INVESTIGATING USER ACCEPTANCE OF *ENOTIFIKASI* (COMMUNICABLE DISEASE CONTROL INFORMATION SYSTEM) AMONG MALAYSIAN PUBLIC HEALTH OFFICERS USING A TECHNOLOGY ACCEPTANCE MODEL

By

KEE CHIA CHOON

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ABSTRACT

**INVESTIGATING USER ACCEPTANCE OF *ENOTIFIKASI*
(COMMUNICABLE DISEASE CONTROL INFORMATION
SYSTEM) AMONG MALAYSIAN PUBLIC HEALTH
OFFICERS USING A TECHNOLOGY
ACCEPTANCE MODEL**

Kee Chia Choon

The main focus of this research is to investigate user acceptance of *eNotifikasi*

(or Communicable Disease Control Information System) among Malaysian

public health officers through an empirical study. A self-administered

questionnaire was used to collect data from 50 public health officers. The

questionnaire comprised of six sections. These sections include: (i) section A-

user background; (ii) section B- comprised questions asking about the training

support and users' knowledge in *eNotifikasi*; and sections C to F requesting

users to rate their level of agreement (i.e. 1= Strongly Disagree, 2= Disagree,

3= Neutral, 4= Agree, 5= Strongly Agree) about use of *eNotifikasi* with several

statements built into the four research constructs namely users' satisfaction

with IT technical support, perceived usefulness, perceived ease of use, and

behavioural intention to use *eNotifikasi*. The questionnaire was pilot-tested

and has demonstrated a high level of internal consistency and reliability

among items. The Cronbach's alpha coefficients of the four research

constructs are 0.930 (users' satisfaction with IT technical support), 0.747

(perceived usefulness), 0.859 (perceived ease of use), and 0.914 (behavioural

intention to use *eNotifikasi*). The research findings showed that users intend to

use *eNotifikasi* to manage the cases of communicable diseases. The findings also revealed that training support is the only influential factor that had a significant effect on the perceived usefulness (PU) and perceived ease of use (PEOU) of *eNotifikasi*, of the three external factors identified though literature reviews (i.e. user background such as gender, age, job classification, division/unit, length of public services experience, training support and users' satisfaction with IT technical support). Besides, the findings indicated that there was a significant relationship between PEOU and PU of *eNotifikasi*, so as the relationship between these two variables and users' behavioural intention to use *eNotifikasi*. Overall, all the research objectives formed have been successfully achieved.

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SUBMISSION OF DISSERTATION

It is hereby certified that **KEE CHIA CHOON** (ID No: **09UEM08882**) has completed this dissertation entitled "**INVESTIGATING USER ACCEPTANCE OF** *ENOTIFIKASI* **(COMMUNICABLE DISEASE CONTROL INFORMATION SYSTEM) AMONG MALAYSIAN PUBLIC HEALTH OFFICERS USING A TECHNOLOGY ACCEPTANCE MODEL**" under the supervision of Dr. Siew Pei Hwa (Supervisor) from the Department of Multimedia Design & Animation, Faculty of Creative Industries.

I understand that University will upload softcopy of my dissertation in pdf format into UTAR Institutional Repository, which may be made accessible to UTAR community and public.

Yours truly,

_____

(KEE CHIA CHOON)

APPROVAL SHEET

This dissertation entitled "**INVESTIGATING USER ACCEPTANCE OF *ENOTIFIKASI* (COMMUNICABLE DISEASE CONTROL INFORMATION SYSTEM) AMONG MALAYSIAN PUBLIC HEALTH OFFICERS USING A TECHNOLOGY ACCEPTANCE MODEL**" was prepared by KEE CHIA CHOON and submitted as partial fulfillment of the requirements for the degree of Master of Information Systems at Universiti Tunku Abdul Rahman.

Approved by:

_____
(Asst. Prof. Dr. SIEW PEI HWA)
Date: 16th April 2013
Assistant Professor/Supervisor
Department of Multimedia Design & Animation
Faculty of Creative Industries
Universiti Tunku Abdul Rahman

DECLARATION

I **KEE CHIA CHOON**, hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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(KEE CHIA CHOON)

Date: 16th April 2013

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LIST OF ABBREVIATIONS

Abbreviation

AMRO   Assistant Medical Record Officer (*Penolong Pegawai Rekod Perubatan*)

BITU   Behavioural Intention to Use

BKP   Disease Control Division (*Bahagian Kawalan Penyakit*)

BPM   Information Management Division (*Bahagian Pengurusan Maklumat*)

BRFSS   Behavioural Risk Factor Surveillance System

CDC   Centers for Disease Control and Prevention (*Pusat Kawalan dan Pencegahan Penyakit Berjangkit*)

CDCIS   Communicable Disease Control Information System (*eNotifikasi*)

CHSI   Community Health Status Indicators

e-Government   Electronic Government

HHS   Health and Human Services'

ICT   Information and Communication Technologies

IS   Information System

IT   Information Technology

MOH   Ministry of Health

PPKP   Assistant Environmental Health Officer (*Penolong Pegawai Kesihatan Persekitaran*)

PEOU   Perceived Ease of Use

PIS   Public Information System

PU   Perceived Usefulness

SM2   e-Measles (*Sistem Measles versi 2*)

SPSS	Statistical Package for Social Science
STI	Sexually Transmitted Infectious (*Penyakit Berjangkit Melalui Hubungan Seks*)
TAM	Technology Acceptance Model
TB	Tuberculosis and Leprosy (*TIBI*)
TBIS	Tuberculosis Information System
TPB	Theory of Planned Behaviour
TRA	Theory Reason Action
Vector	Vector Borne Disease (*Penyakit Bawaan Vektor*)

CHAPTER 1

INTRODUCTION

1.1   Introduction

The introduction of information technology (IT) gives a great impact on the way work is being performed. The government of Malaysia is encouraging public sector workers to use IT to improve the efficiency of public sector (PEMANDU 2010). In general, IT covers all the components of hardware, software, network, database and computer applications (Thompson 2010). One of the most important emerging applications of IT is electronic government (e-Government).

E-Government is defined as "the use of information technology to support government operations, engage citizens, and provide government services" (Daws, cited in Nordfors et al., 2009). The Government system, as any technological system provides many benefits to users. Some of the benefits include increase efficiency, increase transparency, being cost effective, reduce paper works, ensure instant response, available 24 hours a day/ 7 days a week, improve service quality, and enhance citizens involvement (Kim 2009; Soud et al., 2010). An e-Government system also enables citizens and business organisations to implement transactions electronically with related government agencies, and to ensure high level of collaboration and information sharing

between various governmental organisations (Soud et al., 2010).

In Malaysia, the Vision of the e-Government is to transform administrative process and service delivery through the use of IT and multimedia (Masrek 2009). The use of information systems to perform daily tasks in Malaysian public sectors has been steadily increasing since the implementation of e-Government. O'Brien (1999, cited in Masrek 2009, p. 10) defines information systems as "an organised combination of people, hardware, software, communication network, and data resources that collects, transform and disseminates information in an organisation". Furthermore, Sundgren (2005, cited in Masrek 2009, p. 10) has defined public information systems as "information systems available for public use". Therefore, building upon the definition by these two scholars', Masrek (2009, p. 10) defines public information system (PIS) as "an organized combination of people, hardware, software, communication network, and data resources that collects, transform and disseminates information for public use".

The implementation of PIS in Malaysian government is still and will continue to evolve. Through literature reviews, it was discovered that numerous empirical studies have been conducted to evaluate the PIS effectiveness from few dimensions such as systems quality, information quality, perceived usefulness and perceived ease of use and satisfaction from the user's perspective. This research focuses on the implementation of one of the Malaysian public health information systems called *eNotifikasi* or Communicable Diseases Control Information System that have been

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undertaken by the Malaysian government as part of its e-government effort to effectively control communicable Diseases. Generally, public health information systems are critical to effective public health practice and management.

This research aims to propose a research model based on the Technology Acceptance Model where different types of external factors are identified, and how they affect the core variables: Perceived Usefulness and Perceived Ease of Use of a Health Management Information Systems called *eNotifikasi*. It also aims to examine the relationship between these two core variables and behavioural intention to use the *eNotifikasi* among Malaysian public health officers.

1.2   Research Background

Various information and communication technologies (ICT) projects have been implemented to serve the needs of the Malaysian e-Government. One of these ICT projects includes the deployment of public information systems (PIS). PIS projects were deployed to enhance both efficiency and service delivery to the public while, at the same time, fostering a partnership between the government, citizens and business service delivery (Masrek 2009). Among the diverse PIS projects that were implemented, several PIS projects for public health surveillance of communicable diseases were deployed to accommodate the needs of healthcare in Malaysia. Several public health

disease surveillance systems are currently in use, notably the *eNotifikasi* or Communicable Diseases Control Information System, Tuberculosis Information System (TBIS), e-Dengue and e-Measles (also known as *Sistem Measles Versi 2* or *SM2*) (Valdez 2011). However, this research focuses only on the effectiveness or success of *eNotifikasi* from the user's persepctive.

eNotifikasi (formerly known as CDCIS, an acronym for **C**ommunicable **D**isease **C**ontrol **I**nformation **S**ystem) was launched on 2 January 2011. It is a web-based application which is available at http://enotifikasi.moh.gov.my. Figure 1.1 shows the login page of the *eNotifikasi*. It can be assessed by authorised public health officers with a registered username and password. It is a nationwide network that links all health facilities (hospitals and clinics), Centres for Disease Control and Prevention unit in each District Health Office, State Health Department, and Disease Control Division under the National Department of Public Health through the network of Ministry of Health (MOH) Malaysia.

The *eNotifikasi* development project was implemented by Disease Control Division (*Bahagian Kawalan Penyakit* or BKP), MOH Malaysia. The *eNotifikasi* modules were developed by IT vendor. These modules are General (*Am*), Registration (*Pendaftaran*), Query (*Pertanyaan*), Maintenance (*Penyelenggaraan*), Download (*Muat Turun*) and Report (*Laporan*). The *eNotifikasi* is then maintained by Information Management Division (*Bahagian Pengurusan Maklumat* or BPM), MOH Malaysia (Ooi 2007; Shuib 2010).
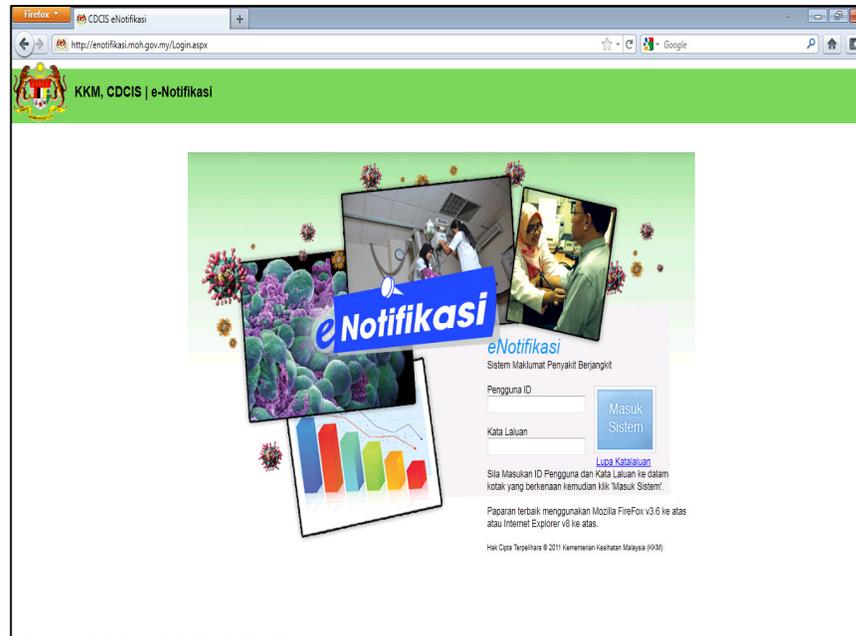
Figure 1.1: Screenshot from the login page of *eNotifikasi*

Drotman and Strassburg (cited in Luck 2002) noted that surveillance of communicable diseases is a fundamental public health activity. The *eNotifikasi* has been developed to notify and monitor communicable disease cases in Malaysia. It was developed in accordance with the Prevention and Control of Infectious Disease Act 1988 (or *Akta CDC 1988*) in which all the communicable diseases cases must be notified by all health facilities (public and private hospitals and clinics) and District Health Offices in Malaysia as fast as posible (usually within 24 hours) in an efficient and effective manner.

The notification data that input into the *eNotifikasi* at health facilities (public and private hospitals and clinics) and action taken (i.e. registered and transferred cases) by District Health Office are able to be accessed and retrieved by State Health Department and Ministry of Health directly. This

enables the state and national level to take prompt action to prevent and control diseases from spreading to wider area. In addition, *eNotifikasi* allows users to generate report and collect data to analyse. It gives alert to public health officers in state and national level before the communicable diseases become epidemic in the country. This also helps the Division of Disease Control to archieve its mission namely monitoring, controling and proving latest information about communicable diseases to the public. Figure 1.2 shows the activities and process flow of *eNotifikasi*.

Input notification by health facilities (public and private hospitals and clinics) to submit notification to nearest District Health Offices

The notification is verified by Assistant Environmental Health Officers (PPKP or *Penolong Pegawai Kesihatan Persekitaran*) in District Health Offices (CDC unit and Surveillance) (i.e. registered or transferred notification to other distict after verification)

Investigated by Assistant Environmental Health Officers (PPKP or *Penolong Pegawai Kesihatan Persekitaran*) in District Health Offices (CDC unit, Vector unit, TB unit and HIV/STI unit) (i.e. Requested to register as cases, requested to tranfer to other district or request ignored notification after investigation)

Supported by Head of Assistant Environmental Health Officers (PPKPK or *Penolong Pegawai Kesihatan Persekitaran Kanan*) in District Health Offices (i.e. supported to register as cases, approved to tranfer to other district or suppotrd to ignore the notification)

Approved by District Health Officers in District Health Offices (i.e. approved to register as cases or approved to ignore notification)

Figure 1.2: Activities and process flow of *eNotifikasi*

1.3   Problem Statement

User acceptance of technology adoption such as ICT products and systems is often the focus of information system implementation research in determining the success or failure of technology (Swanson 1988; Davis et al., 1989; Thompson et al., 1991; Davis 1993; Igbaria 1993, cited in Mokhsin @ Misron et al., 2011). Many information systems have failed during the last decades because users acceptance has many times been very low (Carr 2003; Fortune and Peters 2005, cited in Munir et al., 2011). The literature has provides evidence of failed clinical system implementations, due to lack of adoption by users (Lorenzi and Riley 1995; Lorenzi et al., 1995, cited in Morton 2008). The major problem prompted in this research is the lack of knowledge about the *eNotifikasi* acceptance among Malaysian public health officers which may determine the success or failure of *eNotifikasi* implementation.

The staff in Information Management Division had discovered the lack of *eNotifikasi* usage since the launch of the *eNotifikasi*. This can be traced from the *eNotifikasi* audit trail record. Researchers extended that the key of the problem could be a user (Venkatesh and Davis 1996, cited in Mokhsin @ Misron et al., 2011). The users of *eNotifikasi* comprises a variety of background, knowledge and IT technical skills. Hence, the user demographic attributes such as gender, age, job classification, experience and personality characteristics, users' knowledge and related IT technical skills may influence user acceptance of *eNotifikasi* use. Hence, one of the research objectives was

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to examine the factors that may influence the user's behavioural intention towards using *eNotifikasi* to manage communicable diseases cases.

System usefulness and ease of use may impact on individual behavioural intention towards using a system. Users may reject to use a system if it does not providing benefits and enhancing their job performance. Obermeyer and Pinto (2008, cited in Cakar 2011) draw attention to the importance of behavioural factors in achieving efficient use and acceptance of the system. There is a big concern for both investor and policymaker is whether their investments in information system really result in efficient productivity (Malhotra and Galletta 1999, cited in Cakar 2011). Therefore, it is important to understand and obtain users' opinions (i.e. their agreement or disagreement with a statement given) about the perceived usefulness and perceived ease of use of the implemented system like *eNotifikasi*.

1.4   Research Objectives and Hypotheses

The main focus of this research is to investigate user acceptance of *eNotifikasi* among Malaysian public health officers using a proposed technology acceptance model through an empirical study. Specifically, the following research objectives were formed:

i. To develop and empirically test a technology acceptance model which is built by using the core-ideas of Davis's Technology Acceptance Model (TAM).

ii. To identify influential factors that may affect users' perceived usefulness and perceived ease of use of *eNotifikasi*.

iii. To investigate the extent to which users perceive that the *eNotifikasi* is useful and easy to use, and their behavioural intention to use the *eNotifikasi* in their work.

iv. To examine the relationships between users' perceived usefulness, perceived ease of use and their behavioural intention to use *eNotifikasi*.

From the research objectives ii, iii and iv, the following hypotheses were formulated:

H1: Users perceive that *eNotifikasi* is useful and ease of use.

H2: The users' gender, age, job classification, division/unit, and length of public services experience have significant effects on the perceived usefulness of *eNotifikasi*.

H3: The users' gender, age, job classification, division/unit, and length of public services experience have significant effects on the perceived ease of use of *eNotifikasi*.

H4: There is a significant relationship between users' satisfaction with IT technical support and perceived usefulness of *eNotifikasi.*

H5:   There is a significant relationship between users' satisfaction with IT technical support and perceived ease of use of *eNotifikasi*.

H6:   There is a significant difference between trained and non-trained users' perceived usefulness and perceived ease of use of *eNotifikasi*.

H7:   There is a significant relationship between perceived ease of use and perceived usefulness of *eNotifikasi*.

H8:   Users intend to use *eNotifikasi* to manage the cases of communicable diseases.

H9:   There is a significant relationship between perceived usefulness and behavioural intention to use *eNotifikasi*.

H10:   There is a significant relationship between perceived ease of use and behavioural intention to use *eNotifikasi*.

1.5   Research Scope and Research Overview

This research aims to propose and validate a model of technology acceptance that could help the practitioners to investigate user acceptance of *eNotifikasi* by using the Malaysian public health officers as subjects. According to Davis (1989, cited in Kripanont 2007), practitioners evaluate systems for two purposes: (i) to predict acceptability, and (ii) to diagnose the reasons resulting in lack of acceptance and take proper measures to improve user acceptance.

Figure 1.3 illustrates the research activities that include several phases as follows:

    i.   The research starts with the review of literature related to this research. It includes the reviews of:

- prominent theories and models of user acceptance of information systems in organisations;

- factors associated with user acceptance of information systems in general, particularly *eNotifikasi*;

- definitions of keys terms used in the research such as perceived usefulness, perceived ease of use, behavioural intention, communicable disease, public health surveillance system, and so forth;

- past studies related to user acceptance of information systems.

    ii.   It followed by research methods that include procedures as below:

- Develop a technology acceptance model by using the core-ideas of Davis's Technology Acceptance Model (TAM);

- Construct survey instrument namely a self-administered questionnaire based on the proposed TAM;

- Pilot test and refine the survey questionnaire;

- Research samples selection;

- Distribute the self-administered questionnaire to selected research samples (i.e. 50 Malaysian public

health officers) to empirically test the proposed TAM and validate research objectives;

- The collected data are analysed using statistical methods such as descriptive analysis, independent-sample t-test, One-way ANOVA and Pearson correlation.

iii. Then, data analysis and the discussion of research findings are carried out which include the following steps:

- Code, analyse and interpret the data using SPSS (Statistical Package for Social Science).

- Test the null hypotheses formulated to empirically test the proposed TAM and validate the research objectives formed at the early stage of the research;

- Present research findings.

Investigate users' acceptance of *eNotifikasi*

Phase i

Literature review → Plan and list out significant factors → Develop research objectives and formulate hypotheses → Identify research constructs

Phase ii

Develop Proposed TAM

Design and construct survey questionnaire based on the proposed TAM

Pilot test and refine questionnaire

Research samples selection

Data collection

Phase iii

Data analysis → Empirically test the proposed TAM and research objectives validation → Present research findings

Figure 1.3: Research overview

1.6   Research Significance

This research attempts to investigate the user acceptance of *eNotifikasi* among Malaysian public health officers using the proposed technology acceptance model which is built by using the core-ideas of Davis's Technology Acceptance Model (TAM). The research also examines the influential factors such as the user background, training support and their satisfaction with IT technical support that may affect Malaysian public health officers' perception on *eNotifikasi* use in terms of perceived usefulness and perceived ease of use, which may determine their level of acceptance of *eNotifikasi*. Meantime, to what extent users perceive that the *eNotifikasi* is useful and easy to use may influence their behavioural intentions to use the *eNotifikasi* in their work. Their behavioural intentions to use the *eNotifikasi* will help to determine the success or failure of *eNotifikasi* implementation. Therefore, it is important to identify the influential factors that may affect the PU and PEOU of users which may lead to the behavioural intentions to use *eNotifikasi* among Malaysian public health officers.

In addition, this research also empirically tested the proposed TAM to examine the identified external factors and their significance effects on PU and PEOU which may contribute to the technology acceptance literature for public healthcare system in Malaysia. This may help public organization to formulate an approach to increase Malaysian public employees' commitment in using the online systems as part of the e-government implementation initiative. Hence, this may increase public sectors efficiency in delivery their services.

The implementation of public health surveillance system to manage the communicable diseases has become important in Malaysia in recent years. The public health surveillance system provide benefits to public health officers such as available online 24 hours a day/ 7 days a week to obtain information and monitor the cases of communicable disease, and able to generate report in a few minutes compare to the manually system which they need to fill in the notification form and fax it to the State Health Department and Ministry of Health (MOH) to report the cases of communicable diseases. This increased the public health officers' burden because they need to spend few days to obtain information, monitor the cases of communicable diseases and prepare the report. Therefore, this research is necessary since it may help the administration especially top management in Ministry of Health (MOH) to understand the importance of user acceptance during the implementation of the public health surveillance system to ensure this public information system project is successful.

1.7   Definition of Key Terms

This section defines several terms used in this research as follows:

- **External Variables:** External variables are various factors external to a technology acceptance model, such as demographic characteristics of users, situational constraints, and managerial controlled interventions that impinge behaviour. These external variables would therefore be determinants of

perceived usefulness and perceived ease of use, which are both antecedents of intention to use IT (Davis et al., 1989, cited in Thompson 2010).

- **Perceived Ease of Use:** Perceived ease of use is defined as "the degree to which a person believes that using a particular application system would be free effort" (Davis 1989, cited in Sui 2011, p. 7).

- **Perceived Usefulness:** Perceived usefulness is defined as "the degree to which a person believes that using a particular application system would enhance his or her job performance" (Davis 1989, cited in Sui 2011, p. 6).

- **Behavioural Intention:** Behavioural intention is a measure of the strength of a person's intention to perform a specified behaviour (Davis et al., 1989, cited in Thompson 2010).

- **End User Training:** End user training is a formal exercise provided to application users to provide information and guide them on using computer application (Week 2010).

- **IT Technical Support**: IT technical support refers to the availability of specialized personnel, such as IT staff or application administrator to answer questions regarding computer application usage, troubleshoot emergent problems during actual usage of application system, and to provide instructional and hand-on support to application user before and during usage (Kowitlawakul 2008).

1.8   Summary

eNotifikasi is a web-based application use to notify and monitor communicable disease cases in Malaysia. The purpose of this research is to investigate the user acceptance of *eNotifikasi* among public health officers from public hospitals, district health offices and states health departments in Malaysia.

Overall, this research validates the influences of research constructs built into the proposed TAM on Malaysian public health officers' acceptance of *eNotifikasi* and their behavioural intention to use the system. The research findings could provide guidelines for future implementation of other web-based systems in public sectors.

1.9   Dissertation Structure

Chapter 2 reviews the literature on existing theories, concepts and researches which are related to this research study which includes several topics such as communicable disease, epidemiological literature, user acceptance of system use, user acceptance models, perceived usefulness and perceived ease of use, external factors that influence PU and PEOU, and related studies.

Chapter 3 covers the research methodology topics such as proposed technology acceptance model (TAM), research samples, research instrument, and data analysis.

Chapter 4 analyses the data collected from the research samples through self-administered questionnaires. The data analysis is done using SPSS (Statistical Package for Social Science). It starts with the coding of data and is completed by interpreting the results to test the proposed TAM and hypotheses formulated.

Chapter 5 wraps up the discussion of the research which includes several topics such as overall conclusions from research outcomes, research contributions, as well as limitations and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter discusses a number of topics related to this research pertaining to user acceptance of system use and related topics. It helps to find out factors that may affect the user acceptance of computer technology or system use in organisations. Through literature reviews, the determinants of user acceptance of the use of a Health Management Information System called *eNotifikasi* (formerly known as CDCIS or Communicable Disease Control Information System) are identified for further research.

This chapter contains a series of literature reviews covering the following topics:

- communicable disease,
- epidemiological literature,
- user acceptance of system use,
- user acceptance models,
- perceived usefulness and perceived ease of use,
- external factors that influence PU and PEOU, and
- related studies.

2.2 Communicable Disease

Communicable diseases account for 14.2 million deaths each year and pose an acute threat to individual health and have a potential to threaten collective human security (Bonita et al., 2006, p. 118). The communicable diseases can be grouped in three categories: diseases which cause high levels of mortality; diseases which place on populations heavy burdens of disability; and diseases which owing to the rapid and unexpected nature of their spread can have serious global repercussions (World Health Organization 2000, p. v).

Many of the underlying principles governing the transmission of disease or infectious disease are mostly clearly demonstrated using communicable diseases as a model (Gordis 2000, p. 14). Hence, "Communicable" and "infectious" have the same meaning; both terms are used interchangeably (Pluut 2008, p. 288; Porta et al., 2008, p. 46). *A Dictionary of Epidemiology* (Porta et al., 2008) has defined communicable disease as below:

> illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or the inanimate environment (p. 46).

According to Bonita et al. (2006), a communicable (or infectious) disease is "one caused by transmission of a specific pathogenic agent to a susceptible host" (p. 117). Bonita et al. added infectious agents may be transmitted to humans either directly from other infected humans, or indirectly

through vectors (e.g. insects and animals), airborne particles or vehicles (e.g. contaminated objects or elements of the environment such as clothes, cutlery, water, milk, food, blood, plasma, parenteral solutions or surgical instruments).

2.2.1 Implication for the Research

The *eNotifikasi* as part of the public health surveillance system was developed to manage the communicable diseases cases through the processes of report (notify), verify, investigate and monitor the notifiable communicable diseases. These communicable diseases include Cholera, Typhoid/ Paratyphoid, Dysentery, Food Poisoning, Measles, Pertussis, Tetanus, Poliomyelitis, Diphtheria, Ebola, Leptospirosis, Viral Hepatitis, HFMD, Influenza, Viral Encephalitis, Rabies, Relapsing Fever, Tuberculosis, Leprosy, HIV, AIDS, Syphilis, Gonorrhoea, Chancroid, Dengue, Malaria, Typhus, Plague, Yellow Fever, and Chikungunya.

2.3 Epidemiological Literature

According to Last (2001, cited in Bonita et al., 2006, p. 4), the word "epidemiology" is derived from the Greek words i.e. *epi*, *demos*, and *logos* which mean "upon", "people", and "study" respectively. Epidemiology developed from the study of outbreak of communicable disease and of the interaction between agents, hosts, vectors and reservoirs (Bonita et al., p. 118). *A Dictionary of Epidemiology* (Porta et al., 2008) defines epidemiology as "the

study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the prevention and control of health problems" (p. 81).

According to Morath (2010), epidemiological literature introduces "comprehensive theory in disease control, disabilities management, and quality of life studies" (p. 22). The study mostly views public health phenomena independent from an event context. Morath noted that a few agencies have prevailed in compiling exhaustive community health indicators to measure community health and accessing health quality of life. The two examples of contribution are the US Department of Health and Human Services' (HHS) Community Health Status Indicators (CHSI) and the Centers for Disease Control's (CDC) Behavioural Risk Factor Surveillance System (BRFSS).

2.3.1   Community Health Status Indicators (CHSI)

CHSI project was originally launched by US Department of Health and Human Services' (HHS) in 2000 with the goals of providing an overview of key health indicators for local communities and encouraging dialogue and action to improve community health.

In 2006, the project was re-launched by a new partnership that includes the Centers for Disease Control's (CDC). Focusing mainly on the mortality rates (per cause of death) and lifestyle choices, in addition to health perception,

CHSI contains over 200 health measures for each of the 3,141 United States counties. The re-launch of CHSI is marked by a much needed update of the data and the construction of a web application for viewing reports, mapping select indicators, and downloading the most recent dataset (Morath 2010).

2.3.2 Behavioral Risk Factor Surveillance System (BRFSS)

BRFSS is a state-based telephone health survey system that collects information on health risk behaviours, chronic disease prevalence, preventive health practices, and health care access primarily related to chronic disease and injury (Morath 2010).

BRFSS is first established by the CDC in 1984. It is a continual process with data being collected monthly. Data culled from the BRFSS are used by state and regional health officials to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs (CDC 2010, cited in Morath 2010).

2.3.3 Implication for the Research

In this research, the study of epidemiological literature is crucial especially in the context of communicable disease control. It presents a simple framework for studying vulnerability and baseline health needs that dictate the demands on the public health system. Hence, it may be useful for public health system like *eNotifikasi* to derive health status (i.e. manage communicable

diseases cases) in Malaysia.

2.4   User Acceptance of System Use

In general, user acceptance of system use is conceptualized as an individual's perspective on his/ her voluntary on the intended use of a system (Hu et al., 1999, cited in Edwards 2006). According to Vichita et al. (2008), user acceptance of system use "can be determined by user's intention to use that given information system" and user's perceptions toward that information system, which consists of perceived usefulness and ease of use.

Ghobakhloo et al. (2010) reported that users' acceptance of system use is one of the most applied measures to evaluate IT/ IS adoption success in organisations. The acceptance of IT/ IS by users including managers, professionals and operating level personnel, which is an essential condition for its success, can be regarded as acceptance measures including user attitudes, usage and satisfaction.

Existing literature on software design acknowledges the importance of the user and emphasizes the importance of considering user reactions, typically in the context of predicting system acceptance and usage (Fisher and Howell 2004). According to Kripanont (2007), the technology (systems) that are available in organisations cannot fully demonstrate their value until they are used. Fisher and Howell (2004) also claimed that if the users feel that the

system is easy to use and will help them to get their job done, they are more likely to accept and use it, which is an essential condition for the success of a system.

Davis (1993, cited in Ghobakhloo et al., 2010) noted that the lack of user friendliness of adopted IT is the major barrier to user acceptance while the increase in system usability and ease of use through supplementing user interfaces with current system, as well as perceived usefulness are regarded as the way to success. Users may be persuaded to use a new system early in the implementation stage but the benefits offered may never be achieved in the absence of continued sustained usage (Szajna 1996; Argawal and Prasad 1997; Karahanna et al., 1999, cited in Week 2010).

The studies of Szajna (1996, cited in Kripanont 2007) and Moore and Benbasat (1991, cited in Kripanont 2007) stated that technology acceptance can be measured by either measuring only one behaviour – either intention to use or usage in cross-sectional study for which data are gathered just once (stretched though it may be over a period of days, weeks, or months) to answer the research question, or measuring two behaviours, both intention to use and actual system use in longitudinal study for which data are gathered at several points in time to answer a research question. Davis (1993, cited in Ghobakhloo et al., 2010) added that lack of user acceptance has long been confirmed to be an impediment to the success of new IS, so user acceptance is regarded as the key factor determining success or failure of IT/ IS projects.

Implication for the Research: The study of user acceptance of system use is essential to exemplify how users in an organization acceptance of a new system. It provides clearer understanding on user reactions to the new system. When implementing new systems, users often do not have idea to the system. Users' attitude toward system use might have significant impact on new system success because negative attitude of some users toward system could negatively affect successful implementation of new system (Ghobakhloo et al., 2010).

This research aims to review existing approaches regarding user acceptance of system use after implementation and apply the knowledge gain in this section to public health officers' acceptance of *eNotifikasi* use. Public health officers' acceptance and their behavioural intention to use *eNotifikasi* might give a significant impact on the success implementation of *eNotifikasi*.

2.5   User Acceptance Models

User acceptance of information technology has received extensive attention in the IT discipline (Liu 2009). Several theoretical models have been proposed and widely used to study factors that influence individual's intentions to accept or reject the use of information technology in organisations. These models include the Technology Acceptance Model (TAM), Theory of Reason Action (TRA), and Theory of Planned Behaviour (TPB).

2.5.1 Theory of Reason Action

Theory of Reason Action (TRA) is the widely used theoretical model from social psychology design to access and understand human behaviour, and has been applied to IT. According to TRA, an individual performance of a particular behaviour is determined by his or her intention to perform that behaviour, with behavioural intention being jointly determined by the individual's attitude and subjective norm concerning the specified behaviour (Thompson 2010). According to Davis (1989, cited in Thompson 2010), TRA is a general model, and as such, it does not explicitly state the belief constructs that are to be included for a particular behaviour. The recommendation is that researchers who are using the model to study the human behaviour should first identify the belief constructs that are important for the individuals regarding the particular behaviour being accessed.

Thompson (2010) reported that TRA has been widely used in applied research settings spanning several domains. It is however limited to the assessment of human behaviour only in situations where the actions of individuals were mandatory. The model was subsequently extended to enable the prediction of human behaviours in situations where the actions of individuals were voluntary. A general model of TRA is shown in Figure 2.1.
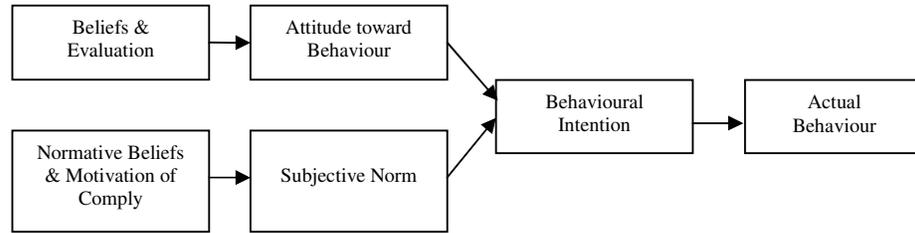
Figure 2.1: A general model of Theory of Reason Action (TRA)

Source: Kowitlawakul (2008, p. 7)

2.5.2 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) model, an extended model of TRA was proposed by Ajzen (1985, cited in Ku 2009). It was designed to explain human behaviour. Ajzen introduced an additional perceived behavioural control construct to the original TRA model as shown in Figure 2.1 in order to account for situations where an individual lacks the control or resources necessary to perform the targeted behaviour freely. According Ajzen, the relative importance of attitude, subjective norm and perceived behaviour control vary across behaviours and situations. Thus, in some application it may be found that only attitude and perceived behavioural control are sufficient to account for behavioural intentions (Thompson 2010). A general model of TPB is shown in Figure 2.2.

Thompson (2010) explained that the "Intention" based in TPB model as shown in Figure 2.2 can be predicted by attitude toward the behaviour, subjective norm, and perceived behavioural control. Perceived behaviour control reflects beliefs regarding access to the resources and opportunities

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needed to perform behaviour, or alternatively, to the internal and external factors that may impede performance of the behaviour.
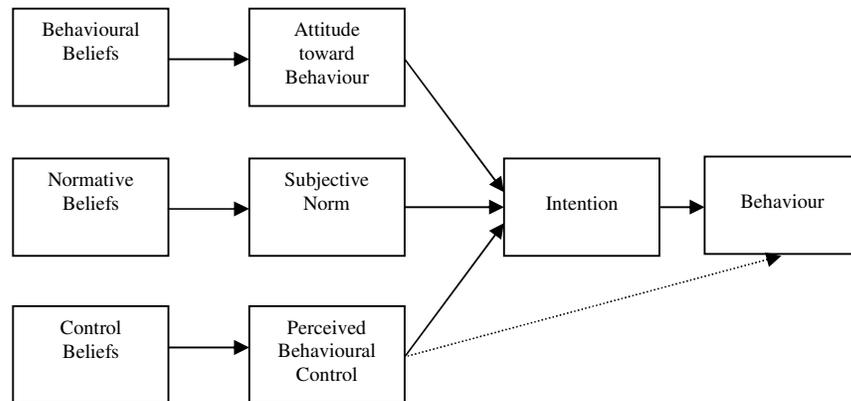
Figure 2.2: A general model of Theory of Planned Behaviour (TPB)

Source: Ku (2009, p. 37)

Ajzen (1991, cited in Thompson 2010) proffered that actual behaviour is a direct function of behavioural intention and perceived behavioural control. As in the original TRA as revealed in Figure 2.1, a central factor in TPB is the individual intention to perform a given behaviour. Thompson noted that intentions are assumed to capture the motivational factors that influence behaviour namely indications of how hard people are willing to try of how much of an effort they are planning to exert, in order to perform the behaviour.

2.5.3 Technology Acceptance Model

The Technology Acceptance Model (TAM) as shown in Figure 2.3 was initially developed by Davis in 1986 (cited in Kowitlawakul 2008). TAM uses theory reason of action (TRA) (Ajzen and Fishbein 1980, cited in Vichita et al., 2008) as a base structure. Davis et al. (1989, cited in Aw et al., 2009) stated

the goal of TAM as below:

> … is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimoniously and theoretically justified (p. 38).
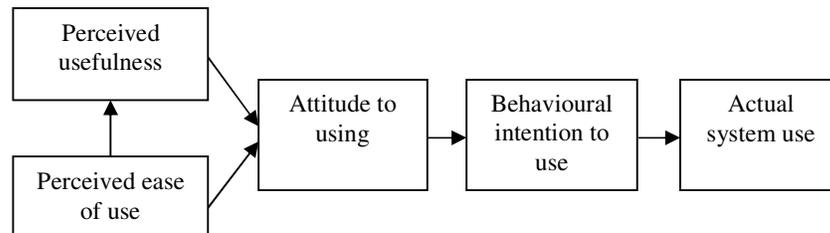
Figure 2.3: The Technology Acceptance Model (TAM)

Source: Wu et al. (2008, p.124)

TAM presumes that perceived usefulness and perceived ease of use are of main relevance regarding computer acceptance behaviours (Ghobakhloo et al., 2010). TAM has specified the linkages between perceived usefulness and perceived ease of use, and user's attitudes toward using, behavioural intentions to use and actual behaviour of system use. According to Davis (1989, cited in Thurasamy 2010), TAM is designed to apply only to computer usage behaviour. Thurasamy (2010) added that it can be readily extended to apply to any type of technology.

2.5.4   Implication for the Research

The study on the development of TRA, TPB and TAM provides a clearer understanding on the evolution of user acceptance models. As has been described in sections 2.5.1 through 2.5.3, TRA and TPB were two foundation

theories that led to the development of the TAM (Thompson 2010). TAM has been established as robust in explaining why a particular information system was accepted or rejected from the users (Vichita et al., 2008). In addition, because of the capability of TAM to measure user acceptance which was specified in technology field compare to TRA and TPB that were used to explain human behaviour across a wide variety of areas (Kowitlawakul 2008; Thompson 2010), thus this research has adopted the core-ideas of Davis's TAM to develop the proposed TAM for investigating the user acceptance of *eNotifikasi*.

2.6   Perceived Usefulness and Perceived Ease of Use

Many studies (Davis 1989; Davis et al., 1989; Legris et al., 2003, cited in Kowitlawakul 2008) reported that perceived usefulness and perceived ease of use are two crucial beliefs for computer acceptance behaviours in TAM (which has been described in section 2.5.3). With reference to the study of Davis et al. (1989), prior studies (Kowitlawakul 2008; Thompson 2010; Young 2010) indicated that perceived usefulness (PU) and perceived ease of use (PEOU) are two major influential emotional beliefs that determine a user's IT acceptance (Lin et al., 2011). Venkatesh and Bala (2008) found that PEOU captures the influence of cognitive instrumental processes on PU, while their empirical test of the relationship between PEOU and PU indicated a positive relationship between these two constructs.

According to Davis (1989, cited in Sui 2011), PU refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 6). Carter (2008) noted that PU is the most significant predictor of intention to use e-government services.

Davis (1989, cited in Sui 2011) defined PEOU as "the degree to which a person believes that using a particular system would be free of effort" (p. 7). Gafen (2000, cited in Sui 2011) indicated that PEOU measures user assessments of ease of use and ease of learning, and it deals with user motivation that is based on the assessment of the intrinsic aspect of using information technology, such as its interface and the process involved in using it. Carter (2008) also noted that PEOU was also a significant predictor of use intentions although it exerts the weakest influence on intention to use.

Vichita et al. (2008) found that external factors have a direct effect upon PU and PEOU, which have indirect effects on beliefs and intention. Vichita et al. (2008) also reported that some studies (e.g. Agarwal and Prasad 1999; Al-Gahtani and King 1999; Venkatesh and Davis 2000; Thatcher et al., 2002) introduced several modifications to the original TAM, in order to further explain the external factors that can influence a user's perception.

Kowitlawakul (2008) highlighted that the external variables influencing PU and PEOU might be different in various settings. Kowitlawakul added that there are very few studies that have addressed the external variables in the healthcare setting regarding the concept of technology

acceptance. The healthcare setting might have factors that influences PU and PEOU of technology usage behaviour but is different with other industrial settings because of the work environment and organizational context.

2.6.1   Implication for the Research

This research aims to investigate the influential factors on users' perceptions toward PU and PEOU of *eNotifikasi*, the relationship between PU and PEOU, and user's perceptions toward the PU and PEOU of *eNotifikasi*. The research also aims to examine whether or not the users' perceptions toward PU and PEOU of *eNotifikasi* could influence their behavioural intention to use *eNotifikasi*.

2.7   External Factors that Influence PU and PEOU

Through literature reviews (Kripanont 2007; Vichita te al., 2008; Kowitlawakul 2010; Soud et al., 2010), the example of external factors that have given impact on PU and PEOU of a technology include user background, end user training and IT technical support. User background includes user experience, job relevance, gender and age.

2.7.1   User Background

According to Vichita et al. (2008), Kowitlawakul (2010) and Soud et

al., (2010), user background such as user experience, job relevance, gender and age are external factors that have affected PU and PEOU of system use and thus affect user acceptance of the system.

2.7.1.1 User experience

Prior experience has been found to be an important determinant of behaviour in the past studies (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980, cited in Kripanont 2008). According to Vichita et al. (2008), when people have experience using specific information technology, they will tend to know its function and how to use them; therefore, becoming more familiar with that information technology. As a result, they will perceive it easier to use than those who have less experience.

Implication for this research: The studies of Fishbein and Ajzen (1975) and Ajzen and Fishbein (1980) as cited in Kripanont (2008) reported that user experience have a significance effect with PU and PEOU of system use but the results of Kripanot's study showed that user experience did not impact PU and PEOU toward behavioural intention to use Internet. Thus, this research intends to examine whether or not the length of public services experience could influence public health officers perceptions toward the usefulness and ease of use of *eNotifikasi*, which may have impact on their behavioural intention to use *eNotifikasi*.

2.7.1.2 Job relevance

With reference to past research work (e.g. Chismar and Wiley-Patton 2002; Venkatesh and Davis 2000, Ku (2009) defined job relevance as "an individual's perception of the degree to which the technology is applicable to his or her job" (p. 44). Vichita et al. (2008) have grouped job relevance under task relevance which was found to have a significant effect upon the user's acceptance of technology. Goodhue and Thompson (1995, cited in Vichita et al., 2008) claimed that "when information technology provides features and supports that relate to fit to the characteristics and requirement of a task, the users will find it useful, and tend to have positive attitudes toward new information technology". Furthermore, Goodhue (1995, cited in Vichita et al., 2008) added that information systems have a positive effect on performance only when there is a correlation between their functionality and task requirements (e.g. job position).

Implication for this research: The results of Vichita et al. (2008) study revealed that there was a significant correlation between job relevance and PU. Besides, the past studies conducted by Goodhue and Thompson (1995, cited in Vichita et al., 2008) and Knight and Pearson (2005, cited in Young 2010) had also reported that job relevance have a significance correlation with PU of system use. Thus, in the context of this research, job relevance related factor namely job classification and division/unit have been identified as factors that may influence public health officers' perceptions toward PU and PEOU of *eNotifikasi*.

2.7.1.3 Gender

Gender has found to have an impact on the influence of attitude, subjective norm, and perceived behaviour control. The study of LeRouge et al. (2005, cited in Young 2010) has suggested that there are differences exist in attitudes held by men and women toward information technologies. Besides, Venkatesh et al. (2000, cited in Kripanont 2008) found that attitude was more salient for men, but both subjective norm and perceived behavioural control were more salient for women in early stages of experience.

Implication for this research: As stated above, the past studies conducted by Venkatesh et al. (2000, cited in Kripanont 2008) and LeRouge et al. (2005, cited in Young 2010) reported that male and female users possess different perceptions toward PU and PEOU of system use. Hence, this research would like to examine whether or not the gender of public health officers could influence their perceptions toward the PU and PEOU of *eNotifikasi*, which may have impact on their behavioural intention to use *eNotifikasi*.

2.7.1.4 Age

Age was found to affect the influence of attitude, subjective norm, and perceived behaviour control as well. An attitude was more salient for younger workers while perceived behavioural control was more salient for older workers. Subjective norm was more salient to older women (Venkatesh et al.,

2000, cited in Kripanont 2008. Young (2010) noted that the past studies such as Burton-Jones and Hubona (2005), Czaja and Sharit (1998), Reed et al. (2005) had suggested that older individuals have problem learning and adopting information technologies compared to younger individuals.

Implication for this research: With reference to the past studies as had been reported by Kripanont (2008) and Young (2010), it can be concluded that users at younger age possess different perception toward PU and PEOU of system use from the users at older age. Therefore, age has been identified as one of the factors that may influence public health officers' perceptions toward PU and PEOU of *eNotifikasi*, which may have impact on their behavioural intention to use *eNotifikasi*.

2.7.2   End User Training

Week (2010) defined training as a formal exercise provided to application users to provide information and guide them on using computer application. This factor would therefore be determinants of PU and PEOU, which are both antecedents of intention to use new application.

According to Vichita et al. (2008), training is an important factor for implementing the e-government initiative because of its positive direct effect upon prior experience. Week (2010) explained that most end-user training programs focus on improving the users' technical abilities such training programmes usually do not include components to improve user acceptance.

Week added that users with enhanced skills and abilities consider the information systems they are currently using and the information provided by the information system as relevant and useful, if they are to accept such system.

Week (2010) highlighted the past studies of the information system (IS) failures stem from a lack of user acceptance rather than poor technical system quality. For example, one study blamed a lack of training on the part of many top and middle managers concerning how best to use computers and computer-generated information in decision making (Brady 1967, cited in Week 2010). Therefore, inadequate end user training in technology especially computer application may cause lack of user acceptance and application failures (Week 2010). Nelson and Chaney (1987, cited in Week 2010) explained that greater ability does not necessarily increase acceptance even though end users with enhanced skills/abilities may use IS more in their job task. Nelson and Chaney added that the higher ability level does not necessarily enhance their satisfaction or acceptance. The relationship between end user training and acceptance of IS technologies through Figure 2.4.
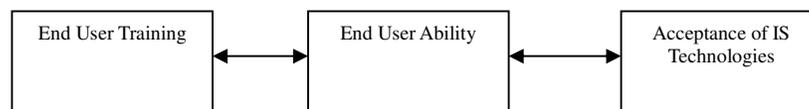
Figure 2.4: Descriptive model for learning and acceptance of IS technologies

Source: Week (2010, p. 4)

Implication for this research: Training support of information system provided to the end users would help to reduce their anxiety and make them more familiar with the use of information systems (Vichita et al., 2008). Week's study (2010) reported that training support would be determinants of PU and PEOU, which are both antecedents of intention to use information system. Hence, training support also has been identified as one of the influential factors on public health officers' perceptions toward the major determinants (i.e. PU and PEOU) of behavioural intention to use *eNotifikasi*.

2.7.3   IT Technical Support

According to Kowitlawakul (2008), IT Technical support refers to the availability of specialized personnel, such as IT staff or application administrator to answer questions regarding computer application usage, troubleshoot emergent problems during actual usage of application system, and to provide instructional and hand-on support to application user before and during usage. Therefore, IT technical support is necessary to ensure ease of use of computer application.

Vichita et al. (2008) asserted that insufficient information technology support in both hardware and software, non-connected networks, and lack of staff, having development expertise will limit proper and successful e-government initiative implementation. This factor has been proven by Moon (2002, cited in Vichita et al., 2008) to be one of the limitations and fundamental problem that has a considerable impact upon the e-government

initiative. Therefore, IT staff or application administrator plays a significant role in preparing and supporting the implementation of the new computer application (Kowitlawakul 2008) to the end users and ensure users are satisfaction with IT technical support provided.

Kowitlawakul also stated that application administrator is often selector to serve in the super user role, to provide and ample resources to explain the benefits of the new computer application and answer question one-on-one from application users who face problem using new application. Users' satisfaction with IT technical support provided would therefore be determinants of PU and PEOU, which are both antecedents of intention to use information system.

Implication for this research: IT technical support is responsible for troubleshooting IT problem related to the particular information system. The past studies (e.g. Kowitlawakul 2008; Vichita et al., 2008) reported that users' satisfaction with IT technical support would be determinants of PU and PEOU, which are both antecedents of intention to use information system. Therefore, this research would like to investigate whether or not the users' satisfaction with IT technical support could also be one of the determinants that could influence public health officers' perception toward PU and PEOU of *eNotifikasi*, and consequently affect their behavioural intention to use *eNotifikasi*.

2.8   Related Studies

Some past studies related to technology acceptance model (TAM) adaption had been conducted to investigate TAM adaption with the user demographic factors (e.g. gender, age, job relevance, and prior experience), prior training and IT technical support. For examples, technology acceptance towards e-government initiative in Royal Thai Navy (Vichita et al., 2008), the technology acceptance model predicting nurses' intention to use telemedicine technology (eICU) (Kowitlawakul 2010), and the relationship between perceived usefulness, perceived ease of use, perceived information quality, and intention to use e-government (Soud et al., 2010).

2.8.1   Technology Acceptance towards E-government Initiative in Royal Thai Navy

Vichita et al. (2008) used two research methodologies for gathering data, which were TAM questionnaire and interview. The TAM questionnaire was used to measure naval finance officers' perceptions on Internet use in terms of perceived ease of use and perceived usefulness. Measured variables in the TAM questionnaire are: respondent profile, education level, intention, perceived usefulness, perceived ease of use, prior experience, job relevance, output quality, result demonstrability, subjective norm, image, commitment, trust, autonomy, training and organization support. 150 TAM questionnaires were distributed to naval finance officers who work at the Naval Finance Department of the Royal Thai Navy. A total of 150 questionnaires were sent out and 124 were returned, indicating a response rate of 83 percent. The TAM

instrument has tested for its reliability. It was investigated by using Cronbach alpha and showing that the alpha value ranged from 0.7068 to 0.9296, where there is a large Cronbach alpha, this usually means that the measurement are reliable (Straub 1989, cited in Vichita et al., 2008).

The interview was used to support the results from the TAM questionnaire. The focal point of interview questions were: e-government development factors, e-government barriers, suggestions for e-government development, how public organizations have supported e-government, the way a public organization plans for information system development to support e-government, comment on internet use in a public organization. The interview with 24 naval finance officers from top, middle, and operational management were conducted by using a set of 20 interview questions.

The outcome for the study of Vichita et al. (2008) showed that naval fiancé officer intention was directly affected by their perceptions, on both usefulness and ease of use with regard to Internet usage. Additionally, the results also showed a direct effect of perceived ease of use on perceived usefulness. There are also three external factors affecting the Royal Thai Navy officers' perception, prior experience, job relevance, and commitment. Job relevance had a direct effect on perceived usefulness, while prior experience and commitment had a direct effect on perceived ease of use. Three other factors; trust, autonomy, and training, are also factors that can influence perceived ease of use through their positive direct effects of training on prior experience and trust and autonomy on commitment. Hence, according to the

large number of external factors, as was hypothesized in the research framework. From the interviews, the IT infrastructure problem requires support with adequate information technology equipment and staff who have expertise in the information technology development field.

2.8.2   The Technology Acceptance Model Predicting Nurses' Intention to Use Telemedicine Technology (eICU)

The study of Kowitlawakul (2010) involved participants (nurses) from critical care units in hospital. Nurses in this study were caring for patients who were in critical conditions that might require life support, such as a ventilator or vasopressive medications. The eICU acceptance survey questionnaire was used as an instrument. Measured variables in the questionnaire are: years working in the hospitals, support from physicians, support from administrators, perceived usefulness, perceived ease of use, attitude towards using, and intention to use. 139 questionnaires were distributed, 131 nurses were responded. 3 were excluded and 11 did not meet the criteria. The final sample was composed of 117 nurses. The internal consistency of the instruments constructs was evaluated using coefficient α (Cronbach alpha), which showed ranges of 0.91 to 0.96 (perceived usefulness = 0.96, perceived ease of use = 0.94, nurse attitude toward eICU (NATE) = 0.91, and intention to use = 0.95) with a total coefficient α of 0.96.

The analysis results for Kowitlawakul's research showed the average age of the participants was 35.4 (standard deviation, 9.37) years. There were 107 women (91.5%) and 10 men (8.5%). 56 of the participants (47.9%) were

employed on the day shift, whereas 35 (29.9%) were employed on the night shift, and 26 (22.25%) worked both day and night shifts. 64 of the participants (54.7%) had bachelor degree in nursing, 31 (26.5%) had associate degree in nursing, and three (2.6%) had graduate degrees in nursing. Most of the participants (46.2%) had heard about eICU from nurses who had prior experience with eICU technology; however, 39 (33.3%) had heard about eICU from both nurses who had prior experience and nurses who had not used the technology. Only one participant had learned about eICU technology from the Internet.

Most participants (101 or 86.3%) had never attended a conference on eICU technology, and 98 (83.35%) had never been trained to use eICU technology. There were only 16 participants (13.7%) who reported that they had attended a conference on eICU technology and 19 (16.2%) who had been trained to use the eICU technology before they worked in their current units. 110 of the participants (94%) reported that they were technology support personnel available in their units, while 7 (6.0%) reported they were no available support personnel.

The participants had worked in nursing an average of 10.44 (standard deviation, 9.13) years, and in the present hospital for 6.83 (standard deviation, 6.98) years. The average number of years that nurses had known about eICU was 2.41 (standard deviation, 1.45) years, and the average number of years working with any type of computer technology was 14.77 (standard deviation, 5.97) years.

A path analysis was performed to determine the casual effects among the variables in the proposed model by Kowitlawakul. Multiple regressions identified four paths based on the assumptions of the casual closure of the path diagram in Kowitlawakul proposed model.

According to the results of regression 1, the following path coefficients were statistically significant: years working in the hospital to perceived usefulness (ß = -0.200, p = 0.010), support from physicians to perceived usefulness (ß = 0.270, p = 0.003), and perceived ease of use to perceived usefulness (ß = 0.420, p = 0.000). The path coefficient of support from administrator to perceived usefulness was not significant (ß = 0.051, p = 0.576). The results of regression 2 provided a path coefficient from support from administrators to perceived ease of use that was statistically significant (ß = 0.242, p = 0.009).

Furthermore, the results of regression3 provided two path coefficients that were statistically significant: from perceived usefulness to attitude toward using (ß = 0.297, p = 0.000) and from ease of use to attitudes toward using (ß = 0.466, p = 0.000). Finally, the results of regression 4 provided two path coefficients that were statistically significant: from perceived usefulness to intention toward using (ß = 0.506, p = 0.000) and from attitudes toward using to intention toward using (ß = 0.364, p = 0.000).

2.8.3 The Relationship between Perceived Usefulness, Perceived Ease of Use, Perceived Information Quality, and Intention to Use e-Government

Soud et al. (2010) used questionnaire survey to collect relevant data from Jordanian citizens who are aware of e-government services. Measured variables in the questionnaire are: perceived usefulness (PU), perceived ease of use (PEOU), perceived information quality (PIQ) which include the following dimensions: Accessibility, Relevancy, Timeliness, Understandability, Appropriate Amount, Objectivity, Security, Completeness, Free of Error, Concise Presentation, and intention to use e-government for gathering information (ITG) and conducting transactions (ITC) in terms of gender, age, level of education, computer experience, and internet experience. 600 questionnaires were distributed, 200 were received. 25 questionnaires were discarded because had unacceptable amount of missing data. 175 questionnaires are usable.

A reliability test was carried out using Cronbach's alpha, which measures the internal consistency of research constructs. The recommended minimum acceptable limit of reliability "alpha" for exploratory study is 0.60 (Hair et al., 1998, cited in Soud et al., 2010). The result of α value ranged from 0.64 to 0.93 (perceived usefulness = 0.93, perceived ease of use = 0.70, Accessibility = 0.81, Relevancy = 0.88, Timeliness = 0.89, Understandability = 0.83, Quantity = 0.64, Validity = 0.64, Objectivity = 0.84, Security = 0.74, Completeness = 0.88, Free of Error = 0.85, Concise Presentation = 0.79, intention to gather information = 0.84, and intention to conduct transactions = 0.80). Thus, it can be concluded that the scale has internal consistency and

reliability.

The analysis results for the research of Soud et al. consists of 118 males (67.4%) and 57 females (32.6%) from different regions across Jordan. 17 respondents (9.7%) are from the age range from 18 to 23, 60 respondents (34.3%) are from the age range from 24 to 29, 58 respondents (33.1%) are from the age range from 30 to 35 and 40 respondents (22.9%) are more than 35 year. Besides, 23 respondents (13.1%) had secondary school, 33 respondents (18.9%) achieved a college certificate, 95 respondents (54.3%) obtained a university degree, 20 respondents (11.4%) possessed higher education (Master education) and only 4 respondents (2.4%) hold a PhD.

User experience in using computer and Internet is also one of the determinants in the study. 21 respondents (12.0%) have less than 1 year of experience with computers, 37 respondents (21.1%) have 1-3 years of experience with computers, 34 respondents (19.4%) have 4-6 years of experience with computers, and 83 respondents (47.5%) have more than 6 years of experience with computers. 35 respondents (20.0%) have less than 1 year of using internet, 36 respondents (20.6%) have 1-3 years of using internet, 40 respondents (22.8%) have 4-6 years of using internet, and 64 respondents (36.6%) have more than 6 years of using internet.

The items of perceived usefulness, perceived ease of use and perceived information quality had been tested through their levels of agreement. The average response for each of the perceived usefulness items are above the

midpoint (3) of Likert scale. This means that the respondents show a high level of agreement and their answers range between agree and strongly agree. The average response for each of the perceived ease of use items are also above the midpoint of the scale. This mean the perception of Jordanian citizens towards ease of use is positive. The average items of perceived information quality midpoint deviate slightly from 3, it is still close to the scale midpoint.

2.8.4   Implication for the Research

The research findings in the related studies found that the two major variables integrated in the TAM proposed by Davis as shown in Figure 2.3 (i.e. perceived usefulness and perceived ease of use) have an impact on user acceptance of information systems used in their studies. Hence, this research investigates the extent to which users perceived that the *eNotifikasi* is useful and easy to use, and their behavioural intention to use *eNotifikasi*, and to examine is there any relationship between users' PU, PEOU and their behavioural intention to use *eNotifikasi*.

In addition, through literature review on related studies, this research has identified several external factors such as users' age, gender, job classification, division/unit, and length of public services experience, training support and users' satisfaction with IT technical support and examine whether or not these factors have significant impact on users' perceptions toward PU and PEOU of *eNotifikasi*.

Furthermore, most of the past studies used questionnaire survey to obtain information from the respondents to find the relationships between the external factors and measures users perceptions on the particular system use in terms of perceived usefulness and perceived ease of use. This research also employs questionnaire survey to collect data from the respondents since questionnaire is designed to collect information on opinions (i.e. level of agreement such as strong disagree, disagree, neutral, agree and strongly agree), reaction and behaviour from large samples of population relating to a particular issue (Parafloo 1993). In this research, a survey questionnaire is created based on the proposed TAM which is further discussed in section 3.4. The TAM questionnaire was used to measure public health officers' perceptions toward PU and PEOU of *eNotifikasi*, find the relationship between external factors (independent factors) and dependent factors within the proposed TAM, and examine their effects on the behavioural intention to use *eNotifikasi*.

2.9   Conclusions

The purpose of the literature review is to study the knowledge and information related to user acceptance of system use and find out the factors which may influence user acceptance of system use from the past studies.

Through literature reviews, it was found that user acceptance in system use are related to PU and PEOU, and PU and PEOU were major determinants

of behavioral intention to use an information system or computer applications in numerous past studies. Besides, past studies had examined the influences of different external variables on the system use. Therefore, in the present research, several external variables such as users' satisfaction with IT technical support, training support, and user background (i.e. age, gender, job classification, division/unit, and length of public services experience) have been identified through literatures reviews as antecedents to PU and PEOU of *eNotifikasi* to investigate users' behavioural intention to use *eNotifikasi*.

Furthermore, the literatures present and contrast extant literature on how past studies using TAM and its variables to explain technology acceptance and use in different settings which have given an inspirational idea to develop the proposed TAM in this research, which is presented in chapter 3.

CHAPTER 3

RESEARCH METHODOLOGY

3.1   Introduction

This chapter describes the actions taken in order to achieve all the research objectives detailed in chapter 1. It covers proposed technology acceptance model, research instrument, research samples, and data analysis.

3.2   Proposed Technology Acceptance Model

This research aims to determine significant factors that may influence user acceptance of *eNotifikasi* among Malaysian public health officers. Data related to user acceptance will be collected to determine whether or not the *eNotifikasi* implementation is successful. As has been discussed in section 2.5.4, an established technology acceptance model (i.e. Davis's TAM as shown in Figure 2.3) has been adopted as the grounded theory model which led to the development of the proposed technology acceptance model used in this research.

Ideally, Davis's TAM provides a theoretical framework to explain, predict and identify factors on internal beliefs, attitudes and intentions of

technology end-user (Kowitlawakul 2008). In this research, the proposed TAM with additional external variables such as user background (e.g. gender, age, job classification, division/unit and length of public services experience), training support, and users' satisfaction with IT technical support as shown in Figure 3.1 was developed. The user background, training support and users' satisfaction with IT technical supports variables are determines of perceived usefulness (PU) and perceived ease of use (PEOU), which are both antecedents of intention to use an application (Thompson 2010).
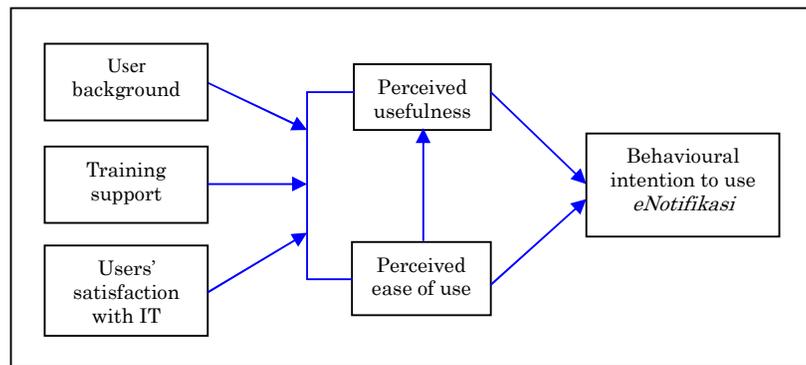
Figure 3.1: Proposed technology acceptance model (Modified from Davis's TAM)

Source: Wu et al. (2008, p.124)

3.3   Research Instrument

The main instrument used to collect data in this research is a self-administered questionnaire. The questionnaire was developed to obtain as much relevant information as possible in achieving the research objectives detailed in chapter 1. The survey questionnaire approach was used because respondents could complete the questionnaire at their conveniences, the

chance of the respondents taking time to think about their responses is greater than if the interview approach was used (Thompson 2010). In addition, Orlikowski and Baroudi (1991, cited in Liu 2009) noted that survey approach has been the most salient methodology in information system research. According to Liu (2009), the survey demands a solid theoretical framework to guide the contextual design and questionnaire development.

Pinsonneault and Kraemer (1993, cited in Liu 2009) claimed that "with survey approach, a theoretical model with designated variables, dependent and independent, and their relationship is used to test the data" (p. 78). Hence, a survey questionnaire used to collect the research data was created based on the proposed TAM as shown in Figure 3.1. The proposed TAM was adapted from Davis's TAM to investigate factors that may influence perceived usefulness, perceived ease of use, and behavioural intention to use *eNotifikasi*.

The TAM questionnaire was created in Malaysian language or *Bahasa Malaysia* as appended in Appendix A. Malaysian language or Standard Malay is the official language of Malaysia. Translation of the questionnaire in English is appended in Appendix B. There were five sections built into the survey questionnaire as follows:

- Section A: Personal Details
- Section B: Training support and user's knowledge in *eNotifikasi*
- Section C: User's satisfaction with IT technical support
- Section D: Perceived usefulness of *eNotifikasi*.

- Section E: Perceived ease of use of *eNotifikasi*.

- Section F: Behavioural Intention to use *eNotifikasi*

The first section in the survey questionnaire was used to collect the demographic data of users which includes gender, age, job classification, division/unit, and length of public services experience. In the second section, three items were used to gather information from the respondents. These three items include information about their frequency of *eNotifikasi* use, their knowledge level in *eNotifikasi*, and whether they have or not attended formal training on *eNotifikasi*.

In the subsequent sections (i.e. sections C, D, E and F) of the questionnaire, respondents were asked to rate their level of agreement using 5-point Likert scale (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree) with several statements built into the each research construct. Factors that may influence user acceptance of *eNotifikasi* encompass user's satisfaction with IT technical support, perceived usefulness of *eNotifikasi*, perceived ease of use of *eNotifikasi*, and behavioural intention to use *eNotifikasi*. Table 3.1 reveals the items built into each research construct.

Table 3.1: Measurement items built into each research construct

Research Construct	Items
User's Satisfaction with IT Technical Support	1. The IT staff is able to support my needs. 2. The IT staff is competent to provide their service to users.
Perceived Usefulness of *eNotifikasi*	1. Using *eNotifikasi* can improve my performance on the job. 2. Using *eNotifikasi* is able to enhance effectiveness in my job. 3. I would find *eNotifikasi* useful in my job.
Perceived Ease of Use of *eNotifikasi*	1. I would find the *eNotifikasi* easy to use. 2. My interaction with the *eNotifikasi* is clear and understandable. 3. It is easy for me to input and analysis data by using *eNotifikasi*.
Bahavioural Intention to Use *eNotifikasi*	1. I always use *eNotifikasi* to perform my tasks. 2. I will continue to use *eNotifikasi* on a regular basic in the future.

The survey questionnaire was pilot-tested among 15 public health officers who have the access to the *eNotifikasi* to ensure that all the research constructs were well constructed and reliable. The sample size adequacy should be determined before the pilot study was conducted. The sample size decisions normally are concentrated on the minimum sample sizes that can be tolerated in data analyses (Fowler 2002, cited in Liu 2009). Bouma and Atkinson (1995, cited in Shiratuddin 2002) noted that if the population this is to be sampled is fairly homogeneous (i.e. the relevant characteristics are fairly evenly distributed), a smaller sample can be relied on than if the population is highly variable. In this research, the requirements of the sample are:

- They have access to *eNotifikasi*, and

- They have basic knowledge in using *eNotifikasi*

Since these requirements are easily met, it is possible to show that sample characteristics such as different gender, age, and so forth are fairly homogeneous in any sample of respondents. Hence, a small number of participants are assumed to be adequate.

A reliability test was carried out on each of the four sections (i.e. sections C, D, E and F) in the survey questionnaire using Cronbach's alpha, which measures the internal consistency of the items used for measuring each research construct. Cooper and Schindler (2006, cited in Liu 2009) noted that "reliability testing assesses the ability for the instrument to produce consistent results" (p.325). Many studies (Davis 1989; Hu et al., 1999; Chau and Hu 2002; Carter 2004, cited in Liu 2009) reported that Cronbach's alpha is a common measure for the internal consistency of the instrument. Hair et al. (1998, cited in Masrom and Hussein 2008) recommended that the lowest limit of acceptability for Cronbach's alpha is 0.70. An alpha of more than 0.70 would indicate that the items are homogeneous and measuring the same constant. The Cronbach's alpha coefficient of each section is 0.930 for user's satisfaction with IT technical support, 0.747 for perceived usefulness of *eNotifikasi*, 0.859 for perceived ease of use of *eNotifikasi*, and 0.914 for the behavioural intention to use *eNotifikasi*. The value of acceptance of alpha for each research construct was above 0.70, which exceeded the minimum acceptance level of 0.70 (see Table 3.2 and Appendix C). The results of

Cronbach's analysis indicate that the survey questionnaire was reliable and well constructed.

Table 3.2: Cronbach's alpha (α) coefficient for each attribute in the survey questionnaire

Research Construct	Cronbach's Alpha (α) Coefficient
User's Satisfaction with IT Technical Support	0.930
Perceived Usefulness of *eNotifikasi*	0.747
Perceived Ease of Use of *eNotifikasi*	0.859
Behavioural Intention to Use *eNotifikasi*	0.914

3.4   Research Samples

The samples participated in this research were 50 public health officers that have the authority to access *eNotifikasi*. The research samples were randomly selected from hospitals, district health offices and state health departments in four states namely Kedah, Melaka, Sabah and Sarawak. They were mainly officers from units of CDC (Centers for Disease Control and Prevention), Vector (Vector Borne Diseases), HIV/STI (Sexually Transmitted Infectious), TB (Tuberculosis and Leprosy), Information Technology division and other division/units that use *eNotifikasi*.

3.5   Data Analysis

Data analysis started with the coding of data and was completed by interpreting the results obtained using SPSS (Statistical Package for the Social Sciences). Both descriptive and inferential statistical analysis methods were used to analyse the data collected from questionnaire to test the hypotheses formulated in chapter 1.

Descriptive statistics were used to find out the respondents' demographic data and data about the use of *eNotifikasi*. The demographic data consisted of gender, age, job classification, division/unit, and length of public services experience. These research findings were presented through the use of figures such as bar and pie charts, which are further described in sections 4.2.1 and 4.2.2.

Moreover, descriptive statistics were also used to test H_01 and H_08. Descriptive statistical data were used to present the results of respondents' levels of agreement with the items that measure the perceived usefulness (PU), perceived ease of use (PEOU) of *eNotifikasi*, and behavioural intention to use (BITU) *eNotifikasi*. Means, standard deviation (S.D.), frequency and percentage of cases were generated to find out the number of respondents agreeing or disagreeing with each item built into the research constructs of PU, PEOU and BITU.

In relation to the testing of $H_0 2$ and $H_0 3$, the data collected through the survey questionnaire was statistically analysed through inferential statistics. There are five null sub hypotheses for $H_0 2$ and $H_0 3$ respectively as shown in Table 3.3.

Table 3.3: Null sub hypotheses 2 and 3

Null Sub Hypotheses 2	Null Sub Hypotheses 3
$H_0 2a$: The users' gender does not have any significant effects on the perceived usefulness of *eNotifikasi*.	$H_0 3a$: The users' gender does not have any significant effects on the perceived ease of use of *eNotifikasi*.
$H_0 2b$: The users' age does not have any significant effects on the perceived usefulness of *eNotifikasi*.	$H_0 3b$: The users' age does not have any significant effects on the perceived ease of use of *eNotifikasi*.
$H_0 2c$: The users' job classification does not have any significant effects on the perceived usefulness of *eNotifikasi*.	$H_0 3c$: The users' job classification does not have any significant effects on the perceived ease of use of *eNotifikasi*.
$H_0 2d$: The users' division/unit does not have any significant effects on the perceived usefulness of *eNotifikasi*.	$H_0 3d$: The users' division/unit does not have any significant effects on the perceived ease of use of *eNotifikasi*.
$H_0 2e$: The users' length of public services experience does not have any significant effects on the perceived usefulness of *eNotifikasi*.	$H_0 3e$: The users' length of public services experience does not have any significant effects on the perceived ease of use of *eNotifikasi*.

The t-test and analysis of variance (ANOVA) are widely used statistical analysis methods to compare group means (Park 2009). Griffith (2010) stated that the independent-samples t-test compares the means of two sets of values from one variable. Thus, the independent-samples t-test was used to test $H_0 2a$ and $H_0 3a$, to determine whether there is a significant

difference between the mean scores of male and female users in perceiving the usefulness and ease of use of *eNotifikasi*.

While the independent sample t-test is limited to comparing the means of two groups, the One-Way ANOVA (Analysis of Variance) is used to determine the mean differences for more than two groups (Gebotys 2006; Park 2009). Stengel et al. (2009) also stated that ANOVA and the associated F-test would be the relevant statistical analysis method for the comparison of mean values that involves three or more groups. Therefore, One-Way ANOVA was used to test H_02b to H_02e and H_03b to H_03e to analyse if there are any differences in using the *eNotifikasi* in terms of perceiving the usefulness and ease of use of *eNotifikasi* attributed to the age, job classification, division/unit, and length of public services experience.

Also, the independent-samples t-test would be the most appropriate statistical analysis methods to test H_06, which examine if there are any differences between trained and non-trained public health officers' perceptions on *eNotifikasi* use in terms of perceived usefulness and perceived ease of use.

Furthermore, Bolboacă and Jäntschi (2006) define Pearson's Coefficient Correlation as "a measure the strength and direction of the linear relationship between two variables, describing the direction and degree to which one variable is linearly related to another" (p. 184). According to Griffith (2010), the Pearson's Coefficient Correlation analysis determines the similarity or difference in the way two variables change in value from one case

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(row) to another through the data. Thus, Pearson's Coefficient Correlation (r) was utilised to test H_04, H_05, H_07, H_09 and H_010.

Table 3.4 summaries the statistical analysis methods used in hypotheses testing. The proposed TAM (Figure 3.1) which was built by using the core-ideas of Davis's TAM is then empirically tested using relevant hypotheses. Figure 3.2 depicts the relationship between variables and relevant hypotheses.

Table 3.4: Summary of the statistical analysis methods used in hypotheses testing

Null Hypothesis	Statistical Analysis Method
H_01: Users do not perceive that *eNotifikasi* is useful and ease of use.	Descriptive statistics
H_02: The users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived usefulness of *eNotifikasi*.	Independent-sample t-test (H_02a) and One-way ANOVA (H_02b to H_02e)
H_03: The users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived ease of use of *eNotifikasi*.	Independent-sample t-test (H_03a) and One-way ANOVA (H_03b to H_03e)
H_04: There is no relationship between users' satisfaction with IT technical support and the perceived usefulness of *eNotifikasi*.	Pearson's Coefficient Correlation (r)
H_05: There is no relationship between users' satisfaction with IT technical support and the perceived ease of use of *eNotifikasi*.	Pearson's Coefficient Correlation (r)

Table 3.4: Summary of the statistical analysis methods used in hypotheses testing (Continued)

Null Hypothesis		Statistical Analysis Method
H_06:	There is no significant difference between trained and non-trained users' perceived usefulness and perceived ease of use of the *eNotifikasi*.	Independent-sample t-test
H_07:	There is no relationship between perceived ease of use and perceived usefulness of *eNotifikasi*.	Pearson's Coefficient Correlation (r)
H_08:	Users do not intend to use *eNotifikasi* to manage the cases of communicable diseases.	Descriptive Statistics
H_09:	There is no relationship between perceived usefulness and behavioural intention to use *eNotifikasi*.	Pearson's Coefficient Correlation (r)
H_010:	There is no relationship between perceived ease of use and behavioural intention to use *eNotifikasi*.	Pearson's Coefficient Correlation (r)
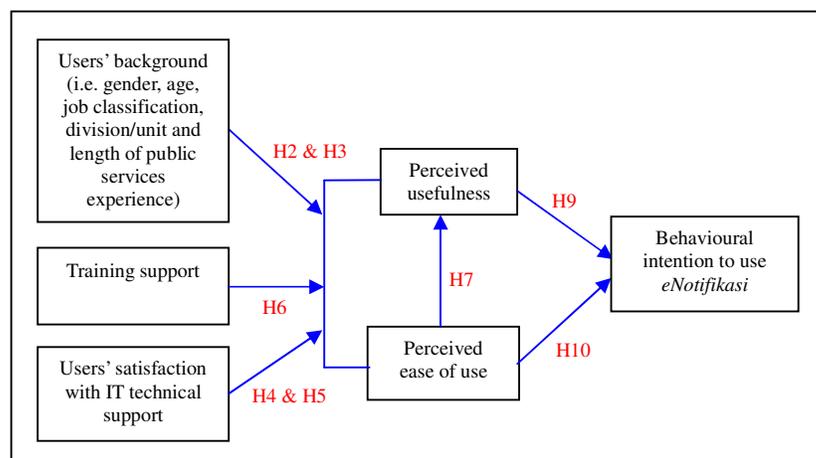
Figure 3.2: Proposed technology acceptance model and relevant hypotheses

3.6   Conclusions

This chapter described the activities and processes involved such as develop the proposed technology acceptance model (TAM) by using the core-ideas of Davis's TAM, constructed the TAM questionnaire, identified the research samples for the survey, and identified data analysis methods for hypotheses testing in order to achieve all the research objectives formed in chapter 1. The research methodology explained in this chapter leads to the discussion of research findings in next chapter.

CHAPTER 4

RESEARCH FINDINGS AND DISCUSSION

4.1   Introduction

This chapter focuses on the discussion of the research findings. The findings are concerned with the research objectives that were formed at the earlier stage of the research. Data were obtained from self-administered questionnaires, completed by 50 public health officers (N = 50). All the 50 sets of questionnaires were usable.

4.2   The Results of Data Analysis

This section presents the findings of data analysis. Analysis started with the coding of data and was completed by interpreting the results obtained using SPSS (Statistical Package for Social Science) statistical package. Both descriptive and inferential statistics was used in analysing the data. The results of data analysis are divided into four sub sections as follows:

i.   The results of data analysis about the respondents' background;

ii.   The results of data analysis for the data collected from the survey questionnaire about the use of *eNotifikasi*;

iii.   The results of hypotheses testing;

iv. The findings of the empirically tested proposed technology acceptance model.

4.2.1 The Results of Data Analysis about the Respondents' Background

This section provides useful information to understand the demographic profile and job characteristics of the respondents. The demographic data consisted of gender, age, job classification, division/unit, and length of public services experience. This set of data intended to describe demographic variables of the samples and to assess for any influences on the research findings.

4.2.1.1 Respondents' background data: Gender
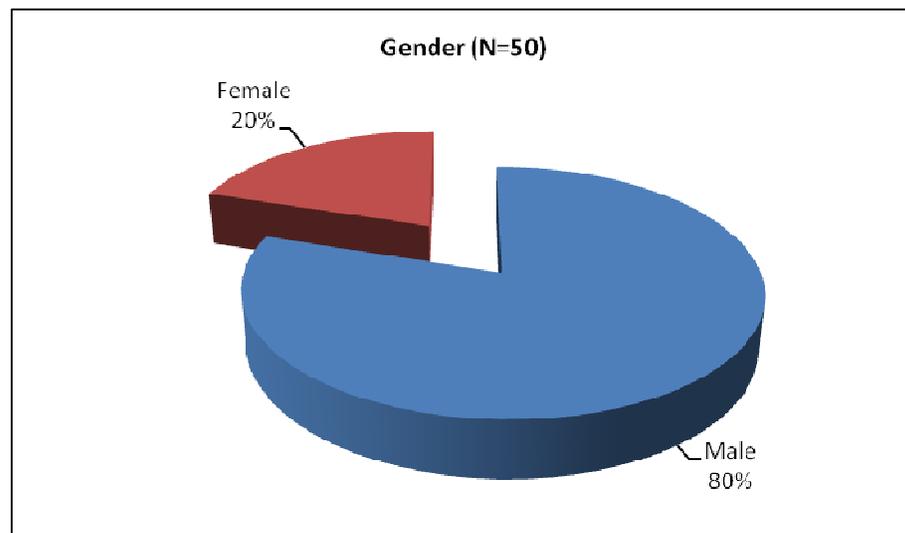
Figure 4.1: Respondents' background data – Gender

Participants were asked to indicate their gender by placing a tick next to the relevant option provided (male or female). Of the 50 respondents, 40

(80%) were male and 10 (20%) were female. Figure 4.1 reveals the gender distribution of the respondents.

4.2.1.2 Respondents' background data: Age category

Participants were asked to tick the age category appropriate to them. 38% of the respondents were in the 30-40 years age category (19 responses) and constituted the bulk of the sample. It followed by 26% of the participants (13 responses) were below the age of 30 years and 24% (12 participants) in the 41-50 year age group. Only 12% of the participants were in the age group above 50 years. The age distribution of the respondents is depicted in Figure 4.2.
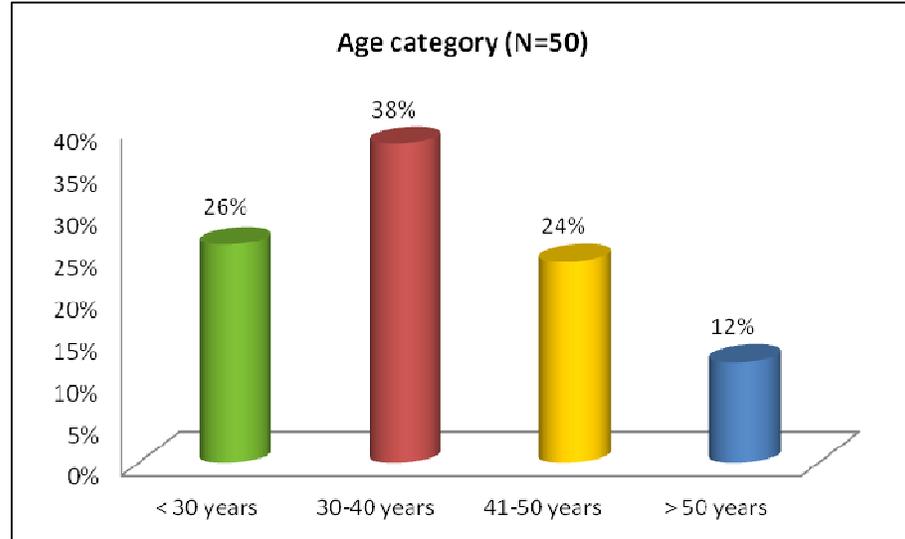
Figure 4.2: Respondents' background data – Age category

4.2.1.3 Respondents' background data: Job classification

Participants were asked to indicate their job classification by placing a tick next to the relevant option provided (see Appendices A and B). The results in Figure 4.3 shows that 80% (40 participants) were PPKP (*Penolong Pegawai Kesihatan Persekitaran* or Assistant Environmental Health Officer), 12% (6 participants) were district health officer, and 4% (2 participants) were AMRO (Assistant Medical Record Officer). Only 2% (1 participant) was epidemiology officer and IT officer respectively.
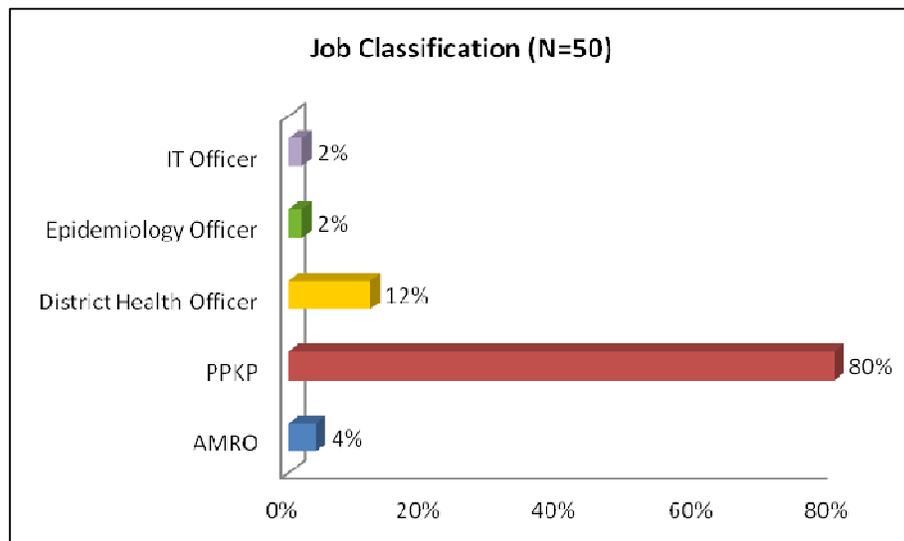
Figure 4.3: Respondents' background data – Job classification

4.2.1.4 Respondents' background data: Division/Unit

The participants were asked to indicate the division/unit they attached to by placing a tick next to the relevant option provided (see Appendices A and B). The division/unit representation of the participants is presented in Figure 4.4.

It was found that 15 participants (30%) were attached to the CDC (Centers for Disease Control and Prevention) unit, 10 participants (20%) were attached to TB (Tuberculosis and Leprosy) unit, and 7 participants (14%) were attached to Vector (Vector Borne Diseases) unit and HIV/STI (Sexually Transmitted Infectious) units respectively. Only 1 participant (2%) was from IT division. Besides, there were 10 participants (20%) from other division/units such as Epidemiology and Surveillance division, Medical Record unit, and Public Health Inspectorate unit.
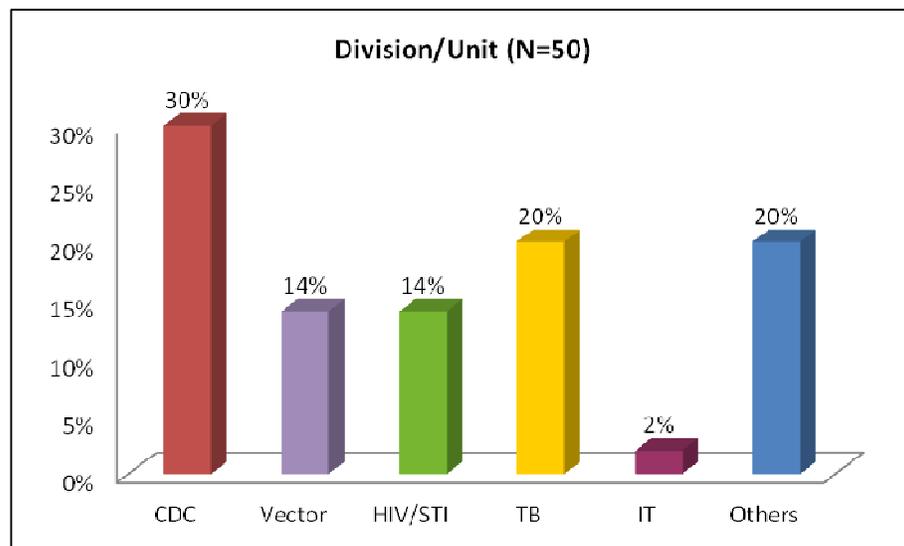
Figure 4.4: Respondents' background data – Division/Unit

4.2.1.5 Respondents' background data: Length of public services experience

Length of public services experience was also tabulated and respondents were asked to tick the relevant option provided (refer to Appendices A and B). Half (50%) of the 50 respondents reported >10 years of public services experience and 12 respondents (24%) reported 6-10 years of

length of public services experience. Besides, there were 7 respondents (14%) reported 1-5 years of public services experience, and 6 respondents (12%) of the 50 respondents reported <1 year of public services experience. The findings of the length of public services experience are revealed in Figure 4.5.
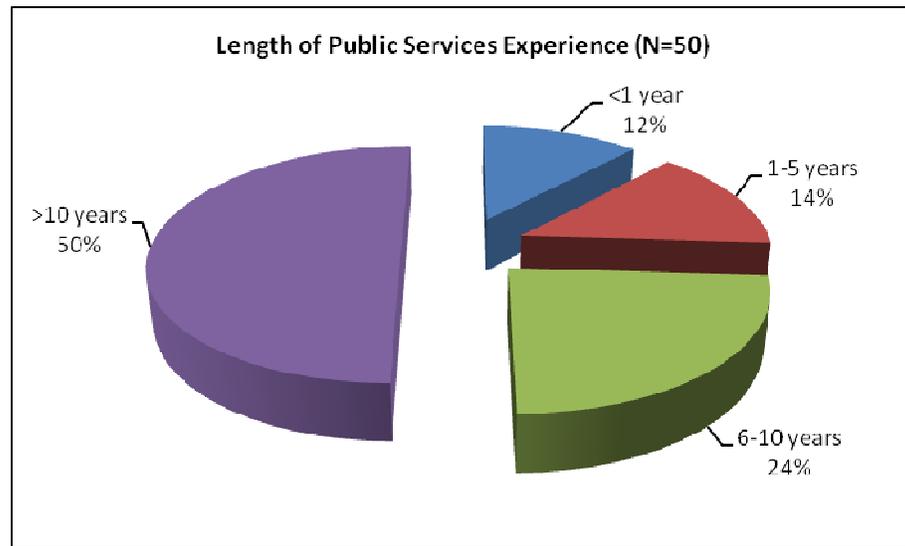
Figure 4.5: Respondents' background data – Length of public services experience

4.2.2 The Results of Data Analysis for the Data Collected from the Survey Questionnaire about the use of *eNotifikasi*

The questionnaire about the use of *eNotifikasi* comprised of five sections (i.e. sections B, C, D, E and F) and data generated is presented as follows:

- Section B comprises data about the training support and user's knowledge in *eNotifikasi*.

- Sections C, D, E, and F comprises data describing the respondents' level of agreement (i.e. 1= Strongly Disagree, 2=

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Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree) with several statements built into the four research constructs as below:

- User's Satisfaction with IT technical support (Section C)
- Perceived usefulness of *eNotifikasi* (Section D)
- Perceived ease of use of *eNotifikasi* (Section E)
- Behavioural Intention to use *eNotifikasi* (Section F)

The research respondents were asked to indicate their opinions on the following three items pertaining to end-user training and user's knowledge in *eNotifikasi*:

- Level of knowledge in *eNotifikasi* (i.e. basic, intermediate, and advanced levels)
- Training support for the use of *eNotifikasi*
- Frequency of *eNotifikasi* use

4.2.2.1 Data about the use of *eNotifikasi*: Level of knowledge in *eNotifikasi*

As can be perceived Figure 4.6, majority of the respondents (64% or 32 respondents) had an intermediate level of knowledge in *eNotifikasi*, and 34% (17 respondents) of them had the basic level of knowledge in *eNotifikasi*. However, there was a respondent (2%) reported that he had the advanced level of knowledge in *eNotifikasi*.
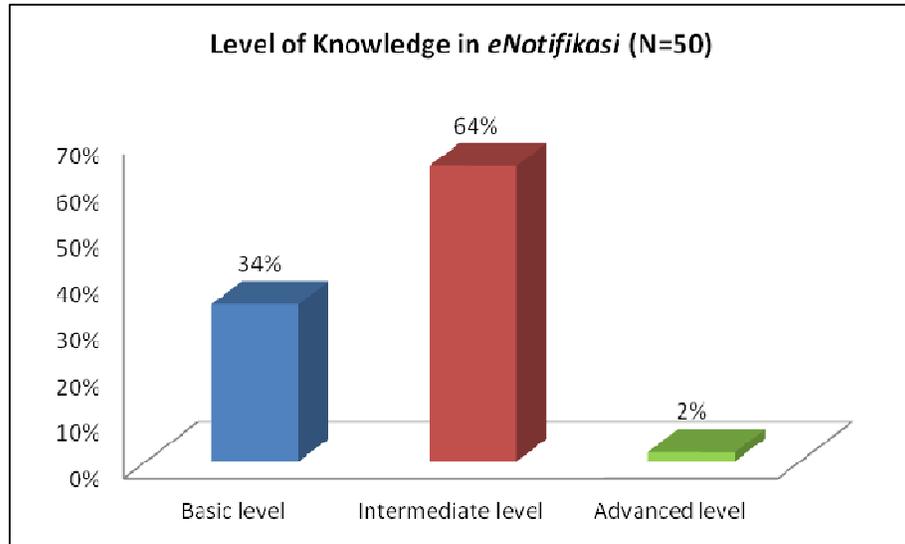
Figure 4.6: Data about the use of *eNotifikasi* – Level of knowledge in *eNotifikasi*

4.2.2.2 Data about the use of *eNotifikasi*: Training support for the use of *eNotifikasi*
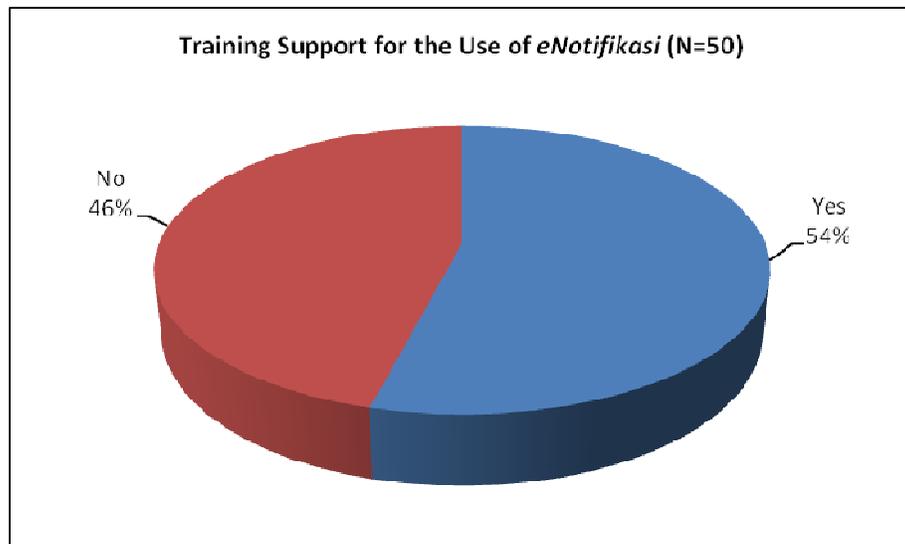
Figure 4.7: Data about the use of *eNotifikasi* – Training support for the use of *eNotifikasi*

When the participants were asked if they have ever received any formal training for the use of *eNotifikasi*, 54% (27 respondents) gave positive responses, whereas the rest (46% or 23 respondents) had contrary opinion. The findings are depicted in Figure 4.7.

4.2.2.3 Data about the use of *eNotifikasi*: Frequency of *eNotifikasi* use

When the participants were asked about how frequent they used *eNotifikasi*, it was found that 68% (34 respondents) used *eNotifikasi* everyday, followed by few times in a week (26% or 13 respondents). Only a small number of the respondents (6% or 3 respondents) used *eNotifikasi* few times in a month. The findings are clearly shown in Figure 4.8.
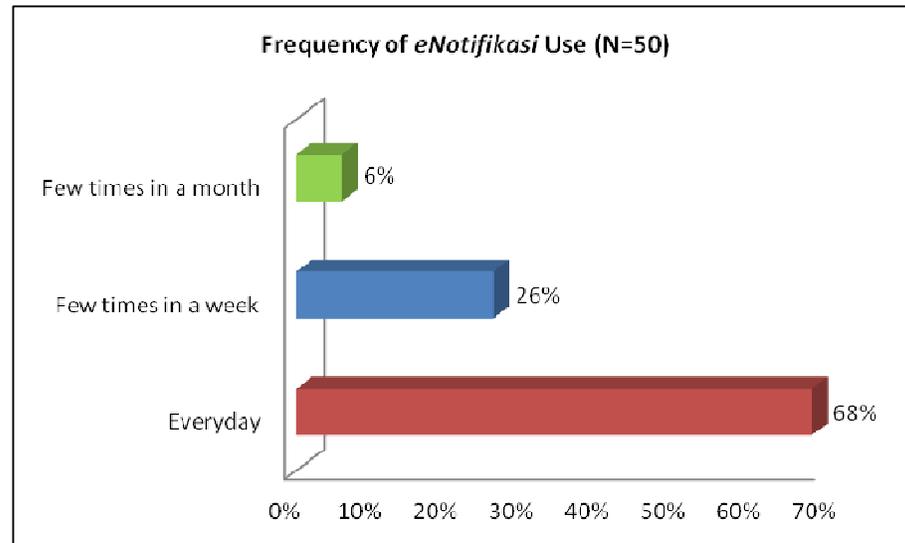
Figure 4.8: Data about the use of *eNotifikasi* – Frequency of *eNotifikasi* use

4.2.3   The Results of Hypotheses Testing

As described in chapter 1, 10 hypotheses were formed and used to verify the research objectives. This section presents the results of each analysed hypothesis.

4.2.3.1 The results of hypothesis 1 (H1) testing

The following null hypothesis was tested:

H_01:   Users do not perceive that *eNotifikasi* is useful and ease of use.

From the first main null hypothesis 1 (H_01), the following two sub hypotheses were formed:

H_01a: Users do not perceive that *eNotifikasi* is useful.

H_01b: Users do not perceive that *eNotifikasi* is ease of use.

To test H_01, the descriptive statistics seem to be the most appropriate method for analysis (which has been discussed in chapter 3). Means, standard deviation (S.D.), frequency and percentage of cases were generated to find out the number of respondents agreeing or disagreeing with each statement built into the research constructs namely perceived usefulness and perceived ease of use.

I.   Testing H1a

As $H_0$1a stated, users do not perceive that *eNotifikasi* is useful. Therefore, it is important to test the real perceptions of users, and the only way to know that is through their levels of agreement with the items that measure the perceived usefulness (PU).

The average response for each of the PU items is above the midpoint (3) of Likert scale (see Table 4.1). This means that the respondents show a high level of agreement and their answers range between agree and strongly agree (see Table 4.2 and Figure 4.9).

Table 4.1: Descriptive statistics of "Perceived usefulness" evaluation among respondents (N=50)

Perceived usefulness	Mean	S.D.
PU1. Using *eNotifikasi* can improve my performance on the job.	3.48	0.646
PU2. Using *eNotifikasi* is able to enhance effectiveness in my job.	3.56	0.675
PU3. I would find *eNotifikasi* useful in my job.	3.64	0.663

The findings in Table 4.2 and Figure 4.9 reveal that 52% of the respondents agreed with statement PU1 (2% strongly agreed and 50% agreed), 58% of the respondents agreed with statement PU2 (4% strongly agreed and 54% agreed), and 62% of the respondents agreed with statement PU3 (6% strongly agreed and 56% agreed). Only a small number of respondents disagreed with these three statements i.e. PU1 (6%), PU2 (6%) and PU3 (4%).

None of the respondents strongly disagreed with these three statements. The

rest remained neutral namely 42% for PU1, 36% for PU2, and 34% for PU3.

Table 4.2: Frequency and percentage of responses for "Perceived usefulness" evaluation among respondents (N=50)

Perceived usefulness	Response	Frequency	Percentage
PU1. Using *eNotifikasi* can improve my performance on the job.	Strongly Agree	1	2
	Agree	25	50
	Neutral	21	42
	Disagree	3	6
	Strongly Disagree	0	0
PU2. Using *eNotifikasi* is able to enhance effectiveness in my job.	Strongly Agree	2	4
	Agree	27	54
	Neutral	18	36
	Disagree	3	6
	Strongly Disagree	0	0
PU3. I would find *eNotifikasi* useful in my job.	Strongly Agree	3	6
	Agree	28	56
	Neutral	17	34
	Disagree	2	4
	Strongly Disagree	0	0
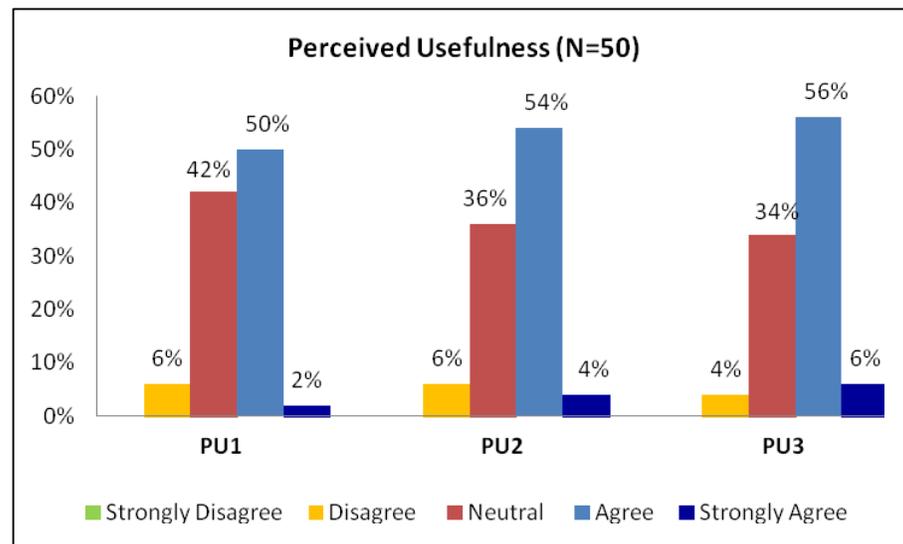
Figure 4.9: Frequency and percentage of responses for "Perceived usefulness" evaluation among respondents

As all the statements that measure the PU construct possess mean around 3.5 (see Table 4.1), hence, the general perception of users towards the usefulness of *eNotifikasi* is positive. Therefore, there was enough evidence to reject H_01a. In other words, users perceive *eNotifikasi* as useful.

II.   Testing H1b

As H_01b stated, users do not perceive that *eNotifikasi* is easy to use. It is important to test the real perceptions of the Malaysian public officers, and the only way to know that is through their levels of agreement with the items that measure the perceived ease of use (PEOU).

The average response for each of the PEOU items is above the midpoint (3) of Likert scale (see Table 4.3). This means that the respondents show a high level of agreement and their answers range between agree and strongly agree (see Table 4.4 and Figure 4.10).

Table 4.3: Descriptive statistics of "Perceived ease of use" evaluation among respondents (N=50)

Perceived ease of use	Mean	S.D.
PEOU1. I would find the *eNotifikasi* easy to use.	3.34	0.745
PEOU2. My interaction with the *eNotifikasi* is clear and understandable.	3.44	0.675
PEOU3. It is easy for me to input and analyse data using *eNotifikasi*.	3.50	0.707

Table 4.4: Frequency and percentage of responses for "Perceived ease of use" evaluation among respondents (N=50)

Perceived ease of use	Response	Frequency	Percentage
PEOU1. I would find the *eNotifikasi* easy to use.	Strongly Agree	2	4
	Agree	18	36
	Neutral	26	52
	Disagree	3	6
	Strongly Disagree	1	2
PEOU2. My interaction with the *eNotifikasi* is clear and understandable.	Strongly Agree	2	4
	Agree	20	40
	Neutral	27	54
	Disagree	0	0
	Strongly Disagree	1	2
PEOU3. It is easy for me to input and analyse data using *eNotifikasi*.	Strongly Agree	2	4
	Agree	24	48
	Neutral	22	44
	Disagree	1	2
	Strongly Disagree	1	2

As can be seen in Table 4.4 and Figure 4.10, 40% of the respondents agreed with statement PEOU1 (4% strongly agreed and 36% agreed), 44% of the respondents agreed with statement PEOU2 (4% strongly agreed and 40% agreed), and 52% of the respondents agreed with statement PEOU3 (4% strongly agreed and 48% agreed). Only a small number of respondents either strongly disagreed or disagreed with these three statements i.e. PEOU1 (2% strongly disagreed and 6% disagreed), PEOU2 (2% strongly disagreed and none of them disagreed) and PEOU3 (2% strongly disagreed and disagreed respectively). The rest of the respondents showed neutral behaviour (i.e. 52% for PEOU1, 54% for PEOU2, and 44% for PEOU3).
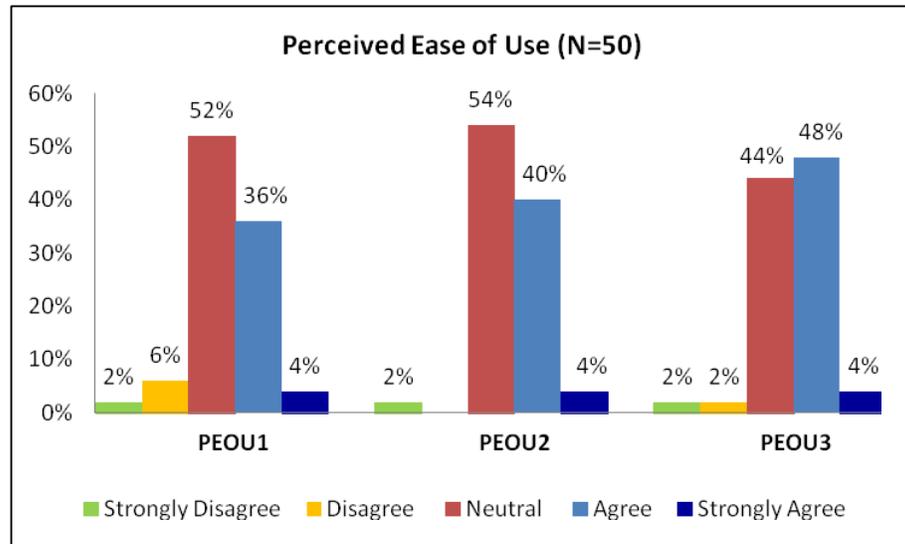
Figure 4.10: Frequency and percentage of responses for "Perceived ease of use" evaluation among respondents

As all the statements that measure the PEOU construct possess mean above 3 (see Table 4.3), hence, the general perception of users towards the ease of use of *eNotifikasi* is positive. Therefore, there was enough evidence to reject H_01b. The results had revealed that users perceive that *eNotifikasi* is ease of use.

III. Testing H1 summary

Since both H_01a and H_01b could be rejected, thus H_01 was rejected indicating that users perceive that *eNotifikasi* is useful and ease of use. Meanwhile, the average mean score of all the statements that built into the perceived usefulness and ease of use research constructs were greater than the neutral point (3) (see Tables 4.1 and 4.3) reflected that the respondents' level of agreement were high and they were agreeable that *eNotifikasi* is useful and

ease of use.

4.2.3.2 The results of hypothesis 2 (H2) testing

The following null hypothesis was tested:

$H_0$2:   The users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived usefulness of *eNotifikasi*.

From the second main null hypothesis 2 ($H_0$2), the following five sub hypotheses were formed:

$H_0$2a: The users' gender does not have any significant effects on the perceived usefulness of *eNotifikasi*.

$H_0$2b: The users' age does not have any significant effects on the perceived usefulness of *eNotifikasi*.

$H_0$2c: The users' job classification does not have any significant effects on the perceived usefulness of *eNotifikasi*.

$H_0$2d: The users' division/unit does not have any significant effects on the perceived usefulness of *eNotifikasi*.

$H_0$2e: The users' length of public services experience does not have any significant effects on the perceived usefulness of *eNotifikasi*.

As described in chapter 3, two statistical tests were carried out to test hypothesis $H_0$2 as follows:

- First, the independent-samples t-test was used to test H_02a to examine if there are any differences between male and female users in terms perceiving the usefulness of *eNotifikasi*.

- Second, the One-Way ANOVA test was used to test H_02b to H_02e to analyze if there are any differences in using the *eNotifikasi* in perceiving the usefulness of *eNotifikasi* attributed to the age, job classification, division/unit, and length of public services experience.

I.   Testing H2a

Griffith (2010) noted that if the significance of the t-test is low, it indicates a significant difference in the two means. As the p-value was large ($t = 0.568$, $p = 0.573$) which indicates that there was no significant difference in the two means, therefore there was not enough evidence to reject H_02a ($p > 0.05$) (see Tables 4.5 and 4.6). The findings explained that there was no significant difference between male and female users in perceiving the usefulness of *eNotifikasi*.

Table 4.5: Descriptive statistics for perceived usefulness and users' gender

	Gender	N	Mean	S.D.
Perceived usefulness	Male	40	3.58	0.574
	Female	10	3.47	0.613

Table 4.6: T-test results for perceived usefulness and users' gender

Perceived usefulness	Levene's Test for Equality of Variance		T-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	0.367	0.548	0.568	48	0.573
Equal variances not assumed			0.545	13.231	0.595

Note:
According to Griffith (2010), the value of equal variance assumed is applicable if the significance of the Levene's test is high (greater than 0.05). Since the p-value for Levene's test is large (p=0.548), which is greater than 0.05, so we can assume that the variances are approximately equal.

II.   Testing H2b

The p-value was 0.013 (F = 4.032) indicating two different interpretations (see Tables 4.7 and 4.8). If the significance level is set at 0.05, $H_0$2b would have been rejected as $p < 0.05$. However, when tested at a 0.01 significance level, $H_0$2b could not be rejected ($p > 0.01$). Hence, the users' age groups had no significant effects on the perceived usefulness of *eNotifikasi* at a 0.01 significance level.

Table 4.7: Descriptive statistics for perceived usefulness and users' age

Age Group	N	Mean	S.D.
<30 years	13	3.36	0.645
30-40 years	19	3.37	0.414
41-50 years	12	3.92	0.653
>50 years	6	3.89	0.172

Table 4.8: ANOVA results for perceived usefulness and users' age

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PU * Age	Between Groups	3.398	3	1.133	4.032	0.013*
	Within Groups	12.922	46	0.281		

* $p < 0.05$

III. Testing H2c

The One-Way ANOVA test was not significant (F = 2.371, p = 0.066). The p-value was 0.066 indicating that there was not enough evidence to reject $H_0$2c (p > 0.05) (see Tables 4.9 and 4.10). Hence, there was no significant difference between users' job classifications. Users of all job classifications agreed on the usefulness of *eNotifikasi*.

Table 4.9: Descriptive statistics for perceived usefulness and users' job classification

Job Classification	N	Mean	S.D.
AMRO	2	4.00	0.000
PPKP	40	3.51	0.534
District Health Officer	6	3.44	0.689
Epidemiology Officer	1	5.00	.
IT Officer	1	4.00	.

Table 4.10: ANOVA results for perceived usefulness and users' job classification

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PU * Job Cl.	Between Groups	2.841	4	0.710	2.371	0.066
	Within Groups	13.479	45	0.300		

IV.   Testing H2d

The One-Way ANOVA test was not significant (F = 1.253, p = 0.301). The p-value was rather large (p = 0.301) indicating that there was not enough evidence to reject $H_0$2d (p > 0.05) (see Tables 4.11 and 4.12). Thus, the public health officers in all divisions/units could be in agreement on the usefulness of *eNotifikasi*.

Table 4.11: Descriptive statistics for perceived usefulness and users' division/unit

Division/Unit	N	Mean	S.D.
CDC	15	3.76	0.408
Vector	7	3.57	0.787
HIV/STI	7	3.19	0.378
TB	10	3.40	0.699
ICT	1	4.00	.
Others	10	3.63	0.576

Table 4.12: ANOVA results for perceived usefulness and users' division/unit

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PU * Div.	Between Groups	2.034	5	0.407	1.253	0.301
	Within Groups	14.286	44	0.325		

V.   Testing H2e

The One-Way ANOVA test was not significant (F = 1.926, p = 0.139). The p-value was 0.139 indicating that there was not enough evidence to reject $H_0$2e (p > 0.05) (see Tables 4.13 and 4.14). Hence, the length of public services experience had no significant effects on perceived usefulness of

eNotifikasi. This means that whatever length of public services experience the public health officers had, they were in agreement on the perceived usefulness of *eNotifikasi*.

Table 4.13: Descriptive statistics for perceived usefulness and users' length of public services experience

Length of Public Services Experience	N	Mean	S.D.
<1 year	6	3.28	0.772
1-5 years	7	3.43	0.568
6-10 years	12	3.39	0.422
>10 years	25	3.75	0.563

Table 4.14: ANOVA results for perceived usefulness and users' length of public services experience

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PU * PS exp.	Between Groups	1.821	3	0.607	1.926	0.139
	Within Groups	14.499	46	0.315		

VI.   Testing H2 summary

Overall, the results show that all the null sub hypotheses for the second hypothesis (i.e. H_02a to H_02e) could not be rejected indicating that the Malaysian public health users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived usefulness of *eNotifikasi* at a significance level of 0.01.

However, when tested at a 0.05 significance level, H_02a, H_02c, H_02d, and H_02e could not be rejected indicating that H_02 could be partially rejected

at a significance level of 0.05. The results showed that only the age groups had significant effects on the perceived usefulness of *eNotifikasi* at a significance level of 0.05. The results showed that the senior officers (age above 40 years old) perceived the *eNotifikasi* as more useful with the mean values above 3.8, compared to junior officers (age below 40 years old) with the mean values below 3.4 (see Tables 4.7). This may due to the senior officers have more experiences in manually managing the cases of communicable disease through filling out and faxing the notification form to the related district health office which are often manual, inefficient, time consuming, and causing delays in the process before the implementation of *eNotifikasi* in year 2011, compared to the junior officers. Therefore, senior officers found the *eNotifikasi* is useful to manage the cases of communicable diseases efficiently.

4.2.3.3 The results of hypothesis 3 (H3) testing

The following null hypothesis was tested:

$H_0 3$:   The users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived ease of use of *eNotifikasi*.

From the third main null hypothesis 3 ($H_0 3$), the following five sub hypotheses were formed:

$H_0 3a$:   The users' gender does not have any significant effects on the perceived ease of use of *eNotifikasi*.

$H_0 3b$:   The users' age does not have any significant effects on the perceived ease of use of *eNotifikasi*.

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H_03c: The users' job classification does not have any significant effects on the perceived ease of use of *eNotifikasi*.

H_03d: The users' division/unit does not have any significant effects on the perceived ease of use of *eNotifikasi*.

H_03e: The users' length of public services experience does not have any significant effects on the perceived ease of use of *eNotifikasi*.

As described in chapter 3, two statistical tests were carried out to test hypothesis H_03 as follows:

- First, the independent-samples t-test was used to test H_03a to examine if there are any differences between male and female users in terms of perceiving the ease of use of *eNotifikasi*.

- Second, the One-Way ANOVA test was used to test H_03b to H_03e to analyze if there are any differences in using the *eNotifikasi* in terms of perceiving the ease of use of *eNotifikasi* attributed to the age, job classification, division/unit, and length of public services experience.

I.   Testing H3a

Table 4.15: Descriptive statistics for perceived ease of use and users' gender

	Gender	N	Mean	S.D.
Perceived ease of use	Male	40	3.38	0.647
	Female	10	3.60	0.516

Table 4.16: T-test results for perceived ease of use and users' gender

Perceived ease of use	Levene's Test for Equality of Variance		T-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	0.015	0.903	-0.981	48	0.332
Equal variances not assumed			-1.124	16.861	0.277

Note:
According to Griffith (2010), the value of equal variance assumed is applicable if the significance of the Levene's test is high (greater than 0.05). Since the p-value for Levene's test is large (p=0.903), which is greater than 0.05, so we can assume that the variances are approximately equal.

As mention earlier in hypothesis 2 (H2) testing, if the significance of the t-test is low, it indicates a significant difference in the two means (Griffith 2010). As the p-value was large (t = -0.981, p = 0.332) which indicates that there was no significant difference in the two means, therefore there was not enough evidence to reject H_03a (p > 0.05) (see Tables 4.15 and 4.16). The findings explained that there was no significant difference between male and female users in perceiving the ease of use of *eNotifikasi*.

II.   Testing H3b

The One-Way ANOVA test was significant (F = 5.125, p = 0.004). The p-value was 0.004 indicating that there was enough evidence to reject H_03b (p < 0.01) (see Tables 4.17 and 4.18). Hence, the users' age groups had significant effects on the perceived ease of use of *eNotifikasi*.

Table 4.17: Descriptive statistics for perceived ease of use and users' age

Age Group	N	Mean	S.D.
<30 years	13	3.05	0.768
30-40 years	19	3.32	0.392
41-50 years	12	3.83	0.611
>50 years	6	3.78	0.272

Table 4.18: ANOVA results for perceived ease of use and users' age

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PEOU * Age	Between Groups	4.790	3	1.597	5.125	0.004**
	Within Groups	14.330	46	0.312		

** $p < 0.01$

III. Testing H3c

The One-Way ANOVA test was not significant (F = 1.444, p = 0.235). The p-value was 0.235 indicating that there was not enough evidence to reject $H_0$3c (p > 0.05) (see Tables 4.19 and 4.20). Hence, there was no significant difference between users' job classifications. Users of all job classifications agreed on the ease of use of *eNotifikasi*.

Table 4.19: Descriptive statistics for perceived ease of use and users' job classification

Job Classification	N	Mean	S.D.
AMRO	2	3.83	0.236
PPKP	40	3.33	0.632
District Health Officer	6	3.67	0.516
Epidemiology Officer	1	4.33	.
IT Officer	1	4.00	.

Table 4.20: ANOVA results for perceived ease of use and users' job classification

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PEOU * Job Cl.	Between Groups	2.176	4	0.544	1.444	0.235
	Within Groups	16.944	45	0.377		

IV.   Testing H3d

The One-Way ANOVA test was not significant (F = 1.384, p = 0.249). The p-value was rather large (p = 0.249) indicating that there was not enough evidence to reject $H_0$3d (p > 0.05) (see Tables 4.21 and 4.22). Thus, the public health officers in all divisions/units could be in agreement on the ease of use of *eNotifikasi*.

Table 4.21: Descriptive statistics for perceived ease of use and users' division/unit

Division/Unit	N	Mean	S.D.
CDC	15	3.56	0.663
Vector	7	3.43	0.460
HIV/STI	7	3.10	0.252
TB	10	3.17	0.892
ICT	1	4.00	.
Others	10	3.67	0.416

Table 4.22: ANOVA results for perceived ease of use and users' division/unit

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PEOU * Div.	Between Groups	2.599	5	0.520	1.384	0.249
	Within Groups	16.521	44	0.375		

The p-value was 0.011 (F = 4.126) indicating two different interpretations (see Tables 4.23 and 4.24). If the significance level is set at 0.05, $H_0$3e would have been rejected as p < 0.05. However, when tested at a 0.01 significance level, $H_0$3e could not be rejected (p > 0.01). Hence, the length of public services experience for the public health officers had no significant effects on the perceived ease of use of *eNotifikasi* at a 0.01 significance level.

Table 4.23: Descriptive statistics for perceived ease of use and users' length of public services experience

Length of Public Services Experience	N	Mean	S.D.
<1 year	6	2.83	0.983
1-5 years	7	3.43	0.535
6-10 years	12	3.22	0.385
>10 years	25	3.67	0.536

Table 4.24:   ANOVA results for perceived ease of use and users' length of public services experience

ANOVA Table		Sum of Squares	df	Mean Square	F	Sig.
PEOU * PS exp.	Between Groups	4.054	3	1.351	4.126	0.011*
	Within Groups	15.066	46	0.328		

* p < 0.05

VI.   Testing H3 summary

Overall, the results of testing the H3 show that all the null sub hypotheses could not be rejected except $H_0 3b$. The findings indicate that the Malaysian public health users' gender, job classification, division/unit, and length of public services experience did not have any significant effects on the perceived ease of use of *eNotifikasi*.

However, the results show that age groups had significant effects on the perceived ease of use of *eNotifikasi*. The results showed that the senior officers (age above 40 years old) perceived the *eNotifikasi* as ease of use with the mean values above 3.7, compared to junior officers (age below 40 years old) with the mean values below 3.4 (see Tables 4.17).

This may due to the senior officers (e.g. supervisors) need to calculate the record manually to prepare the report before the implementation of *eNotifikasi* in year 2011, compared to the junior officers. The *eNotifikasi* had module report which can generate the report by converted input data into aggregate data. Besides, senior officers also can download input data easily in excel format to do their own analysis by selecting the variables that they required. Hence, the senior officers found the *eNotifikasi* is ease of use in their work. The study of Morris and Venkatesh (2000, cited in Venkatesh et al., 2003) had supported that constructs related to perceived ease of use would be stronger determinants of individuals' intention for older workers.

4.2.3.4 The results of hypothesis 4 (H4) testing

The following null hypothesis was tested:

$H_0 4$:   There is no relationship between users' satisfaction with IT technical support and the perceived usefulness of *eNotifikasi*

Table 4.25: Descriptive statistics for users' satisfaction with IT technical support and perceived usefulness

	Mean	S.D.	N
Users' satisfaction with IT technical support	3.35	0.981	50
Perceived usefulness	3.56	0.577	50

Table 4.26: Correlation between users' satisfaction with IT technical support and perceived usefulness

		Users' satisfaction with IT technical support	Perceived usefulness
Users' satisfaction with IT technical support	Pearson correlation	1.00	0.091
	Sig. (2-tailed)		0.528
	N	50	50
Perceived usefulness	Pearson correlation	0.091	1.00
	Sig. (2-tailed)	0.528	
	N	50	50

Note:
The null hypothesis ($H_0 4$) indicates that there is no association between Users' satisfaction with IT technical support and Perceived usefulness. r = correlation value, p = probability value. r can range from –1 to + 1. A +1 correlation means that there is a perfect linear positive relationship. A 0 correlation means there is no linear relationship; this does not necessarily mean that there is no relationship, only that a straight line does not describe it. When the p-value is small, the finding is statistically significant. That is, the data provide enough evidence to allow us to reject H_0. Usually, when $p < 0.05$, we reject H_0; if $p > 0.05$, we fail to reject H_0.

The p-value was rather large (r = 0.091, p= 0.528) (see Tables 4.25 and 4.26). Therefore there was not enough evidence to reject $H_0 4$. This indicates

that there was no association between users' satisfaction with IT technical
support and the perceived usefulness of *eNotifikasi*.

4.2.3.5 The results of hypothesis 5 (H5) testing

The following null hypothesis was tested:

$H_0 5$: There is no relationship between users' satisfaction with IT
technical support and the perceived ease of use of *eNotifikasi*

Table 4.27: Descriptive statistics for users' satisfaction with IT technical support and perceived ease of use

	Mean	S.D.	N
Users' satisfaction with IT technical support	3.35	0.981	50
Perceived ease of use	3.43	0.625	50

Table 4.28: Correlation between users' satisfaction with IT technical support and perceived ease of use

		Users' satisfaction with IT technical support	Perceived ease of use
Users' satisfaction with IT technical support	Pearson correlation	1.00	0.101
	Sig. (2-tailed)		0.485
	N	50	50
Perceived ease of use	Pearson correlation	0.101	1.00
	Sig. (2-tailed)	0.485	
	N	50	50

Note:
The null hypothesis ($H_0 5$) indicates that there is no association between Users' satisfaction with IT technical support and Perceived ease of use. r = correlation value, p = probability value. r can range from –1 to + 1. A +1 correlation means that there is a perfect linear positive relationship. A 0 correlation means there is no linear relationship; this does not necessarily mean that there is no relationship, only that a straight line does not describe it. When the p-value is small, the finding is statistically significant. That is, the data provide enough evidence to allow us to reject H_0. Usually, when $p < 0.05$, we reject H_0; if $p > 0.05$, we fail to reject H_0.

The p-value was rather large ($r = 0.101$, $p = 0.485$) (see Tables 4.27 and 4.28). Therefore there was not enough evidence to reject H_05. This indicates that there was no association between users' satisfaction with IT technical support and the perceived ease of use of *eNotifikasi*.

4.2.3.6 The results of hypothesis 6 (H6) testing

The following null hypothesis was tested:

H_06:   There is no significant difference between trained and non-trained users' perceived usefulness and perceived ease of use of the *eNotifikasi*.

From the forth main null hypothesis 6 (H_06), the following two sub hypotheses were formed:

H_06a: There is no significant difference between trained and non-trained users' perceived usefulness of the *eNotifikasi*.

H_06b: There is no significant difference between trained and non-trained users' perceived ease of use of the *eNotifikasi*.

As described in chapter 3, the independent-samples t-test was used to test H_06 to examine if there are any differences between trained and non-trained public health officers in terms of perceiving the usefulness and ease of use of *eNotifikasi*.

I.   Testing H6a

As the p-value was found to be highly significant (t = 3.824, p = 0.000) which indicates that there was a significant difference in the two means, therefore there was strong evidence to reject H_06a (p < 0.01) (see Tables 4.29 and 4.30).

Table 4.29: Descriptive statistics for perceived usefulness and the training support

	Training support	N	Mean	S.D.
Perceived usefulness	Yes	27	3.81	0.427
	No	23	3.26	0.594

Table 4.30: T-test results for perceived usefulness and the training support

Perceived usefulness	Levene's Test for Equality of Variance		T-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	2.788	0.101	3.824	48	0.000
Equal variances not assumed					
			3.726	39.195	0.001

Note:
Since the p-value for Levene's test is greater than 0.05 (p=0.101), so we can assume that the variances are approximately equal.

The findings explained that there was a significant difference between trained and non-trained users' perceived usefulness of *eNotifikasi*. It implies that the training support can affect users' perceptions toward the usefulness of *eNotifikasi*.

II.   Testing H6b

As the p-value was found to be highly significant (t = 3.014, p = 0.004) which indicates that there was a significant difference in the two means, therefore there was strong evidence to reject $H_0$6b (p < 0.01) (see Tables 4.31 and 4.32).

Table 4.31: Descriptive statistics for perceived ease of use and the training support

	Training support	N	Mean	S.D.
Perceived ease of use	Yes	27	3.65	0.485
	No	23	3.16	0.673

Table 4.32: T-test results for perceived ease of use and the training support

Perceived ease of use	Levene's Test for Equality of Variance		T-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	0.015	0.904	3.014	48	0.004
Equal variances not assumed			2.936	39.241	0.006

Note:
Since the p-value for Levene's test is large (p=0.904), which is greater than 0.05, so we can assume that the variances are approximately equal.

The findings showed that there was a significant difference between trained and non-trained users' perceived ease of use of *eNotifikasi*. It implies that the training support can affect users' perceptions toward the ease of use of *eNotifikasi*.

III. Testing H6 summary

Overall, since both H_06a and H_06b could be rejected, thus H_06 was rejected indicating that users with or without training support have different perceptions toward the usefulness and ease of use of *eNotifikasi*. The results in Figure 4.11 revealed that users' with training support possess higher mean scores (mean for PU = 3.81; mean for PEOU = 3.65) than users' without training support (mean for PU = 3.26; mean for PEOU = 3.16). This means that trained users are generally perceived the *eNotifikasi* as being useful and ease of use.
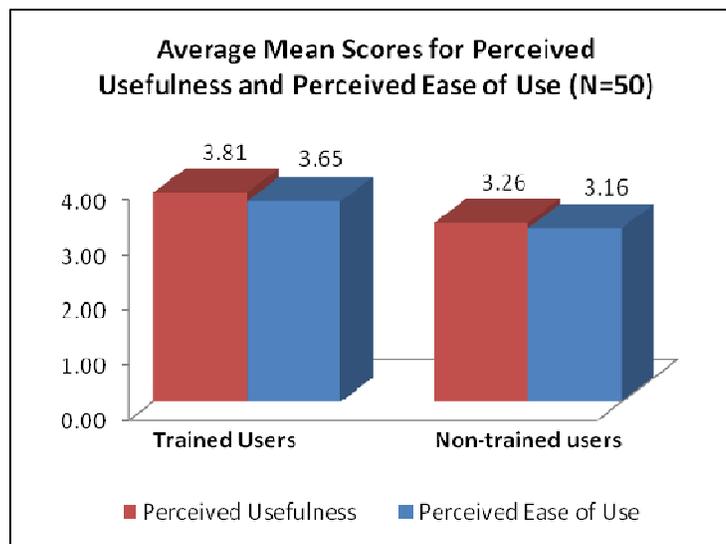
Figure 4.11: Average mean scores for perceived usefulness and perceived ease of use among respondents

4.2.3.7 The results of hypothesis 7 (H7) testing

The following null hypothesis was tested:

$H_0 7$:   There is no relationship between perceived ease of use and perceived usefulness of *eNotifikasi*.

As described in chapter 3, Pearson's Coefficient Correlation (r) was utilised to test $H_0 7$. It studied the relationship between the research constructs, i.e. perceived ease of use and perceived usefulness.

Table 4.33: Descriptive statistics for Perceived usefulness and Perceived ease of use

	Mean	S.D.	N
Perceived ease of use	3.43	0.625	50
Perceived usefulness	3.56	0.577	50

Table 4.34: Correlation between Perceived usefulness and Perceived ease of use

		Perceived ease of use	Perceived usefulness
Perceived ease of use	Pearson correlation	1.00	0.758**
	Sig. (2-tailed)		0.000
	N	50	50
Perceived usefulness	Pearson correlation	0.758**	1.00
	Sig. (2-tailed)	0.000	
	N	50	50

** .Correlation is significant at the 0.01 level (2-tailed)

Note:
The null hypothesis ($H_0 7$) indicates that there is no association between Perceived ease of use and Perceived usefulness. r = correlation value, p = probability value. r can range from –1 to + 1. A +1 correlation means that there is a perfect linear positive relationship. A 0 correlation means there is no linear relationship; this does not necessarily mean that there is no relationship, only that a straight line does not describe it. When the p-value is small, the finding is statistically significant. That is, the data provide enough evidence to allow us to reject H_0. Usually, when $p < 0.05$, we reject H_0; if $p > 0.05$, we fail to reject H_0.

4.2.3.8 The results of hypothesis 8 (H8) testing

The following null hypothesis was tested:

$H_0 8$:   Users do not intend to use *eNotifikasi* to manage the cases of communicable diseases.

To test $H_0 8$, the descriptive statistics seem to be the most appropriate method for analysis (which has been discussed in chapter 3). Means, standard deviation (S.D.), frequency and percentage of cases were generated to find out the number of respondents agreeing or disagreeing with each statement. As it is stated, users do not intend to use *eNotifikasi* to manage the cases of communicable diseases. It is important to test the real behavioural intentions to use *eNotifikasi* of the Malaysian public officers, and the only way to know that is through their levels of agreement with the items that measure the behavioural intention to use (BITU) *eNotifikasi*.

The average response for each of the BITU items is above the midpoint (3) of Likert scale (see Table 4.35). This means that the respondents show a high level of agreement and their answers range between agree and strongly agree (see Table 4.36 and Figure 4.12).

As depicted in Table 4.36 and Figure 4.12, majority of the respondents agreed with statements BITU1 (10% strongly agreed and 64% agreed) and BITU2 (14% strongly agreed and 60% agreed). Only 4% of the respondents disagreed with statement BITU1, but none of the respondents showed disagree

behaviour with statement BITU2. None of the respondents strongly disagreed with these two statements. The rest of the respondents gave neutral responses (i.e. 22% for BITU1 and 26% for BITU2).

Table 4.35: Descriptive statistics of "Behavioural intention to use" evaluation among respondents (N=50)

Behavioural intention to use	Mean	S.D.
BITU1. I always use *eNotifikasi* to perform my tasks.	3.80	0.670
BITU2. I will continue to use *eNotifikasi* on a regular basic in the future.	3.88	0.627

Table 4.36: Frequency and percentage of responses for "Behavioural intention to use" evaluation among respondents (N=50)

Behavioural intention to use	Response	Frequency	Percentage
BITU1. I always use *eNotifikasi* to perform my tasks.	Strongly Agree	5	10
	Agree	32	64
	Neutral	11	22
	Disagree	2	4
	Strongly Disagree	0	0
BITU2. I will continue to use *eNotifikasi* on a regular basic in the future.	Strongly Agree	7	14
	Agree	30	60
	Neutral	13	26
	Disagree	0	0
	Strongly Disagree	0	0

As all the statements that measure the BITU construct possess mean above 3 (see Table 4.35), hence, the behavioural intention of users to use the *eNotifikasi* for managing the cases of communicable diseases is positive. Therefore, there was enough evidence to reject $H_0 8$ indicating that users intend to use the *eNotifikasi* to manage the cases of communicable diseases.
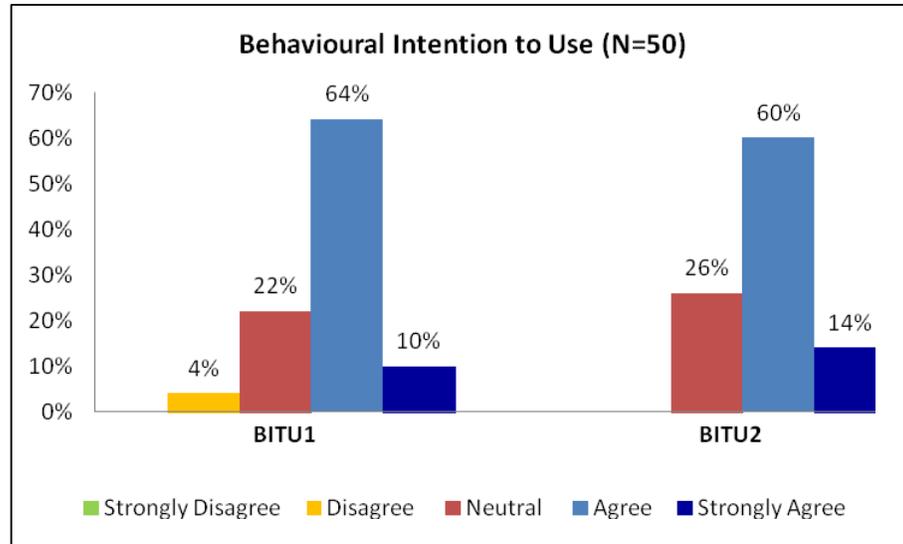
Figure 4.12: Frequency and percentage of responses for "Behavioural intention to use" evaluation among respondents

4.2.3.9 The results of hypothesis 9 (H9) testing

The following null hypothesis was tested:

$H_0$9: There is no relationship between perceived usefulness and behavioural intention to use *eNotifikasi*.

As described in chapter 3, Pearson's Coefficient Correlation (r) was utilised to test $H_0$9. It studied the relationship between the research constructs, i.e. perceived usefulness and behavioural intention to use *eNotifikasi*. The p-value was found to be highly significant ($r = 0.600$, $p < 0.01$) (see Tables 4.37 and 4.38). Therefore there was strong evidence to reject $H_0$9. Perceived usefulness was positively correlated with behavioural intention to use *eNotifikasi* ($r = 0.600$). In other words, users perceived the *eNotifikasi* as being useful, and thus they have intention to use it for managing the cases of

communicable diseases.

Table 4.37: Descriptive statistics for Perceived usefulness and Behavioural intention to use

	Mean	S.D.	N
Perceived usefulness	3.56	0.577	50
Behavioural intention to use	3.84	0.618	50

Table 4.38: Correlation between Perceived usefulness and Behavioural intention to use

		Perceived usefulness	Behavioural intention to use
Perceived usefulness	Pearson correlation	1.00	0.600**
	Sig. (2-tailed)		0.000
	N	50	50
Behavioural intention to use	Pearson correlation	0.600**	1.00
	Sig. (2-tailed)	0.000	
	N	50	50

**.Correlation is significant at the 0.01 level (2-tailed)

Note:
The null hypothesis ($H_0 9$) indicates that there is no association between Perceived usefulness and Behavioural intention to use. r = correlation value, p = probability value. r can range from –1 to + 1. A +1 correlation means that there is a perfect linear positive relationship. A 0 correlation means there is no linear relationship; this does not necessarily mean that there is no relationship, only that a straight line does not describe it. When the p-value is small, the finding is statistically significant. That is, the data provide enough evidence to allow us to reject H_0. Usually, when $p < 0.05$, we reject H_0; if $p > 0.05$, we fail to reject H_0.

4.2.3.10   The results of hypothesis 10 (H10) testing

The following null hypothesis was tested:

$H_0 10$: There is no relationship between perceived ease of use and behavioural intention to use *eNotifikasi*.

Table 4.39: Descriptive statistics for Perceived ease of use and Behavioural intention to use

	Mean	S.D.	N
Perceived ease of use	3.43	0.625	50
Behavioural intention to use	3.84	0.618	50

Table 4.40: Correlation between Perceived ease of use and Behavioural intention to use

		Perceived ease of use	Behavioural intention to use
Perceived ease of use	Pearson correlation	1.00	0.498**
	Sig. (2-tailed)		0.000
	N	50	50
Behavioural intention to use	Pearson correlation	0.498**	1.00
	Sig. (2-tailed)	0.000	
	N	50	50

**.Correlation is significant at the 0.01 level (2-tailed)

Note:
The null hypothesis ($H_0 10$) indicates that there is no association between Perceived ease of use and Behavioural intention to use. r = correlation value, p = probability value. r can range from –1 to + 1. A +1 correlation means that there is a perfect linear positive relationship. A 0 correlation means there is no linear relationship; this does not necessarily mean that there is no relationship, only that a straight line does not describe it. When the p-value is small, the finding is statistically significant. That is, the data provide enough evidence to allow us to reject H_0. Usually, when $p < 0.05$, we reject H_0; if $p > 0.05$, we fail to reject H_0.

As described in chapter 3, Pearson's Coefficient Correlation (r) was utilised to test $H_0 10$. It studied the relationship between the research constructs, i.e. perceived ease of use and behavioural intention to use *eNotifikasi*. The p-value was found to be highly significant ($r = 0.498$, $p < 0.01$) (see Tables 4.39 and 4.40). Therefore there was strong evidence to reject $H_0 10$. Perceived ease of use was positively correlated with behavioural intention to use *eNotifikasi* ($r = 0.498$). As a result, users who perceive that the *eNotifikasi* is easy to use will have intention to use it for managing the cases of communicable diseases.

4.2.4   Summary of the Results of Hypotheses Testing

Overall, the results of hypotheses testing showed that of the 10 null hypotheses tested, six null hypotheses (i.e. H_01 and H_06 to H_010) were rejected as follows:

- H_01 was rejected because all statements in measurement items for PEOU and PU possess mean above 3 which reflected that users were agreed that *eNotifikasi* is ease of use and useful.

- H_06 was rejected because the p-values for H_06a (p = 0.000) and H_06b (p = 0.004) were too small (p < 0.01) (see Table 4.30 and 4.32). This means training support could affect users' perceptions toward the usefulness and ease of use of *eNotifikasi*.

- H_07 was rejected because the p-value was too small (p = 0.000; p < 0.01) (see Table 4.34). This means users that perceived *eNotifikasi* as easy to use will perceive it as useful.

- H_08 was rejected because all statements in measurement item for BITU possess mean above 3 which reflected that users intended to use *eNotifikasi* to manage the case of communicable diseases.

- H_09 (p = 0.000) and H_010 (p = 0.000) were rejected because both the p-values were too small (p < 0.01). This means users' perceived *eNotifikasi* as useful and ease of use would have intention to use *eNotifikasi* to manage the cases of communicable diseases.

In addition, two null hypotheses (i.e. H_02 and H_03) were partially rejected. The results are as below:

- H_02 was partially rejected. The p-values for H_02a (p = 0.573) (see Table 4.6), H_02c (p = 0.066) (see Table 4.10), H_02d (p = 0.301) (see Table 4.12), and H_02e (p = 0.139) (see Table 4.14) were rather large (p > 0.01). Nonetheless, the p-value for H_02b was 0.013 (see Table 4.8) indicating two different interpretations. If the significance level is set at 0.05, the null sub hypotheses (H_02b) would have been rejected as p < 0.05. However, when tested at a 0.01 significance level, H_02b could not be rejected (p > 0.01). Hence, the users' gender, age, job classification, division/ unit, and length of public services experience did not have any significant effects on the perceived usefulness of *eNotifikasi* at a 0.01 significance level. However, users' age had shown significant effects at a 0.05 significance level.

- H_03 was partially rejected. The p-values for H_03a (p = 0.332) (see Table 4.16), H_03c (p = 0.235) (see Table 4.20), H_03d (p = 0.249) (see Table 4.22), and H_03e (p = 0.011) (see Table 4.24) were rather large (p > 0.01). Nevertheless, the p-value for H_03b was 0.004 (see Table 4.18) indicating the null sub hypotheses (H_03b) would have been rejected as p < 0.01. The findings shown that all the users' demographic variables did not have any significant effects on the perceived ease of use of *eNotifikasi*, except users' age.

The rest of the null hypotheses (i.e. H_04 and H_05) were not rejected. The results are as below:

- H_04 and H_05 were not rejected because the p-values for both H_04 ($p = 0.528$) (see Table 4.26) and H_05 ($p = 0.485$) (see Table 4.28) were rather large ($p > 0.05$). Hence, there was no significant relationship between users' satisfaction with IT technical support with users' perception towards the usefulness and ease of use of *eNotifikasi*.

The overall results of all the 10 tested null hypotheses and the decision of acceptance or rejection for each null hypothesis are summarized in Table 4.41.

Table 4.41: **Summary of the hypotheses testing results**

Null Hypothesis	Decision
H_01: Users do not perceive that *eNotifikasi* is useful and ease of use.	**Rejected H_01** The findings indicated that users perceive that *eNotifikasi* is useful and ease of use.
H_02: The users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived usefulness of *eNotifikasi*.	**Partially rejected H_02** **(H_02b was rejected at a 0.05 significance level)** The findings indicated users' gender, age, job classification, division/unit, and length of public services experience did not have any significant effects on the perceived usefulness of *eNotifikasi* at a significance level of 0.01. Nonetheless, users' age had shown a significant effect on the perceived usefulness of *eNotifikasi* at a significance level of 0.05.

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Table 4.41: Summary of the hypotheses testing results (Continued)

Null Hypothesis	Decision
H_03: The users' gender, age, job classification, division/unit, and length of public services experience do not have any significant effects on the perceived ease of use of *eNotifikasi*.	**Partially rejected H_03 (H_03b was rejected)** The findings indicated users' gender, job classification, division/unit, and length of public services experience did not have any significant effects on the perceived ease of use of *eNotifikasi*. Nonetheless, users' age had shown a significant effect on the perceived ease of use of *eNotifikasi*.
H_04: There is no relationship between users' satisfaction with IT technical support and the perceived usefulness of *eNotifikasi*.	**Fail to reject H_04** The findings showed that there was no relationship between users' satisfaction with IT technical support and the perceived usefulness of *eNotifikasi*.
H_05: There is no relationship between users' satisfaction with IT technical support and the perceived ease of use of *eNotifikasi*.	**Fail to reject H_05** The findings showed that there was no relationship between users' satisfaction with IT technical support and the perceived ease of use of *eNotifikasi*.
H_06: There is no significant difference between trained and non-trained users' perceived usefulness and perceived ease of use of the *eNotifikasi*.	**Rejected H_06** The findings had shown that there was a significant difference between trained and non-trained users' perception on *eNotifikasi* in terms of perceived usefulness and perceived ease of use.
H_07: There is no relationship between perceived ease of use and perceived usefulness of *eNotifikasi*.	**Rejected H_07** The findings had shown that there was a significant relationship between perceived ease of use and perceived usefulness of *eNotifikasi*.

Table 4.41: Summary of the hypotheses testing results (Continued)

Null Hypothesis	Decision
$H_0 8$: Users do not intend to use *eNotifikasi* to manage the cases of communicable diseases.	**Rejected $H_0 8$** The findings had shown that users' intended to use *eNotifikasi* to manage the cases of communicable diseases.
$H_0 9$: There is no relationship between perceived usefulness and behavioural intention to use *eNotifikasi*.	**Rejected $H_0 9$** The findings indicated that there was a significant relationship between perceived usefulness and behavioural intention to use *eNotifikasi*.
$H_0 10$: There is no relationship between perceived ease of use and behavioural intention to use *eNotifikasi*.	**Rejected $H_0 10$** The findings indicated that there was a significant relationship between perceived ease of use and behavioural intention to use *eNotifikasi*.

4.3 The Findings of Empirically Tested Proposed Technology Acceptance Model

This section presents the findings of the empirically tested proposed TAM based on the results obtained from testing the relevant hypotheses (which have been discussed in section 4.2). The findings of the empirically tested proposed TAM is visualised in Figure 4.13.

The research findings obtained from testing of H2 to H5 revealed that various user background (i.e. gender, age, job classification, division/ unit and length of public service experience), and users' satisfaction with IT technical support did not have significant effects on perceived usefulness of *eNotifikasi*

at a significance level of 0.01. Nonetheless, the users' age had shown a significance effect on perceived usefulness of *eNotifikasi* at a significance level of 0.05. Meanwhile, the research findings had also shown that the user demographic variables and users' satisfaction with IT technical support did not have significant effects on perceived ease of use of *eNotifikasi*, except users' age.
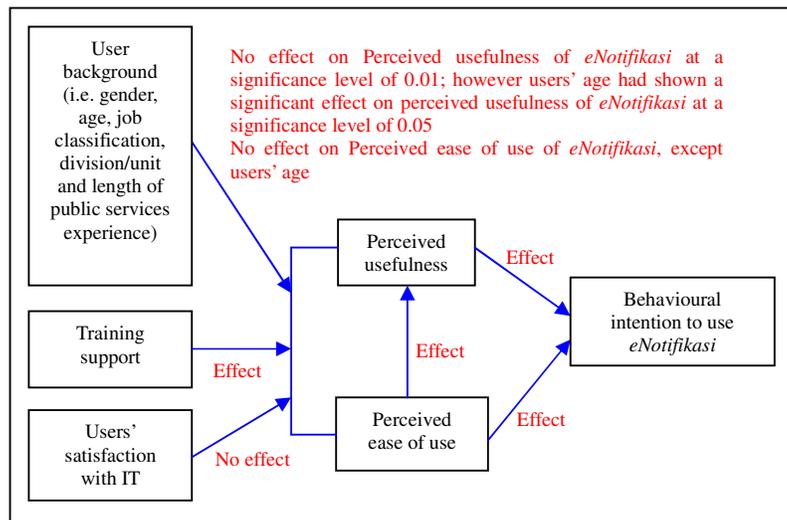
Figure 4.13: **The findings of the empirically tested proposed TAM based on the research findings from testing the relevant hypotheses**

The results obtained through the testing of H6 indicated that the training support had a significant effect on perceived usefulness and perceived ease of use of *eNotifikasi*, which may result in helping the Ministry of Health to overcome the user resistance of *eNotifikasi* use. Trained users perceived *eNotifikasi* as useful and ease of use compare to non-trained users.

Furthermore, the results showed that perceived ease of use of *eNotifikasi* had shown a significant relationship with perceived usefulness of

eNotifikasi through the testing of H7. Also, there were significant relationships found between perceived usefulness and perceived ease of use of *eNotifikasi* with behavioural intention to use *eNotifikasi* respectively (based on the results of H9 and H10 testing).

Davis (1986, cited in Kowitlawakul 2008, p. 8-9) noted that TAM provides the theoretical connection between perceived usefulness and perceived ease of use, and both factors influence the behavioural intention to use, then the behavioural intention to use generates the actual system use. Meantime, Mathieson (1991, cited in Kowitlawakul 2008, p. 9) claimed that the actual system use should be predictable from measures of behavioural intention to use and other factors that would either directly or indirectly influences the behavioural intention to use.

4.4   Conclusions

The results of hypotheses testing found that all the users agreed that *eNotifikasi* is useful and ease of use. This means that the users would use *eNotifikasi* to manage the cases of communicable diseases. The results also indicated that the perceived ease of use of *eNotifikasi* had shown a positive relationship with perceived usefulness of *eNotifikasi*. Also, both perceived ease of use and usefulness had a positive relationship with behavioural intention to use *eNotifikasi*.

Furthermore, out of all the external factors (i.e. user background, training support, and users' satisfaction with IT technical support) that had been built into the proposed TAM, only the training support showed positive results. The users without training support would have difficulty in perceiving the *eNotifikasi* as useful and ease of use compared to the users with training support. Meanwhile, the user background such as gender, age, job classification, division/unit, and length of public services experience did not strongly influence them on the perceived usefulness and ease of use of *eNotifikasi*. Besides, the results also showed that the users' satisfaction with IT technical support did not influence the users in perceiving *eNotifikasi* as useful and ease of use.

The outcomes explained and outlined in this chapter provided inputs to the next chapter, which is the final chapter in this dissertation.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1   Introduction

This chapter covers the following topics:

•   overall conclusions from research outcomes,

•   research contributions, and

•   limitations and recommendations.

5.2   Overall Conclusions from Research Outcomes

As described in chapter 1, four research objectives were formed as below:

i.   To develop and empirically test a technology acceptance model which is built by using the core-ideas of Davis's Technology Acceptance Model (TAM).

ii.   To identify influential factors that may affect users' perceived usefulness and perceived ease of use of *eNotifikasi*.

iii.   To investigate the extent to which users perceive that the *eNotifikasi* is useful and easy to use, and their behavioural intention to use the *eNotifikasi* in their work.

iv. To examine the relationships between users' perceived usefulness, perceived ease of use and their behavioural intention to use *eNotifikasi*.

Overall, all the research objectives have been achieved. The subsequent sub-sections discuss the research outcomes obtained mostly from testing the hypotheses.

5.2.1 Develop and Empirically Test a Technology Acceptance Model which is built by using the Core-Ideas of Davis's Technology Acceptance Model (TAM)

In this research, a technology acceptance model which as shown in Figure 3.1 was developed based on the core-ideas of Davis's TAM. This proposed TAM was then being empirically tested through several relevant hypotheses (see Figure 3.2), which was related to objective ii, iii, and iv that are discussed in sections 5.2.2 through 5.2.4. The results are depicted in Figure 4.13, which have been discussed in detail in section 4.3.

5.2.2 Identify Influential Factors that may Affect Users' Perceived Usefulness and Perceived Ease of Use of *eNotifikasi*

Three external factors that may affect users' perceived usefulness (PU) and perceived ease of use (PEOU) of *eNotifikasi* usage among public health officers had been identified through the reviews of literature. These factors include user background (i.e. gender, age, job classification, division/unit and length of public services experience), training support and users' satisfaction

with IT technical support. An empirical study had been conducted to examine whether or not these factors would have influence users' perceptions on *eNotifikasi* use in terms of PU and PEOU.

5.2.2.1 User background

The results obtained from the testing of H2 and H3 (which have been discussed in sections 4.2.3.2 and 4.2.3.3) show that user background such as gender, job classification, division/unit, and length of public services experience did not have any significant effects on PU and PEOU of *eNotifikasi*, except users' age. Users' age had shown significant effects on PU (at the significance level of 0.05) and PEOU of *eNotifikasi*.

The results shown in Tables 4.7 and 4.17 indicate that the senior officers (age above 40 years old) perceived the *eNotifikasi* as more useful and easy to use with the mean values above 3.7, compared to junior officers (age below 40 years old) with the mean values below 3.4. The *eNotifikasi* had transformed the manual notification form into electronic from which allowed users to accomplish notification more quickly compare to the traditional notification method. Users were not required to fill out all the data in the electronic form because some of the data will be automatically generated such as the name of the users, name of the health facility and facility address after they login into *eNotifikasi*. The past studies (Porter 1963; Hall and Mansfield 1975, cited in Venkatesh et al., 2003) noted that junior employees may concern more on extrinsic rewards compared to senior employees. Nevertheless, the

senior officers had more experiences to manage the cases of communicable disease in traditional method which was a long time processing method compared to *eNotifikasi*. Therefore, senior officers found the *eNotifikasi* is more useful compared to junior officers.

Besides, *eNotifikasi* is a user friendly online application because some of the demographic variables such as patients' gender, age and date of birth (in the format of year, month and day) will be auto generated once users key-in the identity card number of a patient. Liao and Cheung (2002, cited in Dixit and Datta 2010) stated that willingness to use online application (e.g. Internet banking) is depends on the users friendliness of that application.

The study of Mattila et al., (2003, cited in Dixit and Datta 2010) highlighted that complex steps applied in the application discouraged users' perception towards the use of application. Plude and Hoyer (1985, cited in Venkatesh et al., 2003) also reported that older employees will faced difficulty to practice the complex software system compared to the younger employees. Furthermore, the study of Cleaver (1999, cited in Dixit and Datta 2010) summarised that older users prefer online application that easier to use rather than complicated manipulation of software. Hence, the senior officers found the *eNotifikasi* is easy to use.

5.2.2.2 Training support

Past studies (e.g. Vichita et al., 2008; Week 2010) claimed that end user training could affect users' perceptions toward the usefulness and ease of use of system use. The findings of this research indicate that trained users find the *eNotifikasi* is more useful and easy to use compared to the non-trained users (see Tables 4.29 and 4.31, and Figure 4.11). Figure 4.11 reveals that users with training support possess higher mean scores in perceiving the *eNotifikasi* as useful and ease of use (mean for PU = 3.81; mean for PEOU = 3.65) than users without training support (mean for PU = 3.26; mean for PEOU = 3.16).

The results of this research are in line with the research findings of Kim and Lynos (2003) and Yi and Davis (2003) as cited in Vichita et al., 2008. These studies premised that an effective training programme is a major contributor to organisational performance by increasing trainees' skills to perform their work. Moreover, Korsten (2003, cited in Vichita et al., 2008) noted that the trainees would gain a great deal of knowledge and experience during training which led to the increment in organisation competencies. Therefore, it is assumed that training support could reduce users' negative perceptions on *eNotifikasi* use in terms of perceived useful and perceived ease of use.

5.2.2.3 Users' satisfaction with IT technical support

The hypotheses testing results as described in section 4.2.3.4 and 4.2.3.5 reveal that there were no significant relationships shown between the users' satisfaction with IT technical support and users' perception towards the usefulness and ease of use of *eNotifikasi*. This may due to *eNotifikasi* is an online system which does not required much IT technical skills such as system installation and troubleshooting. Users can access to *eNotifikasi* easily using various types of the web browsers (i.e. Internet Explorer, Mozilla Firefox, Chrome, and so forth). It is useful because users can access *eNotifikasi* at anywhere and anytime without much IT technical support.

Furthermore, *eNotifikasi* has simple user interface design which is categorized into five sections namely personal details of patient, residence information of the patient, diagnosis of disease, laboratory test and notification information sections (see Figure 5.1) without required too much gaudiness from IT personnel. Dixit and Datta (2010) noted that users in general especially the older users want application which is incorporating for simpler graphics. Hence, users' satisfaction with IT technical support did not influence users' perception towards the usefulness and ease of use of *eNotifikasi*.
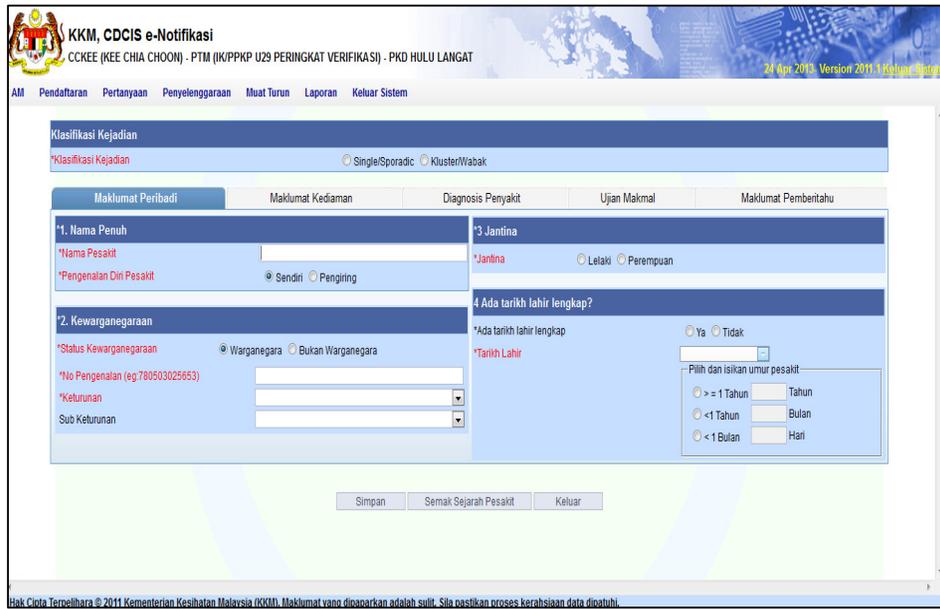
Figure 5.1: Screenshot from *eNotifikasi* showing the simple user interface design

5.2.2.4 Overall conclusions from the research findings obtained from the testing of H2 to H6

Overall, the research findings obtained from the testing of H2 to H6 prove that users' age and training support were influential factors on the perceived usefulness and perceived ease of use of *eNotifikasi* (see Table 5.1).

Table 5.1: **Identification of influential factors on perceived usefulness and perceived ease of use of *eNotifikasi***

Factor	Effect on perceived usefulness and perceived ease of use of *eNotifikasi*
User background	User background such as gender, job classification, division/unit and length of public services experience did not have any significant effects on PU of *eNotifikasi*. However, the users' age had shown a significant effect on PU of *eNotifikasi* at a significance level of 0.05. Besides, user background such as gender, job classification, division/unit and length of public services experience also did not have any significant effects on the PEOU of *eNotifikasi*, except users' age.
Training support	There was a significant difference between trained and non-trained users' perceptions on *eNotifikasi* use in terms of PU and PEOU. The training support had shown a significant effect on PU and PEOU of *eNotifikasi*. Hence, it seemed that the end user training could help to overcome user resistance of *eNotifikasi* use.
Users' satisfaction with IT technical support	The users' satisfaction with IT technical supports did not have any significant effects on PU and PEOU of *eNotifikasi*.

5.2.3 Investigate the Extent to which Users Perceive that the *eNotifikasi* is Useful and Easy to Use, and Their Behavioural Intention to Use the *eNotifikasi* in Their Work

The results obtained from the testing of H1 using descriptive statistics (which have been described in section 4.2.3.1) show that the average response for each of the items that measure the perceived usefulness (PU) and perceived ease of use (PEOU) are above the midpoint (3) of Likert scale (see Table 4.1 and Table 4.3). Majority of the respondents agreed with statements PU1 (2% strongly agreed and 50% agreed), PU2 (4% strongly agreed and 54% agreed)

and PU3 (6% strongly agreed and 56% agreed) (see Table 4.2 and Figure 4.9). Only 6% of the respondents disagreed with statement PU1, 6% of the respondents disagreed with statement PU2 and 4% of the respondents disagreed with statement PU3 (see Table 4.2 and Figure 4.9). The results also reveal that most of the respondents agreed with statements PEOU1 (4% strongly agreed and 36% agreed), PEOU2 (4% strongly agreed and 40% agreed) and PEOU3 (4% strongly agreed and 48% agreed) (see Table 4.4 and Figure 4.10). Only minority of the respondents either strongly disagreed or disagreed with statements PEOU1 (2% strongly disagreed and 6% disagreed), PEOU2 (2% strongly disagreed and none of them disagreed) and PEOU3 (2% strongly disagreed and disagreed respectively) (see Table 4.4 and Figure 4.10). Hence, the perception of users towards the usefulness and ease of use of *eNotifikasi* are positive.

Meantime, the results of testing the H8 using descriptive statistics (which have been discussed in section 4.2.3.8) reveal that the average response for each of the items that measure the behavioural intention to use *eNotifikasi* (BITU) is above the midpoint (3) of Likert scale (see Table 4.35). Majority of the respondents agreed with statements BITU1 (10% strongly agreed and 64% agreed) and BITU2 (14% strongly agreed and 60% agreed) (see Table 4.36 and Figure 4.12). Only 4% of the respondents disagreed with statement BITU1, and none of the respondents showed disagree behaviour with statement BITU2 (see Table 4.36 and Figure 4.12). Hence, the behavioural intention of users to use the *eNotifikasi* to manage the cases of communicable disease is positive.

The results are supported by the perspective of Davis (1989, cited in Vichita et al., 2008) which explained that:

> When new information technology is perceived to be useful, users will have a positive attitude towards its benefit. At the same time, when new information technology is perceived easy to use, the cost perception on information technology decrease because users would perceive that they will put less effort into using this new technology. As a result, the perception of the increase in benefit and the decrease in cost would lead to an increase in positive perception toward new information technology, which would eventually lead to a higher intention to use the technology. In addition, perceived ease of use affects perceived usefulness because when users perceive that new information technology helps them put less effort into its use, they will have more time and be able to put greater effort into other jobs (p. 270-271).

5.2.4 Examine the Relationships between Users' Perceived Usefulness, Perceived Ease of Use, and Their Behavioural Intention to Use *eNotifikasi*

The results obtained from the testing of H7 (which have been described in section 4.2.3.7) show that perceived ease of use was positively correlated with perceived usefulness of *eNotifikasi*. This finding shows that users perceived *eNotifikasi* easy to use were perceived that *eNotifikasi* is useful. The result was supported by the study of Venkatesh (2000, cited in Thompson 2010) which explained that:

> TAM posits that perceived usefulness of a technology is influenced by its perceived ease of use since the easier it is for an individual to use a technology, the more useful the technology appears to be to the individual (p. 8).

Meantime, the results obtained from the testing of H9 and H10 (which have been discussed in sections 4.2.3.9 and 4.2.3.10) show that PU and PEOU of *eNotifikasi* were positively correlated with behavioural intention to use

eNotifikasi. These outcomes showed that user's behavioural intention was directly affected by their perceptions on *eNotifikasi* use in terms of PU and PEOU. As a result, users who perceived the *eNotifikasi* as useful and easy to use would have intention to use it in managing the cases of communicable diseases. The results were supported by the study of Kowitallakal (2008) which explained that:

> Perceived usefulness and perceived ease of use are the primary key determinants for computer acceptance behaviours. Both determinants influence attitudes, which in turn lead to intention to use (p. 12).

In addition, Davis et al. (1989, cited in Vichita et al., 2008) had tested the TAM to find out the relationship between information system usage and the user's perception on its usefulness as well as its ease of use through questionnaire. They found that there was a high correlation between user behavioural intention, user perceived usefulness and user perceived ease of use. Based on the validation of TAM in their studies, the intention generates the actual individual usage behaviour (Davis et al., 1989, cited in Kowitlawakul 2008).

5.3   Research Contributions

The research outcomes could provide useful information to help a public organisation to improve its web-based application development as part of e-government initiative by contributing to the literature of TAM design. E-government is a new challenge to governments and it is needed to modernize

government work more efficiently and effectively. This modernization must be supported by advanced Information Technology.

The barriers for e-government initiative may cause by human and technology factors. Therefore, the external factors that may influence public health officers' perceptions on *eNotifikasi* use and acceptance such as user background (i.e. gender, age, job classification, division/unit and length of public services experience), training support and users' satisfaction with IT technical support are identified to investigate user acceptance of system use in general, and *eNotifikasi* use particularly. In addition, the research outcomes pertaining to the identification of influential factors on the behavioural intention to system use, exclusively *eNotifikasi* use in this research may provide clear understanding to future researchers on how the online applications could be accepted in public organisations that would be beneficial for individual and organisation performance in public sectors.

The research outcomes could also be used as a guideline for the implementation of other IT projects for public organisation in future.

5.4   Limitations and Recommendations

This research study contains three limitations. Taking into account of these limitations, this section also suggests relevant recommendations to overcome the limitations found in this research.

The participants of the survey were limited to the public health officers from four states namely Kedah, Melaka, Sabah and Sarawak. Because of the officers from different states may have different opinions, the outcomes would be different from the respondents in other states. Future research is recommended to include users from other states in Malaysia such as Kelantan, Terengganu, Pahang, Johor, and so forth since the *eNotifikasi* entails the linkage of all states in Malaysia to more effectively manage cases of communicable diseases such as report (i.e. notify communicable diseases), verify, investigate and monitor the cases.

The research method employed in this research is a quantitative research method that utilised self-administered questionnaire to collect data from public health officers. It may not provide more detail information on user acceptance of *eNotifikasi*. Future research is recommended to cover qualitative research method such as interview and observation in addition to questionnaire approach. This would help to obtain additional information from the users to verify user acceptance of *eNotifikasi* and provide more accurate and precise results.

The external factors that may affect user acceptance of *eNotifikasi*, which involved in this research are limited to three factors, namely user background (i.e. gender, age, job classification, division/unit, and length of public services experience), training support, and users' satisfaction with IT technical support. Future research is recommended to involve other factors

such as top management support in the implementation of *eNotifikasi*, IT vendors' involvement, IT infrastructure provided, and so forth.

5.5   Conclusions

From the findings obtained in this research, there were indications that:

- the proposed TAM that was developed using the core-ideas of Davis's TAM was able to explain and predict the behaviuoral intention to use *eNotifikasi* among public health officers.

- users' age and training support were influential factors on the perceived usefulness (PU) and perceived ease of use (PEOU) of *eNotifikasi*.

- users perceived that *eNotifikasi* is useful and easy to use. As they find that the *eNotifikasi* is useful and easy to use, they intend to use *eNotifikasi* to manage the cases of communicable diseases.

- there was a significant relationship between perceived ease of use (PEOU) and perceived usefulness (PU) of *eNotifikasi*, so as the relationship between these two variables and users' behavioural intention to use *eNotifikasi*.

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Appendix A

Survey Questionnaire in *Bahasa Malaysia* or Malaysian language

Arahan 1: Bagi Seksyen A dan B, Sila tanda [✓] SATU (1) jawapan sahaja dalam petak yang berkenaan.

Seksyen A: Maklumat Peribadi

1. Jantina:

   ☐ Lelaki
   ☐ Perempuan

2. Kategori Umur:

   ☐ < 30 tahun
   ☐ 30-40 tahun
   ☐ 41-50 tahun
   ☐ > 50 tahun

3. Jawatan:

   ☐ AMRO (Penolong Pegawai Rekod Perubatan)
   ☐ PPKP (Penolong Pegawai Kesihatan Persekitaran)
   ☐ Pegawai Kesihatan Daerah
   ☐ Pegawai Epidemiologi
   ☐ Pegawai Teknologi Maklumat
   ☐ Lain-lain (Sila nyatakan: _____)

4. Seksyen/Unit:

   ☐ CDC (Pusat Kawalan dan Pencegahan Penyakit Berjangkit)
   ☐ Vektor (Penyakit Bawaan Vektor)
   ☐ HIV/STI (Penyakit Berjangkit Melalui Hubungan Seks)
   ☐ TB (TIBI)
   ☐ Teknologi Maklumat
   ☐ Lain-lain (Sila nyatakan: _____)

5. Bilangan tahun berkhidmat dalam perkhidmatan awam:

   ☐ < 1 tahun
   ☐ 1-5 tahun
   ☐ 6-10 tahun
   ☐ > 10 tahun

Seksyen B: Latihan   Kepengggunaan   dan   Pengetahuan   Pengguna terhadap eNotifikasi

1. Peringkat pengetahuan eNotifikasi:

    ☐ Asas
    ☐ Pertengahan
    ☐ Mahir

2. Pernahkah anda diberi latihan tentang eNotifikasi?

    ☐ Pernah
    ☐ Tidak Pernah

3. Kekerapan mengguna eNotifikasi:

    ☐ Tiap-tiap hari
    ☐ Beberapa kali dalam seminggu
    ☐ Beberapa kali dalam sebulan

Arahan 2: Bagi Seksyen C, D, E dan F, sila tanda [✓] dalam petak yang berkenaan sama ada anda Sangat Tidak Bersetuju, Tidak Bersetuju, Tidak Pasti (Neutral), bersetuju ataupun Sangat Bersetuju bagi setiap kenyataan yang berikut.

Nota:

Nilai Skor	1	2	3	4	5
Petunjuk	Sangat Tidak Bersetuju	Tidak Bersetuju	Neutral/ Tidak Pasti	Bersetuju	Sangat Bersetuju

Seksyen C: Kepuasan Pengguna terhadap Sokongan Teknikal Teknologi Maklumat					
Kenyataan	**1**	**2**	**3**	**4**	**5**
1. Kakitangan teknologi maklumat mampu untuk menyokong keperluan saya dalam penggunaan eNotifikasi.					
2. Kakitangan teknologi maklumat cekap dalam memberi perkhidmatan kepada pengguna.					

Seksyen D: Persepsi Penggunaan eNotifikasi					
Kenyataan	**1**	**2**	**3**	**4**	**5**
1. Prestasi kerja saya dapat dipertingkatkan dengan menggunakan eNotifikasi.					
2. Saya dapat menjalankan tugas dengan berkesan menggunakan eNotifikasi.					
3. eNotifikasi sangat berguna dalam menjalankan tugas harian saya.					

Seksyen E: Persepsi Kesenangan Penggunaan eNotifikasi					
Kenyataan	**1**	**2**	**3**	**4**	**5**
1. eNotifikasi senang untuk diguna.					
2. Interaksi saya dengan eNotifikasi adalah jelas dan senang difahami.					
3. eNotifikasi menyenangkan saya untuk membuat input dan data analisis.					

Seksyen F: Keinginan Menggunakan eNotifikasi					
Kenyataan	**1**	**2**	**3**	**4**	**5**
1. Saya akan sentiasa menggunakan eNotifikasi untuk menjalankan tugas.					
2. Saya akan terus menggunakan eNotifikasi pada masa akan datang.					

Terima kasih dalam melengkapkan soal selidik ini

Appendix B

Translation of the Survey Questionnaire in English

Instruction 1: Please tick [✓] one (1) answer only in the regarding box for section A and B.

Section A: Personal Details

1. Gender:

   ☐ Male
   ☐ Female

2. Age Category:

   ☐ < 30 years
   ☐ 30-40 years
   ☐ 41-50 years
   ☐ > 50 years

3. Job Classification:

   ☐ AMRO (Assistant Medical Record Officer)
   ☐ PPKP (Assistant Environmental Health Officer)
   ☐ District Health Officer
   ☐ Epidemiology Officer
   ☐ Information Technology Officer
   ☐ Others (Please specify: _____)

4. Division/Unit:

   ☐ CDC (Centers for Disease Control and Prevention)
   ☐ Vector (Vector Borne Disease)
   ☐ HIV/STI (Sexually Trasmitted Infectious)
   ☐ TB (Tuberculosis)
   ☐ Information Technology
   ☐ Others (Please specify: _____)

5. Number of years working with the public services:

   ☐ < 1 year
   ☐ 1-5 year
   ☐ 6-10 year
   ☐ > 10 year

Section B: **Training Support for the use of *eNotifikasi* and Level of Knowledge in *eNotifikasi***

1. *eNotifikasi* knowledge level:

   ☐ Basic
   ☐ Intermediate
   ☐ Advanced

2. Have you completed any formal *eNotifikasi* training before?

   ☐ Yes
   ☐ No

3. Frequency of *eNotifikasi* use:

   ☐ Everyday
   ☐ Few times in a week
   ☐ Few times in a month

Instruction 2: Please tick [✓] in the regarding box whether you strongly disagree, disagree, neutral, agree or strongly agree for each of the statement below for section C, D, E and F.

Note:

Score Value	1	2	3	4	5
Indicator	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Section C: User's Satisfaction with IT Technical Support					
Statement	1	2	3	4	5
1. The IT staff is able to support my needs.					
2. The IT staff is competent to provide their service to users.					

Section D: Perceived Usefulness of *eNotifikasi*					
Statement	**1**	**2**	**3**	**4**	**5**
1. Using *eNotifikasi* can improve my performance on the job.					
2. Using *eNotifikasi* is able to enhance effectiveness in my job.					
3. I would find *eNotifikasi* useful in my job.					

Section E: Perceived Ease of Use of *eNotifikasi*					
Statement	**1**	**2**	**3**	**4**	**5**
1. I would find the *eNotifikasi* easy to use					
2. My interaction with the *eNotifikasi* is clear and understandable.					
3. It is easy for me to input and analysis data by using *eNotifikasi*.					

Section F: Behavioural Intention to Use *eNotifikasi*					
Statement	**1**	**2**	**3**	**4**	**5**
1. I always use *eNotifikasi* to perform my tasks.					
2. I will continue to use *eNotifikasi* on a regular basic in the future.					

Thank you to answer this questionnaire survey

Appendix C

Results of Cronbach's Analysis

Reliability of the User's Satisfaction with IT Technical Support

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.930	0.937	2

Item Statistics

	Mean	Std. Deviation	N
1. The IT staff is able to support my needs.	3.60	0.632	15
2. The IT staff is competent to provide their service to users.	3.47	0.743	15

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.533	3.467	3.600	0.133	1.038	0.009	2

Reliability of the Perceived Usefulness of *eNotifikasi*

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.747	0.742	3

Item Statistics

	Mean	Std. Deviation	N
1. Using *eNotifikasi* can improve my performance on the job.	3.53	0.516	15
2. Using *eNotifikasi* is able to enhance effectiveness in my job.	3.40	0.632	15
3. I would find *eNotifikasi* useful in my job.	3.27	0.704	15

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.400	3.267	3.533	0.267	1.082	0.018	3

Reliability of the Perceived Ease of Use of *eNotifikasi*

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.859	0.860	3

Item Statistics

	Mean	Std. Deviation	N
1. I would find the *eNotifikasi* easy to use.	3.13	0.640	15
2. My interaction with the *eNotifikasi* is clear and understandable.	3.33	0.617	15
3. It is easy for me to input and analysis data by using *eNotifikasi*.	3.33	0.617	15

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.267	3.133	3.333	0.200	1.064	0.013	3

Reliability of the Behavioural Intention to Use *eNotifikasi*

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.914	0.921	2

Item Statistics

	Mean	Std. Deviation	N
1. I always use *eNotifikasi* to perform my tasks.	3.67	0.724	15
2. I will continue to use *eNotifikasi* on a regular basic in the future.	3.67	0.617	15

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.667	3.667	3.667	0.000	1.000	0.000	2