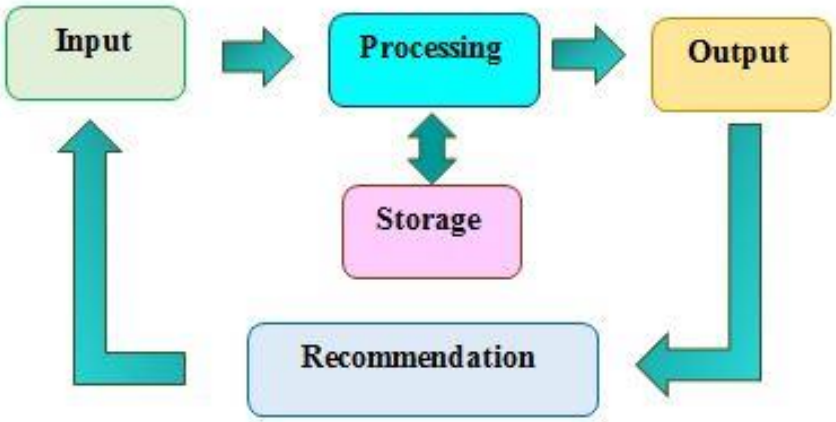

Figure 5.1 The system workflow of innovative tools software development for predicting customer's acceptability on medical Self-testing.

Source: Researcher

Figure 5.2 Software workflow for operator accessing the application

Source: Researcher

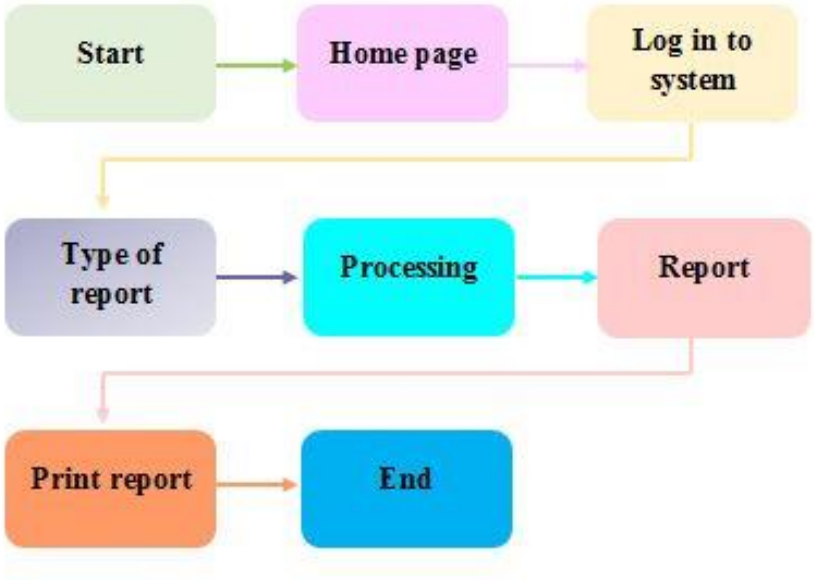

Figure 5.3 Software workflow for administrator accessing the application

Source: Researcher

5.3.3 Software and hardware for system development including of:

5.3.3.1 My SQL

5.3.3.2 Jquery

5.3.3.3 Java script

5.3.3.4 Php codeigniter framework

5.3.3.5 Wamp Server

5.3.3.6 Chart.js (present graph)

5.3.3.7 HTML (User interface)

5.3.3.8 Web Hosting

5.3.4 Software operation

5.3.4.1 Evaluation of health system page for user

Figure 5.4 Home page overview

Home page is the first page, which will display the name of application and user can click start bottom to entering to introductory page.

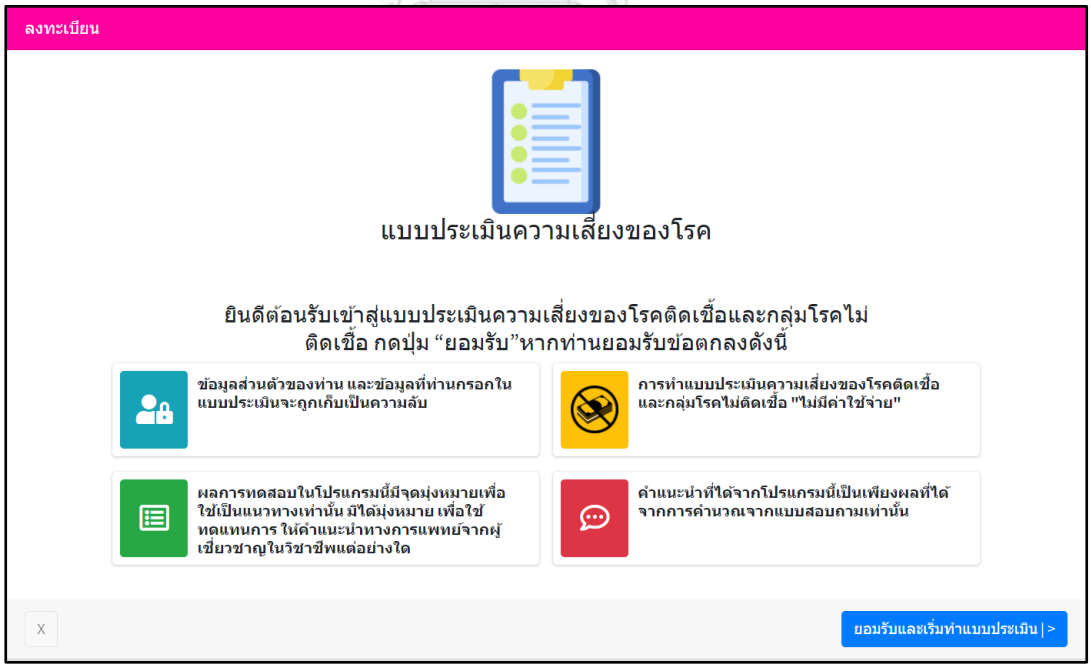

Figure 5.5 Introductory page

The introductory page presents Welcoming into health risk self-assessment, it requires preliminary agreement and the registration process.

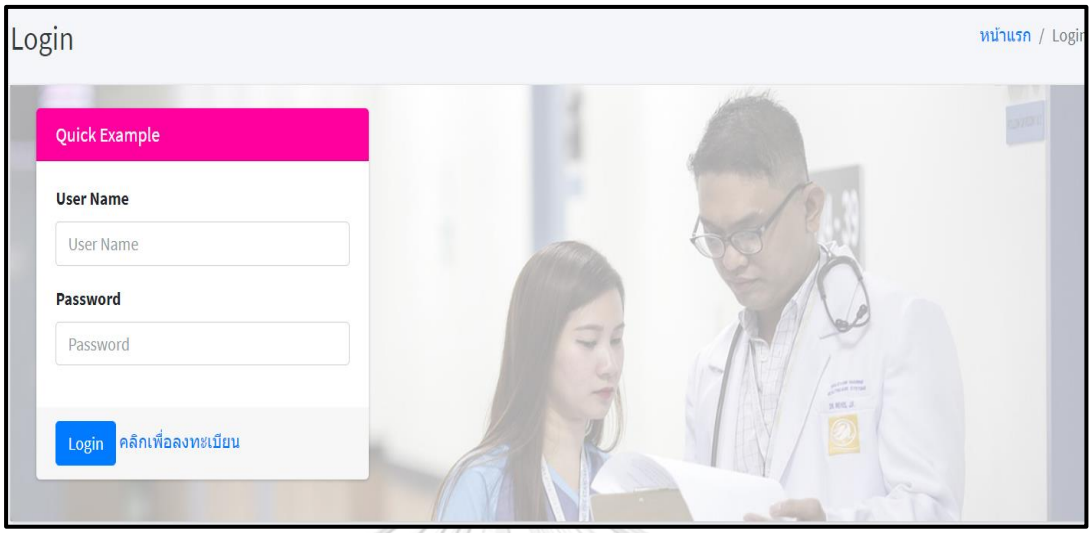

Figure 5.6 Registration page

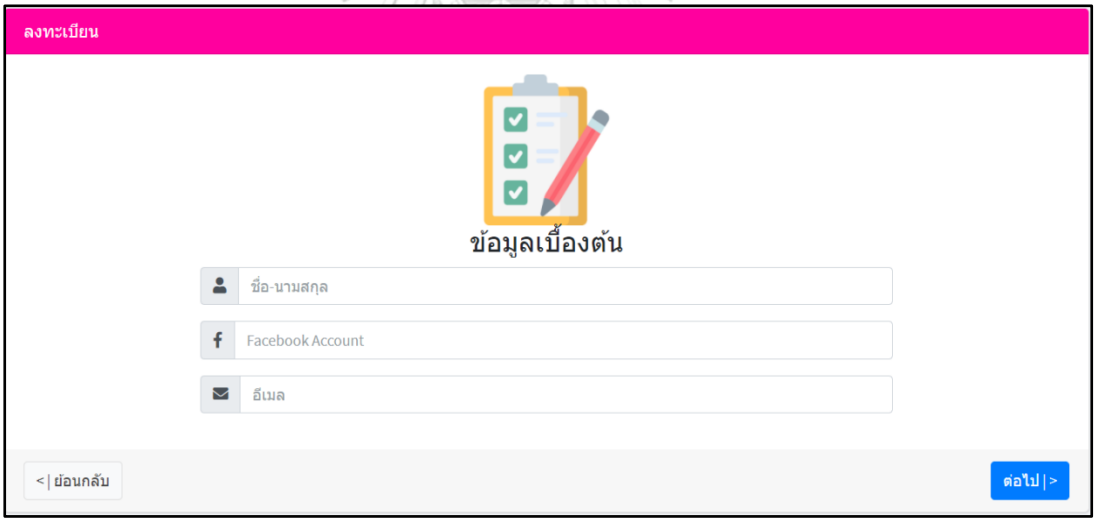

Figure 5.7 User's personal data information page

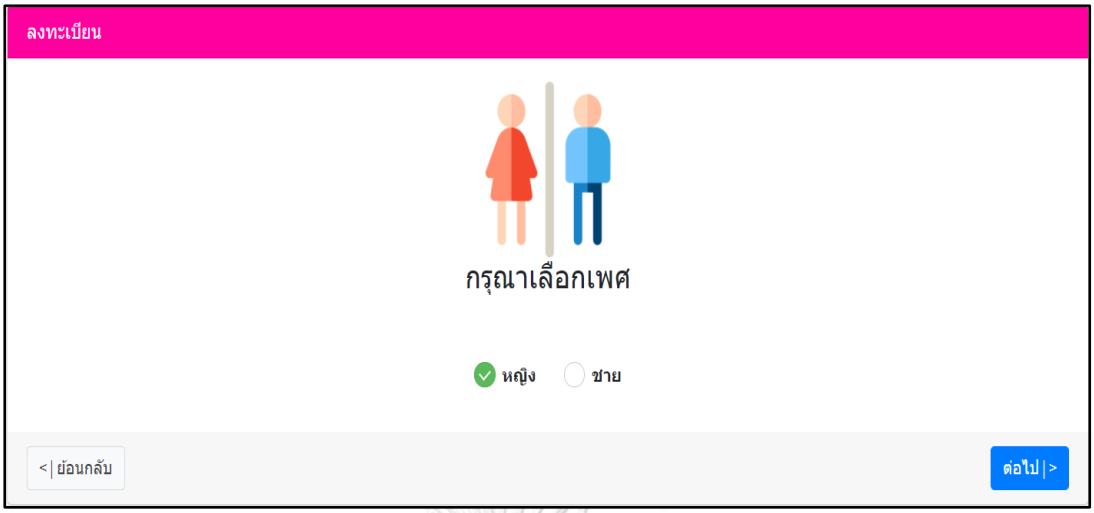

Figure 5.8 User's personal data information page on gender selection

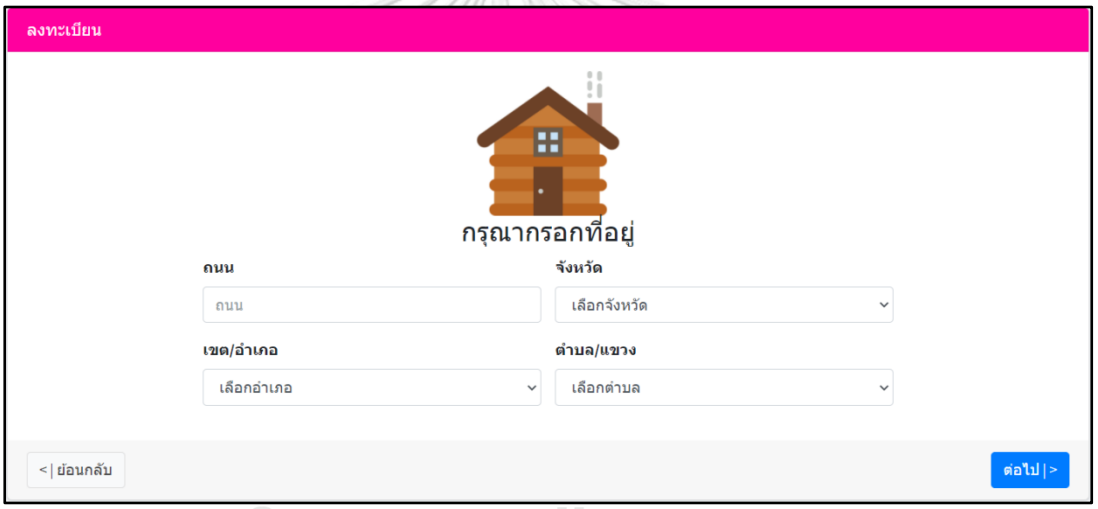

Figure 5.9 User's personal data information page on the address

Figure 5.7 to 5.9 are part of registration pages. The registration page part requires user personal information such as user's name, Facebook account, e-mail, gender and address. User is required to complete this section before entering to the next page.

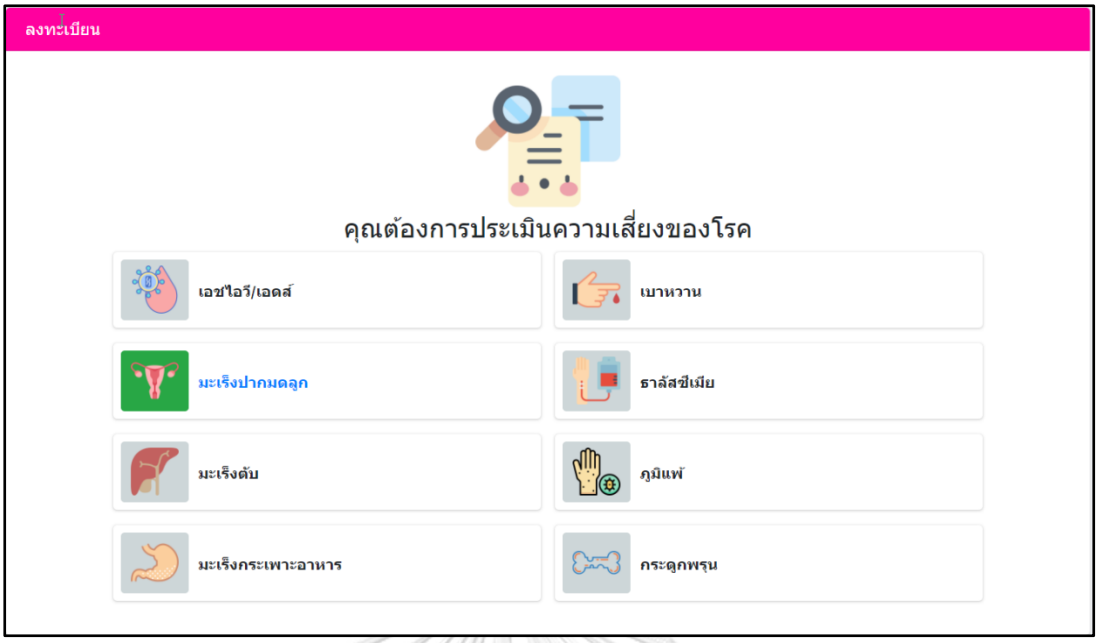

Figure 5.10 Mode of disease selection

User select what disease to perform self-assessment by clicking at the disease and then hitting start bottom to do the assessment.

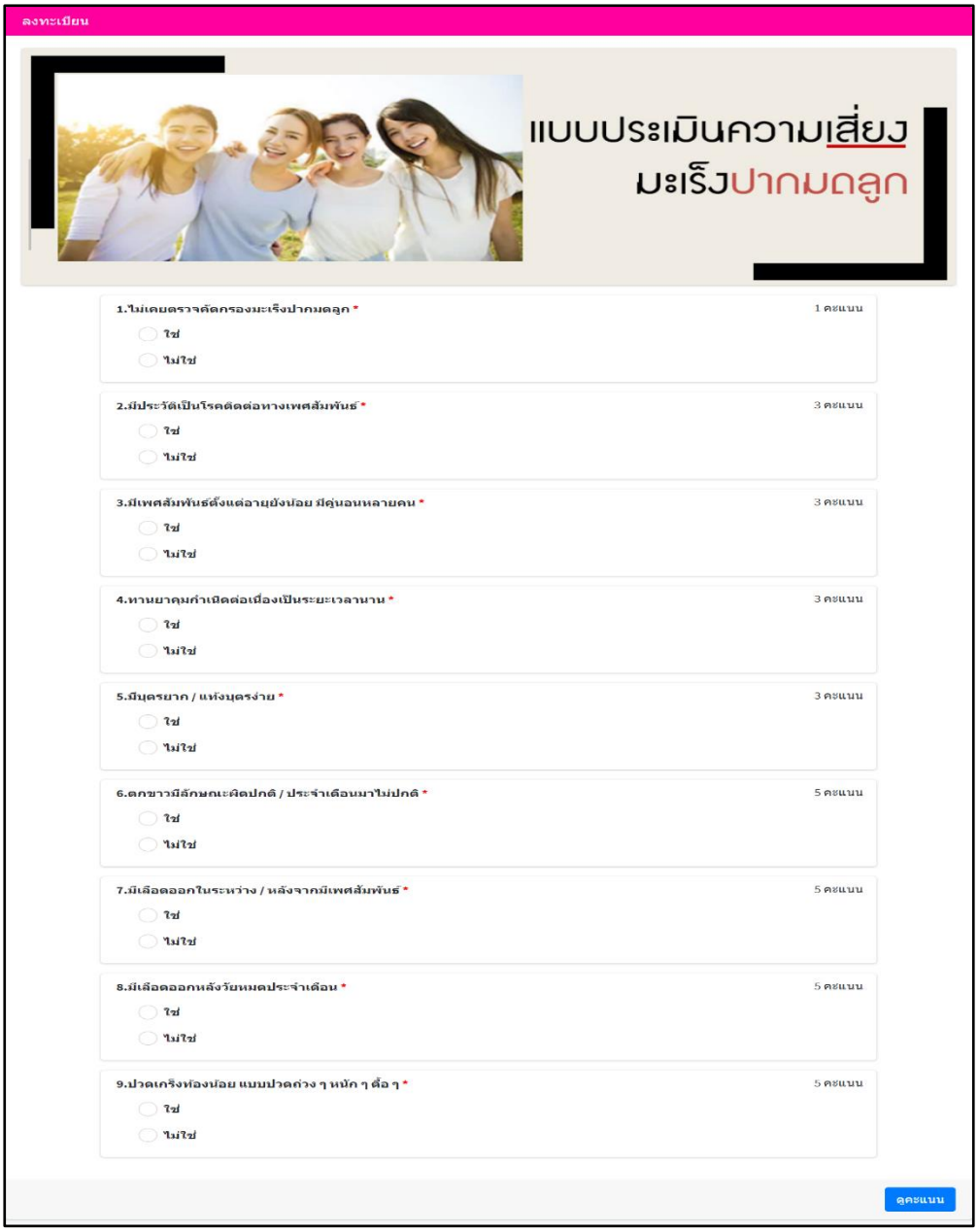

Figure 5.11 Cervical cancer risk assessment question

The risk of cervical cancer question presented in Figure 5.11. After completed all risk assessment questions, user needs to click the score button to view the scored of evaluation. Evaluated scores and interpretation of cervical cancer risk will be shown in the next page.

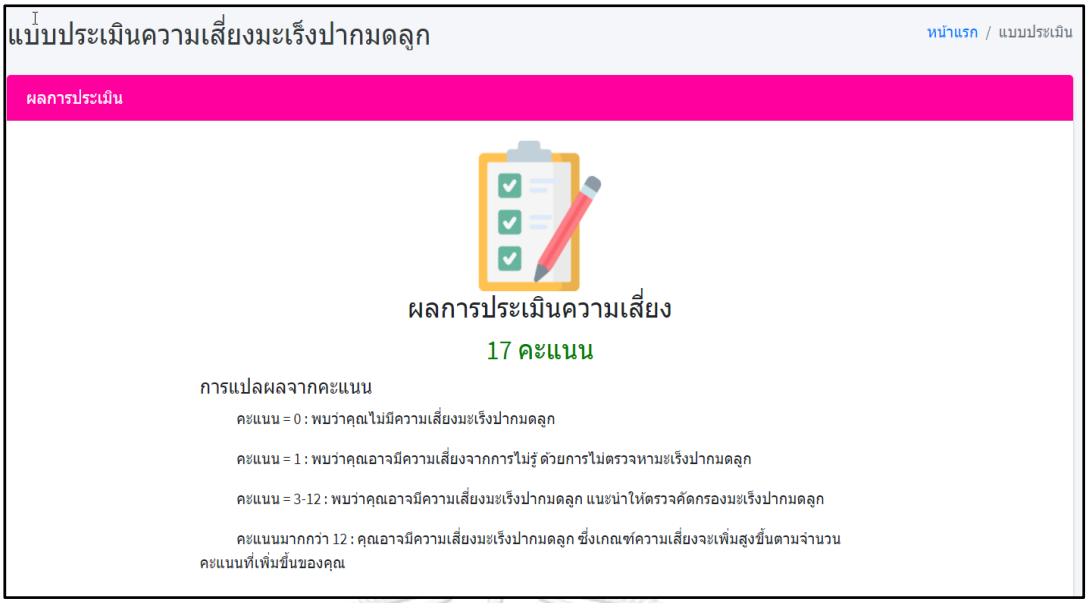

Figure 5.12 Cervical cancer risk interpretation from evaluated scores

Figure 5.13 Introduction page for evaluation of user's acceptability on HPV home testing

Users have an alternative choice to do evaluation of the acceptability on HPV Self-testing by clicking the specimen type button and details of the test kit appear at above the specimen type. Users can also make an appointment for a later day medical consultation with a physician. The system will generate electronic voucher or coupon of any promotion available to buy Self-testing after the user completes all assigned modules.

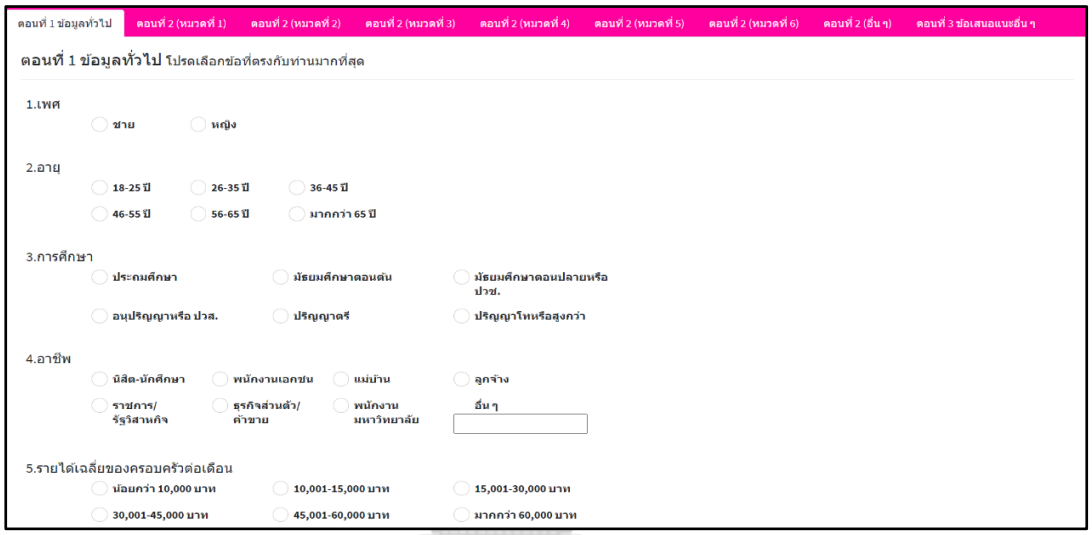

Figure 5.14 Evaluation screen of psychological factors affecting on medical home Self-testing in part of demographic data

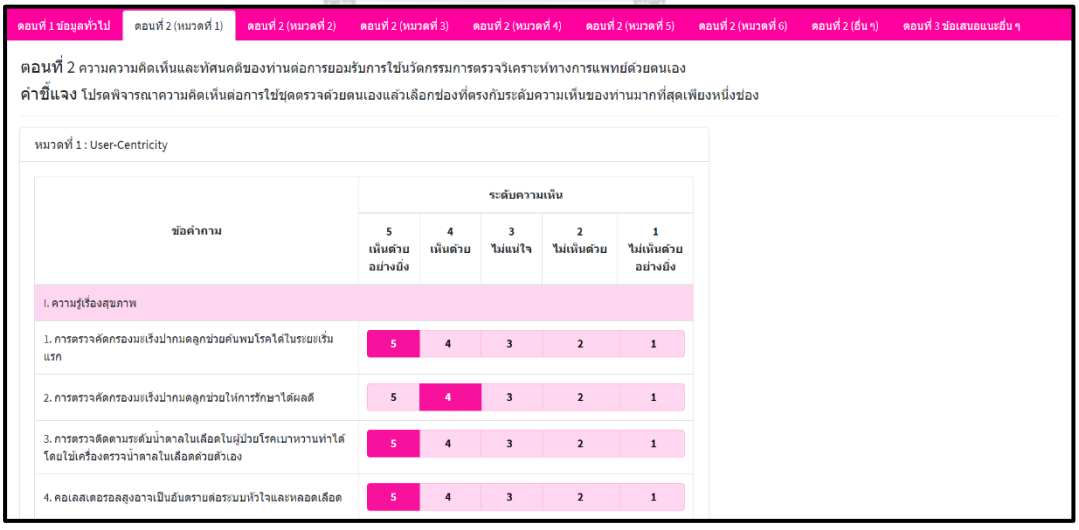

Figure 5.15 Evaluation screen of psychological factors affecting on medical home Self-testing in part of psychological indicators

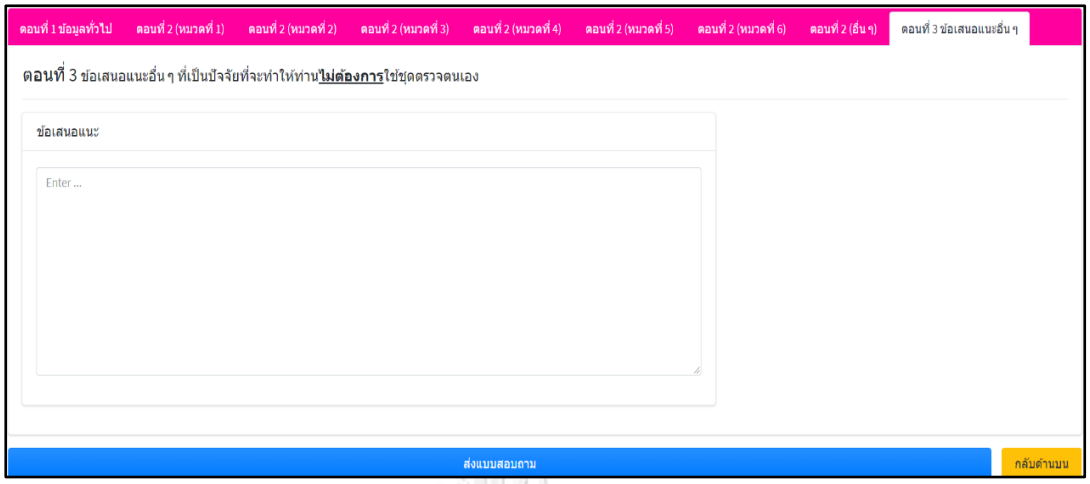

Figure 5.16 Evaluation screen of psychological factor affecting on medical home Self-testing in part of opened-ended question

Figure 5.17 Completion page of the system

Figure 5.14-5.16 presented the evaluation screen in three parts of module. The first part is respondent's demographic data. The second part contained indicator regarding User-centricity, Health belief, Personality trait, Childhood experience, Social influence, Product feature including Environmental factor, Channel to buy and Adoption intention. The last part is the opened-ended question about affected factors of why respondent ignores using medical home Self-testing. User needs to complete two parts before receiving electronic voucher as presented as Figure 5.17-18.

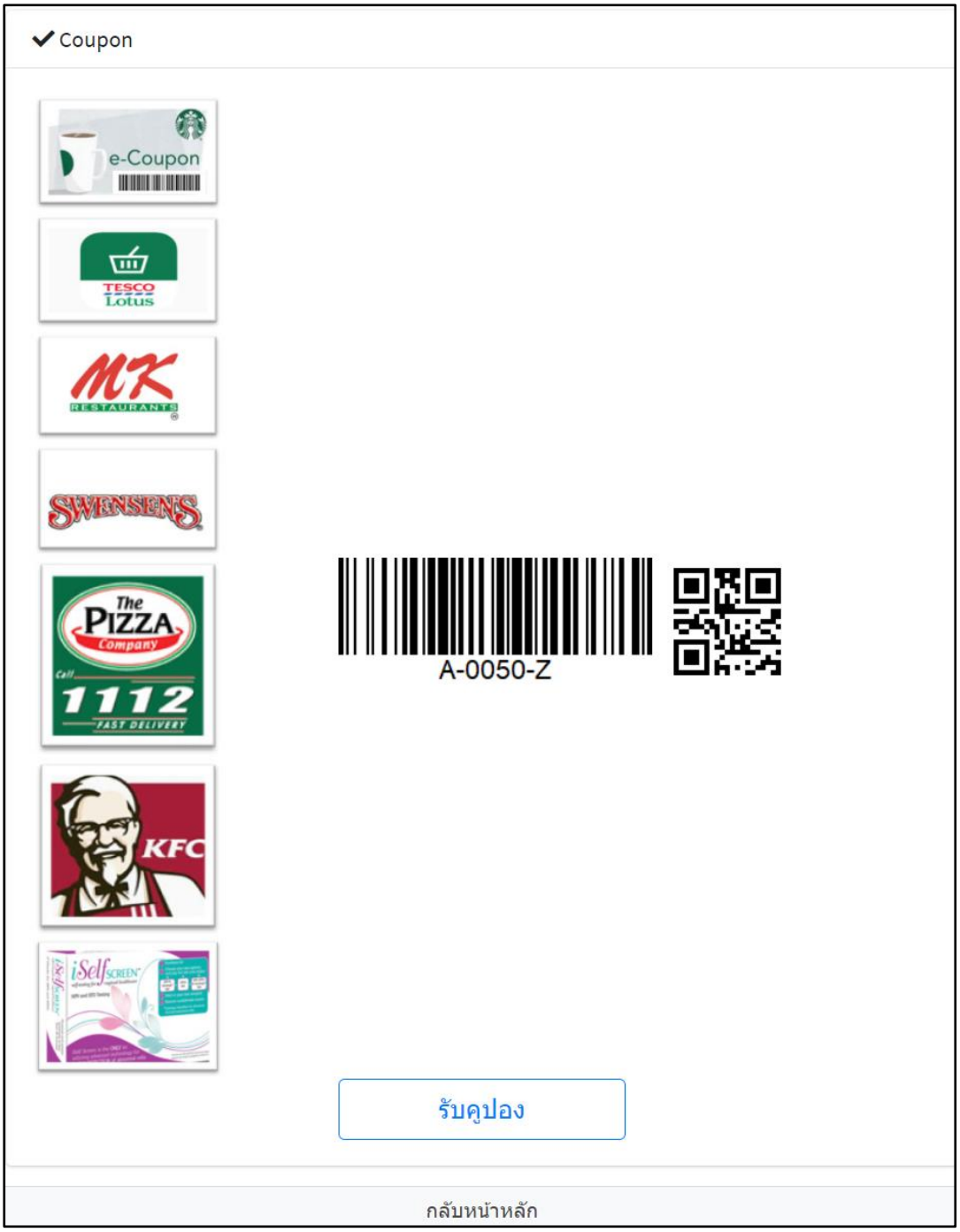

Figure 5.18 Electronic voucher

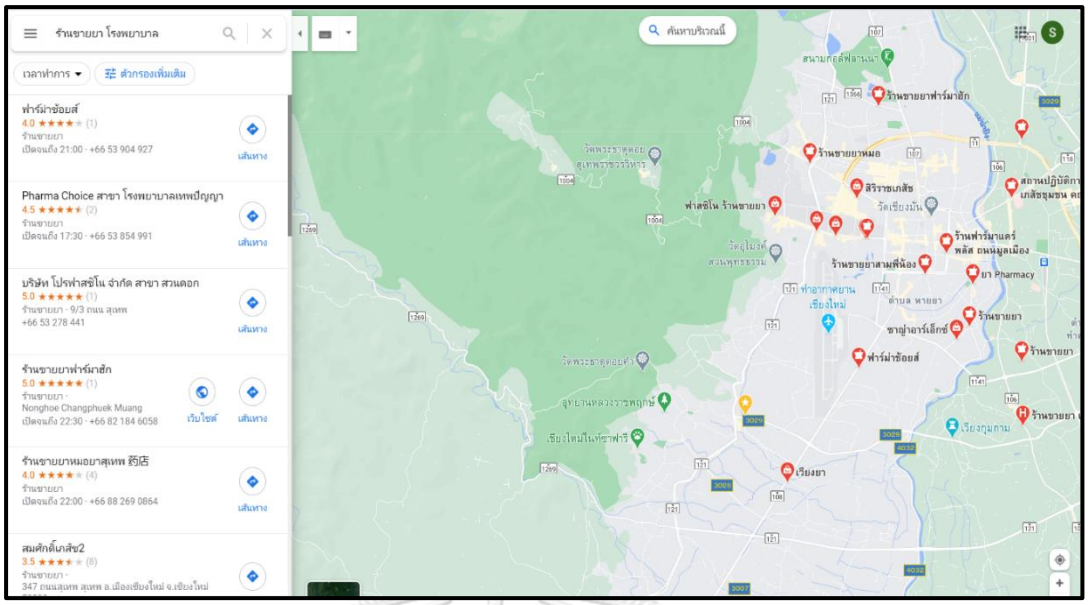

Figure 5.19 Pharmacy shop and hospital nearby user's location via google map

The system will display the nearest pharmacy shop and hospital where user could access to buy HPV Self-testing via google map.

5.3.4.2 Application page for Administrator

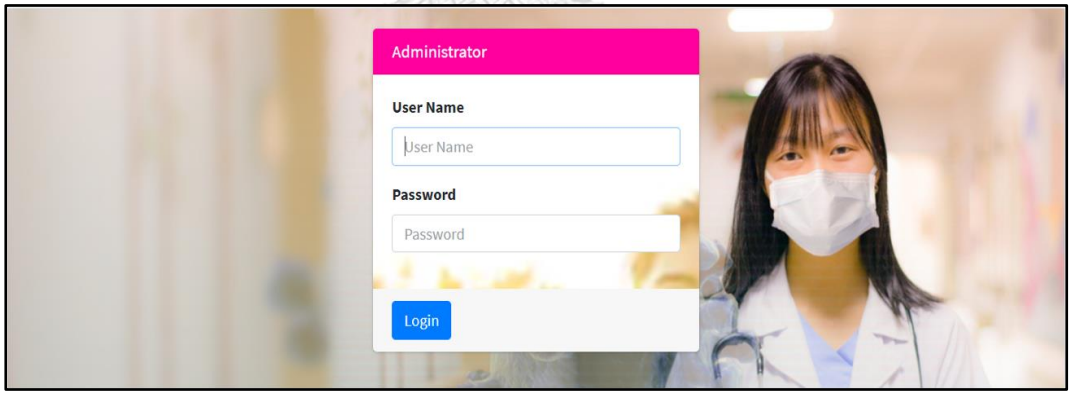

Figure 5.20 Log in page for administrator

Log on by entering assigned User ID and Password and then click Login button to access the system.

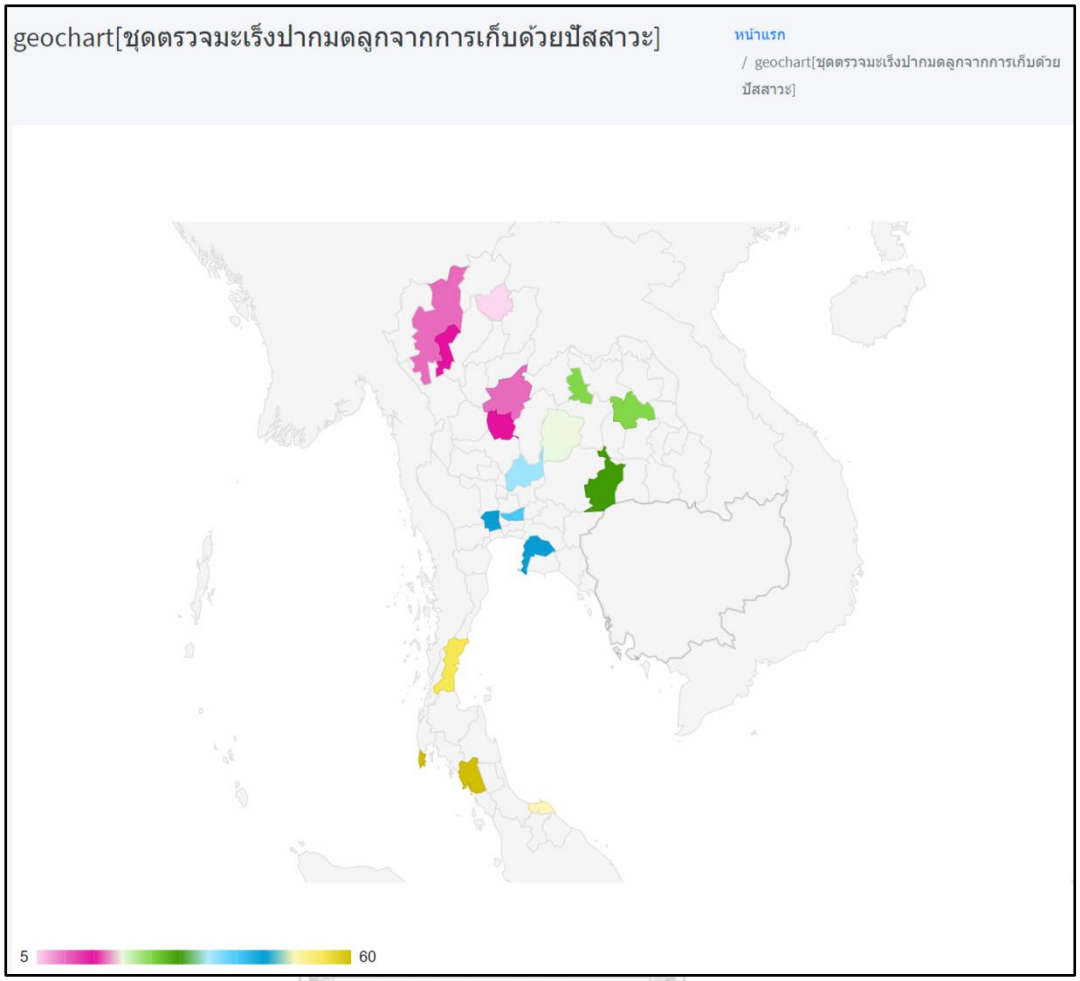

Figure 5.21 Geographical location appears adoption intention rate for urine HPV Self-testing by region using a sequential color scheme. Pink color represented North region while green, blue and yellow presented Northeast, Central and South, respectively.

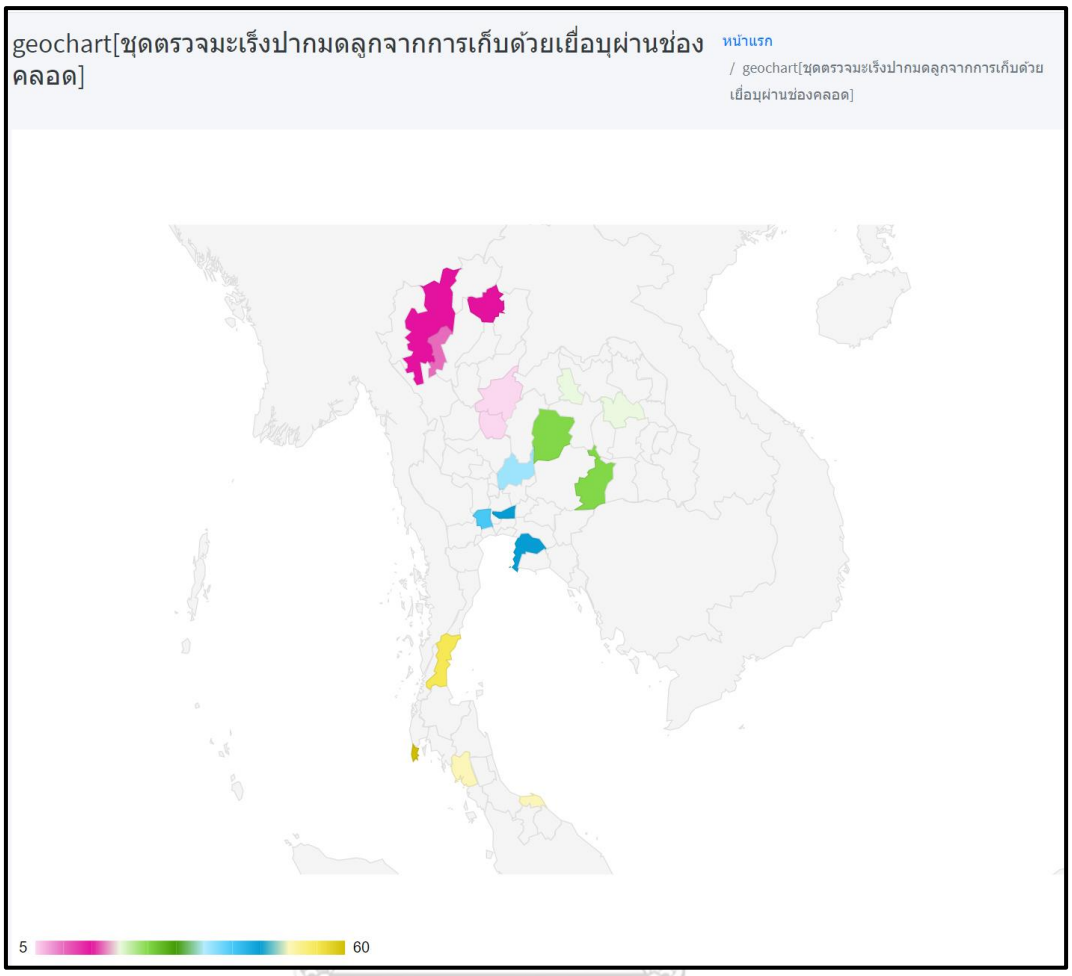

Figure 5.22 Geographical location express adoption intention rate for HPV Self-testing (cervical cell sample collection) by region using a sequential color scheme. Pink color represented North region while green, blue and yellow presented Northeast, Central and South, respectively.

Figure 5.21-5.22 presented geographical adoption intention rate by using urine and cervical cell testing, respectively. The darker color shows higher adoption intention rate and lighter color shows lower adoption rate.

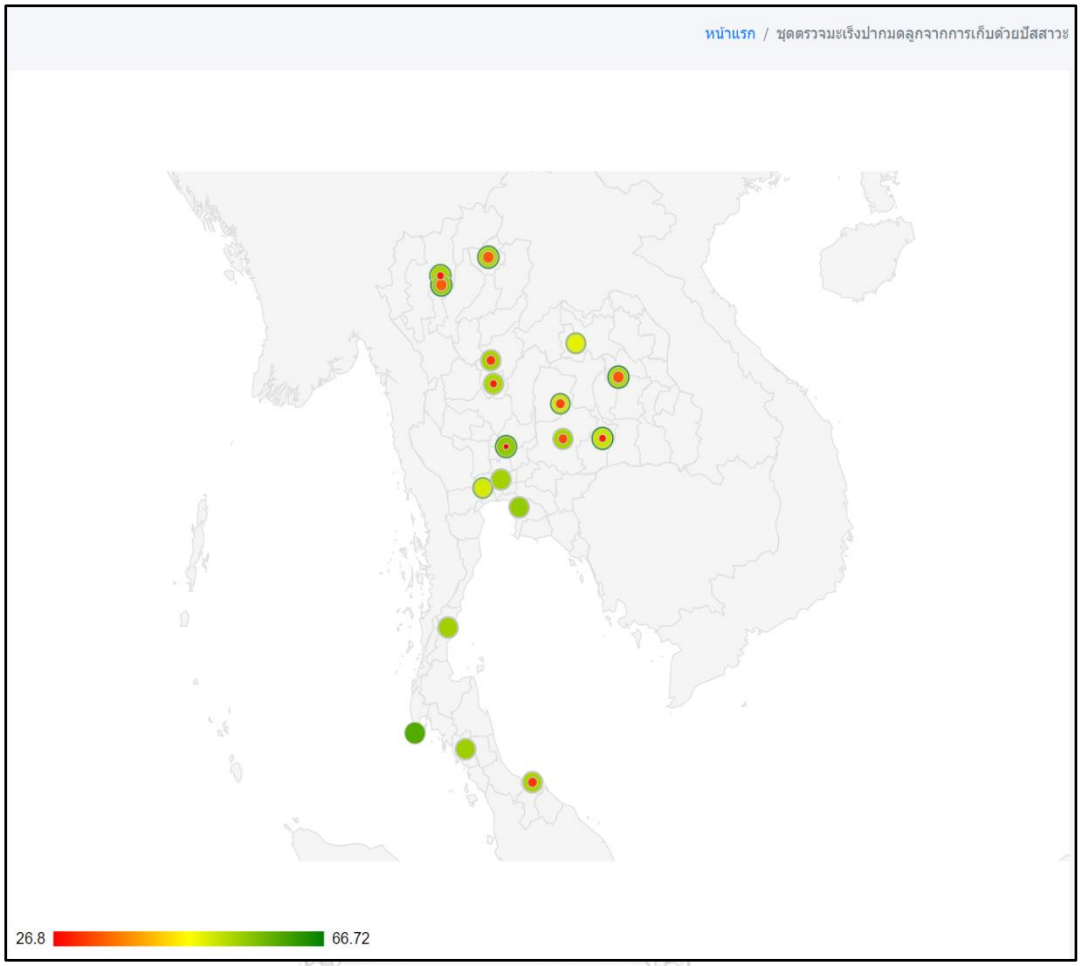

Figure 5.23 Geographical location overview of respondent's acceptability on HPV Self-testing by urine sample

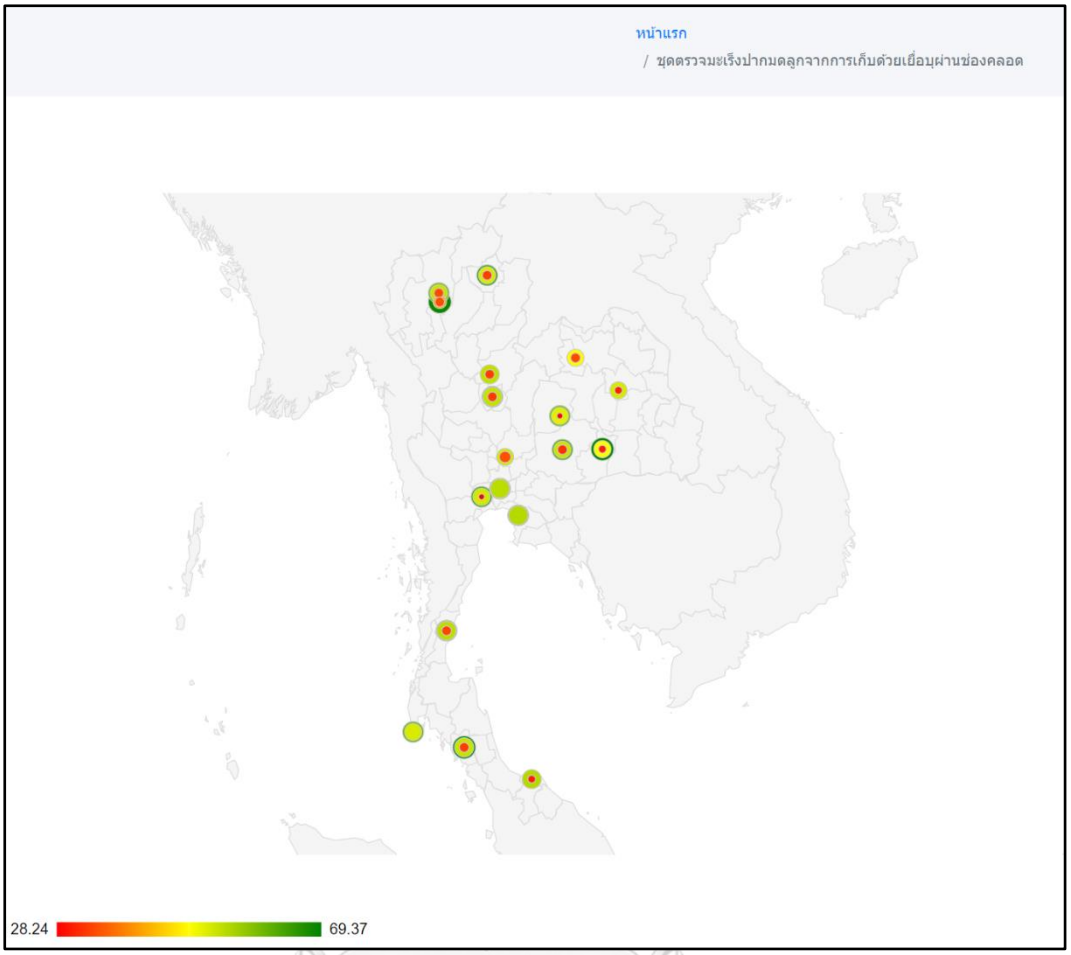

Figure 5.24 Geographical location overview of respondent's acceptability on HPV Self-testing by cervical cell sample collection

Figure 5.23-5.24 presented the overview of respondent's acceptability on HPV Self-testing by urine sample and cervical cell sample, respectively. Red color represented low-scored adoption to higher scored, which presented in yellow to green.

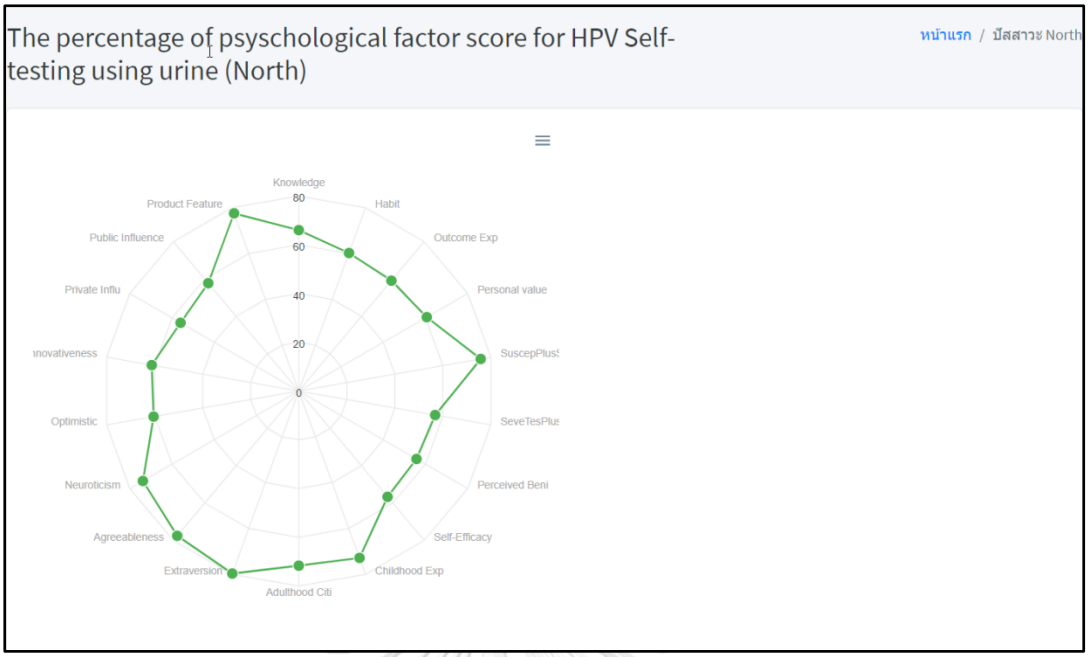

Figure 5.25 Factors association of adoption intention on urine HPV self-testing by North region

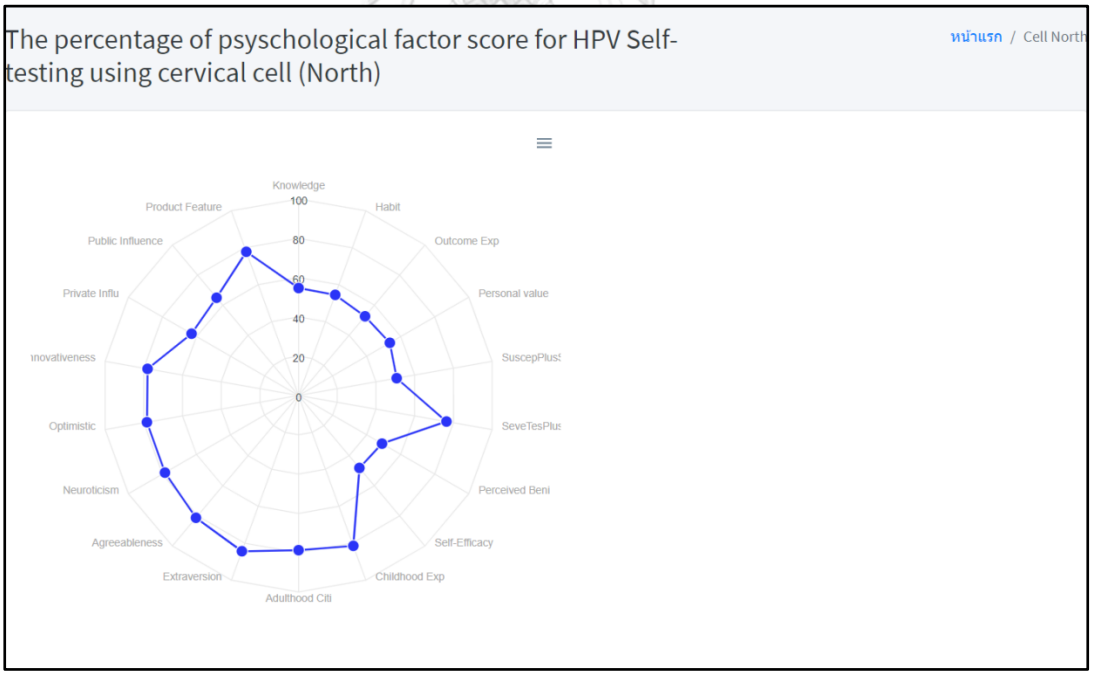

Figure 5.26 Factors association of adoption intention on HPV self-testing using cervical cell by North region

Figure 5.25-5.26 presents the spider graph of psychological factors, which is associated with adoption intention for HPV self-testing by using urine and cervical cell collection. The percentage of psychological factors scored has been shown in the dot line.

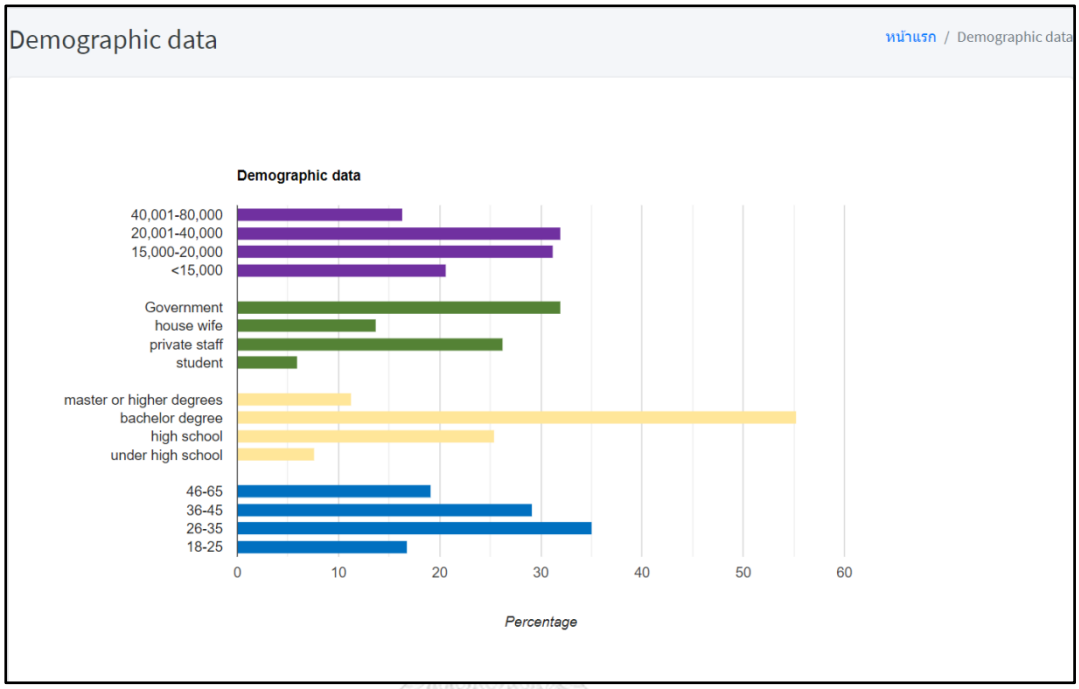

Figure 5.27 Demographic characteristic of respondent's acceptability on urine HPV Self-testing

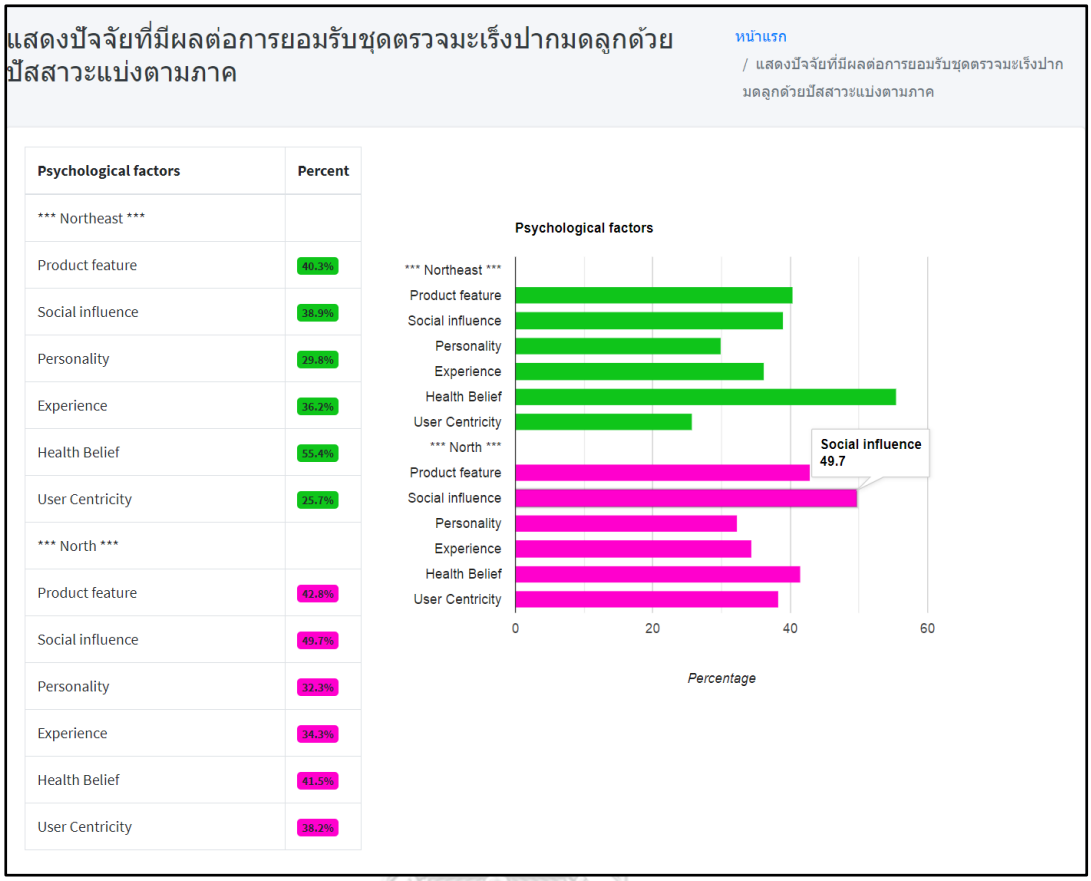

Figure 5.28 Psychological factors influencing on urine HPV self-testing by region

Figure 5.27-28 displayed data analysis of respondent's acceptability on HPV self-testing. Figure 5.27 presented the percentage of respondents demographic in four categories (Age, Education, Career and monthly income) while Figure 5.28 demonstrated the percentage of psychological factors affecting on urine HPV Self-testing divided by region.

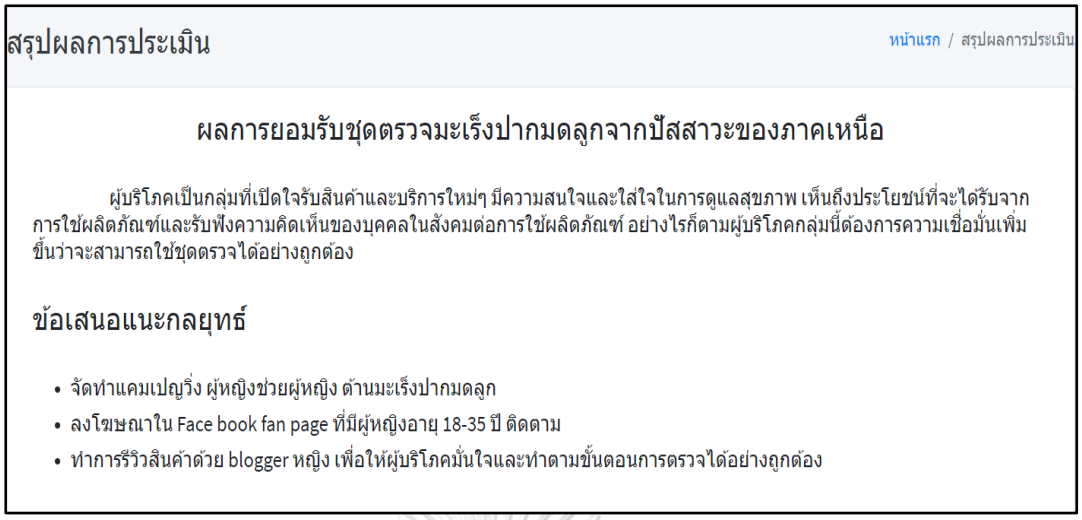

Figure 5.29 Summary result of adoption intention on urine HPV Self-testing by North region for deployment of recommended marketing strategy

Summary

This chapter demonstrated web application development as innovative tool, which presented overview of the system, workflow system and how to operate the system for both user and administrator. The result from using this application would be guidance for prediction of customer acceptance on home medical self-testing.

CHAPTER VI
ADOPTION AND COMMERCIALIZATION

This chapter presented adoption intention to use innovative tools for predicting customer's acceptability on medical self-testing and commercialization.

6.1 Evaluation of customer's acceptability

Technology acceptance model (TAM) was established aimed to predict and explaining the acceptability of end user of technology. Based on TAM model, three major determinants included perceived usefulness, perceived ease of use and attitude. Usage behavior is used to predict reasonable well by behavior intention to use (BI) (Davis et al., 1989). Due to the innovative tools as software for predicting customer's acceptability on medical self-testing. We applied TAM model to evaluate the customers on the acceptance of developed software as innovative tool for predicting how well the user's adoption intention on medical home Self-testing. The instrument measured operational of the program, perceived usefulness, perceived ease of use, attitude and behavior intention utilized ten, six, six, three and four items, respectively. The TAM subscales were measured using five-point semantic differential scales, which indicated how well the participants agrees with the statement in each construct, ranging from 1 to 5. The meaning of the class interval in each segment are interpreted as follows.

Table 6.1 Class interval and result interpretation

Class interval	Interpretation
$4.20 < \text{scored} \leq 5.00$	Strongly agree
$3.40 < \text{scored} \leq 4.20$	Agree
$2.60 < \text{scored} \leq 3.40$	Moderate
$1.80 < \text{scored} \leq 2.60$	Disagree
$1.00 < \text{scored} \leq 1.80$	Strongly disagree

We investigated the acceptability of innovative tool in each construct with the interviewing samples of which consist of twenty-two people. The demographics' participants, evaluation's result and their opinions regarding of commercialization details shown in Table 6.2-6.5.

Table 6.2 Descriptive statistic of participants (n=22)

Demographic	Respondent (%)	Percentage
Gender		
Male	7	31.82
Female	15	68.18
Total	22	100
Age		
≤ 25 yrs.	1	4.54
25-35 yrs.	12	54.55
36-45 yrs.	7	31.82
46-55 yrs.	2	9.09
Total	22	100
Position		
Sales executive	1	4.54
Product executive	2	9.09
Product manager	1	4.54
Marketing manager	4	18.18
Business unit manager	2	9.09
Business Owner	1	4.54
End user	11	50
Total	22	100
Education		
Bachelor degree	7	31.82
Master degree	15	68.18
Total	22	100

Table 6.2 showed descriptive statistic of participants. The majority of respondent was female (68.18%), aged between 25-35 years old (54.55%), business company people (50%), end user (50%) and graduated in Master degree (68.18%).

The second part of the survey measured operational of the program, which consisted of system capability, system usage and data security as shown in Table 6.3.

Table 6.3 Evaluation result of innovation tool regarding of system capability, system usage and data security (n=22)

Performance	Mean	SD	Result
1. System capability			
• The processing of the system is accurate	4.55	0.60	Strongly agree
• The processing of the system is quick	4.55	0.60	Strongly agree
• The evaluation results can be used for business data analysis	4.64	0.58	Strongly agree
2. System usage			
• The system is friendly used and easy to operate	4.50	0.60	Strongly agree
• User interface looks good and properly digitalizing designed	3.95	0.84	Agree
• The system is stable	4.18	0.85	Agree
3. Data security			
• User can set the authority and control who could access to the system	4.59	0.50	Strongly agree
• The system allow only authorized person to access the system by username and password	4.73	0.46	Strongly agree
• System has a privacy and safety protection	4.64	0.49	Strongly agree
• System has an expert team for monitoring the application operation	4.50	0.60	Strongly agree

As presented in Table 6.3, the overall result of system performance showed strongly agree. The most average scored in system capability indicated that the evaluation results can be used for business data analysis (Mean = 4.64) while the system was friendly used and easy to operate received the average highest scored (Mean = 4.50) in system usage. The system allowed only authorized person to access the system by adding username and password of which showed the highest mean scored of 4.73 in the aspect of data security whereas user interface looks good and properly digitalizing designed and presented the lowest mean scored that was 3.95 among three system performance surveys.

The third part of the questionnaire measured the acceptability of developed innovative tool by using three constructs of Technology acceptance model (TAM) which were Perceived usefulness, Perceived ease of use, Attitudes towards use and Behavior intention

Table 6.4 Evaluation result of innovation tool based on Technology acceptance model (Perceived usefulness, Perceived ease of use, Attitudes towards use and Behavior intention) (n=22)

Performance	Mean	SD	Result
1. **Perceived usefulness**			
• Using the system to enables better decisions making based on information	4.55	0.51	Strongly agree
• Using the system to allow task accomplishment more quickly	4.55	0.60	Strongly agree
• Using the system to enhance the effectiveness of working management process	4.50	0.51	Strongly agree
• Using the system to reduce cost	4.41	0.67	Strongly agree
• Using the system in my job to increase work productivity	4.59	0.59	Strongly agree
• The developed system as innovative tool could be applied to work	4.64	0.49	Strongly agree

Performance	Mean	SD	Result
2. Perceived ease of use			
• The interaction with system is clear and understandable	4.50	0.51	Strongly agree
• Learning how to use the system is easy	4.45	0.60	Strongly agree
• Interaction with the system requires less effort	4.32	0.57	Strongly agree
• Using the system can reduce steps of task	4.41	0.59	Strongly agree
• The system is flexible to use or to interact with	4.09	0.53	Agree
• The system is friendly and easy to use	4.32	0.57	Strongly agree
3. Attitudes towards use			
• Using innovative tools as an influencing factor on home medical Self-testing is interesting.	4.82	0.39	Strongly agree
• I think using innovative tool as an influencing factor on home medical Self-testing has some advantage for our business.	4.91	0.29	Strongly agree
• I believe that innovative tool as an influencing factor on home medical Self-testing has a potential driving to apply into our business in the future.	4.73	0.55	Strongly agree
4. Behavior intention			
• I am interested in using the innovative tool as influencing factor on home medical Self-testing.	4.45	0.67	Strongly agree
• I am considering using the innovative tool as an influencing factor on home medical Self-testing.	4.41	0.50	Strongly agree
• I am interested to use the innovative tool as an influencing factor on home medical Self-testing when compared to the original system.	4.41	0.59	Strongly agree

Performance	Mean	SD	Result
• I will introduce the innovative tool as an influencing factor on home medical Self-testing to encourage people to use this tool for enhancing their business.	4.45	0.51	Strongly agree

As Table 6.4 result, the respondents realized that the developed system as innovative tool could be applied to work and increase their work productivity with the highest mean scored of 4.64 and 4.59, respectively in perceived usefulness construct. In the aspect of perceived ease of use construct, demonstrated that the interaction with system is clear and understandable item showed the highest mean scored (Mean = 4.50) and followed by item of learning how to use the system is easy (Mean = 4.45). Next, participants think that using innovative tool, as an influencing factor on home medical Self-testing has some advantage for their business presented the highest mean scored, mean was 4.91 in construct of attitudes towards use. From behavior intention, responders interested in using the innovative tool as influencing factor on home medical Self-testing and they will introduce the innovative tool to encourage people to use this tool for enhancing their business as the highest average scored of 4.45. The lowest mean score was belong to item of the system is flexible to use or to interact with (Mean = 4.09) in perceived ease of use construct.

Table 6.5 The overall result of the technology acceptance model

Performance	**Mean**	**SD**	**Result**
1. Perceived usefulness	4.54	0.56	Strongly agree
2. Perceived ease of use	4.34	0.56	Strongly agree
3. Attitudes towards use	4.82	0.41	Strongly agree
4. Behavior intention	4.43	0.57	Strongly agree
Total	**4.53**	**0.53**	**Strongly agree**

The overall result of the acceptability to use web application as an innovative tool showed "strongly agree" in all category of TAM model factors. Attitudes towards use had the highest mean scored (Mean = 4.82) followed by perceived usefulness (Mean = 4.54) and behavior intention (Mean = 4.43) whereas perceived ease of use presented the least mean scored of 4.34.

Table 6.6 Participant's opinion to innovative tool for further commercialization

Statement	Respondent	Percentage
1. If the innovative tool is used as an influencing factor on home medical Self-testing. What kind of buying type would you interest to use?		
• Purchase of the system	7	31.82
• Annual subscription	5	22.73
• Purchase for a specific report	5	22.73
• Purchase consultation service from the host	5	22.73
Total	**22**	**100**
2. If the innovative tool is used as an influencing factor on home medical Self-testing. What kind of commercialization should it be used?		
• Direct sale	6	27.27
• Non-Exclusive licensing	12	54.55
• Exclusive Licensing	4	18.18
Total	**22**	**100**

As presented as Table 6.6 indicated that seven respondents of twenty-two interested to purchase the system of the most (31.82%) while annual subscription, purchase for a specific report and purchase consultation service from the host presented five respondents (22.73%) in each kind of buying type. For commercialization, the most type of commercialization from survey's opinion was non-exclusive licensing (54.55%) while direct sale and exclusive licensing were 27.27% and 18.18%, respectively.

6.2 Commercialization

6.2.1 Industry analysis: The Five - forces

To analyze the structure of an industry and understand the force affecting of profitability in entering industry, this study used Five-force model, which Michael Porter proposed in 1980 (Porter, 1980). The framework was relatively comprehensive tool and widely used to assess the attractiveness the structure of any industry. However, following Porter's five force, we found that influenced an industry comprising of: (1) the threat of new entrants, (2) the bargaining power of suppliers, (3) the bargaining power of buyers, (4) the threat of substitutes and (5) rivalry among competitors.

Threat of new entrants

Our innovative tool named Health Check In is a web application, which contents is derived from a research discovered of significant psychological factors that influenced the acceptability of using home testing that being passed the criterial of goodness of fit index of measurement and structure model assessment. The product we provided to industry was unique and protected by copyright. New entry firms required a specialist knowledge of healthcare and the research-based model was context specific as well as time period. The barriers to entry are knowledge, the complexities of the industry and product differentiated. Therefore, Health Check In has an advantage opportunity to expand market share.

Bargaining power of suppliers

The developed web application depended on computer technology for development and working system on the internet access. In Thailand, we had a large number of computer's company and internet service's company. It was easily in switching to use products from one supplier to another. Therefore, the researcher had a rather high bargaining power, as there were several options and competitive price comparisons from various suppliers. Our bargaining power is quite be strong we can purpose any of our favorable business to other suppliers.

Bargaining power of buyers

Currently, there were small number of buyers because self-testing was a new modality, which Thai FDA announced only HIV self-testing kit to be available public access at pharmacies shop in 2019. However, this was an opportunity for Health Check In innovative tool to be the pioneer home self-testing option and collecting of health information database in Thailand. Buyers tends to have few bargaining power in choosing to use the existing channel. Health Check In web application is novel application to support customers in decision-making. Although our product is a new marketing channel and it is new brand in healthcare industry and customers may not know about our product. There is a risk that customers will choose other existing web-based channels. However, other tools cannot support the need in this particularly area. Therefore, we should do more advocacy for potential customers on the benefit of our developed Health Check In web application.

Threat of substitutes

The possible substitutes could be a survey program and paper-based questionnaire by researcher or medical company. However, it is time consuming for collecting and do data analyzing. Thus, by this developed application, it is time and switching cost saving for operational efficiency, work productivity and minimizing their expense on the paper based survey about customer. Therefore, Health Check In has a positive way in this force.

Rivalry among competitors

The market research company aimed to provide market's data analysis report, which was considered being competitors like marketresearchintellect.com, crediblemarkets.com and researchandmarkets.com. The market had more competitive and firms that produce similar report platform, which is completing on user license's price. Nevertheless, those reports provided market outlook associated with non-psychological factors. It covered Southeast Asia, not specific only in Thailand. Therefore, Health Check In will take this chance to promote brand as a source of home testing database and provide strategies in the context of Thai culture via Thai language report. We are in the position of less rivalry among firms and this would be a favorable market for Health Check In.

6.2.2 SWOT Analysis

Strengths:

1) Health Check In web application was developed as academic principle supporting health industry. Therefore, this innovative tool is reliable to assist business distributors in target sale strategy and support customer for decision-making.

2) Health Check In web application supports medical self-testing as new product launch, which is source of the information to collect data from end user in Thailand and opportunity for further other market research on product development.

3) The operation on the web application requires less effort, convenient and generates fast result.

4) Using web application on cloud computing system can reduce the payment of service maintenance of the IT expert and requires less computer equipment.

Weaknesses:

1) Health Check In is an unknown brand in healthcare industry, therefore it needs more market research and to do a lot of publicity for the initial launching.
2) Data accessing without the access to the internet is not yet in placed, but potentially to develop in certain circumstance of operation
3) New product and not yet start business partnership for support trade activities.

Opportunities:

1) The government has a policy to support Thailand 4.0 or Digital Thailand.

2) Health Check In web application is the first mover for medical home self-testing which aimed to be a useful the self-testing database in Thailand.

3) Health Check In web application is platform as an individual or group of self-service**,** data hosted in the cloud, customer can access data at any time from any place without any specialized of IT skills.

4) Global marketing trends are stepping into the digital era or Marketing 4.0, therefore, it is a good opportunity for marketing tool platform and this is a possibility of eliminating unnecessary expense of marketing cost.

Threats:

1) Product manager and marketer probably have confidence in the traditional market.

2) Lack of trust in the cloud approach such as availability of data service, unpredictable of web performance and bugs in large-scale.

6.2.3 Organization

As the aspect of software development as an innovative tool to assist in decision making for design strategy and launching medical Self-testing product, the researcher has an idea of establishing a startup company. The objective of the company is to provide innovative tool and examine customers insight not limited to policy maker but also medical home testing provider, researcher. Our start-up company has one chief executive officer acts also as financial manager to run three of business function, which consists of sales & marketing, operation, and administrator.

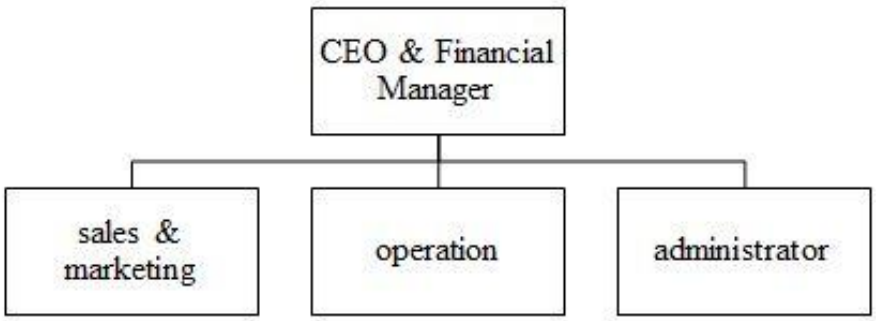

Figure 6.1 Organization Chart

6.2.4 4P Marketing strategy

Marketing mix is used as a tool for attracting customers to our business and achieving marketing's objectives. The four P's of marketing are consisting of product, price, place and promotion.

Product

In this study, we provide Health Check In innovative tool. It is a web application to identify potential customer who has high adoption intention to use medical home testing. This tool can identify who customer are and where they live by checking at customer profile including the psychological factors. Moreover, Health Check In provides strategies from the university's experts. Administrator is able to access the tool via internet at computer or mobile.

Price

The medical company, who may interest in home testing market, could purchase the software one time including program installation, training and system maintenance, annual subscription, a specific report as well as consultation service from the host. There are several different products within the developed application. The customer can be offered the package at a lower price at a package deal for the bundle pricing rather than higher cost if purchase items separately.

Place

Place means distributing channels of the product to the customers. For Health Check In program, it will be supplied directly to customer. The advantage of the direct sales by sales representative could provide the details of the program and providing of product discussion what the customer concern about the product including the price and updating promotion. In addition, the company will promote the product via company's website that will be officially seen by customers.

Promotion

Promotion refer to advertising and the way that the company communicate about what the product is and how distributor can offer to the customers. In the early stage, the innovative tool has not widely known. The marketing campaigns is offered to customer for free sampling and applying admission for 1 month in order to stimulate customer demands. The system can be purchased during free period trial, and new installation training and system maintenance will be included for six months period without any expense. The promotion is advertised via company Web sites, social medial link, directly phone to potential customer and campaign to echo for spreading by word of mouth.

6.2.5 Financial plan

Table 6.7 Estimate cost of use non-exclusive licensing

Income	**Type**	**Cost per unit (Baht)**
1. Copy right to companies	Contact	120,000
2. User code from direct customers	User code	3,000

Table 6.8 Estimate company income from total sales from Years 1-5

Description	**Unit**	**Time (Year)**				
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Copy right to companies	Total	12	14	15	16	17
	Price	120,000	120,000	144,000	144,000	144,000
Income 1: Copy right to companies		1,440,000	1,680,000	2,160,000	2,304,000	2,448,000
2. User code from customers	Total	36	36	36	36	36
	Price	3,000	3,000	3,600	3,600	3,600
Income 2: User code from direct customers		108,000	108,000	129,600	129,600	129,600
Total income		1,548,000	1,788,000	2,289,600	2,433,600	2,577,600

Table 6.9 Estimate operational cost of investment

Description		**Time (Year)**	
		Year 0	**Year 3**
Cost of systemic development for cost of sales	1.1 Analyst and designer	35,000	7,000
	1.2 Programmer for software development	100,000	20,000
	1.3 Graphic design	35,000	7,000
	1.4 Installation and examination	30,000	6,000
	1.5 Expert and consultant	120,000	24,000
	1.6 Research and development of model evaluation	120,000	24,000
	1.7 Host and domain renting	60,000	12,000
	Total of software development	500,000	100,000
	1.8 Office furniture, stationary, computer, printer, fax, etc.	100,000	100,000
Cost estimation		600,000	200,000

Table 6.10 Estimation of administration and management

Description	Duration (Month)	Time (Year)					Remark
	Per month	Year 1	Year 2	Year 3	Year 4	Year 5	
1. Salary and wage cost	85,000	1,020,000	1,050,600	1,082,118	1,114,582	1,148,018.99	increase 3% per year
2. Water bill	500	6,000	6,180	6,365	6,556	6,753	
3. Electricity	1,500	18,000	18,540	19,096	19,669	20,259	
4. Telephone	2,000	24,000	24,720	25,462	26,225.45	27,012	
5. Office rent	15,000	180,000	185,400	190,962	196,691	202,592	
6. Transportation	2,000	24,000	24,720	25,462	26,225	27,012	
7.Communication and marketing promotion	3,000	36,000	37,080	38,192	39,338	40,518	
8. Office and stationary	2,000	24,000	24,720	25,462	26,225	27,012	
9. Installation and examination of system application	15,000	15,000	15,450	15,914	16,391	16,883	
10. Systemic monitoring and maintenance	5,000	5,000	5,150	5,305	5,464	5,628	
11. Training staff and installer of system	12,000	12,000	12,360	12,731	13,113	13,506	
12. Royalty fee to Chula		46,440	53,640	68,688	73,008	77,328	3% from total sales
13. Depreciation		20,000	20,000	20,000	20,000	20,000	
Total cost	143,000	1,430,440	1,478,560	1,535,756	1,583,488	1,632,522	

Table 6.11 Estimation of balance sheet budgeting

Description	Time (Year)				
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Income from copy right to companies	1,440,000	1,680,000	2,160,000	2,304,000	2,448,000
2. Income from user code of customers	108,000	108,000	129,600	129,600	129,600
Total income	1,548,000	1,788,000	2,289,600	2,433,600	2,577,600
Minus cost of software development from cost of sale					
Cost of software development and payment	100,000	100,000	120,000	120,000	120,000
Total cost of sale	100,000	100,000	120,000	120,000	120,000
Primary benefit	1,448,000	1,688,000	2,169,600	2,313,600	2,457,600
Reduction of expense for sale and management					
1. Salary and wage cost	1,020,000	1,050,600	1,082,118	1,114,582	1,148,019
2. Water	6,000	6,180	6,365	6,556	6,753
3. Electricity	18,000	18,540	19,096	19,669	20,259
4. Telephone	24,000	24,720	25,462	26,225	27,012
5. Office rent	180,000	185,400	190,962	196,691	202,592
6. Transportation	24,000	24,720	25,462	26,225	27,012
7. Communication and marketing promotion	36,000	37,080	38,192	39,338	40,518
8. Office and stationary	24,000	24,720	25,462	26,225	27,012
9. Installation and examination of system application	15,000	15,450	15,914	16,391	16,883
10. Systemic monitoring and maintenance	5,000	5,150	5,305	5,464	5,628
11. Training staff and installer of system	12,000	12,360	12,731	13,113	13,506
12. Royalty fee to Chula (3% of total sales)	46,440	53,640	68,688	73,008	77,328
13. Depreciation	20,000	20,000	20,000	20,000	20,000
Total management cost	1,430,440	1,478,560	1,535,756	1,583,488	1,632,522
Benefit from management	17,560	209,440	633,844	730,112	825,078
Earnings before interest and Tax	17,560	209,440	633,844	730,112	825,078
Tax (15%)	2,634	31,416	95,077	109,517	123,762
Net benefit	14,926	178,024	538,768	620,596	701,316

Table 6.12 Estimation of cash flow

Description	Time (Year)					
	Year 0	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Cash from business operation						
Net benefit	-	14,926	178,024	538,768	620,596	701,316
plus depreciation cost	-	20,000	20,000	20,000	20,000	20,000
plus cost of software development - cut out for payment		100,000	100,000	120,000	120,000	120,000
Project operating cash flow	-	134,926	298,024	678,768	760,596	841,316
2. Cash flow from investment activity						
Cost of systemic development for cost of sale	-600,000	0	0	-100,000	0	0
Cash from investment	-600,000	-	-	-100,000	0	0
3. Cash flow from financial fund raising activity						
Cost of registration	1,000,000		0	0	0	0
Cash from cash raising/cash procurement	1,000,000		0	0	0	0
4. Changes of cash flow	400,000	**134,926**	**298,024**	**578,768**	**760,596**	**841,316**
Cash balance at the beginning	-	400,000	134,926	432,950	1,011,718	1,772,313
Cash balance at the end	400,000	534,926	432,950	1,011,718	1,772,313	2,613,630

6.2.6 Project cost-effectiveness assessment

Table 6.13 Cash flow and cumulative cash flow Years 1-5

End of Year	Net Cash Flow (After Taxes) (THB)	Accumulated Cash Flow (THB)
0	-600,000	-600,000
1	134,926	-465,074
2	298,024	-167,050
3	578,768	411,718
4	760,596	1,172,313
5	841,316	2,013,630

Payback period = 2+ (167,050/411,718)

= 2.4 years

Table 6.14 Indicators for project investment decision

Measurement of return investment	Base case
Net Present Value ; NPV (THB)	582,227 THB
Internal Rate of Return; IRR (%)	54 %
Payback period (Year)	2 years and 4 months
Discount rate (%)	25%

The commercialization of Health Check In application from the first year to year's five demonstrated positive earnings after tax at the end of the year as presented in Table 6.11 and a positive project operating cash flow showed in Table 6.12. The initial investment of registration was 1,000,000 baht that will generate a net cash flow of 2,613,630 baht for the entire sixty months. Regarding of project cost-effectiveness assessment result demonstrated payback period as 2.4 years, Net Present Value (NPV) showed a positive returned of 582,227 THB with Internal Rate of Return (IRR) was 54% of which based on discount rate of 25% as summarized in Table 6.14. From the indicator of project investment, it was indicated that this project has considerable and acceptable rate for the investment.

Summary

This chapter provided evaluation of customer acceptability in application software development by measured technology acceptance model construct (TAM). Furthermore, commercialization part that presented Five-force industry analysis, SWOT analysis, 4P marketing strategy including financial plan and the cost impact by Project cost-effectiveness assessment.

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APPENDICES

APPENDIX A
QUESTIONNAIRE

แบบสอบถาม การสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเอง

<u>คำชี้แจง</u>

แบบสอบถามการสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเองฉบับนี้มี**วัตถุประสงค์เพื่อใช้ประกอบการวิจัย**ของสหสาขาวิชา ธุรกิจเทคโนโลยีและการจัดการนวัตกรรม จุฬาลงกรณ์มหาวิทยาลัย ผู้วิจัยจึงขอความอนุเคราะห์ท่านกรอกแบบสอบถามฉบับนี้ตามความเห็นของท่าน การตอบแบบสอบถามของท่านมิได้มีผลกระทบต่อท่านแต่อย่างใด ข้อมูลทั้งหมดจะถูกเก็บเป็นความลับและใช้เพื่อประกอบการศึกษาเท่านั้น

หมายเหตุ : ชุดตรวจด้วยตนเอง หมายถึง ชุดการทดสอบที่ท่านทำการเก็บตัวอย่างเช่น เลือด ปัสสาวะ เซลล์ในช่องคลอด ทำการทดสอบและแปลผลการตรวจตามคู่มือของชุดตรวจด้วยตัวท่านเอง ตัวอย่างชุดตรวจด้วยตนเองในปัจจุบันเช่น ชุดทดสอบการตั้งครรภ์ ชุดตรวจระดับน้ำตาลในเลือด เป็นต้น

<u>ตอนที่ 1</u> ข้อมูลทั่วไป (โปรดทำเครื่องหมาย ☑ ลงในช่องที่ท่านต้องการตอบ)

1. **เพศ** ☐ ชาย ☐ หญิง
2. **อายุ** ☐ 18-25 ปี ☐ 26-35 ปี ☐ 36-45 ปี
   ☐ 46-55 ปี ☐ 56-65 ปี ☐ มากกว่า 65 ปี
3. **การศึกษา** ☐ ประถมศึกษา ☐ มัธยมศึกษาตอนต้น ☐ มัธยมศึกษาตอนปลายหรือปวช. ☐ อนุปริญญาหรือ ปวส. ☐ ปริญญาตรี ☐ ปริญญาโทหรือสูงกว่า
4. **อาชีพ** ☐ นิสิต-นักศึกษา ☐ พนักงานเอกชน ☐ แม่บ้าน ☐ ลูกจ้าง ☐ ราชการ/รัฐวิสาหกิจ ☐ ธุรกิจส่วนตัว/ค้าขาย ☐ พนักงานมหาวิทยาลัย ☐ อื่นๆ .....
5. **รายได้เฉลี่ยของครอบครัวต่อเดือน** .
   ☐ น้อยกว่า 10,000 บาท ☐ 10,001-15,000 บาท ☐ 15,001-30,000 บาท
   ☐ 30,001-45,000 บาท ☐ 45,001-60,000 ☐ มากกว่า 60,000 บาท

6. **สถานภาพการสมรส** ☐ โสด ☐ สมรสหรืออยู่ร่วมกัน ☐ หย่าร้าง, หม้าย หรือแยกกันอยู่
7. **ท่านมีประกันสุขภาพแบบใด** ☐ มีประกันส่วนตัว ☐ ประกันสังคม ☐ บัตรทอง ☐ ประกันกลุ่ม ☐ สิทธิ์ข้าราชการ ☐ ไม่มี
8. **ปัจจุบันท่านคิดว่าสุขภาพของท่าน** ☐ แข็งแรง ☐ ระดับปานกลาง ☐ ระดับต้องดูแล
9. **ท่านเคยใช้ชุดตรวจด้วยตนเองหรือไม่ (ตอบได้หลายข้อ)**
   ☐ เคย โปรดระบุ.....
   ☐ ไม่เคยใช้ชุดตรวจมาก่อน

<u>ตอนที่ 2</u> ความความคิดเห็นและทัศนคติของท่านต่อการยอมรับการใช้นวัตกรรมการตรวจวิเคราะห์ทางการแพทย์ด้วยตนเอง

<u>คำชี้แจง</u> โปรดพิจารณาความคิดเห็นต่อการใช้ชุดตรวจด้วยตนเองแล้วทำเครื่องหมาย X ลงในช่องที่ตรงกับระดับความเห็นของท่านมากที่สุดเพียงหนึ่งช่อง

ข้อคำถาม	ระดับความเห็น				
	5 เห็นด้วยอย่างยิ่ง	4 เห็นด้วย	3 ไม่แน่ใจ	2 ไม่เห็นด้วย	1 ไม่เห็นด้วยอย่างยิ่ง
หมวดที่ 1 : User centricity					
I. ความรู้เรื่องสุขภาพ					
1. การตรวจคัดกรองมะเร็งปากมดลูกช่วยค้นพบโรคได้ในระยะเริ่มแรก	5	4	3	2	1
2. การตรวจคัดกรองมะเร็งปากมดลูกช่วยให้การรักษาได้ผลดี	5	4	3	2	1
3. การตรวจติดตามระดับน้ำตาลในเลือดในผู้ป่วยโรคเบาหวานทำได้โดยใช้เครื่องตรวจน้ำตาลในเลือดด้วยตัวเอง	5	4	3	2	1
4. คอเลสเตอรอลสูงอาจเป็นอันตรายต่อระบบหัวใจและหลอดเลือด	5	4	3	2	1
II. พฤติกรรม					
1. ท่านดูแลสุขภาพของตัวท่านเองเป็นประจำ	5	4	3	2	1
2. ท่านใส่ใจดูแลสุขภาพของคนรอบข้างอยู่เสมอ	5	4	3	2	1
3. ท่านชอบที่จะหาวิธีการในการดูแลสุขภาพของตัวเอง	5	4	3	2	1
4. ท่านชอบแบ่งปันความรู้หรือประสบการณ์เรื่องการดูแลสุขภาพให้กับผู้อื่น	5	4	3	2	1
III. ผลลัพธ์ที่คาดหวัง	5	4	3	2	1
1.การใช้ชุดตรวจด้วยตนเองที่บ้านจะทำให้ท่านต้องการไปพบแพทย์ถ้าผลการตรวจออกมาว่าท่านมีโอกาสเป็นโรคนั้น (ผลบวก)	5	4	3	2	1
2. การใช้ชุดตรวจด้วยตนเองที่บ้านจะสามารถตรวจพบโรคร้ายแรงในระยะเริ่มแรกได้	5	4	3	2	1
IV. ทัศนคติ					
1. ท่านคิดว่าการใช้ชุดตรวจด้วยตนเองไม่ผิดศีลธรรม	5	4	3	2	1
2. ท่านว่าการใช้ชุดตรวจด้วยตนเองเป็นเรื่องถูกต้องและไม่ผิดศีลธรรมต่อบุคคลรอบข้าง	5	4	3	2	1
หมวดที่ 2 : Health belief					
V. การรับรู้ความเสี่ยงและรุนแรงของโรค					
1. ท่านคิดว่าท่านมีความเสี่ยงที่จะเป็นโรคร้ายแรง	5	4	3	2	1
2. เมื่อท่านทราบว่าท่านติดเชื้อ ท่านน่าจะมีความวิตกกังวลว่าท่านจะเป็นโรคร้ายแรง	5	4	3	2	1
3. ท่านคิดว่าการตรวจพบโรคร้ายแรงที่ล่าช้า อาจจะทำให้การรักษามีความยากลำบาก	5	4	3	2	1

ข้อคำถาม	ระดับความเห็น				
	5 เห็นด้วยอย่างยิ่ง	4 เห็นด้วย	3 ไม่แน่ใจ	2 ไม่เห็นด้วย	1 ไม่เห็นด้วยอย่างยิ่ง
4. ท่านคิดว่าถ้าท่านเป็นโรคร้ายแรง ชีวิตของท่านจะเปลี่ยนไป	5	4	3	2	1
5. ท่านคิดว่าถ้าท่านเป็นโรคร้ายแรง จะส่งผลต่อสถานะทางการเงินของท่าน	5	4	3	2	1
6. ท่านรู้สึกกลัวที่จะเป็นโรคร้ายแรง	5	4	3	2	1
7. ท่านคิดว่าถ้าท่านเป็นโรคร้ายแรง จะทำให้คนที่ใกล้ชิดท่านลำบาก	5	4	3	2	1
VI.การรับรู้อุปสรรคของการใช้ชุดตรวจ					
1. ที่บ้านท่านไม่มีสถานที่ที่เป็นส่วนตัวเพื่อใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
2. ราคาของชุดตรวจด้วยตนเองเป็นอุปสรรคต่อการซื้อชุดตรวจ	5	4	3	2	1
3. ท่านไม่แน่ใจกับความถูกต้องของผลลัพธ์จากการใช้ชุดตรวจ	5	4	3	2	1
4. การใช้ชุดตรวจด้วยตนเอง ทำให้ท่านวิตกกังวลว่าจะเป็นโรคนั้น ๆ มากขึ้น	5	4	3	2	1
5. ท่านรู้สึกอายและละอายใจเมื่อใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
6. ท่านกังวลว่าถ้าคนอื่นรู้ว่าท่านใช้ชุดตรวจด้วยตนเอง เขาอาจคิดว่าท่านเป็นโรคที่ไม่อาจเปิดเผยได้	5	4	3	2	1
VII. การรับรู้ประโยชน์					
1. การใช้ชุดตรวจด้วยตนเองช่วยเก็บความลับของท่าน	5	4	3	2	1
2. การใช้ชุดตรวจด้วยตนเองน่าจะลดความอายต่อเจ้าหน้าที่ทางการแพทย์ที่เก็บตัวอย่างสิ่งส่งตรวจจากร่างกายท่าน เช่น การเก็บตัวอย่างจากปากมดลูก	5	4	3	2	1
3. การใช้ชุดตรวจด้วยตนเองให้ผลรวดเร็วและให้ความสะดวกกว่าไปโรงพยาบาล	5	4	3	2	1
4. การใช้ชุดตรวจด้วยตนเองทำให้ท่านทำการตรวจที่ไหน ได้ตามต้องการ	5	4	3	2	1
5. ท่านสามารถเช็คสถานะสุขภาพของตัวท่านเอง จากการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
VIII. สมรรถนะตนเอง					
1. ท่านมั่นใจว่าสามารถใช้ชุดตรวจด้วยตนเองที่บ้านได้	5	4	3	2	1
2. ท่านสามารถตรวจและแปลผลการตรวจด้วยตัวเองจากการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
3. ท่านเป็นคนตัดสินใจซื้อชุดตรวจด้วยตัวท่านเอง	5	4	3	2	1
หมวดที่ 3 : Health experience					
IX. ประสบการณ์วัยเด็ก					
1. ในวัยเด็กท่านชอบเรียนวิชาที่เกี่ยวกับการดูแลสุขภาพ เช่น วิชาสุขศึกษา พละศึกษา	5	4	3	2	1
2. ในวัยเด็กท่านรู้สึกว่าครอบครัวให้ความสำคัญเรื่องการดูแลสุขภาพ	5	4	3	2	1
3. ในวัยเด็กท่านทำกิจกรรมด้านสุขภาพที่โรงเรียน	5	4	3	2	1

ข้อคำถาม	ระดับความเห็น				
	5 เห็นด้วยอย่างยิ่ง	4 เห็นด้วย	3 ไม่แน่ใจ	2 ไม่เห็นด้วย	1 ไม่เห็นด้วยอย่างยิ่ง
4. ในวัยเด็กท่านมีความสุขที่ได้ช่วยเหลือผู้อื่นด้านสุขภาพ	5	4	3	2	1
5. ในวัยเด็กท่านได้รับข่าวสารด้านสุขภาพเป็นประจำ	5	4	3	2	1
X. พลเมืองด้านสุขภาพ					
1. ท่านบริจาคเงินในการสร้างโรงพยาบาลหรือซื้ออุปกรณ์ทางการแพทย์	5	4	3	2	1
2. ท่านเคยเป็นอาสาสมัครทางด้านสุขภาพ	5	4	3	2	1
3. ท่านติดตามข่าวสารด้านสุขภาพ	5	4	3	2	1
4. ท่านเคยเข้าร่วมโครงการด้านสุขภาพ	5	4	3	2	1
5. ท่านชอบซื้อสินค้าที่ช่วยรักษาสุขภาพ	5	4	3	2	1
หมวดที่ 4 : Personality trait					
XI. บุคลิกภาพ					
1. ท่านเป็นคนกระตือรือร้น	5	4	3	2	1
2. ท่านเข้ากับผู้อื่นได้อย่างง่ายดาย	5	4	3	2	1
3. ท่านเป็นมิตรกับผู้อื่น	5	4	3	2	1
4. ท่านรู้สึกลำบากใจที่จะโต้แย้งกับผู้อื่น	5	4	3	2	1
5. ท่านเป็นคนตัดสินใจรวดเร็ว	5	4	3	2	1
6. ท่านเป็นคนมีความเชื่อมั่นในตนเอง	5	4	3	2	1
7. ท่านมีความสุขในการใช้ชีวิต	5	4	3	2	1
8. ท่านทำให้คนรอบข้างมีความสุข	5	4	3	2	1
9. ท่านยอมรับในโชคชะตา	5	4	3	2	1
10. ท่านชอบที่จะเรียนรู้เกี่ยวกับความคิดใหม่ๆ	5	4	3	2	1
11. ท่านชอบเปิดรับเทคโนโลยีใหม่ๆในการดูแลสุขภาพ	5	4	3	2	1
12. ท่านชอบติดตามเทคโนโลยีใหม่ๆ	5	4	3	2	1
13. ท่านอยากจะลองเสี่ยงอะไรใหม่	5	4	3	2	1
หมวดที่ 5 : Social influence					
XII. อิทธิพลทางสังคม					
1. คู่สมรสของท่านคิดว่าเป็นเรื่องดีที่ท่านใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
2. ครอบครัวของท่านให้การสนับสนุนการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
3. เพื่อนของท่านให้คำแนะนำการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
4. ท่านทำตามความคิดเห็นของคู่สมรส	5	4	3	2	1
XIII. อิทธิพลทางสาธารณะ					
1. ท่านศึกษาข้อมูลในโลกออนไลน์	5	4	3	2	1
2. ท่านรับฟังคำแนะนำของพนักงานที่ร้านขายเครื่องมือแพทย์	5	4	3	2	1
3. ท่านรับฟังความคิดเห็นของคนที่เคยใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
4. ท่านรับฟังคำแนะนำของดารา นักแสดงที่ท่านรู้จัก	5	4	3	2	1
5. ท่านรับฟังคำแนะนำของคนที่เป็นโรคเดียวกับท่าน	5	4	3	2	1
6. ท่านรับฟังความคิดเห็นของคุณหมอ	5	4	3	2	1

ข้อคำถาม	ระดับความเห็น				
	5 เห็นด้วยอย่างยิ่ง	4 เห็นด้วย	3 ไม่แน่ใจ	2 ไม่เห็นด้วย	1 ไม่เห็นด้วยอย่างยิ่ง
หมวดที่ 6 : Product feature					
XIIII. ลักษณะของผลิตภัณฑ์					
1. ยี่ห้อของชุดตรวจ	5	4	3	2	1
2. องค์กรที่คิดค้นชุดตรวจ	5	4	3	2	1
3. ชุดตรวจใช้งานง่าย	5	4	3	2	1
4. ความถูกต้องของชุดตรวจด้วยตนเอง	5	4	3	2	1
5. บรรจุภัณฑ์ของชุดตรวจ	5	4	3	2	1
6. ชุดตรวจที่มีการเก็บตัวอย่างตรวจภายในร่างกายเช่นเลือด หรือเก็บตัวอย่างในช่องคลอดด้วยตนเอง	5	4	3	2	1
7. ชุดตรวจที่ใช้ตัวอย่างจากภายนอกร่างกายเช่นน้ำลายหรือปัสสาวะ	5	4	3	2	1
8. คู่มือการใช้งานชุดตรวจ	5	4	3	2	1
9. ความปลอดภัยในการใช้งานชุดตรวจ	5	4	3	2	1

ท่านคิดว่าราคาของชุดตรวจด้วยตนเองที่บ้าน เช่นตรวจหามะเร็งปากมดลูก หรือตรวจหาการติดเชื้อเอชไอวี น่าจะอยู่ที่ราคา

☐ 100-200 บาท ☐ 201-300 บาท ☐ 301-400 บาท ☐ 401-500 บาท

☐ 501-600 บาท ☐ 601-1,000 บาท ☐ อื่นๆ โปรดระบุ.....บาท

2.ท่านคิดว่าข้อใดเป็นปัจจัยที่ท่านอยากจะใช้ชุดตรวจด้วยตนเองเพื่อตรวจเช็คสุขภาพตนเองที่บ้าน **(ตอบได้หลายข้อ)**

☐ ท่านทราบผลการตรวจได้อย่างรวดเร็ว

☐ ท่านต้องการดูแลรับผิดชอบสุขภาพของตนเอง

☐ ท่านได้รับชุดตรวจด้วยตนเองมาฟรี ไม่เสียค่าใช้จ่าย

☐ ท่านทราบผลการตรวจเพียงผู้เดียว ให้ความเป็นส่วนตัว

☐ ท่านร้องขอต่อแพทย์แต่แพทย์ไม่ตรวจให้

☐ ท่านสามารถเบิกค่าชุดตรวจได้จากสิทธิ์ ประกันสังคม หรือ สิทธิ์สปสช

☐ ชุดตรวจด้วยตนเองผ่านการขึ้นทะเบียนสำนักงานอาหารและยา (อย.)

☐ ท่านสะดวกที่จะเดินทางไปตรวจสุขภาพที่โรงพยาบาลมากกว่าตรวจเองที่บ้าน

☐ ท่านยุ่งมากจึงไม่สามารถที่จะใช้ชุดตรวจด้วยตนเองได้

3. ท่านสนใจซื้อชุดตรวจด้วยตนเองทางช่องทางใดมากที่สุด (**เลือกได้ 1 ข้อ)**

☐ ร้านขายยาทั่วไป ☐ ร้านขายอุปกรณ์การแพทย์และยา ☐ ในโรงพยาบาล

☐ ออนไลน์, ทางอินเตอร์เน็ต ☐ อื่นๆ โปรดระบุ.....

ตอนที่ 3 ข้อเสนอแนะอื่น ๆ ที่เป็นปัจจัยที่จะทำให้ท่าน**<u>ไม่ต้องการ</u>**ใช้ชุดตรวจด้วยตนเอง

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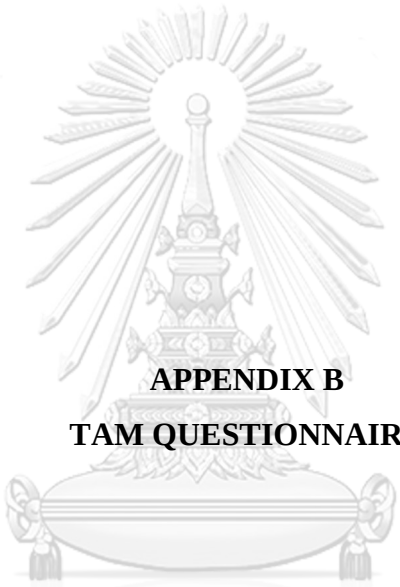
ขอบพระคุณที่ท่านสละเวลาตอบแบบสอบถาม ความคิดเห็นของท่านจะทำให้เกิดการพัฒนาต่อไปคะ



APPENDIX B
TAM QUESTIONNAIRE

แบบสอบถามการยอมรับการใช้นวัตกรรม

<u>คำชี้แจง</u>

แบบสอบถามการยอมรับนวัตกรรมการสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเองฉบับนี้มี**วัตถุประสงค์เพื่อใช้ประกอบการวิจัย**ของสหสาขาวิชา ธุรกิจเทคโนโลยีและการจัดการนวัตกรรม จุฬาลงกรณ์มหาวิทยาลัย ผู้วิจัยจึงขอความอนุเคราะห์ท่านกรอกแบบสอบถามฉบับนี้ตามความเห็นของท่าน การตอบแบบสอบถามของท่านมิได้มีผลกระทบต่อท่านแต่อย่างใด ข้อมูลทั้งหมดจะถูกเก็บเป็นความลับและใช้เพื่อประกอบการศึกษาเท่านั้น

แบบสอบถามชุดนี้ประกอบไปด้วยคำถามทั้งหมด 5 ตอน ดังนี้

ตอนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม (4 ข้อ)

ตอนที่ 2 ด้านความพร้อมของนวัตกรรมการสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเอง (10 ข้อ)

ตอนที่ 3 การประเมินการยอมรับนวัตกรรมการการสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเอง (19 ข้อ)

ตอนที่ 4 ความคิดเห็นต่อรูปแบบการนำไปใช้ประโยชน์เชิงพาณิชย์ (2 ข้อ)

ตอนที่ 5 ข้อเสนอแนะ

ขอขอบพระคุณเป็นอย่างสูงที่ให้ความร่วมมือเป็นอย่างดียิ่ง มา ณ โอกาสนี้

<u>ตอนที่ 1</u> ข้อมูลทั่วไป (โปรดทำเครื่องหมาย ☑ ลงในช่องที่ท่านต้องการตอบ)

1. เพศ ☐ ชาย ☐ หญิง

2. อายุ ☐ ต่ำกว่า 25 ปี

☐ 25-35 ปี

☐ 36-45 ปี

☐ 46-55 ปี

☐ มากกว่า 55 ปี

3. ตำแหน่ง ☐ ผู้แทนขายสินค้า

☐ ผู้เชี่ยวชาญผลิตภัณฑ์

☐ ผู้จัดการผลิตภัณฑ์

☐ ผู้จัดการการตลาด

☐ ผู้จัดการแผนก

☐ ลูกค้าทั่วไป

☐ อื่นๆ โปรดระบุ.....

4. การศึกษา ☐ อนุปริญญาหรือ ปวส.

☐ ปริญญาตรี

☐ ปริญญาโท

☐ ปริญญาเอก

☐ อื่นๆ โปรดระบุ.....

<u>ตอนที่ 2</u> ด้านความพร้อมการทำงานของนวัตกรรมการสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเอง

<u>คำชี้แจง</u> โปรดพิจารณาความคิดเห็นต่อการใช้ชุดตรวจด้วยตนเองแล้วทำเครื่องหมาย X ลงในช่องที่ตรงกับระดับความเห็นของท่านมากที่สุดเพียงหนึ่งช่อง

ข้อคำถาม	ระดับความเห็น				
	5 เห็นด้วยอย่างยิ่ง	4 เห็นด้วย	3 ไม่แน่ใจ	2 ไม่เห็นด้วย	1 ไม่เห็นด้วยอย่างยิ่ง
I. ด้านความสามารถของระบบ					
1. การประมวลผลของระบบมีความถูกต้อง	5	4	3	2	1
2. การประมวลผลของระบบมีความรวดเร็ว	5	4	3	2	1
3. ผลการประเมินสามารถนำไปวิเคราะห์ทางธุรกิจได้	5	4	3	2	1
II. ด้านรูปแบบการใช้งานของระบบ					
1. ระบบใช้งานง่าย	5	4	3	2	1
2. ความสวยงามของระบบ (User interface)	5	4	3	2	1
3. ความเสถียรภาพของระบบ	5	4	3	2	1
III. ด้านความปลอดภัยของข้อมูล					
1. ผู้ใช้สามารถกำหนดสิทธิของผู้ที่จะใช้งานในโปรแกรมได้	5	4	3	2	1
2. การกำหนดรหัสผู้ใช้และรหัสผ่าน (Username, Password) ในการเข้าใช้งาน ทำให้มีความปลอดภัยของข้อมูล	5	4	3	2	1
3. มีระบบป้องกันความปลอดภัย	5	4	3	2	1
4. มีผู้เชี่ยวชาญคอยดูแลระบบ	5	4	3	2	1

<u>ตอนที่ 3</u> การประเมินการยอมรับนวัตกรรมการสำรวจปัจจัยที่ส่งผลต่อการใช้ชุดตรวจด้วยตนเอง

<u>คำชี้แจง</u> โปรดพิจารณาความคิดเห็นต่อการใช้ชุดตรวจด้วยตนเองแล้วทำเครื่องหมาย X ลงในช่องที่ตรงกับระดับความเห็นของท่านมากที่สุดเพียงหนึ่งช่อง

ข้อคำถาม	ระดับความเห็น				
	5 เห็นด้วยอย่างยิ่ง	4 เห็นด้วย	3 ไม่แน่ใจ	2 ไม่เห็นด้วย	1 ไม่เห็นด้วยอย่างยิ่ง
I. ด้านการรับรู้ประโยชน์					
1. ระบบเป็นประโยชน์ต่อการช่วยตัดสินใจในการดำเนินธุรกิจ	5	4	3	2	1
2. ระบบช่วยให้การทำงานมีความรวดเร็ว	5	4	3	2	1
3. ระบบมีประโยชน์ในการบริหารจัดการงานให้มีประสิทธิภาพ	5	4	3	2	1
4. ระบบช่วยลดค่าใช้จ่ายในการทำงาน	5	4	3	2	1
5. ระบบช่วยเพิ่มผลิตผลการทำงาน	5	4	3	2	1
6. มีความเป็นนวัตกรรมที่สามารถประยุกต์ใช้กับงานได้จริง	5	4	3	2	1
II. ด้านการรับรู้ความง่ายในการใช้งาน					
1. ระบบการใช้งานมีความชัดเจนและเข้าใจง่าย	5	4	3	2	1
2. มีความง่ายในการที่จะเรียนรู้ใช้งานระบบ	5	4	3	2	1
3. การทำงานกับระบบไม่ได้ใช้ความพยายามมาก	5	4	3	2	1
4. ระบบช่วยลดขั้นตอนในการทำงาน	5	4	3	2	1
5. ระบบมีความยืดหยุ่นในการใช้งาน	5	4	3	2	1
6. ระบบใช้งานง่าย	5	4	3	2	1
III. ด้านทัศนคติที่มีต่อการใช้งาน					
1. การใช้นวัตกรรมสำรวจปัจจัยต่อการใช้ชุดตรวจด้วยตนเองเป็นเรื่องที่น่าสนใจ	5	4	3	2	1
2. ท่านเห็นประโยชน์ของนวัตกรรมสำรวจปัจจัยการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
3. ท่านเชื่อว่านวัตกรรมสำรวจปัจจัยการใช้ชุดตรวจฯสามารถประยุกต์ใช้งานได้จริง	5	4	3	2	1
IV. ด้านการยอมรับและใช้งานนวัตกรรม					
1. ท่านมีความสนใจนวัตกรรมสำรวจปัจจัยต่อการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
2. ท่านพิจารณาใช้งานนวัตกรรมสำรวจปัจจัยต่อการใช้ชุดตรวจด้วยตนเอง	5	4	3	2	1
3. ท่านสนใจจะใช้ระบบนวัตกรรมสำรวจปัจจัยต่อการใช้ชุดตรวจด้วยตนเองเมื่อเทียบกับระบบเดิม	5	4	3	2	1
4. ท่านจะแนะนำผู้อื่นให้ใช้ระบบนวัตกรรมสำรวจปัจจัยต่อการใช้ชุดตรวจฯ	5	4	3	2	1

<u>ตอนที่ 4</u> ความคิดเห็นต่อการนำไปใช้ประโยชน์เชิงพาณิชย์

1. ถ้านวัตกรรมการสำรวจปัจจัยต่อการใช้ชุดตรวจด้วยตนเองได้ถูกนำไปใช้งาน ท่านคิดว่ารูปแบบใดที่คุณสนใจใช้งาน

☐ ซื้อครั้งเดียวใช้งานได้ตลอด ☐ สมัครสมาชิกเป็นรายปี

☐ ซื้อเป็นเฉพาะรายงานๆ ☐ ซื้อบริการวิเคราะห์ผลจากผู้ทำระบบ

☐ อื่นๆ โปรดระบุ.....

2. ถ้านวัตกรรมการสำรวจปัจจัยต่อการใช้ชุดตรวจด้วยตนเองได้ถูกนำไปใช้งาน ท่านคิดว่า**รูปแบบการพัฒนาในเชิงพาณิชย์**ควรเป็นรูปแบบใด?

☐ การขาย (Selling)

☐ การอนุญาตให้ใช้สิทธิโดยไม่จำกัดแต่เพียงผู้เดียว (Non-Exclusive licensing)

☐ การอนุญาตให้ใช้สิทธิโดยเด็ดขาด (Exclusive Licensing)

☐ อื่นๆ โปรดระบุ.....

<u>ตอนที่ 5</u> ข้อเสนอแนะ

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VITA

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PLACE OF BIRTH	Phrae
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PUBLICATION	Tatu T, Prakunwisit D, Sayachak S, Chiampanichayakul S, Kasinrerk W. RBC Count and Its Differentiation Potential among α-Thalassemia (SEA type), β-Thalassemia and HbE Heterozygotes. CMU. J. Nat. Sci. (2007) Vol. 6(1).