THE USAGE OF HUMAN RESOURCES MANAGEMENT INFORMATION SYSTEM (HRMIS) IN THE MALAYSIAN ARMED FORCES: EMPIRICAL EVIDENCE IN A MILITARY SETTING

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2020

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DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF MANAGEMENT

FACULTY OF BUSINESS AND ACCOUNTANCY
UNIVERSITY OF MALAYA
KUALA LUMPUR

2020

UNIVERSITY OF MALAYA

ORIGINAL LITERARY WORK DECLARATION

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Matric No: **17013707/1**

Name of Degree: **DOCTOR OF MANAGEMENT**

Title of Project Paper/Research Report/Dissertation/Thesis ("this Work"):

THE USAGE OF HUMAN RESOURCES MANAGEMENT INFORMATION SYSTEM (HRMIS) IN THE MALAYSIAN ARMED FORCES: EMPIRICAL EVIDENCE IN A MILITARY SETTING

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THE USAGE OF HUMAN RESOURCES MANAGEMENT INFORMATION SYSTEM (HRMIS) IN THE MALAYSIAN ARMED FORCES: EMPIRICAL EVIDENCE IN A MILITARY SETTING

ABSTRACT

The use of information and communication technology (ICT) among individuals and organisations is growing in accordance with technology invention, innovation and consumer needs. Like other organisations, the Malaysian Armed Forces (MAF) are not left behind to adopt technology in its management and operations. In the individual context, the use of technology can enhance the performance and quality of MAF's personnel work. However, the BADSA's report in 2017 found that the use of HRMIS was not optimal in the MAF. Only 32.4 per cent of the 37 units that were audited had used the system. Therefore, this study aimed to investigate the factors that influence HRMIS use and its impact on MAF personnel. This study chose to use a quantitative method, starting with a preliminary study to identify initial factors that influence HRMIS use. The identified factors then have been integrated with the Information Systems Success Model (ISSM). From this integrated framework, measurement items have been developed by selecting items from previous studies. In addition, some items have been added based on FGDs and interviews results. The finalised items formed a set of questionnaires used in phase 2 of this study and were distributed to 750 HRMIS users in various MAF units. The analysis on the returned questionnaire has yielded findings which are significant factors in influencing the use of HRMIS and impact of HRMIS to MAF personnel. Findings from this study confirmed that factors influencing the use of HRMIS among MAF personnel are information quality, system quality, commander support, technical training, and ICT infrastructure. Based on these factors, this study recommends measures to improve the rate of HRMIS usage among MAF personnel. The study also found a significant positive relationship between HRMIS usage and individual benefits, thus showing the positive impact of HRMIS use on MAF personnel.

PENGGUNAAN SISTEM PENGURUSAN MAKLUMAT SUMBER MANUSIA (HRMIS) DALAM ANGKATAN TENTERA MALAYSIA: BUKTI EMPIRIKAL DALAM PERSEKITARAN TENTERA

ABSTRAK

Penggunaan teknologi maklumat dan komunikasi (ICT) dalam kalangan individu dan organisasi berkembang seiring dengan penemuan teknologi, inovasi dan keperluan pengguna. Seperti organisasi lain, Angkatan Tentera Malaysia (ATM) tidak ketinggalan untuk menggunakan teknologi dalam pengurusan dan operasinya. Dalam konteks individu, penggunaan teknologi dapat meningkatkan prestasi dan kualiti kerja pegawai dan anggota ATM. Namun, laporan BADSA pada tahun 2017 mendapati bahawa penggunaan HRMIS dalam ATM adalah tidak optimum. Hanya 32.4 peratus daripada 37 unit yang diaudit telah menggunakan sistem ini. Oleh itu, kajian ini bertujuan untuk mengkaji faktor-faktor yang mempengaruhi penggunaan HRMIS dan kesannya terhadap pegawai dan anggota ATM. Kajian ini memilih untuk menggunakan kaedah kuantitatif, dimulai dengan kajian awal untuk mengenal pasti faktor asas yang mempengaruhi penggunaan HRMIS. Faktor-faktor yang dikenal pasti telah disepadukan dengan Model Kejayaan Sistem Maklumat (ISSM). Daripada kerangka bersepadu ini, item pengukuran telah dibangunkan dengan memilih item-item daripada kajian sebelumnya. Di samping itu, beberapa item telah ditambahkan berdasarkan hasil perbincangan kumpulan fokus (PGD) dan temu ramah. Item akhir membentuk satu set soal selidik yang digunakan pada peringkat kedua kajian ini dan diedarkan kepada 750 pengguna HRMIS di pelbagai unit ATM. Analisis pada soalan kaji selidik yang telah dikembalikan menghasilkan penemuan yang merupakan faktor penting dalam mempengaruhi penggunaan HRMIS dan kesan HRMIS kepada pegawai dan anggota ATM. Penemuan daripada kajian ini mengesahkan bahawa faktor yang mempengaruhi penggunaan HRMIS dalam kalangan pegawai dan anggota ATM ialah kualiti maklumat, kualiti sistem, keselamatan, sokongan pemerintah, latihan teknikal, dan infrastruktur ICT. Berdasarkan faktor-faktor ini, kajian ini telah mengesyorkan langkah-langkah untuk meningkatkan kadar penggunaan HRMIS dalam kalangan pegawai dan anggota ATM. Kajian ini mendapati terdapat hubungan yang signifikan antara penggunaan HRMIS dan faedah individu, di mana ia memberi kesan yang positif terhadap penggunaan HRMIS dalam kalangan pegawai dan anggota ATM.

ACKNOWLEDGEMENTS

First and foremost, I thank Allah Almighty for giving me the time and strength to accomplish this study.

I would like to express my deepest appreciation and gratitude to my supervisor Dr Farzana for her invaluable support and guidance that empowered me throughout my research journey. Certainly, without her encouragement, invaluable knowledge, and generous support this work would never have been completed.

On a personal note, I want to express my great appreciation for the support, understanding, and relentless encouragement of my family members. I would also to thank the academic and administrative staff of the Faculty of Business and Accountancy for their support. I would indeed like to thank the Commandant of INSPEKA, who provided some guidance and useful comments throughout my study.

I have to thank all my friends and DMgt colleagues for their friendly advices and support. Finally, I would like to convey my thanks to all the participants for taking part in this study.

Mohd Azmi bin Arifin

2020

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LIST OF SYMBOLS AND ABBREVIATIONS

4DMAF	:	Fourth Dimension MAF
5G	:	Fifth Generation
AMOS	:	Analysis of Moment Structures
AVE	:	Average Variance Extracted
BADSA	:	Internal Audit and General Investigation Division
BMS	:	Battlefield Management System
BYOD	:	Bring Your Own Device
CFA	:	Confirmatory Factor Analysis
CFI	:	Comparative Fit Index
CIA	:	Confidentiality, Integrity and Availability
CMB	:	Common Method Bias
CMV	:	Common Method Variance
CO	:	Commanding Officer
COTS	:	Commercial Off-the-Shelf
CSE	:	Computer Self-efficacy
CVI	:	Content Validity Index
CVR	:	Content Validity Ratio
DCED	:	Defence Communications and Electronics Division
DL	:	Digital Library
DOI	:	Diffusion of Innovations
DSS	:	Decision Support System
DUC	:	Data Updating Centre
EFA	:	Exploratory Factor Analysis
e-GL	:	Electronic Guarantee Letter

e-HRM	:	Electronic Human Resources Management
EMIS	:	Educational Management Information System
EMRS	:	Electronic Medical Record System
ERP	:	Enterprise Resource Planning
FGD	:	Focus Group Discussion
HIS	:	Hospital Information System
GFI	:	Goodness Fit Index
HOI	:	HRMIS on the Internet
HOT	:	Human-Organisation-Technology
HRDMS	:	Human Resource Digital Management System
HRIS	:	Human Resource Information System
HRMIS	:	Human Resources Management Information System
ICT	:	Information and Communication Technology
IDT	:	Innovation Diffusion Theory
IFI	:	Incremental Fit Index
IMG	:	Information Management and Governance
INSPEKA	:	Institut Pegawai Kanan Tentera Darat
IoT	:	Internet of Thing
IP	:	Internet Protocol
IR	:	Information Retrieval
IS	:	Information Systems
IT	:	Information Technology
ISSM	:	Information System Success Model
KMS	:	Knowledge Management System
KPI	:	Key Performance Index
LMS	:	Learning Management System

MAF	:	Malaysian Armed Forces
MAMPU	:	Malaysian Administrative Modernisation and Management Planning Unit
MIM	:	Mobile Instant Messaging
MLHR	:	Military Lifetime Health Record
MM	:	Motivational Model
MPCU	:	Model of Personal Computer Utilization
NCO	:	Network Centric Operations
PEOU	:	Perceived Ease of Use
PLS	:	Partial Least Square
PSD	:	Public Service Department
PU	:	Perceived Usefulness
RIMS	:	Research Information Management System
RMAF	:	Royal Malaysian Air Force
RMN	:	Royal Malaysia Navy
RMSEA	:	Root Mean Square Error of Approximation
SCT	:	Social Cognitive Theory
S-CVI	:	Scale-Content Validity Index
SD	:	Standard Deviation
SDS	:	Signal Dispatch Service
SEM	:	Sequential Equation Modelling
SME	:	Small and Medium Enterprise
SMG	:	Salary Management System
SNS	:	Social Network Service
SOP	:	Standard Operating Procedure
SPSS	:	Statistical Package for the Social Science

SPT	:	Security, Privacy and Trust
TAM	:	Technology Acceptance Model
TLI	:	Tucker Lewis Index
TOE	:	Technology-Organisation-Environment
TPB	:	Theory of Planned Behaviour
TPS	:	Transaction Processing System
TRA	:	Theory of Reasoned Action
TTF	:	Task-Technology Fit
UAV	:	Unmanned-Aerial-Vehicle
UTAUT	:	Unified Theory of Acceptance and Use of Technology
VIBES	:	Veterans Integrated Benefit System
VIF	:	Variance Inflation Factor
WFH	:	Work from Home

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.1 Overview

The use of information and communication technology (ICT) today has profoundly impacted people's lives, and the way businesses operate. In the sense of individuals, the use of ICT has allowed employees to communicate more effectively with their colleagues and exchange useful information faster (Jorgenson & Vu, 2016). For organisations, ICT usage improves the effectiveness of the planning process and decision making. Productivity-oriented organisations optimise the use of ICT by implementing various types of information system. Similarly, appropriate use of information system at executive, managerial or operational levels enables these organisations to gain a competitive advantage over their rivals (Valacich & Schneider, 2017). The introduction of the information system in most organisations, however, is not as simple as planned because it is important to recognise and adequately resolve numerous challenges and obstacles. Most of these problems could come from a number of sources, such as consumers, organisations, systems, and environments (Ammenwerth, Graber, Hermann, Burkle, & Konig, 2003; Savoldelli, Codagnone, & Misuraca, 2014; Alharthi, Krotov, & Bowman, 2017).

1.2 Research Background

The importance of technologies, especially ICT is an undeniable fact, and it becomes an indispensable foundation for the development and progress of the country (Dobrota, Martic, Bulajic, & Jeremic, 2015). In the context of organisations, the managements are also aware of this fact and optimise the use of technology. This can be observed through

increasingly technological equipment usage, increasingly computerised procedures and management practices related technologies (Hovhannisyan & Machado, 2018).

In Malaysia, the government has long been aware of this phenomenon and has undertaken tremendous efforts, one of which is through the Public-Sector ICT Strategic Plan (Malaysian Administrative Modernization and Management Planning Unit (MAMPU), 2016). This plan was developed to support the implementation of the National Transformation Program and to improve the impact of public sector agencies' service delivery and information flow. Also, in the 11th Malaysian Plan (Economic Planning Unit, 2016) which was launched in 2016, the government has underlined the importance of ICT through various initiatives that would improve access of the information in agriculture, business, education, and health sector.

Similarly, the importance of ICT also has been stated through Malaysian's National Defence Policy (Ministry of Defence, 2010) which stipulate the ICT usage should be a must in order to achieve information dominance at every level in the MAF. In fact, the Fourth Dimension MAF (4DMAF) plan also postulated the strategy of a capability-based approach which focused the efforts on utilising ICT to ensure the effectiveness of information operations (Ismail, 2016).

Thus, the MAF has accepted the challenge to cultivate the implementation of ICT in its administration and operations. Various systems and ICT infrastructure have been developed and procured in the MAF to manage human resources, logistics, training, planning and development, and operationalisation of command and control. In order to ensure systematic and competitive human resource management, the MAF has embarked on a step by procuring a Human Resources Management Information System (HRMIS)

(Internal Audit and General Investigation Division, 2017). HRMIS is a crucial system in MAF because it is the first system used by personnel since they were recruited, namely during the initial selection. That selected personnel will then continue to use HRMIS throughout their careers, especially in expertise training, performance monitoring and job placement. The MAF personnel supposed to use the HRMIS until they retire from MAF. At the management level, the staff officers use HRMIS in planning and making accurate decisions regarding the number of recruits, specialisation, appointment projections, and so on. The optimal use of HRMIS not only simplifies daily tasks but also has a positive impact on the performance of those who use the system, and it has been proven by the Public Service Department who have used HRMIS since 2005 (Malaysian Public Service Department, 2011).

The implementation of HRMIS in the MAF has initiated by the Army service (Malaysian Army) with the establishment of the Army's HRMIS in 2006. At that time, the Royal Malaysian Navy (RMN) already has a human resource-related system, the Human Resource Information System - HRIS. Similarly, with the Royal Malaysian Air Force who already has the Human Resource Digital Management System (HRDMS). These systems are more focused on their respective services, which cause the duplication of system and network functions. The old human resources system is limited to only single service, high maintenance costs due to stand-alone systems, as well as limited accessibility of information between services in the MAF (Internal Audit and General Investigation Division, 2017).

Therefore, to overcome the limitations of the old human resource systems, the Defense Communication and Electronics Division (DCED) of MAF developed and implemented an enhanced HRMIS in 2013 with ten core modules and 27 systems modules. The system

is designed to be completed by the contractor within four years by using mostly existing network infrastructure. The objective for implementing the MAF HRMIS is to integrate all MAF services data which consisting of all personnel's at MAF Headquarters, Army Headquarters, RMN Headquarters and RMAF Headquarters (Internal Audit and General Investigation Division, 2017). However, some issues were identified in HRMIS usage, which is further explained in the next section.

1.3 Research Problem

In September 2016, the Internal Audit and General Inquiry Division (BADSA) of the Ministry of Defense (MINDEF) found that the use of HRMIS was unsatisfactory. One of the shortcomings found in the audit was the non-optimal use of the system by users, whereby in most of their staff management tasks, they still used the manual process. This setback makes the usage of the HRMIS very low. The statistics of the report showed that only 32.4 per cent of the 37 units that were audited had used the system.

Assistant Chief of Staff MAF DCED also expressed the problem of low HRMIS usage by MAF personnel. He said that HRMIS usage was still at a minimal level even though DCED had conducted 68 roadshows, courses, and seminars related to the system usage. (Rear Admiral Dato' Aris Adi Tan bin Abdullah, interview, January 11, 2018).

The weaknesses in the implementation of this system will result in being unable to fully achieve its acquisition objectives which are mainly to integrate personal data in all MAF (Army, Navy and Air Force) services. This problem should not happen in the MAF because superiority in ICT always become a significant factor for a formidable armed force (Burmaoglu & Saritas, 2017).

The successful implementation of the HRMIS in the MAF is crucial as it will ensure the management of the workforce in the MAF is effective and sustainable. The lack of HRMIS usage by some personnel causes their unit to prepare documents or information in the form of manuals that are time-consuming and slow down the work processes. It gets worse when a document is needed immediately by a superior. In addition, data that is not updated by some MAF personnel will results in incomplete data processing, which eventually produces inaccurate statistic. If personnel update their data regularly in HRMIS, the system will be able to process any military document when needed. For instance, the updated data in HRMIS allows the usage of guarantee letter (GL) by any personnel at the hospital without having to get approval from their intermediate leader. In other situations, the use of HRMIS enables the clerk to prepare the necessary documents in a shorter period and allows them to complete tasks with better quality. These reasons clearly show the importance of HRMIS usage to MAF personnel. However, considering the issue of underutilisation of HRMIS, the factors that support or hinders the HRMIS usage among MAF personnel are unclear. Therefore, this provides motivation to study the HRMIS usage in MAF context. This study will identify the factors that influence HRMIS usage among MAF personnel as well as taking into cognisance, the impact of the HRMIS on the MAF personnel. The outcome of this study will open up space to suggestions for planning measures to overcome this problem. Based on the recommendations, hopefully, the MAF personnel will be able to increase the level of HRMIS usage as well as get appropriate benefits and impacts from this system.

1.4 Research Questions

The scope of this study will focus on the following research questions:

Research Question 1. What are the HRMIS functions used by the MAF personnel?

Research Question 2. What is the rate of HRMIS usage by MAF personnel?

Research Question 3. What are the factors that influence the usage of the HRMIS amongst the MAF personnel?

Research Question 4. How does the use of the HRMIS benefit the MAF personnel?

1.5 Research Objectives

The focus of this study is to examine the factors and issues regarding HRMIS usage in the MAF organisation. Therefore, this study will achieve the following objectives:

Research Objective 1. To identify the HRMIS functions used by the MAF personnel.

Research Objective 2. To discover the rate of HRMIS usage by the MAF personnel.

Research Objective 3. To determine the factors that influence the usage of the HRMIS amongst the MAF personnel.

Research Objective 4. To investigate the impact of the HRMIS usage to the MAF personnel.

1.6 Significance of Research

This study is very significant as it will identify the influencing factors of the information systems usage, especially the HRMIS in the MAF. By identifying these factors, the MAF will be able to implement appropriate measures to increase the usage of the HRMIS. At the same time, HRMIS users are also able to understand the positive impact of using the system, which will contribute to improvement in work performance and personnel tasks. Findings from this study also can be applied to other systems either currently being used or to a new system that will be acquired by the MAF in the future.

In addition, the findings of this study can be adapted by other government agencies or any organisations to optimise the use of their information systems. In the academic context, the integrated framework that has been developed in this study can be used by other future studies, particularly in the security and defence organisation.

1.7 Scope of the Study

The scope of the study was limited to MAF personnel, as this study aims to identify the factors that influence the use of HRMIS among MAF personnel. The study uses purposive sampling to select MAF personnel who use HRMIS as respondents. The selection of the respondents in the unit was handled by the administrative officer of the respective unit. The personnel selected for this study are from all MAF services, namely the Army, the Royal Navy and the Royal Air Force. The distribution of surveys is for all

units in Peninsular Malaysia, Sabah and Sarawak. In terms of formation, the survey involves all units, whether operating units or training centres. For the purpose of questionnaire distribution, the breakdown was done by dividing the respondents into equal proportions according to the total number of personnel in the Army, Royal Navy and Royal Air Force. This study does not involve MAF personnel who have never used HRMIS as well as civil servants working in units within MAF.

1.8 Research Methodology

The main goal of this study is to ascertain the influencing factors that related to the use and the impact of the HRMIS in the MAF. Although this study uses quantitative methods, it begins with a preliminary study involving focus group discussion (FGD) and expert interviews. Two FGDs have been conducted with two units of the MAF. The respondents in this study are those who use the HRMIS. The purpose of the FGD is to obtain feedback from personnel regarding their experience in using the HRMIS. From the FGDs, participants have provided valuable inputs regarding HRMIS's performance which influences them to use the system. In addition, some of them also provide feedback on the weaknesses of the system that need to be improved. The details FGD protocols as attached in Appendix A.

There were also expert interviews with two senior MAF officers, the MAF ICT Project Manager and the Navy ICT Project Manager, respectively. They outlined the implementation of HRMIS in-depth during the interviews, as well as issues related to the use of HRMIS. They also provided their views as an HRMIS user. The details expert interview questions as attached in Appendix B.

From the FGDs and expert interviews, an analysis was performed to identify the appropriate themes and categories. The results from the FGDs, expert interviews and extensive review of the literature, have assisted in the identification of a suitable framework for this study. The next step was the development of questionnaire items based on the selected framework. Before questionnaire items are finalised and used in the survey, it needs to be verified through a pilot test. The pilot test was conducted with three Royal Signal Regiment units in Kuala Lumpur. Reliability tests show that the questionnaire is reliable and valid. The questionnaire was then distributed to 750 respondents using the Signal Dispatch Service (SDS). The returned questionnaire was then analysed using SPSS Version 25.0 software for descriptive statistics and AMOS Version 26.0 for hypothesis testing.

1.9 Summary

Chapter 1 specifically explains the study history. Furthermore, the problem of the study was clarified in this chapter, where it was extracted from an audit report performed by the authorised body within the MAF. Later, the primary objective of the analysis was to determine the influencing factors linked to the use of HRMIS in the MAF. Furthermore, the research problems, research goals, importance of the analysis and a brief description of the study methods used in the study were discussed.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews explicitly the literature which is related to this study. The initial section discusses information systems, technology usage, technology adoption and acceptance, and all relevant issues regarding technology usage. Subsequently, this section presents the content analysis of 229 articles relating to technology usage. Details of year, origin, journal name, methodology, framework, types of technology, and data analysis techniques of the previous studies are discussed. Next, this chapter describes in detail the factors that influence the use of technology in various contexts.

2.2 Information System

Information system (IS) continues to have a huge effect on personnel and organisations as a whole. Although information systems were once mostly used to automate manual processes, they are today changing the nature of work and enhancing the nature of the goods and services provided in many instances (Stair & Reynolds, 2018).

An information system is a set of interconnected components that working together for collecting, processing, storing, and distributing information in order to improve routine activities and decision making in an organisation (Laudon & Laudon, 2018). In detail, an information system included of people, hardware, software and data resources (Huang, Huang, & Chu, 2019). Whereby the primary purpose of the information system is to provide information in a correct and timely manner to achieve management, regulation, and control of activities in the organisation.

In general, most of the companies are using information systems to manage their digital aspect of organisations. Such companies use various types of information systems to provide high-quality products or services and simultaneously achieve a competitive advantage over rivals. Moreover, an information system could provide strategic value to an organisation by supporting various business processes and different decision-making levels (Kathuria, Mann, Khuntia, Saldanha, & Kauffman, 2018; Pearlson, Saunders, & Galletta, 2019). For individual users, they use technology to help them connect and manage their lives thus providing tremendous change to their well-being (Valacich & Schneider, 2017; Hammoudi, Smialek, Camp, & Filipe, 2018).

Whether it is traditional desktop computers, laptops, smartphones or tablets, everything is information systems that benefit all its users. Organisations like UPS and FedEx are using information systems to track trucks and parcels. Retailers like Walmart and Amazon use information systems to analyse customer tastes and preferences, from optimising supply chains to recording purchases (Hanna, Lemon, & Smith, 2019). Cities use information systems and variable speed limits for adaptive traffic control systems. Automobile industries utilise various technologies to enhance the driving experience, performance and safety through navigation system, engine management system, airbags, park-assist systems and many more Airbnb (Stair & Reynolds, 2016). In the business world, many companies including technology creators, asset builders, network orchestrators, and service providers have used a variety of technologies to generate and capture a profit (Tursunbayeva, Lauro, & Pagliari, 2018).

Business challenges in the new economy have increased competition both nationally and globally, and this trend has led companies to look for better ways to operate at low costs but generate more profits. For many businesses, the answer remains to use

information systems as it makes the products better, faster, and cheaper. To help creative business models or develop their entire business models around technological advances, many companies use information systems (Urbach & Roglinger, 2019). Similarly, businesses integrate their operations with global telecommunications networks in order to enable them to access their goods and services in new markets. Furthermore, they are maximising the use of technology in low-income countries to enable access to a wide community of talented workers (Piccoli & Pigni, 2016; Hill & Hult, 2018).

2.3 Technology Usage

Technology is a tool that shapes and composes in every aspect of life today, particularly in the employment and consumer sectors. This is because the use of technology in the workplace can help in improving the performance of employees in the organisation compared to the dependence of manual methods or the use of manual labour (Mainardes, Funchal, & Soares, 2017; Marinoudi, Sorensen, Pearson, & Bochtis, 2019). Usually, this technology is better recognised as a tool that serves to accelerate in completing work assignments and improve production results, for example, electronic equipment or robots (Latikka, Turja, & Oksanen, 2019; Schwarz, Auzepy & Knoeri, 2020). In addition, technology as information and multimedia systems such as computers, networks and websites that have been created to empower work and can increase work productivity in an organisation (Cao & Yu, 2019; Verstegen, Houkes & Reymen, 2019). Therefore, the use of technology has been emphasised in any organisation because it can meet the needs of management by ensuring that the work can be done quickly, on time, and in high-quality output (Hong, Choi, & Chae, 2020). Perfect technology involving the use of computing technology to facilitate organisations' operation such as networks,

hardware, software, and the website of the organisation itself (Li, Zhao, Jin, Liu, Sun, Wen, & Xu, 2019).

In terms of consumerisation, the use of technology has provided many advantages and saves costs to consumers. For example, the use of technology in e-hailing allows users to make transportation bookings easily and at a meagre price (Joia, & Altieri, 2018; Rodriguez-Valencia, Paris, & Cala, 2020). Similarly, technology greatly helps consumers to make online purchases where goods are delivered directly to the home (Singh & Sinha, 2020).

In certain situations, crises such as pandemics involving social distancing and lockdowns such as COVID-19, the use of technology helps consumers a lot. A study by Pandey and Pal (2020) found that during the pandemic period, there was a sharp increase in the use of technology by consumers. Lockdown imposed by countries affected by COVID-19 has caused consumers to switch by buying online and communicating using video or audio conferencing (Hartmann, & Lussier, 2020). The use of various technologies also allows work performed from home (WFH) as practised by many organisations (Grant, Wallace, Spurgeon, Tramontano, & Charalampous, 2019; Phillips, 2020).

2.4 Technology Adoption

The use of the terms technology adoption and technology acceptance has been widely used in many scientific studies related to the use of technology and is often used interchangeably and incorrectly.

Technology adoption is defined as a process that initiates with the user's awareness of the technology and endures with the full use and embraces the technology in their daily lives (Renaud & Biljon, 2008). On the other hand, technology acceptance refers to the attitude towards technology, and various factors determine it. In individual contexts, it describes how the use of technology continues after the user has tried it in the trial phase (George, Ekinci, Simkin, & Sutan, 2015). Similarly, Liu, Cruz, & Rincon (2019) explain that technology acceptance precedes technology adoption, where attitude and individuals' beliefs take place and trigger a specific behavioural change in individuals. They define technology adoption as a consistent and ongoing process by which an individual decides whether to integrate the technology into their life or stop using it.

The process of how technology is adopted was described in detail by Rogers (1983) through the diffusion of innovation theory. He explains how the process of a product or innovation generates momentum and spreads into a group or community. Furthermore, he also clarifies how the process does not take place simultaneously because some individuals do so quickly, and while some are slow to adapt it depending on their characteristics.

For an individual, the technology introduced in the organisation should be accepted as it will assist their day-to-day tasks (Ninaus, Diehl, Terlutter, Chan, & Huang, 2015). The use of the system will not only accelerate the process of data preparation and documentation but will also help their career planning (Asonitou, 2015). In addition, employees who are familiar with the information system will be more productive (Chen, Niebel, & Saam, 2016).

At the national level, technology adoption will increase productivity and assist the country's economic development (Diaz-Chao, Sainz-Gonzalez, & Torrent-Sellens, 2017). In an organisation, the use of technologies such as social media and web-based applications enables organisations to understand their customers' needs and to provide accurate and timely feedback (Parveen, Ismawati, & Ainin, 2017).

2.5 Technology Adoption and Success Factors

Schwarz et al. (2014) postulate that individual user behaviours will determine the success of a technology introduced in the organisation. In a learning environment, Alhabeeb and Rowley (2017) explain the role of students and instructors, the essential groups which are the critical success factors. In the organisational context, Alipour, Karimi, Ebrahimi, Ansari, and Mehdipour (2017) state that to achieve success in the acceptance of technology, the user requirements should be assessed profoundly. In addition, they suggest that employers should provide adequate training to their staff so that they can improve computer skills at each implementation stages.

From an organisational perspective, many studies address the success of technology adoption through topics involving critical success factor (CSF). Yeh and Chen (2018), in their research, found that cost and environment are CSFs that determine the success of 3D printer technology adoption in organisations. The technology adoption study by de Vera, Gide, Wu, and Chaudhry (2018) found that the size and age of the firm, user training, connection with other organisations, technological experience, user satisfaction, and location of business are the significant CSF for Asia-Pacific SMEs. While other studies have found that many CSFs influence the success of technology adoption by classifying these factors under the technological, users, implementation, organisational,

management, environmental, security, privacy, total benefits, and overall costs factors (Lin, 2016; Ajmal, Yasin, & Norman, 2017).

In individual perspective, digital skills and information literacy are indispensable factors that influenced users in adoption behaviour (Yu, Lin, & Liao, 2017). Choshin and Ghaffari (2017) in their study, indicate that user satisfaction, infrastructures, costs, and system performance are among the factors that will determine the success of technology adoption as in the use of e-commerce technology. A study by Veeramootoo, Nunkoo, & Dwivedi (2018) found that the success of e-government adoption is determined by system quality and users' habit when using the system. However, other factors such as social influence, facilitating conditions and trust of the Internet were also found to have a positive effect on behavioural intention to use e-commerce services (Kurfali, Arifoglu, Tokdemir, & Pacin, 2016).

2.6 Research on Technology Adoption

The complex issues and challenges associated with the use of technology by individuals and organisations are an interesting topic to explore as they are trendy and directly related to modern lifestyle and the operational approaches of most organisations. It has been proven by the numerous studies on technology adoption that has been carried out worldwide (Singh & Srivastava, 2018; Maican, Cazan, Lixandroju, & Dovleac, 2019). Numerous studies have been carried out to study these issues, particularly involving acceptance and adoption factors that include various perspectives and points of view. Each of these studies refers to different contexts and approaches in the term of technology, organisation, research framework, research methodology and other related aspects. Therefore, in order to get clear insight and

understanding of technology adoption issues, a systematic approach to literature review needs to be conducted.

Therefore, this study began with systematic literature review intending to understand the current state of the art on technology adoption as well as the related issues. In achieving this goal, literature from various credible sources has been selected by using an online search method to UM Library databases such as Emerald, JSTOR Archive, ScienceDirect, Scopus, and Taylor and Francis Online. Searching process using the Boolean operators such as AND, OR and NOT combined with suitable keywords, for instance, technology adoption, technology acceptance, organisation, model, and framework. The use of specific keywords will confine the search process to the articles that contain only the selected keywords. It means that the search will find articles that discuss the use of technology acceptance or technology adoption, along with the research model or framework that is used in the study. Therefore, the combination of keywords used for article searching as follows:

- "technology adoption" AND organisation AND model OR framework.
- "technology acceptance" AND organisation AND model OR framework.
- "technology adoption" AND individual AND model OR framework.
- "technology acceptance" AND individual AND model OR framework.

Searches with keywords combined with Boolean operators resulted in a large search result, but they were narrowed by limiting the searches between the year 2008 and 2018. Additionally, the number of articles has also been reduced by selecting the most relevant articles from the academic perspective and fulfilling most of the research area. Finally, 229 articles have been selected for content analysis. The articles have been analysed according to data and features as in Table 2.1.

Table 2.1: Article Information

No.	Article Information
1.	Title
2.	Year
3.	Country origin
4.	Framework
5.	Data analysis technique
6.	Types of survey
7.	Name of journal
8.	Technology

From the content analysis that has been applied to the journal from 2008 to 2018, most of the journals selected are from 2011 to 2016. The statistics distribution for each year's journal is published as per Figure 2.1. Trends from statistics show that most researchers are shifting from acceptance and adoption-based studies to studies that examine the impact of technology on individuals and organisations.

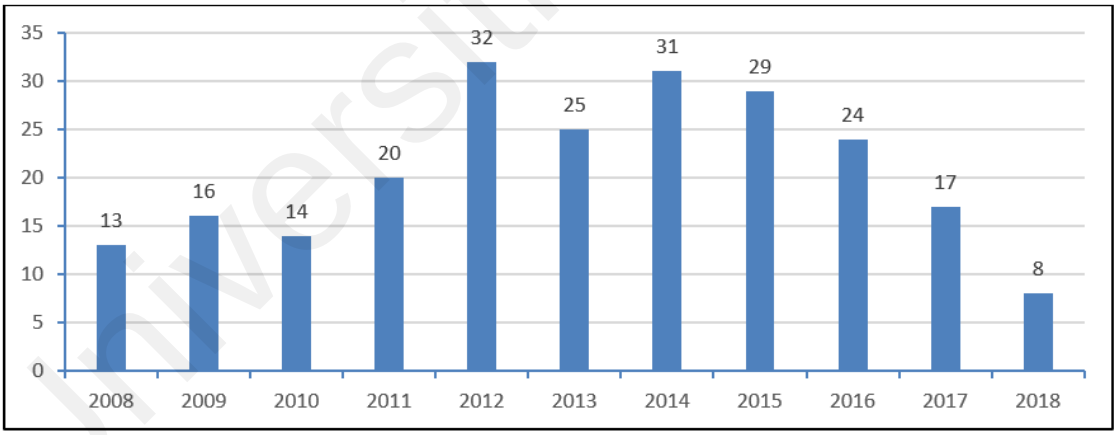

Figure 2.1: Years of Articles Published

Regarding the types of the journal, the number of articles for each journal as in Table 2.2. All articles are from top tier journal as assessed by Scimago Journal Ranking.

Table 2.2: Journal and Number of Articles

No.	Journal	No. of articles
1.	Computers in Human Behaviour	38
2.	Computer and Education	15
3.	International Journal of Medical Informatics	14
4.	Government Information Quarterly	13
5.	International Journal of Information Management	13
6.	Information and Management	9
7.	Telematics and Informatics	9
8.	Decision Support Systems	7
9.	Journal of Enterprise Information Management	7
10.	Technological Forecasting and Social Change	6
11.	Journal of Business Research	5
12.	Expert Systems with Applications	4
13.	Industrial Management and Data Systems	4
14.	Information Technology and People	4
15.	Automation in Construction, International Journal of Contemporary Hospitality Management, Library Hi-Tech, Procedia - Social and Behavioral Sciences, Technovation, Tourism Management	3 each
16.	Computer Standards and Interfaces, EuroMed Journal of Business, International Journal of Bank Marketing, Internet Research, Journal of High Technology Management Research, Journal of Indian Business Research, Journal of Retailing and Consumer Services, Journal of Strategic Information Systems, Online Information Review	2 each
17.	Other Journals	1 each

Most of the articles are from science and technology journals which are dominated by Computers in Human Behavior (38) followed by Computer and Education (15), International Journal of Medical Informatics (14), Government Information Quarterly (13), and International Journal of Information Management (13) while the rest of the articles are published in other journals.

As for the country of origin, most of the articles are from Taiwan (40), USA (33), South Korea (24), India (13), Malaysia (12), and China (11). These six countries make

up 58 per cent of all selected articles, while the rest are from other countries that produce less than ten articles. Description of the origin of the article shown in Figure 2.2.

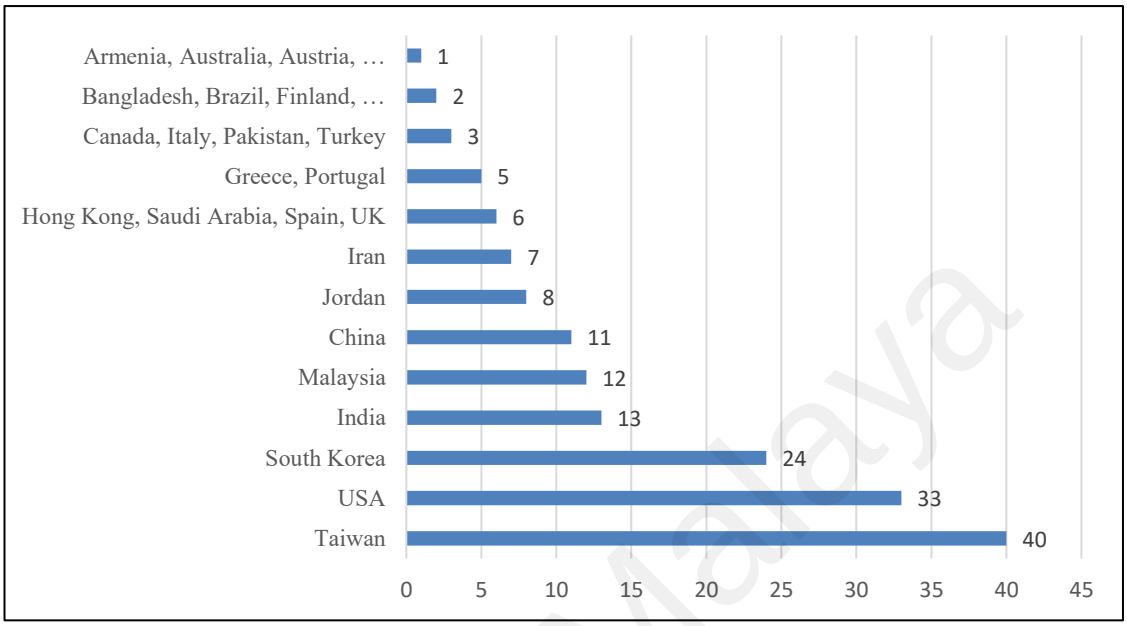

Figure 2.2: Origin of Studies

From the number of articles published in a credible journal, Malaysia ranks almost as much as India. The top 3 places are dominated by three developed countries, Taiwan, USA and South Korea. Technology adoption studies are mostly dominated by Taiwan, USA and South Korea due to strong research funding as well as the support of educational institutions that encourage research involving innovation, consumerism and technology (Franzoni, Scellato, & Stephan, 2011; Yin, Liang, & Zhi, 2018; Lee, 2020). Countries with substantial financial resources will allocate adequate budget to their respective sponsored universities either in the form of grants or incentives to conduct research and publish the findings.

It also seemed that technology adoption-related studies in Malaysia need to be increased. The input from such studies will create an avenue for agile technology adoption implementation for various business sectors in the country. This situation could

eventually improve the overall economic status of the country. Due to this reason, this study will increase the number of studies on technology adoption in the Malaysian context.

2.6.1 Context of the Study

Moreover, from 229 articles chosen for the content analysis, 134 articles (59%) were related to an individual perspective while the rest 95 articles are organisations perspective (41%). For individual perspective, 37 studies relating to general usage, adoption (35), intention (20), user acceptance (18), security, privacy and trust (SPT) (8), usage behaviour (7), culture (6), and perception (3). The detailed breakdown of the study involves the individual is as in Figure 2.3.

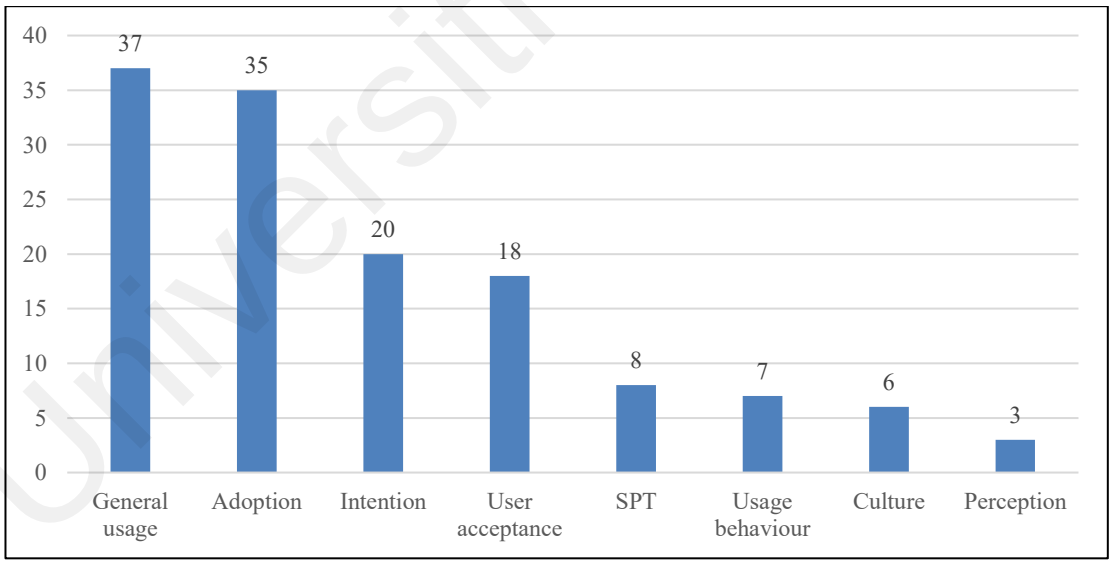

Figure 2.3: Individual Context of Studies

From 95 articles involving the organisation, a total of 31 studies related to general organisation, 30 studies on educational organisations, 18 studies on health organisations, six studies hospitality services, five small and medium enterprise (SME), two studies on

police and military organisation, and one study each involving technology adoption in automotive, banking and telecommunication organisations. Most of technology adoption studies conducted in general organisation and education due to the ease of the study procedure as well as many respondents have knowledge and background similarities to respond appropriately to research issues. From this analysis also shows that not many technology adoptions studies have been conducted on the military organisation. Therefore, this study on the usage of HRMIS by MAF personnel will contribute to filling the gap in this area. Figure 2.4 shows a breakdown of studies involving technology adoption in various organisations.

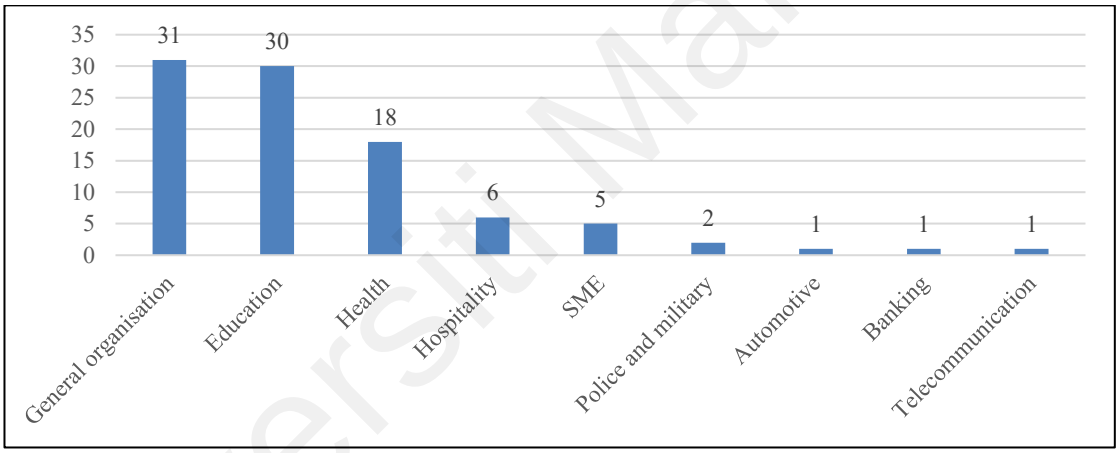

Figure 2.4: Organisational Context of Studies

2.6.2 Types of Technology

Content analysis of the selected articles also identified various types of technology and information systems used by individuals or organisations. A total of 34 articles examined the use of e-learning, especially in the educational environment. 27 articles discussed the use of e-government, 20 articles in medical systems, 20 articles on Internet banking, 14 articles investigating the mobile application and 11 articles on general ICT. Other technologies such as ERP (enterprise resource planning), online shopping, e-commerce, cloud computing, self-

service technology, online web application, KMS (knowledge management system) and many more technologies were also studied. The detail types of technology are shown in Figure 2.5. The types of technology investigated in adoption studies are mostly web-based applications and mobile devices. It is in line with current trends that more users likely to use mobile devices to access the system. The development of infrastructure and online technologies such as the Internet of Thing (IoT) and cloud storage further facilitates the content of web-based applications.

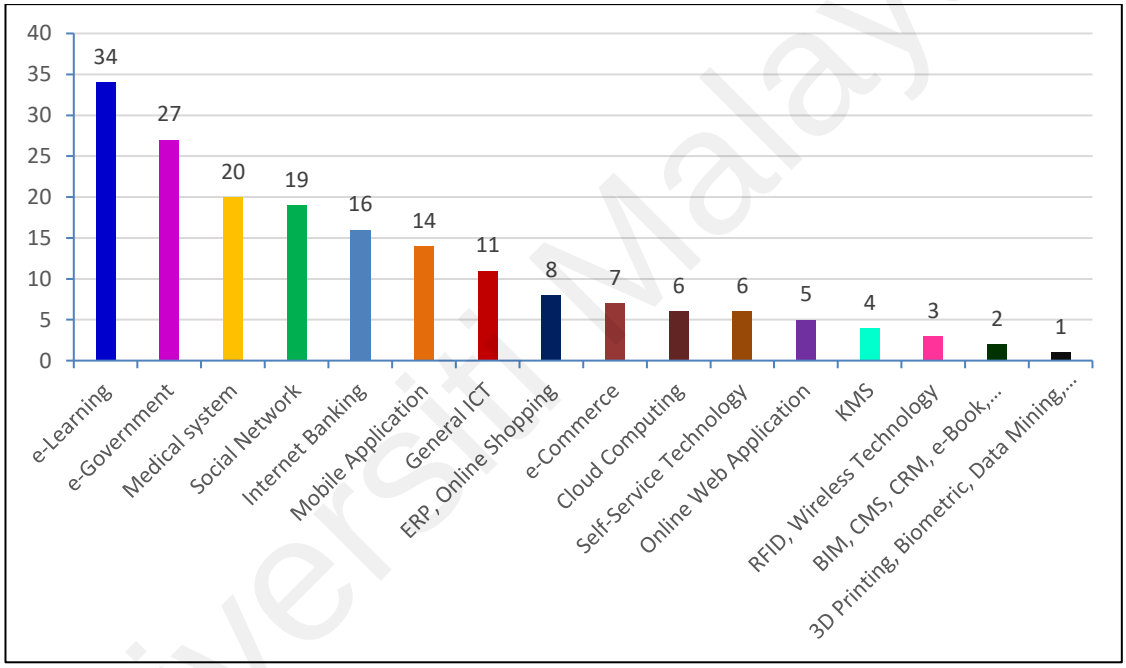

Figure 2.5: Types of Technology

The results show that not many studies have investigated the HRMIS adoption and its usage, especially in Malaysia context, therefore this adds motivation for this study to investigate HRMIS usage and its impact in Malaysia context.

2.7 Technology Adoption in the Malaysian Context

There are several studies on technology adoption in Malaysia, as shown in Table 2.3. From the content analysis carried out as part of this study found 12 relevant studies with 8 of them were from individual contexts. Four studies involve technology adoption with 3 of them involving the study of the Hospital Information System (HIS), i.e., Ismail, Abdullah, and Shamsuddin (2015), Ahmadi, Nilashi, Shahmoradi, and Ibrahim (2016) and Ahmadi, Nilashi, Shahmoradi, Ibrahim, Sadoughi, Alizadeh, and Alizadeh (2018). Similarly, one study involves the use of social media by the SME organisation by Ainin, Parveen, Sedigheh, Ismawati, and Liyana (2015).

None of the previous technology adoption studies conducted in Malaysia involved security and defence organisations. Hence, the absence of technology adoption studies in security and defence organisations is a motivation for conducting this study in Malaysia. Achmad and Dyah (2015) supported this fact in their study noted that very few studies on technology adoption had been conducted in the context of the military environment, especially involving command and control systems. Some issues limit the implementation of technology in military settings, particularly regarding the security and classification of information such as in cloud computing (Shetty, Kamhoua, & Njilla, 2019).

Table 2.3: Technology Adoption Studies in Malaysia

Reference	Subject	Perspective
Letchumanan and Tarmizi, 2011	Assessing the intention to use e-book among engineering undergraduates in Universiti Putra Malaysia, Malaysia.	Individual (Student)
Hussein, Mohamed, Ahlan, & Mahmud, 2011	Assessing factors influencing citizens' intention to use e-filing in the Malaysian context.	Individual (E-filing user)
Oii, Sim, Jew, & Lin, 2011	Exploring factors influencing consumers to adopt broadband in Malaysia.	Individual (Mobile device user)
Yahya, Nadzar, & Rahman, 2012	Examining user acceptance of E-Syariah Portal among syariah users in Malaysia.	Individual (E-Syariah portal user)

Table 2.3: continued

Moghavvemi & Salleh, 2014	Effect of precipitating events on information system adoption and use behavior.	Individual (Entrepreneur in SME)
Wong, Tan, Loke, & Oii, 2014	Exploring the factors in predicting users to use mobile television.	Individual (Electronic payment user)
Ismail et al., 2015	Examining the adoption of Hospital Information System (HIS) in Malaysian Public Hospitals.	Organisation (Hospital)
Ainin et al., 2015	Use and applications of social media by SMEs.	Organisational (Small and medium enterprise)
Teo, Tan, Ooi, Hew, & Yew, 2015	Use and application of m-payment.	Individual (M-payment user)
Ahmadi et al., 2016	Assessing expert perspectives on Hospital Information System in Malaysian public hospitals.	Organisation (Hospital)
Suki & Suki, 2017	Examining student's intention to use animation and storytelling as learning media.	Individual (Student)
Ahmadi et al., 2018	Assessing the hospital size on inter and intra-organizational factors of Hospital Information System adoption.	Organisation (Hospital)

2.8 Technology Usage and Impact in Organisation

The use of technology in an organisation is in tandem with the need to achieve a competitive advantage. It is true for most profit-based organisations where the use of technology will reduce operating costs as well as improve the quality of products and services. In addition, the use of technology also enables many organisations to refine their business approach and business model (Valacich & Schneider, 2017).

The application of technology in an organisation has strategic value because it works at every level of the organisation. It is used with different functions at the operational, managerial, executive level. The use of technology at every level of the organisation is closely related to how the technology helps a task or thing be done faster, cheaper and more precisely. For example, the use of the Internet of Things (IoT) enables business processes to be implemented faster by various organisations (Firouzi, Rahmani, Mankodiya, Badaroglu, & Merret, 2018). Moreover, it helps accelerate the repetition of

operations and provides valuable information which is required by top management (Omar & Nehdi, 2016; Moskowitz, Russel, & Suri, 2019).

In addition, the use of technology also helps organisations in the context of organisational learning where organisations use past experiences as well as previous data to improve business processes including automating them (Valacich & Schneider, 2017). Its use also helps identify weaknesses that need to be improved regarding the effectiveness of the organisation's operations.

In dynamic and viable organisations, they will use technology in formulating organisational strategy, which is preceded by strategic planning. The right use of technology helps management in innovating, streamlining operations, optimising the supply chain, or better understanding customers (Sabri, Micheli, & Nuur, 2018). Over time, they also use technology to analyse their capabilities in the context of competitive forces while increasing competitive advantages (Gunasekaran, Subramanian, & Papadopoulus, 2017).

In large and complex organisations, the use of technology helps to manage the resources and capabilities of their organisations. Appropriate technology needs to be used to manage human resources so that genuinely competent employees will be retained (Stone, Deadrick, Lukaszeski, & Johnson, 2015). Also, the management of existing assets needs to be appropriately managed as they need to be optimised for their use to help the organisation achieve the mission and vision of the organisation (Love, Matthews, & Gates, 2019).

In modern-day, the use of information system always described as a benchmark for success, effectiveness and acceptance within the organisation (Alewine, Allport, & Shen,

2016). In any implementation of technology, the ultimate objective to gain the maximum benefits from the utilisation of the technology (Molinillo & Japutra, 2017; Tam & Oliveira, 2017). The framework introduced by DeLone and McLean (1995) has discussed in detail about the possible impact of information system adoption, which consists of individual impacts and organisational impacts. Individual impact refers to the benefits realised by the individuals as a result of using the particular technology and how the technology influences their behaviour (Bigne, Andreu, Hernandez, & Ruiz, 2018; Jeyaraj, 2019). In a broader context, organisational impact implies how the system benefited the organisation in terms of business performance, capabilities, and organisational output (Jayawickrama, Liu, & Smith, 2017; Bhatti, Baile, & Yasin, 2018).

For individual users, the use of IS involves the use of personal management and is often with any web-based application as well as an online system. Users in this category regularly using mobile devices that allow them to access the system anywhere provided they have Internet access (Stair & Reynolds, 2018). Whereas in the context of organisations, the use of information system primarily utilises the infrastructure owned by their organisations. Among the types of the information system used by organisations are knowledge management system (KMS), transaction processing system (TPS), electronic resource planning (ERP) system, decision support system (DSS), learning management system (LMS), and office information system (Valacich & Schneider, 2017).

A study by Lu, Hu, Gao, and Kinshuk (2016) demonstrated that information system utilisation having a more significant impact on short-term performance than long-term performance, while IS usage exploration has a positive impact on long-term performance. On a more encouraging note, their findings also demonstrate that the use of IS has a positive

impact on organisational efficiency. In addition, they also argued that IS use technology should be more relevant to encourage IS capabilities for organisations.

Nwankpa (2015) found that in order to achieve significant benefits, many organisations invest in various information systems. These benefits can be quantified through increased business efficiency, such as shorter run times, lower operation cost and efficient communication between functional management boundaries.

It is a reality that the use of technology has a tremendous impact on the user. One of the most important impacts is how technology usage increases the efficiency of the users in performing their daily jobs. The use of the right technology greatly facilitates users to perform repetitive and speed-related tasks. In most work processes, the use of an information system does not require the use of paper as well as physical documents (Abidin & Husin, 2018). The data and information search process in an information system also faster by utilising search engine features which equipped with intelligent algorithms (Moustafa & Zeadally, 2016).

Similarly, the effective use of networks and data storage does not require employees to move from one place to another to get the information they need. At the management level, the use of information system enables top management to get the right data or information to assist them in making accurate decisions (Ghani, Hamid, Hashem, & Ahmed, 2019). Accurate information also helps the executives to plan all types of management function including personnel management, assets monitoring and organisation strategic vision achievement (Nelson & Staggers, 2016; Liebowitz, 2019).

2.9 Technology Usage in Government Organisation

The use of technology in the government sector does not differ much from profit-based companies and firms. As non-profit organisations, government agencies have significant constraints in term of approach of the implementation and budget allocation. The implementation and use of technology in government are often materialised through an ICT strategic plan that includes new initiatives and visions (Ahmad, Aljafari, Venkatesh, 2019; Abdullah, Yusof, & Mokhtar, 2019). Usually, this strategic plan is a subset of the national development plan in which allocation of budgets is centralised by one financial body. The main focus is to serve the people as well as a tool to improve information flow within the organisation. Other than that, technology usage in the government also to increase the efficiency of the workforce by automating work processes and simultaneously reducing the number of the human workforce (Sawyer, Erickson, & Jarrahi, 2019).

The implementation of computerised information systems has provided the public with the opportunity to access certain services through the Internet as provided via e-government (Cordella & Tempini, 2015). For example, a passport applicant can apply for a passport online by filling out the required forms and documents without having to go to the immigration counter. It means that the use of technology in government not only facilitates the efficiency of the workforce but also helps provide more efficient services to the people (Sharma, Al-Badi, Rana, & Al-Azizi, 2018).

While the use of technology in government has many benefits, there are some common issues and challenges that come with each implementation. In most case, the cost of the technology itself is a critical thing to consider. The high cost always becomes a barrier in

the implementation of technology particularly involving new systems, infrastructure, training, and maintenance (Liang, Qi, Wei, & Chen, 2017; Sadiq, 2018).

In implementing new technology, the issue of human resources must be taken into account by ensuring that they are well trained and motivated to use the technology introduced in their organisation. Any failure to meet these requirements results in the underutilised system and have a tendency to be a failed project (Anthopoulos, Reddick, Giannakidou, & Mavridis, 2015; Hwang, Al-Arabiat, Shin, & Lee, 2016). Training will also ensure that those who do not have technology literacy can reduce the digital divide with those who are proficient in technology (Ayinla & Adamu, 2018; Hillier, 2018).

The use of technology is undeniable, and it plays an essential role in the operation of the organisation not only in government organisations but also in profit-oriented organisations. Its use is greatly improved by the development of various adoption technology models that study in detail the factors that drive the use of technology in the organisation.

2.10 Technology Adoption Model

Based on the content analysis of this study, 66 previous studies using the Technology Acceptance Model (TAM), 42 studies using the combined model, 41 studies using UTAUT (Unified Theory of Acceptance and Use of Technology), 31 studies using DeLone and McLean ISSM (Information System Success Model). In comparison, the rest uses various models such as TOE (Technology-Organisation-Environment), TPB (Theory of Planned Behaviour), UTAUT2, HOT-fit (Human-Organisation-Technology fit), TAM2 and others. The types of a model used in the study involving technology adoption are as in Figure 2.6.

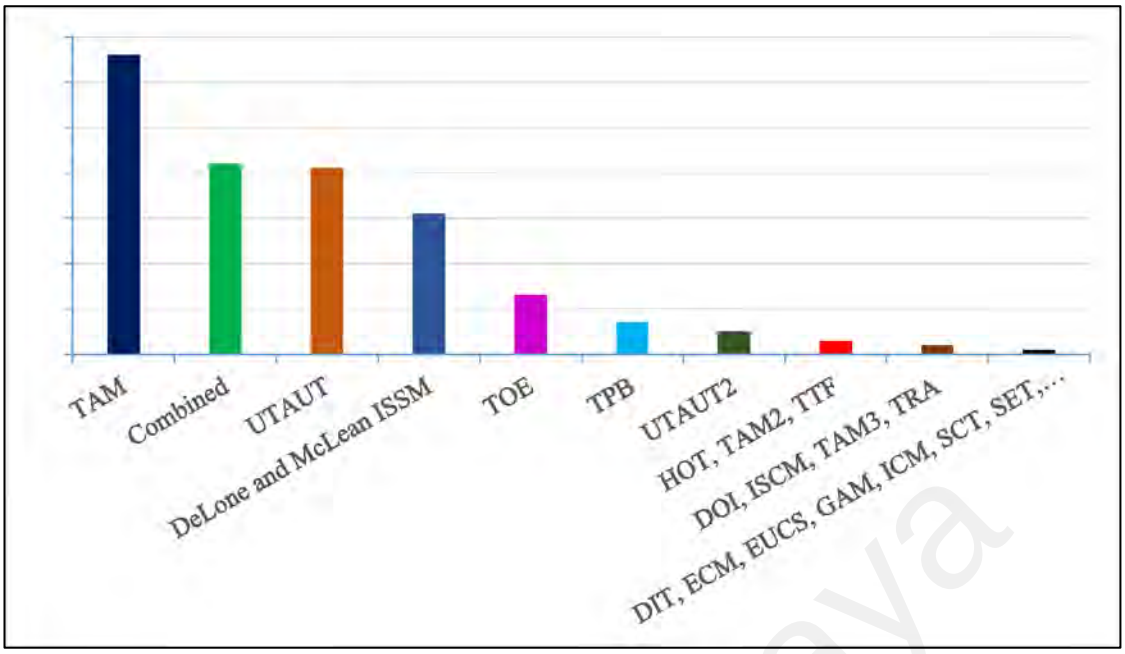

Figure 2.6: Types of Technology Adoption Model

These technology adoption models have been developed and tested in various contexts and situations to foresee the behaviours of individual, group, and organisations (Durodolu, 2016). As a result, the development of these models able to improve technology adoption success rate in various organisation (Hussein, 2017). Content analysis shows that most of the technology adoption studies use TAM, combined technology adoption models, UTAUT, and DeLone and Mclean ISSM. The use of TAM as a model to examine technology implementation has become a trend because it is the earliest model developed in line with the growth of the use of technology. In reality, since it is easy to adapt to various situations and circumstances of technology use, this model is an alternative. The use of a combined model is also widely used in studies through the use of an existing model and combined with multiple factors that are specific to the context of the study.

In terms of research methods used in previous technology adoption studies, it was found that 214 articles (69%) used quantitative methods, 17 (4.4%) used mixed methods,

and 63 (17%) used qualitative methods. It shows that the quantitative method is the most widely used method to study technology usage, adoption, and acceptance. Therefore, this study also uses a quantitative method to investigate HRMIS usage in MAF context. The next section discusses some of the prominent technology adoption models.

2.10.1 Prominent Technology Adoption Model

Various technology adoption models have evolved from year to year to achieve perfection for usage in modern and dynamic environments (Eze, Duan, & Chen, 2014). The development of these models has helped many researchers to study the influencing factors in individual technology usage and adoption (Abrahao, Moriguchi, & Andrade, 2016). Some of the prominent technology adoption models are:

- Theory of Reasoned Action - TRA (Fishbein, 1967).
- Social Cognitive Theory - SCT (Bandura, 1986).
- Theory of Planned Behavior - TPB (Ajzen, 1988).
- Technology Acceptance Model - TAM (Davis, Bagozzi, & Warshaw, 1989).
- Model of PC Utilisation - MPCU (Thompson, Higgin, & Howell 1991).
- Diffusion of Innovation Theory - DOI (Rogers, 2004).
- Unified Theory of Acceptance and Use of Technology - UTAUT (Venkatesh, Morris, Davis, & Davis, 2003).
- Information System Success Model - ISSM (DeLone & McLean, 2003).

2.10.1.1 Theory of Reasoned Action (TRA)

TRA is the earliest technology acceptance model, and Fishbein and Ajzen developed it in 1975, and it based on social psychology theory. The main idea is to enable a clearer understanding of how attitude, intention and behaviours affect technology adoption. When this theory is developed, it is the beginning of individual behaviour research through attitudes (Glanz, Rimer, & Viswanath, 2015). This theory is constructed by three primary constructs, namely behavioural intention, attitude, and subjective norm. Based on this model, one's behaviour is determined by the intention of the behaviour. The TRA suggests that a behavioural intention depends on attitude and subjective norm (Armitage & Christian, 2017).

In general, the TRA is the most basic theory regarding human behaviour. In addition, it is not developed for a particular behaviour or technology. Therefore, it does not explicitly state whether the other variables affect behavioural intention or not. The limitation with TRA is that it is not able to foresee individual user behaviour if his/her intention to use it is not known beforehand (Tarhini, Asanka, Arachchilage, Masa'deh, & Abasi, 2015).

2.10.1.2 Theory of Planned Behaviour (TPB)

Theory of Planned Behaviour is a further development of the TRA. As a conceptual framework, the TPB aims to explain the determinants of certain behaviours of the individual subject.

The TPB is a conceptual framework that aims to explain the determinants of certain behaviours. The core factor of individual actions, according to Ajzen (1988), is that the behaviour is affected by the behaviour's purpose. Moreover, this intention behaviour is influenced by three components, namely, subjective norm, attitude, and perceived behaviour control.

This theory does not consider the planning mechanism by individuals as well as not considering how other variables are affected by behavioural intention and motivation. In addition, the TPB also does not consider the environmental and economic effects that might influence the behaviour of an individual (Tornikoski & Maalaoui, 2019).

2.10.1.3 Technology Acceptance Model (TAM)

In the study of technology acceptance and adoption, TAM is one of the most influential models. Fred Davis invented it and introduced it in 1986. This model suggests that certain variables influence their decision about how and when they can use them when users are presented with something creative. The TAM is a model used to forecast consumer adoption of technology with regard to two variables, according to Davis (1989), namely perceived usefulness (PU) and perceived ease of use (PEOU). PU means the degree of confidence that can be increased by using the system, where the performance of the user can be enhanced. PEOU is characterised as the confidence level of the user that the system can be easily used and can be learned on its own. The TAM emphasises that the use of ICT is dictated by the purpose of using the system, while the ability to use the system is influenced by one's attitude towards using systems.

However, the TAM model has been criticised as it is only applied in a voluntary environment with little consideration to mandatory settings (Chuttur, 2009). Therefore, to overcome this weakness, Venkatesh and Davis (2000) have improved the TAM model by considering the needs of the voluntary and mandatory environment.

2.10.1.4 Social Cognitive Theory (SCT)

Initially, SCT is a Social Learning Theory developed by Miller and Dollard (1941) as a model for learning alone. Subsequently, many researchers have utilised the SCT for use in their studies, among them is Bandura. The SCT describes how an individual gets and retains a behavioural patent and provides a strategic basis (Bandura, 1997).

The SCT states that the change in individual behaviour depends on individual factors, environmental factors, and attitude factors. Armitage and Christian (2017) explain that environmental refers to factors that affect behaviour, either social or physical. Compeau and Higgins (1995) improved the SCT to make it more suitable for use in research involving computer usage.

The SCT has significant weaknesses when the research involves the relationship between individual, behaviour and environment. The main reason for this pitfall is that it is developed for the learning process rather than for technology acceptance or motivation purpose (Sheeran, Conner, & Norman, 2001).

2.10.1.5 Diffusion of Innovations Theory (DOI)

The Innovation Diffusion Theory pioneered by Rogers (1995; 2003) describes how people in a social environment embrace and practice innovation. This innovation can exist, whether, in the form of ideas, technologies, or products evolves. Diffusion, according to Rogers, is the mechanism by which technology or invention is communicated in a specific way that is exchanged over time with the society in the social system.

Rogers postulates that innovation (ideas), communication channels (ways to convey messages from one person to another), time (the time it takes for people to adopt innovation), and the social system (a group of social members who share the same goals) are important elements. In the diffusion of innovation. In term of application, DOI more focus on the system characteristics, organisational attributes and environmental aspects, nevertheless, in contrast with other adoption systems and models, it has limited use in the explanatory study and less realistic results prediction (Taherdoost, 2017).

2.10.1.6 Model of PC Utilisation (MPCU)

MPCU is an extended version of the theory of human behaviour (Triandis, 1979). Thompson et al. (1991) found that in MPCU's theoretical model it is presumed that the use of the computer is influenced by social norms and three components expected outcomes namely social factors, affect toward use, and facilitating conditions. Therefore, they suggest that the MPCU should be able to differentiate between perceptions of actual use and beliefs about future consequences of using technology.

The MPCU model specifically assesses the direct effect of facilitating condition, long term use, perceived consequences, complexity, job fit, and social influence on user behaviour. The findings of previous research using the MPCU model also indicate that factors that have a major effect on PC usage are social factors, job fit, complexity, and long-term consequences. Although this model is very detailed and useful in technology acceptance and behaviour studies, it is occasionally used in technology behaviour studies because of complexity factors (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019).

2.10.1.7 Unified Theory of Acceptance and Use of Technology (UTAUT)

By comparing the similarities and differences between the eight models and systems previously used in different studies, Venkatesh and Morris (2000) have tried to establish a method for predicting user acceptance of information technology. All the models and frameworks had their origins in sociology, psychology, and communications. These models are Technology Acceptance Model (TAM), combined TAM and TPB, Theory of Reasoned Action (TRA), Model of PC Utilisation, Theory of Planned Behavior (TPB), Diffusion of Innovation (DOI), Motivational Model (MM) and Social Cognitive Theory (SCT). Venkatesh and Morris named this new model as Unified Theory of Acceptance and Use of Technology (UTAUT).

This model has four independent variables which are to determine the relationship of behavioural use of technology and the direct determinant of user behaviour in promoting the situation. The UTAUT also integrates four moderating variables of age, experience, gender, and voluntariness of use, as a factor of moderation that has various effects to independent variables of the model (Venkatesh et al., 2003). However, some researcher argues that this model has an obvious limitation as it relatively lows parsimony due to the

complex relations among the attributes as indicated by the moderation effects (Dwivedi, Rana, Chen, & Williams, 2011; Venkatesh, Thong, & Xu, 2016).

Venkatesh, Thong, and Xu (2012) have released UTAUT extended model known as UTAUT2. They added three more independent variables to the original UTAUT model: hedonic motivation, price value, and habit. However, moderating variable voluntary of use has been discarded because UTAUT2 model is focused on individual users, whereas the UTAUT model developed specifically for the individual in the organisation.

2.10.1.8 Information System Success Model (ISSM)

Among the most notable models used in the study of success factors in technology adoption in organisations is the DeLone and McLean ISSM (Information System Success Model) framework. The original DeLone and McLean taxonomy was based on Mason's (1978) combined with the adjustment of Shannon and Weaver's (1949) theory of communications. However, this model does not include feedback loops as per Mason's approach. They have identified and separated the process of communication into three stages. The first stage is the technical level in which the function is to determine the precision and effectiveness of the system that generates it. The second stage is the semantic level in which it explains the capability to transmit the message. The final stage is the level of effectiveness by which it measures the message influence on the recipient side (Shannon & Weaver, 1949).

Since its publication in 1992, there have been many researchers who have given new input to the model. Pitt, Watson, and Kavan (1995), for instance, notice that a measure of IS service quality was not included in the DeLone and McLean information system

performance model. They concur that the quality of IS service needs to be included and further claim that system quality, quality of information, and quality of service together have an effect on the use of IS and user satisfaction. This resulted in some changes were made to the original model by DeLone and McLean, and they published a new model in 2003 with six variables for the success of IS, namely service quality, system quality, information quality, system use, user satisfaction, and net benefits. This general framework of IS posits that the relationship between information quality, service quality and system quality is more likely to have a positive impact on net benefits if the end-user uses the system and resulted in feels satisfied with the system. However, this new model also has been criticised for lacking the foundation theory to predict intention to use (Tam & Oliveira, 2016).

Despite this criticism, ISSM is widely used in technological adoption studies because it is simple and easy to use either in its original form or in combination with other models or frameworks. Many articles have been published in the IS field that applies the ISSM as the theoretical basis. These include the study on online learning usage (Aldholay, Isaac, Abdullah, & Ramayah, 2018), investigating the success of knowledge management (Wang & Yang, 2016), e-learning success determinants (Cidral, Oliveira, Felice, & Aparicio, 2018), implementation of electronic medical record system (EMRS) (Kuo, 2018), and implementation of mobile e-books application (Chiu, Chao, Kao, Pu, & Huang, 2016).

Several researchers demonstrate that ISSM can be combined with other models such as the Technology Acceptance Model (TAM) to explain mobile tourism empirical study (Chen & Tsai, 2017); ISSM with organisational support factors to explain military personnel utilise digital library system (Rahman, Mohezar, Habidin, & Fuzi, 2020), or

continuance intention of mobile instant messaging (MIM) in Taiwan (Tseng, Cheng, Yu, Huang & Teng, 2019).

Figure 2.7 shows the original DeLone and McLean ISSM in 1992, and Figure 2.8 shows the updated DeLone and McLean ISSM in 2003.

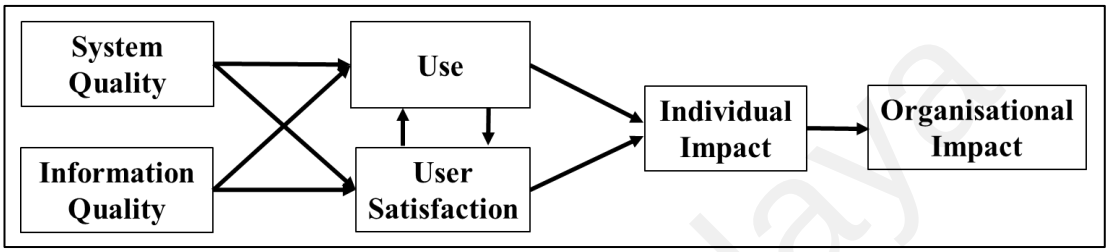

Figure 2.7: DeLone and McLean ISSM (1992)

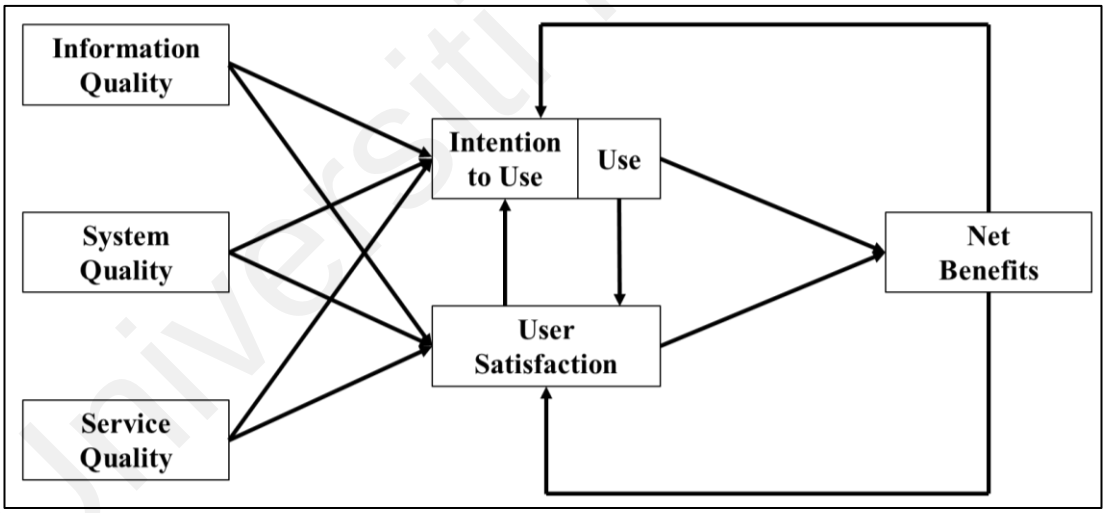

Figure 2.8: DeLone and McLean ISSM (2003)

Most adoption models are developed from numerous theories such as sociological theory, social psychology theory and psychosocial theory. All the theories underlying the technology adoption model have successfully explained most of the human behaviour in different contexts, whether they are behaviours of individual or organisational characteristics (Taherdoost, 2017).

From the various models and frameworks used in the study of technology adoption as well as technology acceptance, multiple approaches are used by researchers to produce the most comprehensive model that can be used in a variety of contexts and settings. However, the trade-off between complexity and usability limits the researcher to produce a model that applies to all contexts. Choosing the right model in a study requires systematic considerations as the most suitable model of the framework must support researchers study objectives (Hennink, Hutter, & Bailey, 2020).

The development of models and frameworks to study technology adoption has resulted in a vast amount of output and greatly assisted in solving problems related to technology acceptance and adoption. Previous literature has also facilitated other researchers to use findings from other studies as a guide. Similarly, this study employed the literature from previous studies to obtain preliminary input on factors influencing technology usage and adoption. It is discussed in detail as in the next section.

2.11 Factors Influencing Technology Usage

Related articles, as reviewed in the earlier section of this chapter, have been analysed to provide factors influencing technology adoption in the perspective of individuals and organisations. From the analysis, the factors are having been sorted and listed as in Figure 2.9.

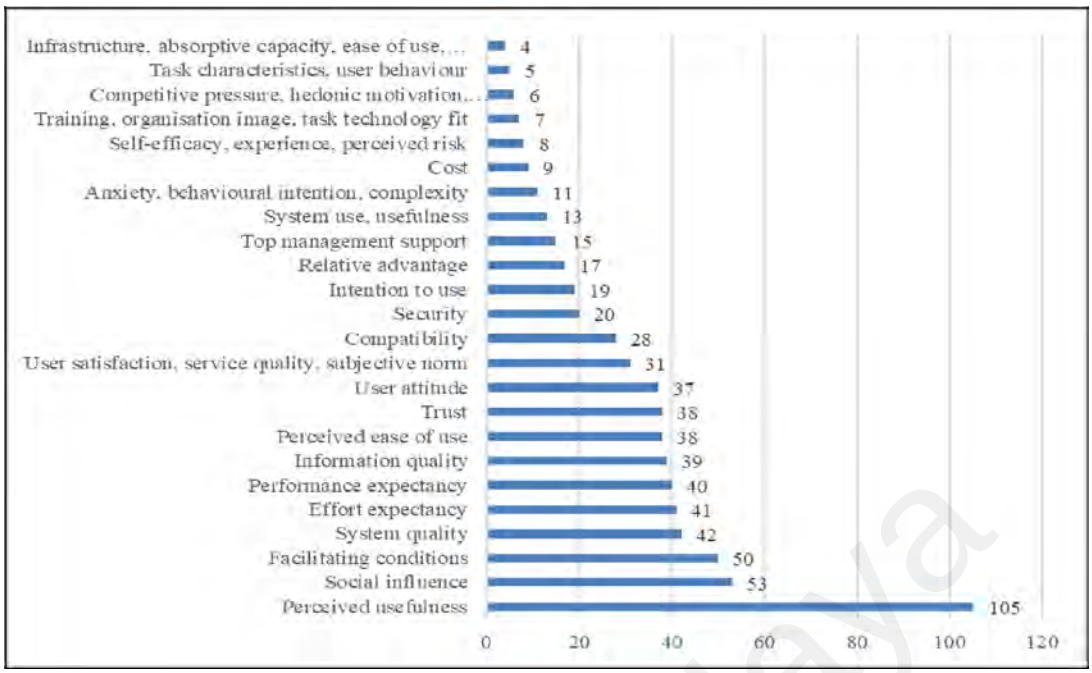

Figure 2.9: Factors Influencing Technology Adoption

Perceived usefulness (PU) is the most widely studied factor involving 105 studies. PU describes the users' perception that using a system will boost or improves their performance. In studies involving TAM framework, PU is believed to be the primary predictor of behavioural intention to use (BI), especially when discussing it in the context of technological interest (Park & Kim, 2014).

Prior studies demonstrate that PU is positively linked with continuance intention in the context of instant messaging (Peng, Zhao, & Zhu, 2016, Mouakket, 2019), e-text (Gerhart, Peak, & Prybutok, 2017; Horne, Henze, Schuh, Colvin, & Russell, 2017), a mobile service provider (Park, Amendah, Lee, & Hyun, 2019), online travel services (Ruiz-Mafe, Tronch, & Sanz-Blas, 2016), e-learning (Abdullah & Ward, 2016; El-Masri & Tarhini, 2017), knowledge creation (Tarhini, Tarhini, & Tarhini, 2019; Ullah & Shams, 2020). This factor seems dominant because it is widely used in conjunction with other factors in different models or frameworks.

Factors shown in Figure 2.9 are widely discussed in the various study on technology adoption involving the use of frameworks such as TAM, TOE, combined framework, UTAUT, ISSM, TPB and others as shown in Figure 2.6 (types of technology adoption model).

In discussing factors influencing technology adoption, most authors tend to classify it into several groups or categories. Kim and Chung (2017) outline four groups of factors that influence the technology implementation process, namely social, organisational, individual, and innovation characteristics. Meanwhile, Fridin and Belokopytov (2014) highlight some factors which influence the adoption of technology in organisations such as organisational capacity, technological considerations, content characteristics, and user characteristics. Sadoughi, Ali, and Erfannia (2019) conducting factors analysis on cloud technology adoption using systematic review and divided the factors into four categories, namely technological, organisational, environmental, and individual. Bouwman, Van Den Hooff, Van De Wijngaert, and Van Dijk (2005) divide these factors into four main groups: organisational perspective, economic perspective, technological perspective, and user perspective. All the factors play a different role in every operational process within the organisation, and their effects are also different at every level of management within the organisation.

2.11.1 Technological Perspective

Technology adoption factors in technological perspective refer to attributes of the technologies which are available for possible implementation of new technology and existing organisation's state of the art (Gide & Sandu, 2015). In discussing the factors that are in the technological perspective, they are also clearly related to the organisational factors

themselves (Bouman et al., 2005), which is an important perspective in which the role of the technology used will influence the adoption and implementation phases. It also describes the characteristics of the technological environment, which can influence the diffusions of technology usage in the organisation (Mattos &Laurindo, 2017).

Most researchers choose relative advantage as the most influential factor in technological factors. It is based on the innovation diffusion theory (Rogers, 2003), which explains how a user or customer evaluates a new product or technology that is being used compared to what was used previously. It also describes how perceptions of benefits are linked to the advantages of innovation in the form of economic and political legitimacy of technology being implemented (Wang et al., 2016).

In addition, among the most important features are the reliability of technology and system where it describes the system's ability to function properly to ensure quality service, minimal error and fast recovery (Alsetoohy, Ayoun, Arous, Megahed, & Nabil, 2019). Reliability can be summarised as the ability to perform the promised service, dependably and accurately (Gonzalez-Benito, Venturini, & Gonzalez-Benito, 2017). It is one of the qualities that must exist and must always be reliable over time (Akter, Wamba, & Dewan, 2017).

Implementation of technology in organisations requires technological readiness in the organisation, which refers to the availability of ICT infrastructure and IT human resource expertise of the organisation (Gide & Sandu, 2015). ICT infrastructure means the physical assets an organisation possesses that can be used to facilitate technology adoption. It includes all the networks, hardware, and software used to support the operation of the technology. At the national level, ICT infrastructure, which includes a stable and adequate supply of

electricity, high-speed Internet networks, and reliable telecommunications networks, plays a crucial role in the process of spreading innovation. In addition, it is critical facts that many of these innovations have a high reliance on good infrastructure (Sabi, Uzoka, Langmia, & Njeh, 2016). IT human resource expertise are personnel who have adequate knowledge and skill to conduct computer-related jobs (Li, Dai, Gershberg, & Vasarhelyi, 2018).

The use of a network, especially wireless network as well as the sensitivity of the data requires the system to be secured both in logical and physical aspects. The security aspect is often associated with privacy and trust which are two distinct issues but must be managed in technology adoption application especially when it comes to personal information and user perceptions (Merhi, Hone, & Tarhini, 2019). However, regardless of the measures introduced to control these issues, it should not burden the user in utilising the technology (Vacca, 2017).

The choice of the type of technology is also an important criterion on which technology will be selected in facilitating the organisation's operation (Li, Wu, Gao, & Shi, 2016). The use of complex technology that is hard to comprehend will be a hindrance to its usage within the organisation (Yoo, Bae, Park, & Yang, 2019). It is especially obvious when users are less exposed to technology before it introduced in the organisation (Bortamuly & Goswami, 2015). Complex technology also will create trouble when it comes to troubleshooting procedure and maintenance. Therefore, new technology introduced in the organisation needs to comply to a certain standard and compatibility features which will facilitate the integration process with existing and legacy systems (Gholami, Daneshgar, Beydoun, & Rabhi, 2017).

2.11.2 Organisational Perspective

Organisational perspective explains all the factors related to organisational existence and the nature of how it uses technology to become a competitive and effective organisation (Ales, Curzi, Fabbri, Rymkevich, Senatori, & Solinas, 2018). However, these factors differ between profit-based and non-profit organisations (Palacios-Marques, Soto-Acosta, & Merigo, 2015). The use of technology in profit-based organisations offering services and products will increase profitability while also positively impacting the operations and work culture of the organisation (Kirton & Robertson, 2018). On the other hand, although non-profit organisations have limitations in budget allocations and the number of employees, they also benefit from the use of technology which enhances operational efficiency and speed in decision making (Miranda, Farias, Schwartz, & Almeida, 2016).

In discussing the factors in the organisational perspective, it can be separated into two groups: factors that affect the organisation and factors that involve vendors or service providers (Sadoughi et al., 2019). In most of the organisation, the benefits gained in adopting technology depend on the top management commitment. Top management responsible in planning stage of the procurement by drawing awareness of the importance of the technology to the organisation in achieving the vision and mission of the organisation (Schmitt, Mladenow, & Strauss, 2019). They also need to ensure their employees use the technology by issuing appropriate instructions and policies related to the usage. At the same time, the nature and size of an organisation also play a significant role in adopting technology (Kurnia, Choudrie, Mahbubur, & Alzagooul, 2015; Wang, Li, Li, & Zhang, 2016). It is because large organisations can absorb any risks and be more flexible in their financial allocations and technical expertise.

Experienced organisations will have an advantage in implementing new technology (Balapour, Reychav, Sabherwal, & Azuri, 2019). Their experience allows them to predict management and technical requirements more accurately. These organisations usually are supported by dedicated divisions or specialised branches that provide direct support on technical issues as well as provide internal training (Jacox, Mihas, Cho, Lin, & Ko, 2019).

In addition to organisational factors, factors affecting service providers is also crucial concerning their reputation and performance concerning the implementation of the adoption they address (Tapanainen, Dao, & Nguyen, 2018). Service providers must also comply with all the terms of the contract as agreed involving training and documentation such as licenses and permits (Chaudhuri, Rogers, Soberg, & Pawar, 2019).

2.11.3 User Perspective

The user perspective refers to how the factors of use of technology influence its use among users. It relates to how users want technology to function for the betterment of their lives and indirectly benefits their social life (Bouwman et al., 2005). Factors influencing user perspectives are factors specifically related to the attitudes, behaviours, and perceptions of users toward the technology (Kim & Gambino, 2016; Belletier, Robert, Motax, & Izaute, 2018).

Although these factors appear to be focused on individuals, they also have a direct impact on individuals who are working in organisations where technology widely used as the backbone of organisational operations (Valacich & Schneider, 2017). The use of technology by the user in the context of the individual user focusing on work productivity as well as facilitating users' life (Hassan, Dias, & Hamari, 2019).

In adopting technology in an organisation, users are an essential factor to consider as they are the determinants whether the technology is used or not (Tsai, Cheng, Tsai, Hung, & Chen, 2019). These factors are closely related to how the users values the technology and this assessment depend on their technical knowledge and skill (Rahayu & Day, 2015). It deals with the willingness to change and the way users deal with the change in their work process (Fies, 2018; Yuan, Nembhard, & Kane, 2020).

Proper programs can ensure a knowledge gap and digital divide among users can be remedied so that they will realise the benefits of using the technology. At the same time, management needs to ensure that other user-related barriers are identified and that they need to be overcome or minimised to an acceptable level (Arkorful, Shuliang, Muhideen, Basiru, & Hammond, 2019; Marikyan, Papagiannidis, & Alamanos, 2019).

2.11.4 Economic Perspective

Factors in the economic perspective are closely related to how technology helps organisations to offset the costs and benefits gained at all stages of technology application, adoption, implementation, use, and effects (Bouwman et al., 2005). It is also stated by Valacich and Schneider (2017), where most organisations in the information age gain economic benefits and increase organisational value through efficient use of technology. Efficient use of technology can reduce operating costs through reduced employment, resource and power concentration, transportation costs, waiting-time, storage and so on (Valacich & Schneider, 2017; Wang & Zander, 2017).

Global economic development has also shown that the use of technology is strongly associated with macroeconomic growth, particularly in the context of a network or

information economy (Eroshkin, Kameneva, Kovkov, & Sukhorukov, 2017). In the network economy, for instance, communication is an important concept. People and computers are becoming more interconnected using various mobile technology. The use of ground-breaking technology has resulted in multiple applications, and systems innovations that enhance the supply chain process by ensuring supply is efficient and economically viable (Wu & Chiu, 2018; Tseng, Wu, Lim, & Wong, 2019).

The introduction of technology in the organisation will involve high overhead costs as it requires the acquisition of new infrastructure as well as training and system maintenance (Li & Wang, 2016). For non-profit organisations, technology specification or features may be limited due to small budgets and financial limitations. Whereas for other organisations and firms, all costs incurred will be reimbursed through additional benefits and cost savings in the long run (Karakaya, Hidalgo, & Nuur, 2015).

Various factors influence the use of technology, either in the context of individuals or organizations. These factors often have a direct relationship with technology usage and its impact on improving the quality of life and improving organizational performance. The next section discusses the technology usage in the military environment.

2.12 Evolution of Military Technology

The use of technology in the military is extensive, and this usage is based on the advantages that technology has in producing faster, and more accurate output especially in terms of the use of combat equipment and weapons. It goes hand in hand with the changing and the nature of warfare. The technology used in the military has not changed dramatically and is evolving as technology changes the entire military setting. In other

words, the digital military revolution is changing warfare dynamics (Dyer-Witheford & Matviyenko, 2019).

The use of technology provides an immense advantage in the military, which involving the use of combat technology, logistics, intelligence, and training (Collins & Futter, 2015). Technically, the use of technology in the military increases force readiness as well as force multipliers, where it strengthens the armed forces (Bresler & Bresler, 2018). In addition, the use of technology which always related to efficient information sharing, which ensures that the necessary information is always available and thus enhances situational awareness (Hitchens, 2019).

Among the most widely used technologies in the military is the use of weapons based on precision technologies such as smart weapons where the weapons and ammunition used are extremely effective and only destroy their target without damaging the surrounding environment (Theodoulis & Wernet, 2017). In times of conflict or crisis, military organisations often rely on the battlefield management system (BMS). Previously, the use of BMS required a large number of personnel and equipment. With today's technology, the systems are simpler with the help of audio-visuals that allow operational situations to be monitored in the control room. It also means that war strategy and approaches have changed from people-centric and platform-centric to network-centric warfare (Dong, Wu, Yang, & Jiang, 2019).

The use of technology has allowed the war spectrum to expand from just inland to the oceans and atmosphere with the invention of equipment such as satellites and unmanned-aerial-vehicles (UAVs). Command and control of warfare are made easier as technology

enables remote information to be achieved through networks that include all friendly forces (Hagler & Baker, 2018).

In terms of logistics, the use of technology enables the forward team to re-supply quickly from the rear echelon. It includes how the needs of new supply are planned at the top level, assisted by systems that predict future usage by the operational units (Tortonesi, Morelli, Michealis, Suri, Stefanelli, & Russel, 2016).

Like any other organisation, military organisations also have human resources that need to be managed efficiently and deployed in one place quickly and efficiently. In order to carry out a mission, the right personnel need to be deployed because each person has different skills and expertise. Therefore, military organisations require a more critical human management system than the civilian's system (Neill & Salas, 2017; Kaneberg, 2017). Due to the uncertain and critical operational requirements factors, the human resource management system used by the military also needs to be integrated into the tactical and operational systems to enable quick deployment of personnel (Evans & Steeger, 2018). Besides, human resource assets in the military also need to be constantly trained to ensure they have the skills and knowledge to suit every assignments and task. As such, there are also training systems used by the military in training centres using various types of computer-aided system and equipment (Khizhnaya, Kutepov, Gladkova, Gladkov, & Dvornikova, 2016).

2.13 Technology Adoption in Military Setting

The use of technology by the armed forces or military setting depends largely on the policy of a government where it is determined by a country's national and defence policy

(Glas, 2018). Developing countries with a defence industry have a defence export strategy where it clearly states the conditions for the sale and export of weapons and military equipment to foreign countries (Malik, 2017; Hartley & Belin, 2020).

The process of acquiring new technologies and equipment by the military is similar to the procurement by other agencies in the government. Typically, it also involves offset programs that include training and transfers technology from the vendor. However, the procurement of technology, systems and equipment for military usage is usually administered through government to government, as it needs to comply with import controls and arms trade treaty (Zeimpekis, Kaimakamis, & Daras, 2015; Howard, Wu, Daldwell, Jia, & Konig, 2016).

In terms of specification, the technology used by the military is often more advanced than what is being used by public and commercial organisations (Drifte, 2019). The reason behind this practice is that the use of such technology is advantageous compared to the adversary. It is particularly important for systems and technologies that are critical to operations, and the usage is often kept secret from the public eye (Monte, 2018). However, for some non-critical systems, COTS (commercial off-the-shelf) products are also used by military organisations which often involve with much lower management and administration (Tozan & Karatas, 2019).

The military operating environment requires more robust equipment and technology with more resistant to extreme weather, humidity, and temperature. In addition, the equipment and technology used by the military organisation have a higher standard of security due to the sensitivity of its information (Carayannis, Campbell, & Efthymiopoulos, 2018; Daras, 2019). The use of technology in the military setting is of

paramount importance in term of logical security or physical security. Network usage, for example, primarily involves the use of tactical and operational systems always used dedicated networks which separate from the public network. At the same time, the military network uses higher encryption technology and security protocols than other public organisations (Agrawal & Gupta, 2019; Caravelli & Jones, 2019)

As for real-time applications, technology usage in a military setting is limited to its personnel and may not involve contractors, especially when operating in the field. Therefore, users in the military setting will be trained to be less dependent on contractors or vendors (Johnson, Moroney, Cliff, Markel, Smallman, & Spirtas, 2010; Curran, 2017). Thus, the use of any technology in military settings required full involvement and commitment from the military personnel.

Like civilian organisations, military organisations also have a specific system to manage their human resources. However, the human resource system in the military is more critical because they have different expertise which will determine the types of task and unit that they can be deployed. The system also manages the careers of all personnel, starting with their entry into the armed forces until retirement (Goldenberg, Soeters, & Dean, 2017).

2.14 Human Resource Management Information System (HRMIS)

In general, a human resource management information system (HRMIS) is involved with all activities related to previous, current, and potential employees of the organisation. Over the last decade, the sophistication of the human resource management role has increased significantly, largely due to the need to adhere to new laws and regulations (Laudon & Laudon, 2018). As an improvement on traditional job functions and tasks, HRMIS is

increasingly being used to supervise and manage various levels and types of employees within the organisation. HRMIS plays a vital and critical role in ensuring organisational success because human resource functions are relevant and affect all functional and operational aspects of the organisation (Valacich & Schneider, 2017). The use of HRMIS involves the management of human resources through recruiting, placement, training, assessment, assignment, and from entering the organisation upon to their retirement. Effective use of HRMIS ensures optimal use of the workforce which will save emolument costs in the long run. Highly managed quality workforce enables them to be recruited and retained to help organisations achieve their vision and mission. Their competencies will also be constantly enhanced by systematically managing their careers along with clear career pathways using HRMIS (Kavanagh & Johnson, 2018).

Most human resource management systems are made up of several subsystem components. In addition, the system also has subsystems that manage and plan their career journeys, especially involving placement and assignment. Many large organisations have adopted a system of human management systems that have a variety of functions and interfaces in which each function is directly related to other functions in the system (Malaysian Public Service Department, 2011). The development of a human resource management system starts with the following steps:

- Human Resource Planning. The first step in human resource planning is to establish a clear strategy for acquiring a new workforce. In the HRMIS subsystem, it needs to have the number and type of employees that the organisation needs. It needs to specify the number of employees to be hired, whether permanent, contractual and as external workers. At the same time, the

planning function of the existing workforce is also important in the HRMIS subsystem. (Chakraborty & Biswas, 2019).

- Personnel Selection and Recruiting. After developing a hiring strategy, the next step in an HRMIS system is how to get employees. The convenience of technology has made it possible for most employees to apply online for jobs in an organisation. All the details will be attached to the system and will be analysed by the system administrator. Those who meet the criteria will be shortlisted for an interview (Mayfield, Mayfield, & Wheeler, 2018).

- Training and Skills Inventory. After new employees are selected, they need to be trained on the training and requirements for their new positions in the organisation. They need to be assessed the level of competency before training is given to determine the level of training they need. At the same time, administrative matters relating to placement, salaries, tasks, and work culture will be explained and oriented as they enter the organisation. It is imperative for all organisations today to test and ensure that most of their new employees have basic ICT skills and knowledge (Khan, Hussainy, Khan, & Khan, 2017). Furthermore, job benchmarks can be created in the organisation for assistant managers, general managers, and district managers positions. Candidates and current employees were evaluated against the benchmark. Current employee development programs are defined based on gaps identified in the benchmark process (Nagendra & Deshpande, 2014).

- Scheduling and Job Placement. In HRMIS, each employee's schedule is presented by showing their weekly and monthly schedules. The system will also

determine which employee is most appropriate for an assignment by reference to the frequency and output expected for a task. In the context of occupations that are critical and require specialised skills such as the aviation industry, the military, and many other fields, sophisticated scheduling programs are often used to get people with the right level of skills to complete such assignments (Kavanagh & Johnson, 2018). It is challenging to schedule this many people to ensure 24-hour coverage. Especially when someone called in sick, needed time off, or asked for overtime, scheduling becomes difficult. The system enforces company scheduling rules and ensures that there are always enough employees. All this occurs without any input from the supervisor (Espinosa, 2011).

- Salary Administration. Another function of the HRMIS subsystem is related to salaries and remuneration of employees. These functions include salary scales, allowances, bonuses, and other financial related matters such as savings plans, insurance, medical benefits, and retirement accounts. Many organisations facilitate this function to their human resource system as a self-service feature. It allows workers to manage their timetables, makes changes to their personal information, adjusts their selection of different employer benefit programs, and demand reports or a paycheck printout (Susanto, Leu, Chen, & Mohiddin, 2019).

- Outplacement. Challenges in the job cause most workers to quit their jobs. They may have various reasons for doing so, and this could affect the organisation if not curtailed. One of the functions that HRMIS should have is how to manage employees who may be distressed and unhappy with their work. Corrective measures such as counselling and motivation programs and

drastic options such as laid-off and retirement are also included in the outplacement subsystem (Klein & Kahn, 2017).

In the Malaysian context, the HRMIS project is a government initiative to ensure that human resource management is always qualified, educated, and motivated (Malaysian Public Sector Department, 2011). HRMIS implementation initiated in the Civil Service Department in 1999, and since that, all government agencies in Malaysia have used it. It is a management system that uses a new approach where it is more integrated and comprehensive to address the more complex human resource management challenges.

One of HRMIS's popular features is that it is process-driven, provides self-service, and web-based features that can be accessed anywhere if an Internet connection is accessible to a customer. This application helps all public sector employees to update their records and to register for the various benefits of the available facilities, such as requests for leave, travel claims and training courses. HRMIS human resource data stored in a centralised database will facilitate human resource analysis and strategic planning by top management. In addition, data sharing also enables HRMIS to be used jointly by all government agencies personnel, such as the use of e-GL at the government hospital. As with most information systems development, the development of HRMIS has begun with feasibility studies to identify the best approaches and support needs to implement it (Malaysian Public Service Department, 2011). Malaysian Public Service Department as a lead agency in HRMIS development has considered the followings before the implementation:

- Optimal Use of Current Infrastructure Technology. The development of HRMIS will utilise existing infrastructure and technologies as well as being designed in a

comprehensive form of standards and functionality so that they can be easily used by various agencies in the public service (Haron, Harun, Sahibuddin, & Zakaria, 2011). Using existing networks will also reduce system procurement costs and minimise compatibility issues (Nagendra & Deshpande, 2014).

- Continuous Monitoring of Human Resource Management Policies. The use of standard systems will facilitate the sharing and monitoring of government agencies as well as more manageable and more organised data integration. Sharing will make it easier for decision-makers from different agencies to make quick and accurate decisions while reducing the amount of bureaucracy that often occurs with the use of manual processes (Shahibi, Saidin, & Izhar, 2016).

- Intra and Inter-agency Information Sharing. The use of the same system, HRMIS, enables rapid sharing of information between agencies and reduces processing time. Moreover, human resource management at different levels will be facilitated by the use of HRMIS through information sharing (Kamal, Singh, & Ahmad, 2012). An example is the interagency transfer of staff, which includes both the selection and wage control. Sharing information through the system will help to avoid repeating new information recording, resulting in more efficient human resource management. The HRMIS allows federal agencies and other organisations to share information on human resource management via online. Its use also accelerates the process of information analysis and ensures consistent planning, strategy and operations work distribution among civil servants.

- Performance of Civil Servants. The use of HRMIS ensures that public sector performance is monitored by key performance indicators (KPIs) and annual work

targets as agreed by their respective department heads. Monitoring activities are simple, and the evaluation process is very comprehensive for any future analysis (Susanto et al., 2019).

2.15 Research on HRMIS

There are some studies on the HRMIS usage in the Malaysian public sector. A study by Maryati and Kamisah (2015) found that the use of HRMIS, especially in knowledge management and job monitoring, was beneficial to users. In their report, Hadziroh and Yusliza (2015) noted three factors that will ascertain the progress of the implementation of HRMIS, namely user attitude, readiness for change and preparedness for technology. In the same vein, Mazlan, Ahmad, and Raman (2016) found that a key factor in system use and net benefits was user engagement and self-preparedness.

Ahmad, Mohd, and Raja (2017) have studied the implementation of HRMIS in Malaysia, focusing on the aspects of the application, a user characteristic, organisational support, and user's satisfaction. They stated that HRMIS was able to speed up the work process from the viewpoint of the application and minimise bureaucracy. Most users already agree that this programme is ergonomic, and they have assessed that its usage is easy to moderate. However, by conducting continuous training and service support, organisational support needs to be strengthened (Husin, Loghmani, & Abidin, 2017; Soong, Ahmed, & Tan, 2020).

The comparable study performed by Mohd, Azlinda, and Tengku (2016) with employees of the Human Resource Department, Kuala Lumpur City Hall, Malaysia, shows that users are happy with the use of HRMIS, especially in terms of information

quality. This study, however, also showed that the degree of usage was still unsatisfactory, with the system never used by 29 per cent of respondents.

At the international level, studies on the factors that influence the implementation of e-HRM in a government agency in Bangladesh have found that the internal environment is the most influential factor (Rahman, Mordi, & Nwagbara, 2018). It is explained by the relationship of the internal environment with the activities and processes of e-HRM implementation and the pressure within the organisation itself.

The use of e-HRM by commercial banks in Pakistan unearthed service quality of e-HRM had a significant impact on labour productivity (Iqbal, Ahmad, Allen, & Raziq, 2018). Service quality of the e-HRM enables employees at all levels in the organisation to perform their tasks and activities in better results.

A case study conducted by McDonald, Fisher, and Connelly (2017) who used the ISSM framework in studying the implementation of e-HRM in a North American company discovered that data quality plays a significant role in technology adoption in organisations. The reason is that it directly affects the quality of reporting and decision-making. Furthermore, system quality factor also plays a substantial role in the success of technology adoption as they involve user's interaction when they use the technology.

Based on the literature review, technology adoption has been widely studied regarding individual and organisational perspectives. In the Malaysian context, although there are some studies on technology adoption, however in the context of defence and military organisations, there is still a significant gap due to lack of technology adoption studies in

these organisations. Therefore, this study purposes of filling up this gap by examining the relevant factors influencing HRMIS usage and its impact on MAF personnel.

2.16 MAF HRMIS

The MAF HRMIS is a comprehensive human resource management system starting from commissioning and recruitment until the retirement of all personnel of the MAF. The HRMIS used by MAF is the same version as used by the Public Service Department (PSD). The implementation of HRMIS utilises existing infrastructure facilities in MAF. Among the infrastructure used is a previously leased network with Telekom Malaysia Berhad (TM), whereas the computers used in the unit are computers that have been distributed for office automation. The user interfaces for the system, displayed in Figure 2.10 and Figure 2.11.

In terms of databases and information sharing between government agencies, HRMIS needs to be integrated with government information systems under the Ministry of Defence such as Information Management and Governance - IMG, Network Centric Operation - NCO, Veterans Integrated Benefit System - VIBES, Military Lifetime Health Record - MLHR, Salary Management System - SMG, and HRMIS under PSD (Internal Audit and General Investigation Division, 2017).

Figure 2.10: MAF HRMIS - Windows Web Interface

Figure 2.11: MAF HRMIS - Android Web Interface

The HRMIS serves as human resource planning, training, benefits and remuneration, management and career development, salary management, competency assessment, and

personal records management (Malaysian Public Service Department, 2011). The system is deployed in almost all MAF units in the Peninsula, Sabah, and Sarawak. It utilised a network called MinDefNet, which is a network leased from Telekom Malaysia and is logically separated from other networks. There are only a few locations that do not have access to this system because it is not economical to physically install the network. However, such units may use the Data Updating Centre (DUC) facility located near their units to use the HRMIS.

The MAF also introduced HRMIS on the Internet (HOI) that is accessible everywhere as long as it has access to the Internet. Still, it has only a few features due to functional and security factors. Among the modules accessible through HOI are leave and approval applications, personal records, annual work targets and electronic guarantee letters.

Unit-level users consist of both regular users and those with authority. As normal users, they have access to many of the features and modules available in HRMIS. For administrator-level users, they have access to all the HRMIS features as well as the most important functions which are to approve online applications by ordinary users.

Indeed, HRMIS has various functions and interfaces designed to allow users to use this system easily. However, there are multiple factors that influence MAF personnel to use HRMIS, and it needs to be studied and understood in depth with reference to previous studies.

2.17 Factors Influencing HRMIS Usage

The study conducted some preliminary investigation using focus groups and expert interviews (described in Chapter 3) to identify the HRMIS adoption factors in MAF setting. The identified influential factors of HRMIS usage in the MAF are explained in detail as below.

2.17.1 Information Quality

The information quality is described as the accuracy, clarity, completeness, usefulness, comprehensibility, and reliability of information system data outputs (Chen & Chang, 2018). Data and information are undoubtedly a very critical asset in any organisation. High-quality information in a competitive environment cannot be achieved without it being converted into useful and attractive products. Thus, it is important for the company or product provider in satisfying their customers (Kim, Lee, Shin, & Yang, 2017). In the context of business, it can be achieved if the company has both the experience and quality products of information.

The production of quality information involves information development, and it is an ongoing process. Studies by Walle & Brugghemans (2016) found that information production can be viewed as a raw data processing system to manufacture information products. To increase productivity, they urge the organisation to systematically manage the information as it manages other products.

In any organisation, the correlation between information quality status and decision-making process is considered complex issues and therefore, it becomes the focus of

extensive discussion and research (Kim et al., 2017). It creates a situation where the reliability of information-generating data tools become the key determinants of an organisation's decision-making (Demoulin & Coussement, 2018). It means that data and information are critical resource and asset in most of today's organisation (Gritzalis, Theocharidou, & Stergiopoulos, 2019).

Seppanen and Virrantaus (2015) recognise that doing the right thing is not the main issue in an organisation but having the correct information is a more important fact. Inaccurate information can lead to incorrect decisions and can have a negative impact on those involved. Moreover, at the organisational level, it gives a bad image to the reputation of the organisation (Ye, Fu, & Law, 2016). In most cases, poor quality information can affect the operations and reputation of the organisation that owns it. On the other hand, the precise information gathered by the business process can enhance significant value to the performance of the organisation as well as a contributing factor of competitive advantage (Lohrke, Frownfelter-Lohrke, & Ketchen, 2016).

Many previous studies have revealed that providing quality information can have an impact on the decision-making process. It is because high-quality information allows decision-makers to make more efficient and effective decisions (Janssen, Voort, & Wahyudi, 2016).

The use of the right technology allows information to be processed by the information system then the information can be used immediately. This situation is materialised with the development of big data technologies and data warehouses that are accessible through ubiquitous networks (Merino, Caballero, Rivas, Serrano, & Piattini, 2016).

2.17.2 System Quality

System quality in an information system refers to the understanding of the level of technical interaction by the user (Al-Hubaishi, Ahmad, & Hussain, 2017). It applies explicitly to the assessment of the information processing system and reflects on the outcomes of the user-specific interaction with the information system. The key dimensions of system quality are reliability, flexibility, accessibility, and timeless.

Good system quality will ensure the users to rely on the system which used to produce or exchange the information they needed (Wang, Xu, & Chan, 2015). System quality is a vital factor when it comes to mobile payments, security, and privacy components (Chen & Tsai, 2017). Therefore, system quality characteristics such as reliability, availability and privacy are fundamental needs to be given special attention by service providers and system developers (Akter et al., 2017). To ensure that the national quality system is maintained, the regulatory body must set quality standards and regulations for all government agencies and network service providers (Chen & Tsai, 2017).

System quality research measures the technical and functional aspects of the system that help users navigate the web easily or perform online transactions effectively, and can ensure user satisfaction (Hung-Joubert, 2017). In the context of an information system, system quality represents the overall performance of a website system provided to users (Hsu, Chang, & Hsieh, 2015).

With well-designed websites, most businesses can increase efficiency, reduce costs, and increase revenue. On the other hand, poorly designed systems may not be able to operate efficiently, which will result in loss of income, increased operating costs, and

long-term losses (Gorla, Somers, and Wong, 2010; Piercy, 2018). In most situations and as a rule of thumb, the quality of the system primarily reflects the level of access speed, ease of use, visual attractiveness, and navigation (Grange & Barki, 2020).

2.17.3 Service Quality

Service quality refers to an individual's evaluation of the quality of online service delivered via the website, including reliability, responsiveness, assurance, and personalisation (Chen & Tsai, 2017; Grange & Barki, 2020). In recent years, many studies have focused on customer satisfaction and quality of service in the hospitality, medical, education and e-government service. Some significant contributions have been made in scientific studies on various mechanisms for increasing customer satisfaction (Almarashdeh, 2017; Malik, Suresh, & Sharma, 2017). Namahoot and Laohavichien (2018) initially identified service quality as a focused assessment that reflected customers' perceptions of service-specific dimensions namely courtesy, competency, reliability, credibility, security, responsiveness, assurance, tangibles and understanding.

Montesdioca and Macada (2019) stated that the primary purpose of a service instrument is to provide tools to assess customer perceptions of service quality in service and retail organisations. They added to the quality of an IS assessed by interpreting the value of the difference between the perceptions and expectations of a user or customer. Customer perception is a subjective assessment of true customer service experience. This instrument is based on the principle that the quality of services received differs from the expectations of the customers and the actual services they receive (Biswas & Roy, 2017).

In the context of technology adoption, service quality describes the support delivered by the online service provider to users and customers (Chi, 2018). Almoqren and Altayar (2016) postulated that the basis for service quality is service dependent on the reliability of the system. The reliability of a system is an essential feature that reflects the service quality it possesses. This feature is important in the digital world as it increases the level of trustworthiness of customers to an organisation or service provider and further enhances their credibility (Barua, Aimin, & Hongyi, 2018). For example, the good service quality provided by the e-learning system depends on its ability to meet the needs of teachers and students who use the system. At the same time, good service quality will also encourage users to continue using the system in the future and thus succeed in implementing the technology (Oni, Adewoye, & Eweoya, 2016).

2.17.4 Security

Network security starts with authorisation, usually with necessary features such as username and password. Network security consists of protocols and policies enforced by the network administrator at an organisational level to prevent and monitor unauthorised access, alteration to equipment, misuse or denial of computing networks and network-accessible properties. Network security involves approving access to data in an administrator-controlled network. Issues involving network security are becoming more prominent with the spread of technology that has seen the personal use of computers and mobile devices, both individually and by organisations increasing (Pawar & Anuradha, 2015).

Information and data security breach is a major concern for most organisations that use information technology in their organisations. The damage is far beyond the stolen company data, redemption costs or regulatory penalties enacted by the authorities. There

are also intrinsic costs such as loss of trust, damage to reputation, loss of IP address (Internet Protocol), or termination of operations for audits affect users and shareholders and may have an unexpected impact in the future (James, 2018).

Rapid technological advancements have opened the way to network intrusion as there are many protocols that are not yet matured and yet fully tested but are already in the market. Most have vulnerabilities and flaws that are easy to exploit by hackers as examples of 5G technology security issues are being debated at the moment (Tuna, Kogia, Gungor, Gezer, Taskin, & Ayday, 2017; Liyanage, Ahmad, Abro, Gurtov, & Ylianttila, 2018). What is worrying is that financial factors motivate today's network, and many of them are willing to obtain valuable data and information when offered with a high payment. Technological advances have also created various tools and techniques to invade the network without leaving a trace (Relia, 2016).

Thus, it is vital to ensure that end-user and organisations information is secured at all costs. As such, organisations and service providers need to provide security measures that include physical and logical security as well as awareness among employees through cybersecurity and information security campaigns organised by internal and external organisations (Furnell & Vasileiou, 2017). Adequate security measures for online systems will prompt users to use a system without fear of leaking their sensitive information (Vacca, 2017).

2.17.5 Computer Self-efficacy

The widespread use of technology means that individuals need the skills and knowledge of all such technologies as it will be able to assist them in using the

technology. Otherwise, individuals who directly use new systems and technologies within an organisation will face the challenge of using applications introduced by their organisation (Achim & Kassim, 2015). Particularly, this challenge leads to the need for every person to be aware of their ability to use any application and system introduced to them. This type of awareness is referred to as self-efficacy.

The issue of computer self-efficacy has been discussed extensively by Compeau (1995). In his study on the learning environment, the results show that the effectiveness of self-efficacy provides the insight why a person uses a computer where it is above concepts of outcome expectations, anxiety, and affect.

From a practical standpoint, previous studies have found that computer experience is more effective in determining and influencing computer self-efficacy (CSE) trust. It is important to know what kind of computer experience stronger impact on CSE as improvements can be made through courses, training, and educational programs (Hasan, 2003). Throughout their research, Chen, and Tsai (2017) found that the computer effectiveness of the students contributes to their dedication to learning and, throughout the effect, to their learning efficiency.

In most voluntary environments, employee's technical self-efficacy plays a vital role in adopting technology (Tsai, Hung, Yu, Chen, & Yen, 2019). Many studies have been performed in the field of IS where computer self-efficacy is the key antecedents that significantly influence technology adoption. In a study of mobile hotel booking applications, findings found that users with computer self-efficacy have a greater tendency to adopt new technologies introduced to them (Ozturk, Bilgihan, Nusair, & Okumus, 2016). The study also discovered that computer self-efficacy has a significant

association with the user's attitude in adopting new technology as a study of the user ERP system in India by Rajan and Baral (2015).

2.17.6 Commander Support

Top management in a hierarchical organisation is a person or group of people who direct and control a top-level organisation (Almeida, Lourinho, Silva, & Pereira, 2018). Kumar, Chandra, Bharati, and Manava (2016) clarify in the sense of technology adoption that top management implies to the degree to which top managers provide assistance and instructions in the form of providing human resources, the provision of software and hardware, and allocating fund. For organisations, top management support for ICTs is strategic involvement as it facilitates technology creation, transition, and usage. It improves the acquisition of organisational knowledge, encourages the exchange of knowledge, and helps to solve problems (Grover & Froese, 2016). Top management support in organisations that promotes access to knowledge and information through the storage, recovery, transfer, processing, and use of personnel within the organisation. Such an approach will provide a solid foundation for developing a network of accessible information within the organisation and will assist in the faster and more accurate decision-making process (Li, Li, Li, Xu, & Guo, 2019). This support implies how top management promotes the processes of knowledge management in any organisation (Tretiakov, Whiddett, & Hunter, 2017).

From a detailed and specific perspective, several studies have been conducted focusing on how active commitment in upper management becomes a strategic factor in technology adoption. This commitment normally translates through innovation, learning,

or the development of new products that promote knowledge management success (Lee, Shiue, & Chen, 2016; Hamdoun, Jabbour, & Othman, 2018).

It is a fact that top management commitment is not a silver bullet that determines the success of technology adoption in an organisation. Many other factors have a direct and indirect effect on the successful implementation of knowledge management (Dhaenens, Marler, Vardaman, & Chrisman, 2017). Also, there is evidence and truth that are lacking management support is one of the causes of system information failures (Gaviria-Marin, Merigo, & Baier-Fuentes, 2018).

Top management support is essential when they provide support through financial approval and justification for new technology as well as their involvement in ensuring that the technology is learned by their personnel (Torres-Ruiz & Moreno-Ibarra, 2019). Top management support for ICT enables organisations to process all kinds of information by enabling access, transmitting, and applying the knowledge to create a conducive environment for new technology acceptance and adoption (Singh & Gaur, 2018). In addition, the adoption of technology supportive culture by personnel within the organisation will have a positive attitude by understanding the organisation's objective to implement innovation and use technology in its operations (Alhaqbani, Savage, & Ries, 2016), it is because they have reached a level of awareness and understanding after being trained in training management by top management (Dahlgaard, Reyes, Chen, & Dahlgaard-Park, 2019).

In the context of this study, top management support is referred to as commander support. As with any military organisation that exercises command hierarchy, the implementation of policies and procurement of any technology is subject to the approval

of the highest MAF commander. Detailed implementation is carried out by the ICT department of their respective services headquarters. For example, Defence Communications and Electronics Division (DCED) is responsible for approving and monitoring all IS in the MAF. Meanwhile, the services headquarters plan IS procurement according to their operating and management needs. Malaysian Chief Defence Force in its grand command speech on 15 January 2020 emphasised the need for MAF to have strong connectivity as well as enhance cyber domain capabilities by focusing on systems of systems, industrial Internet of Things, big data handling, and cloud technologies (Malaysian Armed Forces, 2020). Under this direction, the commander at the bottom will provide support by ensuring that all IS under their management achieve their procurement objectives.

At the unit level, MAF personnel know their commander support to the use of HRMIS based on the daily orders. In addition, they are also constantly reminded to always update the data in HRMIS through instructions given verbally whether during parades, meetings, and circulars. From the actions of the commander or the commanding officer (CO), the MAF personnel can understand their commander support for the use of HRMIS.

2.17.7 Technical Training

When an organisation introduces a new system or technology, one of the most important aspects is the training aspect for users within the organisation (Alt, 2018). Although the introduction of new technology is often not very different from the previous technology, there are situations where some technologies replace manual work procedures previously used. It requires a systematic training program to ensure that the transition from work to new is smooth and that the familiarisation period is as short as possible (Fies,

2018). Technical training involving new technology acquisitions in most organisations is embedded in procurement contracts and is often coupled with offset programs that include the transfer of technology requirements, as well as research and development (R&D) (Martin, 2014; Jones, 2018).

Ongoing interactions might improve their knowledge and skills acquired via periodic training programs and activities. In general, technical training is essential because it can catalyse the development of innovative businesses, products, and services while providing enhanced productivity and a competitive advantage for companies in many sectors, including the government (Barrette, 2015; Liu, Ruiz-Menjivar, Zhang, Zhang, & Swisher, 2019).

The organisation needs to ensure that all staff are proficient in system usage. No matter how experienced the staff are, there will be a specific feature in the systems that they will need to be trained. Inadequate training on a new system can lead to implementation failure (Zhu & Kindarto, 2016). Similarly, lack of technical training was a major barrier to the acceptance and implementation of information systems (Luhoway, Ryan, Istl, Davidson, Christakis, Butter, & Mele, 2019).

2.17.8 ICT Infrastructure

In a highly competitive new economy, those who are quick to adapt to technology will be more successful than the others. In order to achieve a high level of competitiveness, their operations need to be flexible and agile enough to follow current technology. This situation should be achieved by ensuring that their organisational strategies and business processes can implement technology through the proper system and infrastructure preparation

(Valacich & Scneider, 2017). It beyond refutes that the most discerning factor to technology adoption requires the presence of proper infrastructure. This is due to the role of infrastructure as a determinant of technology capabilities which influences the development, acceptance, and diffusion of technology (Lee, Nam, Lee, & Son, 2015).

Valacich and Scneider (2017) have divided ICT infrastructure into four main components which are comprised of hardware, software, storage, and networking. It is a clear fact that technology infrastructure is fundamental to all computer-based information systems (Stair & Reynolds, 2016).

One of the most frequently discussed issues of infrastructure is how the role of strategic management proposes solutions to the provision of appropriate infrastructure (Zardini, Rossignoli, & Ricciardi, 2015). Many studies have been conducted on the significance of providing infrastructure to support the adoption of technologies such as those involving e-government applications that are now widely used globally (Dahiya & Mathew, 2016). Findings from most studies indicate that infrastructure plays a vital role in the successful implementation of technology adoption (Feder, Savastano, 2017).

Based on the literature review, many factors influence technology adoption. The factors discussed previously are among the factors associated with the scope of this study. These factors will be further discussed in detail in focus group discussions (FGDs) and expert interviews.

2.18 Summary

This chapter gives a general overview of how technology adoption is used extensively to assess individual and organisational performance. The content analysis has been carried out in previous studies. The results of the systematic literature reviews and content analysis outlined the frameworks and many other facets of technology adoption. Information about HRMIS, previous studies on HRMIS in Malaysia context and HRMIS in the MAF were also discussed. Next, discussion regarding the framework and theories related to technology adoption in the perspective of individuals and organisations was explained. The systematic literature review and content analysis provide clear information regarding various factors influencing technology adoption.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter aims to present the research framework and develop the hypotheses to answer the research questions. Also discussed and elaborated is the epistemological and ontological orientation for the study. In addition, the research approach and methodology selection for the study's will be discussed in detail. In a preliminary investigation, the FGDs and interviews steps are discussed, followed by an explanation. Then the explanation of population of interest, the unit of analysis, the frame of sampling, and method of sampling used in the study. Next explanation is about questionnaire design, operational definition, variables measurement, and questionnaire validity assessment. Next, the research data analysis methodology used in quantitative method was addressed, as well as information on the techniques of data analysis used throughout the study.

3.2 Research Framework

A research framework is a foundation for every deductive research, and it will be a basis for the hypothesis's development (Sekaran & Bougie, 2016). It is a view of the researchers who believe that in an event or phenomenon, some factors or variables cause it to happen, and it always has a relationship (Cooper & Schindler, 2013).

In the early stages of this study, the focus group discussions (FGDs) and expert interviews with HRMIS personnel have been conducted. The results of the FGDs and expert interviews were compared with literature to identify a suitable framework for this study. An integrated framework with the DeLone and McLean information system success model (ISSM) as

a base was developed. The framework consists of independent variables such as information quality, system quality, service quality, ICT infrastructure, security, technical training, commander support, and computer self-efficacy with use as a mediator and individual benefits as a dependent variable. The hypotheses were developed based on the research framework. Later it will be tested to validate the findings obtained from FGDs and expert interviews.

In FGDs and expert interviews, most of the participants highlighted the various issues (positive and negative) regarding the performance of the HRMIS as the determinant factor that influenced them in using the system. These facts supported by many works of literature explaining that a reliable and quality system will encourage users to fully utilise the system (Davis, 1993; Legris & Ingham, 2003; Cohen, Coleman, & Kangethe, 2016; Veeramootoo et al., 2018).

In addition, Zheng, Wang, Doll, Deng, & Williams (2018) state that organisational support and computer self-efficacy are also the factors that are the driving force behind the use of a system. It is in line with the findings of the FGDs and interviews. In an organisational context, top management plays a significant role in promoting the use of systems in the organisation (Bradford & Florin, 2003; Giotopoulos, Kontolaimou, Korra, & Tsakanikas, 2017; Zhang, Wei, & Zhou, 2018).

Training to end-users is an essential contributor to the productive use of the system in an organisation as it increases their confidence in using it (Compeau & Higgins, 1995; Limbu, Jayachandran, & Babin, 2014; Mirzajani, Rosnaini, Ayub, & Wong, 2016). In addition, infrastructure factor plays an essential role as it provides sharable platforms and technologies to the system used (Ahmadi et al., 2016). Security factors become crucial

when a system uses networking platform and involves access to classified data (Salisbury, Pearson, Pearson, & Miller, 2001; Lu, Yu, Liu, & Wei, 2017; Ahmadi et al., 2016). Based on FGDs and interviews, and after reviewing the literature, the DeLone and McLean ISSM, along with other factors, are used to construct an integrated research framework for this study.

Although this study uses DeLone and McLean (2003) as a basic framework, it does not use two dimensions, namely intention to use, and user satisfaction. Its justification is to embrace the views of Gable, Sedera, and Chan (2003) who argue that user satisfaction is not a distinct alternative to use dimension. They also argue that the use of user satisfaction is more appropriate to be applied in studying the impact in a financial-based organisation rather than on organisational change and business process improvement. A similar argument was made by Hildreth (2001) who postulates that user satisfaction provides a false measure when used in studying the benefits that can be gained using IS especially in an environment that involves information retrieval (IR) such as HRMIS. Therefore, this study decided to remove user satisfaction as in the original framework of DeLone and Mclean (2003). This study also does not employ intention to use as in the original model of DeLone and McLean (2003) by adhering to the argument of Urbach and Mueller (2011) that *intention to use* is an alternative to *use* dimension in the event of difficulty in using use dimension. Therefore, the finalised framework for this study is shown in Figure 3.1.

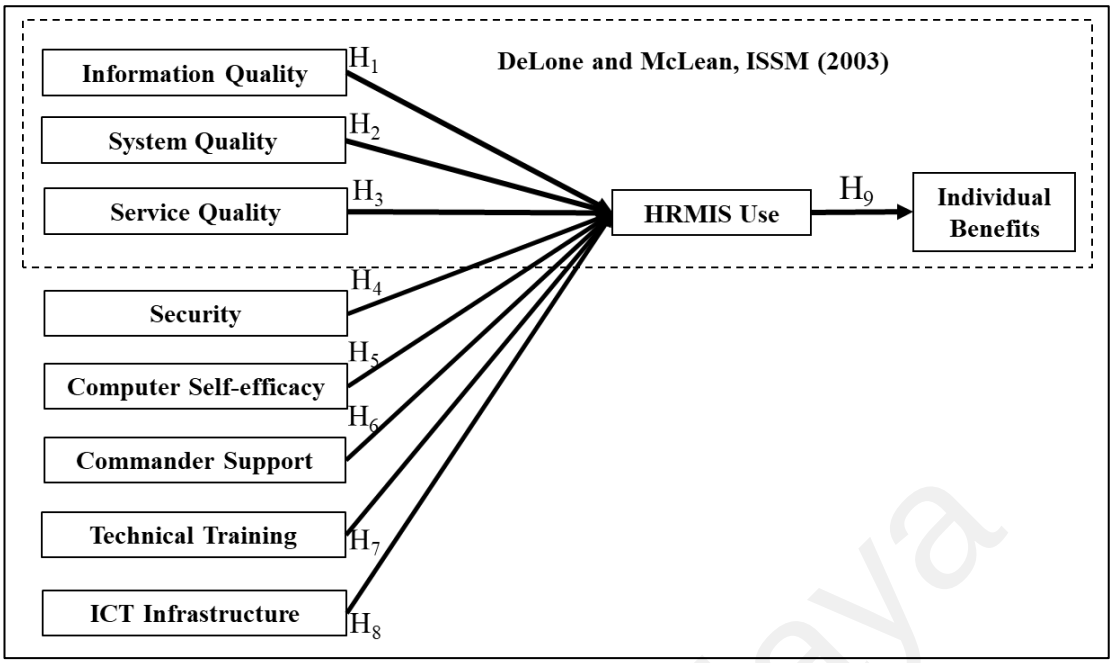

Figure 3.1: Research Framework

3.3 Hypotheses Development

The quality of the information in this research framework refers to the desirable features of the system outputs, such as management web reports and web interfaces. The features of information quality include relevance, completeness, comprehensibility, accurateness, currency, conciseness, timeliness, and usability (DeLone and McLean, 2003; Petter, DeLone, & McLean, 2008). Most of the researchers tend to focus on measuring the quality of the information in a system by evaluating and quantifying the quality of the system performance (DeLone & McLean, 1992).

Santa, MacDonald, and Ferrer (2019) suggest that information quality is a critical aspect of measuring end-user satisfaction, which also impacts system use. The quality of information will shape positive attitudes towards the use of a specific technology (Tam & Oliviera, 2016). On the other hand, poor information quality will deliver low system

value and usefulness and will reduce the motivation to take advantage of the technology (Hajer & Hustad, 2015).

In the context of MAF, the information quality needs to reach the level of user expectations as it is developed with the aim of facilitating less efficient and time-consuming manual processes. The quality of the information presented in HRMIS will encourage the user to continue using the system and thus benefit the performance and quality of the work. While at the management level, quality information from HRMIS enables them to make correct decisions, especially for MAF's career management and human resource planning. In the MAF, the quality of information of the HRMIS is expected to be significantly related to its usage. Hence, by considering the importance of information quality to HRMIS usage, this study formulates the following hypothesis:

H1: There is a relationship between information quality and the use of HRMIS.

System quality is defined as the required features of an information system. The example of system quality features is the ease of use, system flexibility, system reliability, and ease of learning, as well as intuitiveness, sophistication, and response times (DeLone and McLean, 2003; Petter & Fruhling, 2011). Improving the quality of a system has a significant impact on user satisfaction and system usage, which in turn has a positive impact on productivity (Isaac, Abdullah, Ramayah, & Mutahar, 2017).

In a study conducted at a public hospital in Iran on the hospital information system (HIS), Markazi-Moghaddam, Kazemi & Alimoradnori (2019) found that system quality is a vital aspect of consumer satisfaction and encouraging the use of the system. Similarly, the study by Nwankpa (2015) concluded that system quality influenced ERP system usage

through the user's perception regarding the usefulness and satisfaction after using the ERP system. These findings are supported by a study conducted by Seol, Lee, Yu, and Zo (2016) who stated that the use of corporate social network service (SNS) depends on system quality where a high level of system quality provides more interactive space and convenient usage through user-friendly functions, audio-visual support, and user customisation.

The high-quality aspects of HRMIS are essential to the users as they require a system that is easy to use and reliable when performing their daily tasks as well as involving their management. For example, the easy-to-use HRMIS feature gives the user an advantage over previous working approaches that use difficult and time-consuming file management methods. The quality of the HRMIS system also enables them to learn in a short time and can be used on a variety of platforms, whether using computers or mobile devices. The interactive and responsive design of the interface and menus also help users to use HRMIS. In the MAF, the system quality of the HRMIS is also expected to have a relationship with the usage of the system. Thus, the following hypothesis regarding system quality is formulated:

H2: There is a relationship between system quality and the use of HRMIS.

The quality of service refers to the quality of support provided by the ICT department and its staff to the end-users. The characteristics of the quality come in the form of accuracy, technical skill, responsiveness, and dependability (DeLone and McLean, 2003; Petter and Fruhling, 2011). Service quality is another conceptual construct of quality, is recognised as not only a good indicator of IS success but also influences the satisfaction and continuance of usage (Boakye, 2015).

A study by Li and Shang (2020) showed that the standard of service has the greatest effect on the use of the system. In discussing the use of technology in the perspective of tourism, Ukpabi and Karjaluoto (2016) explain that service quality is important for predicting purchase intention and customer satisfaction. A study conducted by Liang and Nguyen (2017) on Internet banking users in Vietnam found that service quality is relevant to users when choosing banking services. An important conclusion from most studies is that service quality must be offered by fulfilling the needs of users to achieve high system usage.

Service quality is an essential feature for HRMIS users, primarily associated with the technical support given by the technical section of MAF. The support they need is when they are faced with technical problems that cannot be solved by their unit's technical staff. The quality of service available in HRMIS in the form of an online manual is also essential to the user when they are having problems with the setup and usage of HRMIS application. Therefore, the service quality that reaches the user's desired level in the MAF will encourage the user to continue using HRMIS. Based on this discussion, the following hypothesis is formulated:

H3: There is a relationship between service quality and the use of HRMIS.

Security describes the degree to which the technology is believed to be secure for the transmission of sensitive information (Ahmadi et al., 2016). Based on the reported incidents by ICT security firms, information security in the organisation is an issue that is constantly addressed by ICT security experts, and this factor is always directly linked to user behaviour (Vacca, 2017). Further, the users' trust in the security of e-Government applications and services seriously affects their usage (Warkentin, Sharma, Gefen, Rose,

& Paylou, 2018). The study on web site applications yielded a similar result where security influences system usage (Jayawardhena & Foley, 2000; Sikdar, Kumar, & Makkad, 2015).

Boonsiritomachai and Pitchayadejanant (2017), who conducted a study in Thailand, discovered that the security aspect of information was one of the issues that consumers often wondered about when it came to using online banking systems and mobile devices. This fact is supported by Alsmadi and Prybutok (2018), who explains that it is due to the user's concern that sensitive information they handle through the technology may be insecure and misused by unauthorised persons. As such, it is the responsibility of organisations and service providers to ensure that the technology used complies with three fundamental principles of information security, namely confidentiality, integrity, and availability (CIA). However, there is a need for balance between ease of use and the requirement to protect sensitive information so that it does not burden and hindrance user intention to use the particular technology (Janssen, Weerakkody, Ismagilova, Sivarajah, & Irani, 2020).

The use of HRMIS by MAF personnel requires every user to use a unique username and password. For data updating as well as any document application or approval, it will be verified by an authorised officer. The use of user authentication in HRMIS is important as it involves confidential data and information. Based on the FGDs and interviews results, a similar situation occurred in the MAF, where the HRMIS security factor is expected to have a significant relationship with system usage. The following hypothesis is formulated:

H4: There is a relationship between security and the use of HRMIS.

Computer self-efficacy is referred as the assessment of the technological ability of users to use the information system based on their previous skills, knowledge, and experience (Shareef, Kumar, Kumar, & Dwivedi, 2011). Computer self-efficacy has always been mentioned as one of the essential constructs in the study of technology adoption and IS (John, 2015; Omotayo & Haliru, 2019). Computer self-efficacy has been found to have an important effect on new technology's learning results (Zainab, Bhatti and Alshagawi, 2017). Earlier studies have shown that computer self-efficiency and attitude are closely related to the use of technology in computer-supported teacher learning (Yesilyurt, Ulas, & Akan, 2016; Lu et al., 2017). Hasan et al. (2017) in their study on Research Information Management System (RIMS) suggest that computer self-efficacy has a significant relationship on end-user usage and satisfaction. In addition, computer self-efficacy which classified as cognitive abilities was concluded as essential predictors of computer and technology adoption as shown by both descriptive and experimental studies (Zhang, Grenhart, McLaughlin, & Allaire, 2017; Chen & Allman-Farinelli, 2018; Reychav, Beeri, Balapour, Raban, Sabherval, & Azuri, 2019).

In the MAF environment, the use of technology is quite widespread, with most trained personnel using technological tools such as computers, radio communication equipment, radar, and so on. They realise that they need to have the appropriate technical skills and knowledge before they can handle the technical equipment as all use of the equipment has its standard operating procedures (SOP), and they must comply with it. This realisation requires them to be able to assess their computer knowledge level when using HRMIS. From FGDs and interviews with the MAF personnel, it was found that computer self-efficacy is expected to have a significant relationship with HRMIS usage. Hence, the following hypothesis is formulated:

H5: There is a relationship between computer self-efficacy and the use of HRMIS.

According to Lin (2014), top management support demonstrates how top managers aware of the role of the information system in their organisation and the degree to which they participate in any system operation. Prior studies have reported that encouragement from top management is a key factor in the implementation of any knowledge system (Ahmadi et al., 2016; Zhang et al., 2018). Therefore, the support of top management in an organization with respect to new technology becomes a catalyst for the willingness of employees to use the technology (Giotopoulos et al., 2017). In turn, the ongoing support of top management will develop a positive attitude of users, which enhances the use of existing information systems in their respective organizations (Wang & Song, 2017).

In the military organisation, the commander or commanding officer (CO) in a unit has legitimate authority to carry out his obligations or to coordinate, to command and to control forces under him (Malaysian Army Manual, 2009). Similarly, Triffterer and Ambos (2016) explain the term military commander applies to persons officially or legitimately assigned to perform military command roles. Each level of the armed forces has their respective commanders referred to as top management in military organisations. In the MAF, the smallest unit with a CO is the regiment, who has the power to enforce his instruction through the First Part Order. Normally, all instructions issued are follow-up instructions issued from the top formation. For HRMIS usage, the top management or commander plays an important role in delivering instructions to use HRMIS, including issuing HRMIS standard operating procedures (SOP). In the meantime, it is the CO's responsibility to ensure that all HRMIS operations in their units are functioning correctly. At the top level, the formation and service commander will monitor the use of HRMIS and direct the units under their command to send periodic usage reports to the respective

higher formation. Therefore, the role of commander support is crucial in ensuring HRMIS is used by MAF, and the following hypothesis is formulated:

H6: There is a relationship between commander support and the use of HRMIS.

Training means the transition of the requisite knowledge of IS concepts, technological skills, organisational skills, and particular IS products (Lee, 2008). In order to ensure success in the implementation of any information system in any organisation, technical training involving the process of providing users with sufficient system awareness is crucial. The need for technical training is critical for the adoption of new technologies that are radically different from those of previous technologies (Hage, 2018). The results from the previous studies suggest that there is an apparent influence of training on any information system usage (Amoako-Gyampah & Salam, 2004; Mirzajani et al., 2016). Similarly, previous studies with respect to technology adoption indicate that technical training has a very significant relationship and influence with the use of technology by end-users (Lee et al., 2008; Limbu et al., 2014). Conversely, the lack and poor of formal technical training have been a contributing factor to the failure of the digital library (DL) system, according to a study by Omotayo and Haliru (2019). Likewise, a study by Ekberg and Gao (2018) found that the lack of effective technical training is one of the challenges with the use of ICT in secondary schools in Sweden.

From FGDs and interviews conducted among MAF personnel found that those who had undergone technical training could use HRMIS effectively while those with less training needed guidance from others to use HRMIS. As the system developers develop, they are aware of the importance of technical training by conducting centralised training in almost all MAF formations. In addition, train the trainer approach is also provided by

the contractor to enhance the use of HRMIS in MAF units. In the MAF, the training provided to the HRMIS users might have some relationship with the use of HRMIS. Hence, this study formulated the following hypothesis:

H7: There is a relationship between technical training and the use of HRMIS.

ICT infrastructure applies to the technologies for which any information system is established (Garcia, Aunario, Handriyantini 2019). The ICT infrastructure, according to Zeadally and Bello (2019), was one of the most important factors in the adoption process. It includes the tangible resource for infrastructure components including hardware, software and other supporting devices. Korczak and Kijewska (2019) propose that ICT infrastructure plays an essential part in empowering IT organisation. In addition, facilities and amenities provided through ICT infrastructure will increase system usage within an organisation (Limbu et al., 2014). The study by Sabi et al. (2016) found that the readiness of good ICT infrastructure is positively associated with the intention to adopt and use of technology. It relates to how the ICT infrastructure improves ease of use and positively impacts on user's satisfaction.

A study on the use of e-learning in Nepal conducted by Acharya and Lee (2018) found that Internet connectivity and computer facilities are among the infrastructures that drive the use of the technology. It is true for most developing countries where limited infrastructure is a barrier to technology adoption (Raj, Dwivedi, Sharma, Jabbour, & Rajak, 2019). In the context of usage within an organisation, hardware such as computers and terminals for access is provided by the organisation. At the same time, access to an organisational system using personal devices is practised by organisations that allow it

through the BYOD (bring your own device) concept (Baillette, Barlette, & Leclercq-Vandelannoitte, 2018).

Access to HRMIS in MAF units is mainly through computers provided by MAF HQ in offices within the unit. MAF personnel can also use personal computers to access HRMIS by using the network ports of their units. The network that connects HRMIS is an Intranet network leased from Telekom Malaysia, and it connects almost all MAF units. In the MAF, the ICT infrastructure of the HRMIS is expected to have a significant relationship with the use of HRMIS. Thus, the following hypothesis is formulated:

H8: There is a relationship between ICT infrastructure and the use of HRMIS.

System use refers to the extent, and way employees and customers use the capabilities of an information system. The example of system use is the amount of use, the frequency of use, the nature of use, the suitability of use, the extent of use and the purpose of use (DeLone & McLean, 2003; Petter et al., 2008). Previous studies also prove that system usage influence user's experiences towards the system (Song & Kim, 2017). According to DeLone and McLean (2003), there is a strong relationship between system use and net benefits. The significant relationship between system use and net benefits is supported by Kilsdonk, Peute, and Jaspers (2017) in their study which found that the Educational Management Information System (EMIS) usage has a positive relationship with net benefits. However, system usage does not always influence individual net benefits. Findings from Jeyaraj's (2019) study shows that only specific context such as the number of organisations, the number of users, type of users, and information system type influenced the relationship between system use and individual benefits.

In fact, the use of HRMIS as directed by top management in the MAF gives many benefits to MAF personnel. Through the FGDs and interviews, this was acknowledged by the personnel saying that the use of HRMIS improves their effectiveness in terms of quantity, speed and quality of work. For the decision-maker, they can make decisions faster and accurate by using HRMIS. Therefore, the use of HRMIS in MAF is supposed to have a significant relationship with individual benefits. Accordingly, the hypothesis is formulated as:

H9: There is a relationship between the use of HRMIS and individual benefits.

3.4 Research Design

Among the most critical aspects of the methodology is research design as it provides the framework for the study and is a method to answer research questions while using sound principles of scientific inquiry (Yang & Shen, 2017). Some authors use the terms of strategies of inquiry (Denzin & Lincoln, 2011) or procedures of inquiry (Creswell, 2014) to refer to research design.

Malhotra (2015) explains that the purpose of a research design is giving details of the procedures that must be implemented for obtaining the required information regarding the research. A good research design ensures that research can be carried out effectively, and results can be achieved, as stated in the study's objectives.

Different authors propose various approaches and methods for choosing the appropriate research design. For example, Sarantakos (1998) proposed that the research design is divided into three steps: research paradigm selection, approach selection and

methodology selection. Therefore, this study will use the research design by dividing it into three steps of selection, namely research paradigm, research approach and research methodology.

3.4.1 Research Paradigm

The research paradigm, also known as the worldview, is referred to as a set of basic beliefs that guide action (Guba, 1990). Crotty (1998), Mertens (2010), and Lincoln, Lynham, and Guba (2011) described it as a paradigm. According to Creswell (2014), a research paradigm is a general philosophical orientation about the world and the nature of research that a researcher brings to a study. For instance, Teddlie and Tashakkori (2009) identified five worldviews or paradigms, namely, positivism, post-positivism, transformative, constructivism, and pragmatism. In the context of the research approach, quantitative research paradigms are based on the philosophy that every phenomenon in the world can only be explained by the positivist paradigm.

Although this study used qualitative methods such as FGDs and interviews, they are considered as a preliminary study. Therefore, this study employs a quantitative method (survey) to examine the factors that influence the HRMIS usage by the MAF personnel.

3.4.2 Research Approach

A research approach is defined as a plan and procedure for research, and it includes specific steps ranging from broad assumptions to detailed methods with regard to data collection, analysis, and interpretation (Creswell, 2018). It is divided into quantitative,

qualitative, and mixed methods. The choice of research approaches depends on the research problem and questions, personal experiences, and the audience (Tran, 2016).

This study uses a quantitative approach to collect primary data. This is the most suitable data for the study, as this research specifically investigates technology usage and impact in a military setting. Therefore, it is necessary to collect primary data from MAF personnel. The questionnaire survey method was used for data collection; however, at the preliminary stage, FGDs and interviews were conducted to identify the important variables and to finalize the research framework of the study.

3.4.3 Research Methodology

In the early stages of the study, literature on technology usage and related issues were examined for more ideas and insights. Furthermore, content analysis was conducted by downloading articles from various credible journal sources. An analysis has been conducted to identify factors influencing technology adoption. Factors obtained through content analysis then guide in designing the questioning route for the FGDs and expert interviews.

3.4.3.1 Preliminary Study

This study uses the FGDs and expert interviews to delve into the factors that influence the use of HRMIS and impact of HRMIS in MAF. The purpose of the focus group discussion is to achieve discussion objectives by identifying various perspectives on the topic being studied. Discussions in this way facilitate to gain an understanding of an issue directly from the perspective of the participants themselves. The main advantage of this FGD is due to several specific features compared to other data collection methods

(Hennink, 2014). The most noteworthy is that the group environment allows for a variety of views on research issues to be gathered individually from all participants. FGDs also allow participants to highlight the issues that are most important to them, thus giving other participants a greater understanding of the issues being discussed. In addition, a comfortable discussion environment is crucial to provide participants with a conducive atmosphere where they can share ideas, beliefs, and attitudes within groups of people from the same ethnic, gender and socioeconomic backgrounds (Liamputtong, 2011). Another essential feature of FGD is that it generates information that cannot be easily replicated via other data collection methods (Cyr, 2015).

During the group discussion, participants will share their views and at the same time, hear others' opinions and may reject their views based on what they hear. This situation is regarded as a type of social moderation of the views expressed by group members, which provides an outstanding quality check of the information supplied (Barbour & Morgan, 2017). Regularly, the FGD was chosen because it was the most appropriate method for identifying various perspectives in the research and get input from the perspective of respondents about the problems studied (Hennink, 2014). In any discussion, participants will be asked and then will be followed with other questions on the issues being discussed, thus increasing the clarity, depth, and detail of the discussion. In-depth interviews provide the benefits of personal perceptions, feelings, and opinions through detailed questions (Denzin & Lincoln, 2018).

For FGD, the respondents were selected by using purposeful sampling that is by selecting respondents who have used HRMIS. One unit was selected from MAF in Sungai Besi and another unit in Kuala Lumpur. Both units were chosen because they are among the largest units in MAF and have been using HRMIS since 2016. In addition, consent

has been given by the CO of these two units to carry out this FGD. The first FGD involved 11 officers and personnel, and the second FGD involved six personnel. The FGD for Unit A was performed on April 30, 2018, and the activity lasted about an hour. The FGD for Unit B was performed on 8 July 2018 and lasted approximately 45 minutes. The FGD interview protocol and questions used in this study are shown in Appendix A.

Expert interviews were also conducted among two senior officers from the MAF who are the MAF ICT Project Manager and the Royal Navy ICT Project Manager. The two interviews took place on July 15 and 17, 2018, and both were about half an hour long. The interviews have been done in their respective offices. Expert interviews are a type of specialised survey where people are specifically selected who have in-depth knowledge of a particular field, are highly competent and have reliable and comprehensive information on research issues (Rai, Verlinde, Macharis, Schoutteet, & Vanhaverbeke, 2019). This type of interview is one of the prevalent methods of qualitative assessment as it delivers a powerful instrument to achieve a clear insight of underlying reasons, views, beliefs, and motivations of the research (Atlam & Wills, 2019). In the case of this research, expert interviews are the best way to delve into the issues raised by HRMIS users during FGD. In addition, expert interviewees will also give their views as normal users of HRMIS.

This study only conducted two FGDs and two expert interviews to obtain the factors influencing MAF personnel to use HRMIS. It is sufficient for this study because to achieve saturation of 80% of all themes requires two or three FGD (Guest, Namey, & McKenna, 2017). The percentage of themes obtained was also increased by adding two expert interviews. At the same time, the homogeneous characteristics of the available respondents allow this study to achieve saturation as desired (Nyumba, Wilson, Derrick, & Mukerjee, 2018).

The questions for this FGD were developed with the main objective of obtaining as much information as possible on the use of HRMIS in MAF. The information obtained through this activity should also provide the best answers to the research questions investigated (Rosenthal, 2016). At the same time and should always be observed, the questions in these FGDs must help achieve the objectives of the research (Hennink, 2014; Barbour & Morgan, 2017; Cyr, 2019). Therefore, when planning focus group interview questions, the above considerations are always taken into account. Also, the questions asked in the focus group and the interview must meet the nature and principles of each of these methods (Hansen-Turton, Sherman, & King, 2015; Carey & Asbury, 2016; Balasubramaniam, 2019). The developed questions are designed to meet what is being said by way of questioning, which in turn helps to spark each other's thoughts or memories (Potischman et al., 2020).

The purposive sampling method was used to choose the MAF unit based on high HRMIS usage. Similarly, for the interview, individuals were selected purposively by considering their technical knowledge concerning the HRMIS and has a better understanding of issues related to HRMIS usage. For that purpose, two senior officers, namely the MAF ICT Project Manager and the Navy ICT Project Manager, were interviewed. The data obtained from focus group discussions and interviews were transcribed verbatim in the Malay language and then translated into English. A MAF bilingual expert verified the translated transcript before processing for thematic comparison and analysis (Jukic, Gagliardi, Fagnani, Venturini, & Orlandoni, 2017).

The text of the transcript is analysed by identifying units of meaning (message units) that is words or phrases of words. Units that have similarities are then grouped and given code. The frequency was also calculated from each respondent. The number of units less

than half of the total respondents will be dropped. All codes will be named as sub-categories and will then be grouped under one larger theme or category based on their features with reference to the literature. Based on that theme, the factors have been identified by comparing it with the literature. Next, the questionnaire was developed for the survey conducted in the second part of the study.

3.4.3.2 Survey

In the part of this study, the survey approach was used to collect data from participants in the MAF unit. Survey research is a systematic set of instruments used to collect information to render knowledge and help to make correct decisions. It is a highly valuable method of measurement in social science and behavioural science research (Ruel, Wagner, & Gillepsie, 2016). Surveys are tools designed specifically to gather information for analysis purposes that can answer research questions. It is often linked with a deductive approach and is commonly used in research and descriptive research (Rea & Parker, 2014). Items are carefully selected or constructed, organised, and distributed to participants, by mail, or over the Internet.

Survey research has gained a lot of credibility from its wide acceptance and uses in academic institutions. Many universities have established research institutes where survey techniques have been taught, and surveys can be conducted in the context of scientific reasoning and practice. Although survey research has been widely accepted, there is still little doubt about its findings as it relates to the credibility of the information obtained from some respondents whether they represent the whole population (Cowles & Nelson, 2015).

Survey research involves asking people for verbal information about themselves. The end goal of the sample survey is to enable researchers to make sense of a large population by examining only a small portion of the population. This procedure determines what information is available, how it will be collected, where it will be requested, and how it will be analysed (Hui, Man, Carrie, Kwong, John, & Kong, 2019).

This method is suitable if the researcher requires self-reported information and is not available elsewhere, and it represents the larger population as the study desired. This fact is true as long as general information is sufficiently known or readily available to the person under investigation. It is necessary to formulate detailed questions, and as long as the targeted population easily accessible and ready to provide self-reported information (Rea & Parker, 2014).

This study will use the self-administrated mail survey method using the paper-based approach as it provides a higher response rate than an electronic questionnaire (Chan, Stanley, Meadus, & Chien, 2017). It is based on the opinion expressed by most survey participants who prefer paper-based surveys as it eases participant besides improving data quality and responses (Hagan, Belcher, & Donovan, 2017).

3.4.4 The Population of Interest and Unit of Analysis

Target population or population of interest explains the group of people of interest whom the researcher wishes to investigate (Dezdar, 2012). In research, the population of interest means the entire group of people or items that meet the subject inclusion criteria set by the researcher. The population consists of all such subjects, whereas the subpopulation is a researcher-defined subgroup of the population. A sample is selected

from the population or the subpopulation. A population does not necessarily refer to people; it may also refer to things such as records or events that are being studied (Hissong, Lape, & Bailey, 2014). The population of interest is an important requirement in every research as it will be an object or element that supplies data and information to the study (Maguire & Geiger, 2015). In this study, the population of interest is the population of the MAF. The element in this study is the personnel of the MAF that uses HRMIS.

The unit of analysis implies to the level of the entity for which the researcher measures the concept (O'Sullivan, Berner, Taliafero, & Rassel, 2016). The unit of analysis also describes the types of cases on which the researcher will collect and analyse data (Martin & Polly, 2016). While the researcher often has discretion over the unit of analysis to be used in the study, it is crucial that once the unit of analysis is defined, all analyses and conclusions apply only to that unit of analysis.

The unit of analysis of the study was determined by the research questions and the objectives of the study (Sekaran & Bougie, 2016). In this study, the personnel of the MAF are individuals who are the users of the HRMIS. Therefore, the MAF personnel are the unit of analysis in the context of this study.

3.4.5 Sampling Frame and Sampling Method

The sampling frame is the list of elements where the sample will be taken, and it is comprised of a complete and precise list of population members (Cooper & Zmud, 2014). In this study, the sampling frame is all the MAF personnel who are using the HRMIS. Research questions determined the sampling method in a study and a paradigm (Jason &

Glenwick, 2016). In this study, the methods to access the population of interest are through the purposive sampling strategy.

According to Mewomo and Maritz (2017), purposive sampling will be used when informants are selected based on their experience in the subject investigated, and this will be done by selecting the MAF personnel from various units that use the HRMIS. Purposive sampling was conducted by sending 750 questionnaires to selected MAF units based on the ratio of personnel of the Army, Navy and Air Forces. Thus, 520 questionnaires were sent to the Army unit, 120 questionnaires to the Navy unit and 110 questionnaires to the Air Force unit. The number of questionnaires distributed is based on the ratio of the estimated number of personnel in the MAF; 80,000 Army, 18,000 Navy, and 17,000 Air Forces (Central Intelligence Agency, 2019).

Answering instructions are attached with each set of questionnaires as well as returning instructions to all unit commander. Selected participants are those who meet the profile where they must be MAF personnel and have used HRMIS. Those who do not meet this sampling profile, such as civilians, as well as those who have recently entered the service and have not used HRMIS, were excluded from the study. By taking the estimation of the MAF strength of 110,000 personnel, the total valid sample required for this study is at least 384 respondents as proposed by Krejcie and Morgan (1970). The sample size of 384 is considered appropriate when the population constitutes more than 100,000, as shown in Figure 3.2.

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

Figure 3.2: Table for Determining Sample Size

Source: Krejcie and Morgan (1970)

3.5 Questionnaire Design

The method of gathering primary data in most survey is using a questionnaire. Systematically constructed questionnaires will enable the respondent to answer questions accurately and provide valuable information for the analysis (Rea & Parker, 2014). Questionnaire design is a critical step as it will determine whether the survey conducted is valid, and its decision can justify any previous hypothesis or assumption made (Kumar, 2019). Malhotra (2015) proposes ten steps to produce a systematic questionnaire design process starting with the first step, which is to specify the necessary information, a task that was done earlier. Reviewing components of the issue and approach, especially the information needed, is helpful.

The second step in the development of the questionnaire is to decide the form of the interview, which was done at the previous stage. An understanding of how the questionnaire structure determines the form of a procedure can be obtained by analysing how the questionnaire is carried out according to each approach. The questionnaire should be self-administered; therefore, simple and thorough instructions should be given.

Step three is to determine the content need to be included in individual questions. This step can be taken when the appropriate information is specified, and the type of interview method is selected. What matters most is whether the question can provide the necessary information for the study being conducted.

The next step is step four which is to prevent the respondents from being willing to answer or unable to answer the question. For situations involving sensitive information, appropriate steps are required when developing questions to desensitizing the questions. Questions should also be easy to understand and interpret by simply providing relevant and accurate information.

In step five, the questions developed need to be structured or unstructured. Structured questions are more reliable because they are less likely to be biased than unstructured questions. The structure that researchers can choose from is multiple-choice, dichotomous, or scale.

The choice of wording in step six is important as it ensures that the desired question content and structure are translated accurately and clearly into words. Otherwise, respondents will refuse to answer, or the answer given does not meet what the researcher wants. To overcome this tendency, researchers recommend making sure the selected

words explain the issue, use unambiguous terms, use common words, and avoid leading questions.

Step seven is to decide the order of the questions in a logical order to facilitate the flow of thoughts to answer the questions. The opening questions can be crucial in initiating the respondents' confidence and cooperation. Some of the suggestions in arranging the questions that the order of the questions is to follow in sequence by the type of information. Questions can also be organized from general to specific, or also known as the funnel approach.

Step eight in designing questions is to determine the format, spacing, and positioning of questions. The questions need to be broken down into sections and numbered in order not only to facilitate respondents' answers but also to the process of coding the answers.

The next step after the question is refined to reproduce the questions into physical form by printing them on paper and photocopying them. The quality of the printing needs to be clear and use appropriate paper where the print on a single page is preferred to avoid the respondent from overlooked some pages.

The last step in developing the question is pre-test the question. It addresses the pre-test of questions to a small group of respondents to determine if there are issues and weaknesses that the researcher overlooks. Among the things that need attention again during this pre-test are the nature of questions, wording, order, shape and format, complexity in questioning, and directions. In order to perform a pre-test, the sample size does not have to be so large and usually does not exceed 30 respondents. Pre-tests need to be done at least once and should continue until no further changes are required.

In this study, the information regarding the questionnaire was obtained from Phase 1 of the study and also from literature. This study employs a self-administrated mail survey because it has an advantage in term of time and cost. For each question, what has been considered is whether every question is necessary to the research and contributes to a specific purpose. In order to ensure that respondents are able to answer the question properly, it should be easy to understand and do not contain sensitive information.

Questionnaire in this study uses a structured question scale by using a 5-point Likert scale. The questionnaire was reviewed by the expert and non-expert panels to produce an easy-to-understand questionnaire. Based on the reviews, the questionnaire was assessed by using a content validity index approach. Next was psychometric assessments where the questionnaire was translated and back-translation by bilingual experts.

Suitability of formats and layouts has also been considered by using correct numbering and heading, which facilitates readability. The questionnaire has been photocopied from its original copy with high-quality equipment. Finally, a pre-test of questions has been done by ten non-expert respondents to review the questionnaire clarity.

3.6 Measurement of Variables

In research, the measurement of the variables is to correctly identify the significant associations between the variables by using the appropriate measurement. The measurements and scales for this study were adapted from the prior studies except some were self-developed from the FGDs and interviews findings.

3.6.1 Information Quality

Information quality is referred to as a required characteristic of HRMIS outputs, such as relevance, accurateness, currency, completeness, understandability, conciseness, timeliness, and usefulness (Petter et al., 2008). The information quality construct was measured using six items adapted from Lee et al. (2009). In order to assess respondent perception to information quality, this study will use the 5-point Likert scale, which starts from 1 = strongly disagree to 5 = strongly agree. All other items of constructs were measured by using the 5-point Likert scale. The detail of items and sources are presented in Table 3.1.

Table 3.1: Items Related to Information Quality

No.	Items	Source
1.	The HRMIS provides the exact information that I need.	Lee et al. (2009).
2.	The HRMIS provides information that I need at the right time.	
3.	HRMIS provides information that is relevant to my job.	
4.	The HRMIS provides sufficient information.	
5.	The HRMIS provides information that is easy to understand.	
6.	HRMIS provides up-to-date information.	

3.6.2 System Quality

System quality is the required features of HRMIS. The example of features such as easy to use and learn, flexible, and reliable (DeLone & McLean, 2003; Petter & Fruhling, 2011). The system quality construct was measured by six items adapted from Wang et al. (2007). The detail items and sources are shown in Table 3.2.

Table 3.2: Items Related to System Quality

No.	Items	Source
1.	The HRMIS is always available.	Wang et al. (2007).
2.	The HRMIS is easy to use.	
3.	The HRMIS provides interactive features between users and the system.	
4.	The HRMIS provides a personalised information presentation for every user.	
5.	HRMIS has many features to attract users.	
6.	The HRMIS provides high-speed information access.	

3.6.3 Service Quality

Service quality is defined as the quality of support provided by the ICT department and its staff to the end-users of HRMIS. The example service qualities are accuracy, responsiveness, technical skills, reliability, and empathy of the support staff (DeLone & McLean, 2003; Petter & Fruhling, 2011). Five items for service quality construct were adapted from Wang et al. (2007). Items and sources are shown in Table 3.3.

Table 3.3: Items Related to Service Quality

No.	Items	Source
1.	The HRMIS provides a proper level of online assistance and explanation.	Wang et al. (2007)
2.	The HRMIS developers interact extensively with users during the development of the HRMIS.	
3.	The HRMIS Project Team always available for consultation.	
4.	The HRMIS Project Team provides satisfactory support to users using the HRMIS.	
5.	The HRMIS Project Team always responds to your suggestion for future enhancements of HRMIS.	

3.6.4 Security

Security refers to the degree to which HRMIS is believed to be secure to transmit sensitive information (Salisbury et al., 2003). Seven items for security construct were adapted from Ahmadi et al. (2016) and Salisbury et al. (2003). Items and sources are shown in Table 3.4.

Table 3.4: Items Related to Security

No.	Items	Source
1.	The data regularly exchanged between server or/and units are under a secured network.	Ahmadi et al. (2016)
2.	In the HRMIS, data is safeguarded from unauthorised changes.	
3.	In the HRMIS, sensitive data is protected from those who should not have access to it (by using unique ID and password).	
4.	I feel secure sending sensitive information across the HRMIS.	Salisbury et al. (2001)
5.	The HRMIS is a secure means through which to send sensitive information.	
6.	I feel totally safe, providing sensitive information about myself over the HRMIS.	
7.	Overall, HRMIS is a safe place to transmit sensitive information.	

3.6.5 Computer Self-efficacy

Computer self-efficacy is defined as the assessment of the technological ability of users to use the HRMIS based on their previous skills, knowledge, and experience (Shareef et al., 2011). Six items for computer self-efficacy construct were adapted from Shareef et al. (2011). Items and sources are shown in Table 3.5 below:

Table 3.5: Items Related to Computer Self-efficacy

No.	Items	Source
1.	I have the qualifications to use and operate a computer.	Shareef et al. (2011)
2.	I have the qualifications to use and operate the Internet.	
3.	I have skills in using HRMIS.	
4.	I am confident in using the HRMIS.	
5.	I do not feel difficulties to use the HRMIS.	
6.	I do not need another person assistance to use the HRMIS.	

3.6.6 Commander Support

Commander support refers to the extent to which MAF leadership realises the importance of HRMIS and the extent to which it provides a long-term strategic vision and essential resources for HRMIS adoption (Alsaad, Mohamad, & Ismail, 2018). Five items for commander support construct were adapted from Ahmadi et al. (2016), and Wang and Wang (2016). One item was self-developed based on the FGD and interviews' findings. Items and sources are shown in Table 3.6.

Table 3.6: Items Related to Commander Support

No.	Items	Source
1.	The commander of my unit supports the adoption of the HRMIS.	Ahmadi et al. (2016)
2.	The commander of my unit is aware of the benefits of the HRMIS.	
3.	The commander of my unit has enthusiasm in adopting the HRMIS.	
4.	The commander of my unit supports with adequate resource allocations for the HRMIS implementation.	Wang & Wang (2016)

Table 3.6: continued

5.	The commander of my unit considers the HRMIS is important.	
6.	The commander of my unit always instructs us to use the HRMIS.	Self-developed from FGDs and interviews finding.

3.6.7 Technical Training

Technical training refers to proper instructions that are provided to the users to enable HRMIS usage by internal or external entities of MAF organisation (Roy, Zalzala, & Kumar, 2016; Fanta, Pretorius, & Erasmus, 2017). Five items for technical training construct were adapted from Amoako-Gyampah & Salam (2004). Items and sources are shown in Table 3.7.

Table 3.7: Items Related to Technical Training

No.	Items	Source
1.	The training on using the HRMIS provided to me was sufficient.	Amoako-Gyampah & Salam (2004)
2.	My level of understanding of the HRMIS substantially improved after going through the training program.	
3.	The training gave me confidence in using the HRMIS.	
4.	The training on using the HRMIS was adequate in detail.	
5.	The trainers have aided me in my understanding of the HRMIS.	

3.6.8 ICT Infrastructure

ICT infrastructure refers to technologies that provide a foundation for HRMIS operation (Lin & Lin, 2008). Four items for ICT infrastructure construct were adapted

from Limbu et al. (2014), and two items were self-developed. Self-developed items are derived from the findings of the FGDs and interviews. Items and sources are shown in Table 3.8.

Table 3.8: Items Related to ICT Infrastructure

No.	Items	Source
1.	The MAF has allocated a generous budget for purchasing ICT hardware.	Limbu et al. (2014)
2.	The MAF has allocated a generous budget for purchasing ICT software.	
3.	The MAF has embraced sophisticated Internet applications.	
4.	The MAF has embraced sophisticated communication applications.	
5.	The network speed in my unit in the MAF is sufficient to access the HRMIS.	Self-developed from FGDs and interviews
6.	My unit in the MAF has adequate computer terminal to access the HRMIS.	

3.6.9 HRMIS Use

Use is referred to how the users access the functionality of HRMIS. The example of the useful functions was frequency usage, appropriateness, extent, amount, nature of use, and purpose of use (DeLone & McLean, 2003; Petter & Fruhling, 2011). Five items adapted from Lee et al. (2009) and Chen (2010) were used to measure HRMIS usage. Items and sources are shown in Table 3.9.

Table 3.9: Items Related to HRMIS Use

No.	Items	Source
1.	I use the HRMIS very frequently (many times per month).	Lee et al. (2009)
2.	I use the HRMIS for a variety of tasks (updating personal data, leave application, hospital admission, etc.).	
3.	I use many functions of the HRMIS.	Chen et al. (2010)
4.	I depend on the HRMIS to manage personal data and administration.	Lee et al. (2009)
5.	Overall, I use the HRMIS a lot. (Dropped)	

3.6.10 Individual Benefits

Net benefits are the extent to which HRMIS helps individuals, organisations, industries, and nations to succeed (DeLone & McLean, 2003; Petter & Fruhling, 2011). The net benefits of this study focused solely on individual benefits, therefore *individual benefits* terminology used throughout this study. Consequently, seven items for individual benefits construct were adapted from Lee, Kim, and Gupta (2009). The items and sources for the net benefits construct are shown in Table 3.10.

Table 3.10: Items Related to Individual Benefits

No.	Items	Source
1.	Using the HRMIS teaches me a lot in managing personal data.	Lee at al. (2009)
2.	Using the HRMIS improves my skills and knowledge in personal record management.	
3.	Using the HRMIS enables me to accomplish my tasks more quickly.	
4.	Using the HRMIS improves my job performance.	
5.	Using the HRMIS improves my productivity.	
6.	Using the HRMIS increases the output quality of my task.	
7.	Overall, using the HRMIS is a benefit to me.	

3.7 Assessment of Questionnaire Validity

Several types of validity assessment are used to test the goodness of measures, and researchers use various terms to signify them (Sekaran & Bougie, 2016). In order to validate the designed questionnaire, content validity and face validity were assessed.

Content validity examines the extent to which the measurement method includes all the key elements relevant to the measured structure and can be carried out by at least five experts (Grove, Burns, & Gray, 2013). The validity of the questionnaire for this study was based on the Cavana, Delahaye and Sekaran (2001) recommendations.

The first step is to use the original items that have been verified and from the credible source. Since some of the items have been amended, and there are three items developed from FGDs and interviews, the expert panel needs to validate the questionnaire. A total of 6 experts, three academicians and three senior officers from the MAF were selected. They individually evaluated each item in questionnaire with 4-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant, 4 = very relevant).

The content validity index (CVI) which proposed by Lynn (1986) was used to assess the validity of each item in the questionnaire (Grove et al., 2013). Item will be valid if the CVI value more than 0.83 when at least 5 out of 6 of the expert panel assess the item as relevant (3 or 4). All items reach the CVI value at least 0.83 are retained except the "Overall, I use the HRMIS a lot" (Use) with the CVI value 0.67 was dropped. The CVI scale level (S-CVI/Ave) reaches 0.93, which is above 0.90. Therefore, all constructs are valid and can be retained in the study (Hew & Kadir, 2016).

The questionnaire is sent to a MAF bilingual expert to translate into Malay. The translation results are then sent to another bilingual expert to be re-translated into English. It was found that no change of meaning and sentence structure were detected between items which were back-translated with original items in English. Therefore, the questionnaire in Malay is suitable for use in the survey.

The next step is the face validity process where the questionnaire was tested by asking ten non-expert respondents to fill out the questionnaire and give feedback about the clarity of the items (Ulloa & Adams, 2004). The item needs to be restructured and simplified if the value of CVR = (n-N / 2) / N / 2) has a value less than 0.62, where n is the number of panels agreed, and N is the number of panels (Simpson, Maher, Page, Gibbons, Franklin, & Foa, 2010). In this study, all items have been rated CVR between 0.8 and 1.0. Therefore, all the items are valid and will be retained for this study.

The next step is the reliability assessment which is to ensure the instrument is always consistent throughout the time as well as with other items in the instrument (Sekaran & Bougie, 2016). For determining the sample size for the pilot test, Cooper and Schindler (2014) proposed the appropriate sample size of 25 to 100 respondents depending on the type of analysis to be performed. Thus, a pilot test was carried out by distributing 30 questionnaires to 3 units of the MAF around the Ministry of Defence using HRMIS. Analysis of the questionnaire found that all constructs were reliable as its Cronbach's Alpha value was above 0.7, as shown in Table 3.11 (Hair, Hult, Ringle, & Sarstedt, 2017).

Table 3.11: Reliability of the Variables

No.	Variables	No. of items	Cronbach's Alpha
1.	Information quality	6	0.823
2.	System quality	6	0.795
3.	Service quality	5	0.860
4.	ICT infrastructure	6	0.768
5.	Security	7	0.827
6.	Computer self-efficacy	6	0.817
7.	Commander support	6	0.856
8.	Technical training	5	0.909
9.	HRMIS use	5	0.916
10.	Individual benefits	7	0.906

After assessing the reliability, the questionnaire was finalised and distributed to 750 respondents within the MAF using MAF Signal Dispatch Service (SDS) along with an envelope with an INSPEKA's address to facilitate the returning process. The detail of the finalised questionnaire as attached in Appendix C.

3.8 The Technique of Data Analysis

As with other studies, the use of analytical tools of Structure Equation Modelling (SEM) is a central method in this study. SEM is a cross-sectional, linear, and generalized statistical modelling procedure. SEM has become a more powerful analytical technique as it considers interaction modelling, nonlinear, correlated independent variables, measurement errors, correlated error terms, various latent variables (Benitez, Henseler, Castillo, & Schuberth, 2020). Other useful functions of SEM are factor analysis, path analysis and regression (Hair et al., 2017). Another definition explains that SEM is a statistical technique used to build and test statistical models which are usually in the form of causal models (Baltes, Featherman, & Lerner, 2014). SEM is a hybrid technique that includes confirmatory aspects of factor analysis, path analysis and regression, which can be considered as a special case in SEM (Shanti, 2019).

Generally, there are two types of SEM: covariance-based SEM (CB-SEM) and variance-based SEM (PLS-SEM). CB-SEM is used to confirm or reject the theory. In contrast, PLS-SEM is used primarily to develop theories in exploratory research (Hair et al., 2017). A covariance-based SEM (CB-SEM) is a useful tool because, theoretically, the models proposed in this study have several variables that are studied simultaneously to determine the influence of variables on other variables (Anderson, Fontinha, & Robson, 2019).

It can be concluded that SEM has characteristics as an analytical technique to confirm rather than explain (Lukman, Setiani, & Muhassanah, 2020). For the purpose of this study, SEM able to provide direct, indirect, and overall impact of HRMIS usage to MAF personnel.

Thus, the framework in this study is analysed using Structural Equation Modelling (SEM) software, AMOS Version 26.0 to identify factors influencing the HRMIS usage by MAF personnel with a primary focus on individual benefits.

3.8.1 Assessing SEM Measurement Model

SEM is a confirmatory approach that provides a systematic means of evaluating and refining the latent construct measurement model. It is known as Confirmatory Factor Analysis (CFA). The method can evaluate the uni-dimensionality validity and reliability of the (constructive) measurement model. The uni-dimensionality assessment should be made first prior to assessing validity and reliability (Awang, 2012).

By using CFA analysis, each item that does not fit the measurement model due to low factor loading, i.e., below 0.70 should be removed from the model (Hair et al., 2019). Researchers need to perform CFA for all latent constructs involved in the model. Researchers can conduct a CFA for each measurement model individually or use a combined CFA. However, the CFA procedures collected are preferred because they are simpler compared to individual CFAs (Chong, Nazim, & Ahmad, 2014).

3.8.2 Assessing the Structural Model

The next step after the analysis of the measurement model is the evaluation of the structural model. An evaluation of the model of the structure is initiated by evaluating its collinearity. Collinearity is achieved when the tolerance value is below two, and variance inflation factor is less than 5 (Hair et al., 2017). When both are below the critical value, then there is no sign of collinearity problem.

Next is the assessment of the path coefficient on the structural model. If the value obtained from the SEM algorithm is low, then the use of bootstrapping is suggested with a value of 5000 samples to obtain the p and t values. The critical t values for the two-tailed test were 2.57 (1% significance level), 1.96 (5% significance level), and 1.65 (10% significance level).

The most common method of evaluating the structural model is the coefficient of determination (R^2 value). R^2 explains how far the dependent variable can be explained by the independent variable. The R^2 value is between 0 to 1 with a value closer to the number one means better R^2. If R^2 is 0.6, then 60% of the dependent variable can be explained by independent variables (Hair et al., 2017).

3.9 Summary

This chapter specifically explained the research framework and the hypotheses used in this study. Furthermore, this section presented the research approaches that comprise research design, research paradigm and research methodology. The research methodology enlightens the conduct of FGDs and interviews. Research methodology also describes the population and sampling involved in this study. Then the final part is about the design of the questionnaire, which is accompanied by the measurement of variables and the questionnaire validity.

CHAPTER 4: DATA ANALYSIS

4.1 Introduction

This chapter explains the results of the preliminary study (FGD and expert interviews) and quantitative data (questionnaire). Data for the FGD were analysed to identify factors that influence the use of HRMIS in the MAF units. By using thematic analysis, the factors have been identified and have been integrated into the existing framework. Based on the framework developed, data for the questionnaire were obtained and analysed. The initial analysis involves descriptive statistics, which is a frequency distribution. Next, the measurement model was analysed by testing composite reliability, convergent validity, discriminant validity and factor loadings. Next, the structural model was evaluated to examine the relationship in the hypotheses presented in this study. SPSS Version 25 and AMOS Version 26.0 were used throughout this analysis.

4.2 Preliminary Phase

This phase aims to identify and classify the various factors influencing the HRMIS usage. From the FGDs and the interviews, respondents have also explained the benefits gained from using the HRMIS. The respondent of FGDs and interviews have discussed issues related to the use of HRMIS such as information quality, system quality, service quality, use, ICT infrastructure, security, commander support, computer self-efficacy, technical training, and individual benefits.

4.2.1 Respondents Background

The respondents for the FGD were selected through purposive sampling involving one MAF unit from Kuala Lumpur and one MAF unit from Sungai Besi. These two units have been using HRMIS extensively since 2016 (Malaysian MINDEF Internal Audit, 2017). Eleven staff who used HRMIS were involved in the first FGD, and six staff were involved in the second FGD. All FGD participants are from administrative departments with experience in using the HRMIS. Unit A is under the MAF Headquarters, which is responsible for trunk communications and provide a Signals Dispatch Services (SDS) service, while Unit B is a central workshop unit of the Army that maintains communications equipment. These units were chosen on the basis of the size of the unit, the availability of staff and the consent provided by the unit's respective CO. The respondents have numbered accordingly, i.e. A1, A2 up to A11 and B1, B2 up to B6 respectively.

The respondents were asked for their permission to use their information verbally, and all concurred. The respondents were then asked about their opinions on the HRMIS processes. The FGD interview protocol and questions used in this study are shown in Appendix A. In these activities, the respondents presenting their views on the system's benefits and shortcomings in terms of efficiency, ease of use, assistance, and so on. The respondents were also asked if they had any recommendations to strengthen the system.

Expert interviews with two senior MAF officers, who were the MAF ICT Project Manager and the Royal Malaysian Navy ICT Project Manager, were also conducted following the FGD. The two interviews took place on July 15 and 17, 2018, and both were about half an hour long. The objective was to gather their expert opinions on the technical aspects and the development of the HRMIS at the headquarters of the MAF and

the level of the MAF service. They were also selected based on their knowledge of the development of HRMIS, and their availability for the interview. In the interview, they explained in detail the implementation process of HRMIS. Then, they were asked about the limitations and problems that the participants in the FGD had raised. As an HRMIS user, the respondents also gave their opinions.

The factors influencing the use of HRMIS amongst the MAF personnel were discovered based on the FGDs and interviews conducted. The final list of factors was categorized by using the constant comparison method, as suggested by Strauss and Corbin (2008). The factors were specified with appropriate names after referring to the associated literature. The following section further elaborates in detail the variables discussed in the FGDs and the interviews.

4.2.2 Themes

All FGS respondents and interviews addressed the variables affecting the use of HRMIS. The themes found have been subdivided and recorded in the section below from the FGDs and interviews conducted.

4.2.2.1 Information Quality

Information quality portrays an essential role in certifying that an IS continues to be used. It will also boost the benefits to users (Rezaian, Salamat, Malekzadeh, Yusoff, & Zare, 2018; Wamba, Akter, Trinchera, & De Bourmont, 2019: Cheng, 2020). As has been said, the impact on end-users has an even greater impact on the use of a system. The

findings of the FGDs have shown that the information quality of the HRMIS has performed a critical role in boosting the user's acceptance of any information system.

> *"it's a good system because when we go to the hospital, we can check on HRMIS for our data, where all of the information for our GL are complete as in our records."* (Respondent A1)

> *"information can be accessed when it needs to be used and it always available."*
>
> (Respondent B4)

The quality of the information in HRMIS allows any required information can be quickly accessed and processed by users or personnel. It is as described by Expert 2.

> *"Previously, if we want to know the statistics of our personnel, we need to calculate it one by one, how many in 2018, how many in 2019, but with the HRMIS we just need to click, and the system will display a statistic, how many personnel retiring in 2019, how many officers still in service."* (Expert 2)

4.2.2.2 System Quality

The system quality of the HRMIS was among the factors that influenced the use of the HRMIS, according to the output from the FGDs. Support for this fact is provided by Riski, Noor, and Duli (2020). They noticed that the Hospital Information System (HIS) system efficiency was greatly affected by user satisfaction, which promoted the use of the system. The respondents in the FGDs considered that the HRMIS system efficiency was

acceptable. They were then encouraged to use the scheme more quickly. Some evidence is produced.

> *"I have a view on the HRMIS. I think that this system is best to use in the MAF as it eases our administration, and it saves time as well. For example, as I am a clerk; I will check the documents of each personnel. For me, it makes my task easier because it's online.* (Respondent B2)

However, some respondents felt that the quality of the system could have some problems.

> *"...data is not saved and need to repeat. When I spoke with the Staff of Signal Directorate, he notifies me there is no update whereas I have updated the data already. I'm not sure what's going on, maybe the system is slowly updating."* (Respondent A2)

From the interviews, it was noted that there are some issues on accessibility as HRMIS should be able to be accessed through various types of web browsers. Evidence is drawn from Expert 1:

> *"So, the contractor has taken the initiative to create what is called multi-platform integration through their R&D. The response given by the contractor is that HRMIS can be opened and used using any web browser. The user needs to download "IE tab software" to allow other web browsers other than IE. Just open HRMIS and get the best possible display quality. The instructions are included in the "IE tab" download in the MAF HRMIS user manual."* (Expert 1)

4.2.2.3 Service Quality

Service quality was the third factor to arise from the input of the respondents, meaning the service providers' responsiveness, flexible operating hours, efficiency, and easy contact (Hoffman, & Bateson, 2010; Sharma, Gaur, Saddikuti, & Rastogi, 2017). It is also an essential factor in ensuring that the IS continues to be used by the user because it gives the advantages and affects the users. Rahi and Ghani (2019) found that in affecting the user's acceptance of the method, service quality had the utmost importance. In this regard, the quality of the service provided by HRMIS' technical support was also stated by most of the respondents.

> *"If we have a problem with the system, it will be referred to the HRMIS team. We can refer to it by telephone, as stated in the booklet or manual. Often, they will guide in the phone first; if the problem cannot be resolved, they will send their nearest staff to handle it."* (Respondent B2)

When a user has encountered an issue with both technological usage and problems with regard to service quality, the user may resolve it by communicating the technical support to deal with the situation. This was confirmed by Expert 2:

> *"We have a team called the RMN HRMIS team. Users can WhatsApp anytime 24/7. For example, if the system down, they will assist immediately."* (Expert 2)

4.2.2.4 Security

Vacca (2017) has demonstrated that information security is a significant concern for many management organisations. To secure corporate information, security strategies focused on technological attributes alone are insufficient. It would appear that when using the IS, adequate information protection still relies on acceptable user behaviour (Knapp & Langill, 2014). Most of the respondents in this research were sure of the security qualities presented in the HRMIS. Respondent A7 confirmed this issue:

> *"I feel the information in this system is secure because each user has their username and password to update their documents. The document administrator only monitors to determine the data is the same as in the document."* (Respondent A7)

The security part of the system was also expounded by Expert 2.

> *"This system is located in a secured infrastructure with a firewall and has been endorsed by CDOC (Cyber Defence Operation Centre). At the same time, we are testing HOI (HRMIS on Internet). While this has been outstanding due to security issues, the issues have been overcome and we will open HRMIS on the Internet soon."* (Expert 2)

4.2.2.5 Computer Self-efficacy

Most respondents are aware that one needs to have some degree of technical expertise as an HRMIS user. Thongsri, Shen, and Bao (2020) stressed that computer self-efficacy is

a crucial predictor of the attitude of prospective teachers to computer-supported education. This is focused on the fact that it encourages them to ask for assistance if they have issues using the system by understanding their degree of computer self-efficacy. This situation also will provide some reasons for the users to get the appropriate knowledge when it comes to technology and computer knowledge before using the system (Ale, Loh, & Chib, 2017). However, in the context of HRMIS, it is found that the majority of MAF personnel are aware that they do not have adequate technical knowledge.

> *"At first, I don't have enough technical knowledge to use HRMIS without anyone's help. I will often ask anyone who has used it to help me."* (Respondent B5)

This issue is highlighted by Expert 1.

> **"***The step he used is incorrect. He key-in the data wrongly as at the last process of key-in the data; he did not click SAVE. After that, he just kept logging out like that. The process is incomplete".* (Expert 1)

4.2.2.6 Commander Support

Top management support suggests the scale of awareness of the value of the IS role by top management, and the extent to which IS activities include top management (Lin, 2014). In organisational behaviour, top management support is crucial (Colwell & Joshi, 2013; Zhang et al., 2018). The system was more likely to be adopted by organisations that have top management support for innovative technologies (Giotopoulos et al., 2017; Hsu, Liu, Tsou, & Chen, 2019). In MAF units, all respondents were aware that the commanding

officer (CO), who is the top management in each particular unit, had already given specific order to use the HRMIS. Respondent A3 emphasised that personnel had been encouraged to use the system by the CO's support.

> *"I think there is an instruction from higher headquarters that directs the use of HRMIS by ensuring the updating of data to achieve one hundred per cent. The CO also has issued instructions so that the system is used as in the orders."* (Respondent A3)

> *"The CO put the usage instruction in Part One Orders, which need to be abided by all personnel in this unit."* (Respondent B2)

The factor associated with commander support was endorsed by Expert 2.

> *"If we realise, the Royal Malaysian Navy's (RMN's) top management is playing an important role, not only play a role but 100 per cent support for system usage. For example, the Chief of Navy provided 100 per cent support to ensure ICT culture in the RMN."* (Expert 2)

4.2.2.7 Technical Training

To ensure the effectiveness of technology implementation, technical training that delivers users with adequate knowledge of the system is necessary. Liu et al. (2019) claimed that technical training has an essential link with the use of the system. Most of the respondents also believed that training on the use of HRMIS would help make it easier for

them to comprehend the modules in the HRMIS. However, some of the respondents thought that although there was training provided, they were insufficient.

> *"I have attended HRMIS courses, just one week and only taught personal details module even though there are many other modules available. What I learned is just to key-in personal data during the week-long course. The course duration is not enough because the system has a lot of modules; there is a duty module; a posting module and others. All I have learned was just personal details module."* (Respondent B2)

However, Expert 1 has a more positive view regarding technical training, as he states below.

> *"... at the same time, we have conducted about 64 training sessions throughout the country as well as a session for senior officials in the formation."* (Expert 1)

4.2.2.8 ICT Infrastructure

ICT infrastructure is one of the most widely debated factors influencing the process of technology adoption, according to Ahmadi et al. (2016). ICT includes quantifiable resources such as hardware and software. Garcia, Aunario, and Handriyantini (2019) have stated that ICT infrastructure plays an essential role in encouraging the use of organisational IT. Most of the respondents in this study emphasized the significance of the infrastructure and its effect on the use of HRMIS. They claimed that the current infrastructure was insufficient, thus affecting the use of HRMIS among the MAF personnel.

"I suggest adding more terminal and increase the speed of the network so that more user can use it." (Respondent A9)

The lack of ICT infrastructure to support the HRMIS was conceded by Expert 1.

"Access bandwidth is great, but when it is about to access the system, it is slow due to the computer component itself. According to bandwidth allocation, MAF has 154 sites across Malaysia within MindefNet network. For bandwidth allocation, we take into account the number of users, as well as other system being used by the units. These are the two main factors how we allocate for bandwidth. And then, out of the way, we're going to review usage levels every year. If underutilised, we will reduce the bandwidth for that particular unit and will allocate the said bandwidth to the unit that needs extra bandwidth." (Expert 1)

4.2.2.9 HRMIS Use

Many factors need to be taken into consideration by system developers and service providers in order to ensure the best use of the system in the organisation. Most of the factors are correlated with user perceptions and behaviours. The other factors include the system's efficiency and quality (Andersson, Soderman, & Sanden, 2017). Majority of MAF personnel used HRMIS consistently in this report.

"I always use HRMIS to update my personal details. Also, I used HRMIS when I went to the hospital when my child was sick." (Respondent A6)

"I always use HRMIS to update personal details of personnel, leave application, personnel appointment, and posting publication which should be updated regularly". (Respondent B1)

Based on the analysis to the transcript, the themes for the factors influencing the HRMIS usage were summarised as in Table 4.1.

Table 4.1: Themes for Factors Influencing the HRMIS Usage

Unit A	Unit B	Expert 1	Expert 2
Lack of infrastructure, poor infrastructure, poor system quality, use frequently, poor system reliability, benefits, security, system functionality, and infrastructure.	Easy to use, instruction to use, system functionality, lack of infrastructure, security, use frequently, information quality, system reliability, technical support, intend to use, poor infrastructure, basic HRMIS training, basic technical knowledge, cost reduction, productivity, infrastructure, poor system quality, and poor system reliability.	Basic HRMIS training, contractor performance, cost reduction, easy to use, information quality, use frequently, infrastructure, instruction to use, lack basic technical skills, lack of infrastructure, benefits, security, system functionality, system integration, system reliability, technical support, and user attitude.	Basic HRMIS training, contractor performance, culture, information quality, infrastructure, instruction to use, use frequently, lack of basic technical knowledge, lack of infrastructure, security, system functionality, system reliability, technical support, top management support, benefits, train the trainer, user attitude, and work culture.

4.2.3 Factors

By using the constant comparison method, the final list of categories was identified. After referring to the related literature, the categories were specified with appropriate names. Table 4.2 shows the list of finalised factors.

Table 4.2: Factors Influencing HRMIS Usage

Categories	Sub-categories	Respondent			
		Unit A	Unit B	Expert 1	Expert 2
System quality	System functionality	√		√	√
	Poor system reliability	√	√		
	Poor system quality	√	√		
	System reliability		√	√	√
	Easy to use		√	√	
	System integration			√	
Information quality	Information quality		√	√	√
Service quality	Technical support	√		√	√
Security	Password	√	√	√	√
	Access control				√
Computer self-efficacy	Basic technical knowledge	√	√		
	Lack of basic technical knowledge				√
	Self-learning			√	
Commander support	Instruction to use	√	√	√	
	Top management support				√
Technical training	Basic HRMIS training		√	√	√
	Train the trainer				√
ICT infrastructure	Infrastructure	√	√	√	√
	Poor/lack infrastructure	√	√	√	√

From Table 4.2, it is clear that the HRMIS usage is influenced by factors such as system quality, information quality, service quality, ICT infrastructure, security, commander support, computer self-efficacy, and use.

4.2.4 Individual Benefits

The impact of IS use can therefore be determined within an organisation by the impact of the individual user, workgroup influence, social impact, inter-organizational impact or industry (Jurison, 1996; DeLone & McLean, 2003; Valacich & Schneider, 2017; Stair & Reynolds, 2018, Talukder, 2019). In this study, the advantages of the use of IS at the individual level (individual benefits) are discussed. The results of the FGDs and interviews have shown that the benefits of using HRMIS can be categorised into three categories: productivity, job performance and decision making.

4.2.4.1 Job Performance

Job performance describes employees' behavioural effectiveness that contributes to organisational objectives; it consists of contextual performance and task performance (Jex & Britt, 2014; Robertson & Cooper,2015). Job performance also implies to acts and actions deemed essential for the achievement of organisational objectives (Charara, 2012; Lee & Tomal & Schilling, 2018). An organisation using the IS in its functions appears to benefit the productivity of its workforce. In this study, the respondents said HRMIS helped them improve their performance at work.

> *"I used the HRMIS regularly, and I think this system provides many facilities to ease my tasks and* allow me to improve my daily job performance.*"* (Respondent A11)

> *"I think the system is good as it enhances our skill in using a systematic way of managing our data compared to manual methods."* (Respondent B2)

4.2.4.2 Work Productivity

Work productivity refers to employees' capacity to perform their job effectively and efficiently (Brunetto & Farr-Wharton, 2008; Bautista, Rosenthal, Lin, & Theng, 2018). Work productivity refers to the level of competence an employee perceives as required by their job in terms of working hours management, relationships with co-workers and clients, and assignment needs as well as how they provide effort on the quality and quantity of their work (Thaedom et al.,2017). In other words, work productivity is defined as the output per unit of labour, where employees can be expressed in terms of the number of hours worked

and the number of employees (Deaconu, Gogu, Radu, & Tudor, 2018). An increase in productivity is often associated with the efficient use of technology (Munoz-Villamizar, Santos, Garcia-Sabater, Lleo, & Grau, 2019). This study showed that their productivity had been increased by using HRMIS. This has been observed from the FGDs.

> *"This system is good because it enables us to finish our work faster and can complete more tasks in terms of updating personal details, applying for leave etc."* (Respondent A3)

> *"By using the HRMIS, it speeds up and simplifies my work, so it saves my time. Therefore, I can complete more work within a shorter period."* (Respondent B3)

4.2.4.3 Decision Making

Decision making refers to the process of making choices on the various options available. This process is often done by managers or senior officials who have authority in formalizing decisions (Frisk & Bannister, 2017). Appropriate use of technology will make information available for use when needed. Thus, the use of technology enables people with authority in any organization to be able to make quick and accurate decisions (Netz, Svensson, & Brundin, 2020). In this study, respondents stressed that HRMIS facilitates them and their senior officers in making correct decisions.

> *"This system is good; we can look online on the personal details and list of posts. For example, we can also nominate personnel to attend the course by looking at the personnel course data."* (Respondent A9)

"This system will simplify my job as it does not need to run here and there to get the officer's signature for approval since all officers can access the system. All officers can make immediate decision to approve or not to any leave application by personnel." (Respondent B6)

Table 4.3 illustrates the themes derived from FGD and interviews on MAF individual benefits.

Table 4.3: Themes for Individual Benefits

Categories	Sub-categories	Respondent			
		Unit A	Unit B	Expert 1	Expert 2
Job performance	Improve work process			√	√
	Speed-up tasks	√			
	Enhance skill using system		√		
	Personal management				√
Work productivity	Complete more tasks			√	
Decision making	Assist decision making	√	√	√	√

Analysis of the individual benefits of using HRMIS among MAF personnel has yielded three categories of benefits in the form of improving job performance, work productivity, and decision-making process.

4.2.5 Summary of Preliminary Study

The results from the FGDs and interviews provided important information on the factors influencing the HRMIS usage among the MAF personnel. The study shows that system quality, service quality, and information quality are essential factors that influence the usage of the HRMIS. The outcome is consistent with previous studies conducted by Petter and Fruhling (2011) and DeLone and McLean (2003). Likewise, the result showed that ICT

infrastructure influences the use of HRMIS and is consistent with previous studies (Lin and Lin, 2008; Limbu et al., 2014). As demonstrated by previous studies, the security factor also improves the use of HRMIS (Salisbury et al., 2001; Ahmadi et al., 2016). In a military perspective, top management support or commander support plays a vital role in influencing the usage of HRMIS. Prior studies have supported this factor (Ahmadi et al., 2016; Wang & Wang, 2016). The results have also shown that computer self-efficacy has helped to enhance the use of HRMIS. Similar findings on how computer self-efficacy impacts the use of the information system have been found in previous studies (Shareef et al., 2011; Cheung & Vogel, 2013). The research framework was developed based on the outcomes. The results of the preliminary phase will be verified by employing a survey method in the next phase.

4.3 Survey

The data was collected in this phase using the survey method. In May 2019, after the measurement was updated and finalised, large-scale data collection began. In order to obtain at least 384 valid responses, data was collected from as many as 750 MAF respondents (Krejcie & Morgan, 1970).

It has to be prepared so that it is accurate for analysis before the data can be analysed. Some errors and imperfections may also be corrected before analysis is performed.

4.3.1 Data Preparation

In the data preparation process, it starts by examining all the received questionnaire, whether it can be accepted or not as one of the data. Next is editing, which is the treatment

of unsatisfactory responses. After editing, the coding process begins and continues with transcribing and finally, data cleaning.

A total of 750 questionnaires were circulated to various units in the MAF, of which 460 were returned with a response rate of 61.3 per cent. Data cleaning was performed in accordance with the procedure proposed by Van den Broeck, Cunningham, Eeckels, and Herbst (2005). For cases that respond with a strange pattern such as answering with all responses either 1, 2, 3, 4 or 5 on the Likert scale was removed (21 cases). Fifteen cases have not answered more than five questionnaire items. A total of 36 cases (8%) were removed from the total responses. There are seven cases have been corrected by using mean values from other subjects (Brick & Kalton, 1996). Thus, a total of 424 sets of questionnaires were used for the final analysis. The construct items in the questionnaire used the 5-point Likert scale, and they were coded as 1- strongly disagree to 5- strongly agree. For descriptive analysis purposes, specific codes have been given to demographic questions to assist in the analysis. The codes for the demographic questions are shown in Appendix D.

After coding, the next step in the data preparation stage is transcribing. Transcribing data involves transferring the coded data from the questionnaires directly into the computer. Since the study used a paper survey, the data need to key-in one-by-one into SPSS Version 25. After data transcribing, data cleaning was performed. Data cleaning is a thorough and extensive inspection for consistency and treatment of missing responses (Malhotra, 2015).

Consistency checking involves the process of carefully examining a complete questionnaire by identifying data that is beyond the scope of permitted, inconsistent, or

of extreme value. Any data that does not comply with the specified coding scheme will not be used in the analysis.

4.3.2 Demographic Analysis

This chapter describes in detail the demographic characteristics of the respondents involved in this study. From the responses, it showed that almost 81.1% of the respondents were from other ranks. The other ranks showed that the respondents with the rank of Corporal (Cpl) were the most personnel involved in this survey with 35.5% followed by Sergeant (18.9%), Lance Corporal (16.3%), Private (14.8%), Warrant Officer Grade 2 (7.3%), and Warrant Officer Grade 1 (1.2%). The results from demographic analysis also showed that 63% of the responses were from clerk background. This was followed by 14.9% of those from general duty background.

In terms of gender, the majority of respondents were men of 336 (79.2%) while women were only 88 (20.8%). On working experience, 27.4% of the respondent have one to four years' experience. Whereas 24.3% of respondents had work experience between 10 and 14 years, followed by 22.4 with 5 to 9 years' experience, 19.1% had 15 to 19 years' experience, 5.0% more than 20 years, and 1.9% less than one years. In term of academic qualifications, majority of the responses were from the personnel who have SPM (GCE O-Level) as their highest academic qualification (70.3%) while 3.5% of the responses were from personnel have only SRP (Lower Certificate of Education) as their academic qualification. 22.6% of responses indicate that MAF personnel have either a diploma, bachelor's degree or master's degree. The demographic profile of the respondents is shown in Table 4.4.

Table 4.4: Respondents Profile

Profile	Frequency	Percentage
Rank: Officer		
2nd Lt	7	8.8
Lt	20	25.0
Capt	32	40.0
Maj	15	18.8
Lt Col	6	7.4
Rank: Other Ranks		
Private	51	14.8
LCpl	56	16.3
Cpl	122	35.5
Sgt	65	18.8
SSgt	21	6.1
WO2	25	7.3
WO1	4	1.2
Track		
Clerk	267	63.0
Technical	31	7.3
Communication	31	7.3
General Duty	63	14.9
Others	32	7.5
Gender		
Male	336	79.2
Female	88	20.8
Age		
Below 25	64	15.1
25-29	148	34.9
30-34	114	26.9
35-39	78	18.4
40 or more	20	4.7
Working Experience		
Less than one year	8	1.8
1 to 4 years	116	27.4
5 to 9 years	95	22.4
10 to 14 years	103	24.3
15 to 19 years	81	19.1
20 years or more	21	5.0
Academic Qualification		
SRP	15	3.6
SPM	298	70.3
STPM	11	2.6
Diploma	32	7.5
Bachelor's Degree	57	13.4
Master's Degree	7	1.7
Others	4	0.9

As for HRMIS usage, 31.8% of the respondents stated that they have more than two years' experience using the system, while only 17.9% have less than six months of experience in using the HRMIS.

In the survey conducted, respondents can freely choose any of the seven purposes of using the HRMIS (more than one) depending on their use. Most personnel used the HRMIS to update personal data by 49.4%, followed by hospital admissions by 15.2%. Pertaining frequency of usage, 46.7% use it once a month, while only 5.9% use the system daily. For the duration of usage, a total of 29.0% use HRMIS within 30 to 59 minutes, and only 2.1% use it more than 6 hours every time they used the system. The detail of HRMIS usage is shown in Table 4.5.

Table 4.5: HRMIS Usage

Usage Characteristics	Frequency	Percentage
Use Experience		
Less than six months	76	17.9
6 to 11 months	89	21.0
12 to 23 months	124	29.2
24 months or more	135	31.8
Purpose of Using the HRMIS		
Updating personal data	382	49.4
Leave application	42	5.4
Parade attendance	12	1.6
Hospital admission	118	15.2
Document verification	93	12.0
Annual work target	96	12.4
Others	31	4.0
Frequency of Usage		
Monthly	198	46.7
Twice a month	119	28.1
Weekly	41	9.7
Twice a week	41	9.7
Every day	25	5.9

Table 4.5: continued

Time Spend of Every Usage		
0 to 29 minutes	112	26.4
30 to 59 minutes	123	29.0
1 to 1 hour 59 minutes	82	19.3
2 to 2 hours 59 minutes	37	8.7
3 to 3 hours 59 minutes	24	5.7
4 to 4 hours 59 minutes	24	5.7
5 to 5 hours 59 minutes	13	3.1
More than 6 hours	9	2.1

4.3.3 Descriptive Statistics

The preliminary data analysis involved descriptive statistics analysis. This section concentrates on giving general information about the respondent's profile. The aim is to present a brief explanation of the sample profile for this research. Frequency analysis was used to calculate the mean, and standard deviation according to the demographic profile. The mean scores for all the items ranged from 3.52 to 4.20, whereas the standard deviation scores ranged from 0.53 to 0.79. All items showed moderate response variability.

The information quality's item lowest mean score was 3.57 (SD = 0.753), while the highest mean score was 3.93 (SD = 0.696). The mean scores for system quality showed that the lowest value was 3.02 (SD = 0.938), and the highest mean value was 3.74 (SD = 0.886). The lowest mean score for the items of service quality was 3.06 (SD = 0.759), while the highest mean score was 3.88 (SD = 0.633). The mean scores for the items of security showed that the lowest mean score was 3.81 (SD = 0.685), and the highest score was 4.15 (SD = 0.652).

The lowest mean scores for the items of the computer self-efficacy were 3.91 (SD = 0.722), and the highest mean score value was 3.98 (SD = 0.723). The mean scores for the

items of the variable commander support that the lowest score was 4.05 (SD = 0.729) and the highest score were 4.28 (SD = 0.679).

The items of technical training showed the lowest mean score was 3.35 (SD = 0.853), while the highest was 3.60 (SD = 0.804). The lowest mean score for the items of individual benefits was 3.91 (SD = 0.734), and the highest score was 4.01 (SD = 0.634). Furthermore, the mean scores for the items of use showed the lowest mean score as 3.75 (SD = 0.702), while the highest score was 3.82 (SD= 0.730). Lastly, the examination of the mean scores of ICT infrastructure showed the lowest mean score as 3.21 (SD = 1.069), and the highest was 3.72 (SD = 0.867). The mean values showed the agreement of respondents with items, and no anomalies were detected. The standard deviations values above 0.5 depicted that the items are diverse. The details of the mean and standard deviation scores for all items are shown in Appendix E.

Besides the mean and standard deviation scores for all items, the mean and standard deviation scores for every variable were also examined. The mean scores ranged from 3.52 to 4.20, whereas the standard deviation ranged from 0.53 to 0.79. Technical training scored the lowest mean with a value of 3.52 (SD = 0.68) while commander support scored the highest mean value 4.20 (SD = 0.57). The mean values showed the agreement of respondents with items, and no anomalies were detected. The standard deviations values above 0.5 portrayed that the items are diverse. The mean and standard deviation scores for all the variables in this study are shown in Table 4.6.

Table 4.6: Descriptive Statistics for the Variables

Variables	Mean	Standard Deviation
Information Quality	3.81	0.59
System Quality	3.56	0.74
Service Quality	3.60	0.53

Table 4.6: continued

Security	4.06	0.58
Computer Self-efficacy	3.94	0.60
Commander Support	4.20	0.57
Technical Training	3.52	0.68
ICT Infrastructure	3.52	0.79
HRMIS Use	3.78	0.60
Individual Benefits	3.94	0.61

4.3.4 Examination of Outliers

An outlier is a case or analytical unit that has unusual data values for a variable that can misinterpret or distort the interpretation of the data (Saunders, Lewis & Thornhill, 2016). When analysing data, appropriate outliers must be distinguished from errors in data entry, calculating, editing, and coding (Cooper & Schindler 2014). There are several methods for dealing with outliers, and this study uses the box plot method to examine the presence of outliers. From the box plots obtained in the analysis, some outliers were found. To analyse the severity of the outliers, comparisons between mean and 5% trimmed mean was carried out, and the results showed 5% trimmed mean value is not significantly different from mean values. Therefore, available outliers are retained in the dataset for further analysis in this study. Details of investigation of box plots are as attached in Appendix F. Table 4.7 shows the mean, and 5% trimmed mean for all variables in this study.

Table 4.7: Mean and 5% Trimmed Mean

Variables	Mean	5% Trimmed Mean	Standard Error
Information Quality	3.80	3.81	0.028
System Quality	3.56	3.57	0.036
Service Quality	3.60	3.60	0.026
Security	4.05	4.07	0.028
Computer Self-Efficacy	3.94	3.95	0.029
Commander Support	4.20	4.22	0.028
Technical Training	3.52	3.54	0.033
ICT Infrastructure	3.52	3.55	0.038
HRMIS Use	3.78	3.80	0.029
Individual Benefits	3.94	3.95	0.030

4.3.5 Normality Test

Normality is used to explain the key concept in statistics which describe the normal distribution and has bell-curve. Lack of normality in variable distributions can mislead the findings of multivariate analysis. It can be verified by measuring the levels of the variable of skewness and kurtosis (Hair et al., 2017). As for skewness is that if the value is greater than +1 or lower than –1, this is a sign of a skewed distribution. For kurtosis, the general principle is that if the number is larger than +1, the distribution is too high. Also, the analysis indicated that values for skewness are within the range of ±1. This showed that all variables are within a normal distribution. Therefore, no further analysis of normality was performed. The values of skewness and kurtosis are shown in Table 4.8.

Table 4.8: Skewness and Kurtosis

Variables	Skewness	Standard	Kurtosis	Standard
Information Quality	-0.126	0.119	0.131	0.237
System Quality	0.068	0.119	-0.634	0.237
Service Quality	-0.093	0.119	0.368	0.237
Security	0.009	0.119	-0.743	0.237
Computer Self-efficacy	-0.158	0.119	-0.062	0.237
Commander Support	-0.182	0.119	-0.683	0.237
Technical Training	-0.586	0.119	0.518	0.237
ICT Infrastructure	-0.587	0.119	0.358	0.237
HRMIS Use	-0.482	0.119	0.643	0.237
Individual Benefits	-0.015	0.119	-0.277	0.237

The linearity test is designed to evaluate the relationship between independent variables. By analysing the P-P (predicted probability) graph, the dependent variable is either linear or non-linear. Linearity is assumed if the relationship between the independent and dependent variable is straight (Hair et al., 2017). The visual observation of the P-P plots displayed in Appendix G shows clearly that no indication of non-linearity

exists on the graphic plots because most dots are on the straight diagonal line. Therefore, linearity between all variables is verified.

4.3.6 Testing for Multicollinearity

In regression analysis, it is obvious to have a correlation between the response and predictor but having correlation among predictors is something undesired. Multicollinearity is a phenomenon when two or more predictors are correlated; if this occurs, the standard error of the coefficients will increase. Increased standard errors mean that the coefficients for some or all independent variables may be noticed to be significantly different from each other. In other words, by overinflating the standard errors, multicollinearity renders some variables statistically insignificant when they should be significant. In the context of SEM, a tolerance value of 0.20 or lower and a VIF value of 5 and higher respectively indicate a potential multicollinearity problem (Hair et al., 2017). Based on that, the multicollinearity problem does not exist in this study. Table 4.9 shows tolerance and VIF values.

Table 4.9: Tolerance and VIF

	Variables	Tolerance	VIF
Dependent Variable: Individual Benefits	Information Quality	0.567	1.763
	System Quality	0.551	1.814
	Service Quality	0.607	1.648
	Security	0.441	2.266
	Computer Self-efficacy	0.486	2.056
	Commander Support	0.385	2.594
	Technical Training	0.520	1.924
	ICT Infrastructure	0.600	1.666
	HRMIS Use	0.479	2.088

4.3.7 Common Method Bias

Common method bias (CMB) or common method variance (CMV) is one of the most frequently discussed issues in the information system community with most of them still not being appropriately identified in the study (Malhotra, Kim, & Patil; 2006). There are various approaches introduced to detect CMV, but most are only able to detect its presence but cannot correct it. However, Kock (2015) has proposed a full collinearity test that recommends the steps which consist of sequential steps start with indicator removal, indicator re-assignment, latent variable removal, latent variable aggregation, and hierarchical analysis to overcome CMV.

For this study, the full collinearity test was used to test for common method bias. Collinearity in multiple regression models is classically characterized as a predictor-predictor phenomenon. Predictors are said to be collinear when two or more predictors measure the same underlying construct or a component of such construct. This means that some of the constructs are highly correlated with each other.

Kock and Lynn (2012) proposed the full collinearity test as a comprehensive method for the concurrent assessment of both vertical and lateral collinearity (Kock, 2015). The existence of a VIF greater than 3.3 is proposed as a symptom of pathological collinearity, and also as a sign that a model may be contaminated by CMV. However, the VIF values more than 3.3 and below 5.0 are still acceptable, particularly in a complex model (Kock, 2015; Hair et al., 2017). All VIFs resulted from the full collinearity test in this study are lower than 5.0. Thus, the model in this study can be considered free of CMV, as shown in Table 4.10.

Table 4.10: Full Collinearity Test

	CSE	Cmdr Support	Info Quality	ICT Infra	PNB	Security	Service Quality	System Quality	Training	Use
CSE		1.858	1.875	1.866	1.836	1.843	1.867	1.828	1.879	1.888
Cmdr Support	2.324		2.336	2.334	2.168	2.097	2.334	2.347	2.299	2.290
Info Quality	2.563	2.545		2.481	2.569	2.468	2.326	2.159	2.453	2.555
ICT Infra	1.767	1.743	1.762		1.756	1.740	1.658	1.757	1.709	1.726
PNB	3.140	2.998	3.222	3.198		3.129	3.194	3.178	3.082	2.876
Security	2.360	2.140	2.311	2.374	2.318		2.322	2.334	2.378	2.392
Service Quality	1.949	1.956	1.847	1.856	1.972	1.942		1.881	1.867	1.950
System Quality	2.742	2.885	2.372	2.727	2.829	2.816	2.574		2.746	2.867
Training	2.067	2.030	2.028	1.998	2.006	2.053	1.960	2.065		1.939
Use	2.334	2.301	2.346	2.291	2.091	2.347	2.286	2.355	2.199	

4.3.8 Non-response Bias

In any study involving surveys, there is a tendency for a condition to be called non-response bias (Lavrakas, 2008). Non-response bias suggests a situation in which people who do not respond to a questionnaire have views that are systematically distinct from the opinions of those who do respond (Plewes & Tourangeau, 2013). This may be due to the respondents' inability or inability to complete the survey. This should be noted when the response rate of a study is low, which is less than the preferential minimum of 50% to 60% response rate (Vedaa, Erevik, Hysing, Hayley, & Sivertsen, 2019). However, although the response rate is high, testing for non-response bias should also be conducted to ensure that the sample studied is free from non-response bias as it can ultimately affect the validity of the findings (Krishnan & Poulose, 2016; Stevens & White, 2018).

This study will use extrapolation methods to test non-response bias, as suggested by Armstrong and Overton (1977). Through this method, two groups divided by the first group are those who respond in the first week, and the second group are those who respond in the second week. The first group was all responses that collected from 14 to

18 May 2018 and the second group was from 21 to 25 May 2018. Comparison of means for all measured variables was performed to test for response tendencies using t-tests. In this study, t-test results indicated that the significance of all variables was above 0.05 (Mooi & Sarstedt, 2019), so it can be concluded that there were no statistically significant differences between the two groups of respondents. Table 4.11 shows the results for the non-response bias for this study.

Table 4.11: Analysis of Non-response Bias

Variables	Early Respondent (14-18 May 2018) (n=243)	Late Respondent (21-25 May 2018) (n=155)	Significance (p-value)
Information quality	3.762	3.865	0.087
System quality	3.788	3.208	0.871
Service quality	3.581	3.640	0.796
Security	4.066	4.032	0.230
Computer self-efficacy	3.929	3.975	0.481
Commander support	4.201	4.176	0.101
Technical training	3.450	3.634	0.220
ICT infrastructure	3.400	3.725	0.138
HRMIS use	3.732	3.837	0.631
Individual benefits	3.929	3.988	0.088

4.3.9 Assessment of Measures

In general, reliability and validity tests are the two-primary assessment of measures in quantitative research. Reliability refers to replication and consistency (Saunders et al., 2017). It refers to the consistency of the measurement or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects. There are many methods and tests available to check reliability, such as inter-rater reliability, test-retest reliability, Cronbach's alpha coefficient and the split-half test. Cronbach's alpha is the most common assessment of internal consistency of items in a scale, which gives an estimate of the reliability based on the intercorrelations of the

observed indicator variables. For Cronbach alpha, the minimum acceptable value is 0.70 (Hair et al., 2017).

The results in Table 4.12 showed that α value for all constructs is above 0.7. The α value for the information quality construct for which the measures were developed was 0.896. The system quality constructs achieved an α value of 0.872, while service quality achieved an α value of 0.831. The value for security was 0.926, whereas training and ICT infrastructure construct achieved a value of 0.913 and 0.912, respectively. The Cronbach's alpha value for computer self-efficacy, commander support, HRMIS use, and individual benefits are 0.901, 0.921, 0.846 and 0.941.

Based on the values of internal consistency and reliability of the scale measurement indicated that the questionnaire used in this study was a reliable measurement tool.

Table 4.12: Reliability Analysis

Constructs	Cronbach Alpha	Number of Items	Number of Items Deleted
Information quality	0.896	6	0
System quality	0.872	6	0
Service quality	0.831	5	0
Security	0.926	7	0
Computer self-efficacy	0.901	6	0
Commander support	0.921	6	0
Technical training	0.913	5	0
ICT infrastructure	0.912	6	0
HRMIS use	0.846	4	0
Individual benefits	0.941	7	0

Validity is the degree of correctness, that is, a scale can accurately measure what it is intended to measure which include effectiveness and correctness of the scale (Zhong, Xu, Dong, Lyu, Liu, & Chen, 2017). Internal validity refers to the extent that observations are

authentic representations (Wang & Hooper, 2017). One of the approaches to assess internal validity is to check for construct validity by using factor analysis techniques (Saunders et al., 2017). Factor analysis refers to a kind of statistical technique which extracts the common factors from each of the variable group (Gong, Shao & Zhu, 2017). In general, there are two basic types of factor analysis methods: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is an interdependent technique whose primary purpose is to define the underlying structure among variables in the analysis (Jayan, Bing & Musa, 2016). It will increase the reliability of the scale by removing inappropriate items and identifying the dimensionality of constructs by examining relations between items and factors when the information of the dimensionality is limited (Yu & Richardson, 2015). In comparison, confirmatory factor analysis (CFA) is a structural equation model that is concerned with the measurement models of the relations between latent variables and observed measurements (Korkmaz, Cakir & Ozden, 2017). This study will use the different dataset for EFA and CFA in order to avoid overfitting stimulating model replicability (DeVellis, 2017; Kyriazos, 2018).

The SPSS was used to perform EFA with 212 of data. In EFA, convergent validity is achieved when items are strongly loaded by their associated factors. Similarly, if item loadings are stronger on its associate factor than other factors, discriminant validity is attained (Hair et al., 2017). A 0.5 cut-off for factor loading was used as the loads are almost significant at 0.5 or higher (Hair et al., 2017).

As shown in Appendix H, the results of EFA showed that almost all items factor loadings were greater than 0.50, and each of these items loads strongly on their associate factors, confirming the convergent and discriminant validity. However, an item from security construct, SY1 – "The data regularly exchanged between the server or/and units are under

a secured network" and item from individual benefits, IB1 – "Using the HRMIS teaches me a lot in managing personal data" were below 0.5 and removed. For item SY1, the removal is justified as most of the participants did not realize and understand the concept of data transfer between terminal and server. For item IB1, the participants might not be aware of how HRMIS teaches them in managing personal data.

4.3.10 Structural Equation Modelling

This study utilises the SEM (Structural Equation Modelling) technique to analyse data by using AMOS Version 26.0 software as well as for validating measurements and testing the hypothesis.

4.3.10.1 Measurement Model

The assessment of measurement model conducted to ensure the quality criteria before proceeding to the structural model assessment. Firstly, the model evaluation focuses on the reliability and validity of the indicators used for each research construct. All the final constructs obtained from the EFA were used in the assessment of the measurement model (Hair et al., 2017). Next, CFA was used to evaluate the measurement model for all constructs, and to describe how measured variables reasonably and systematically exemplify constructs in the model (Hair et al., 2017).

4.3.10.2 Assessment of Measurement Model

As for the measurement models, the estimates for the relationships between the reflective latent variables and their indicators were analysed by using 424 data. The result

of the analysis of the measurement model with all constructs and the number of items is shown in Figure 4.1.

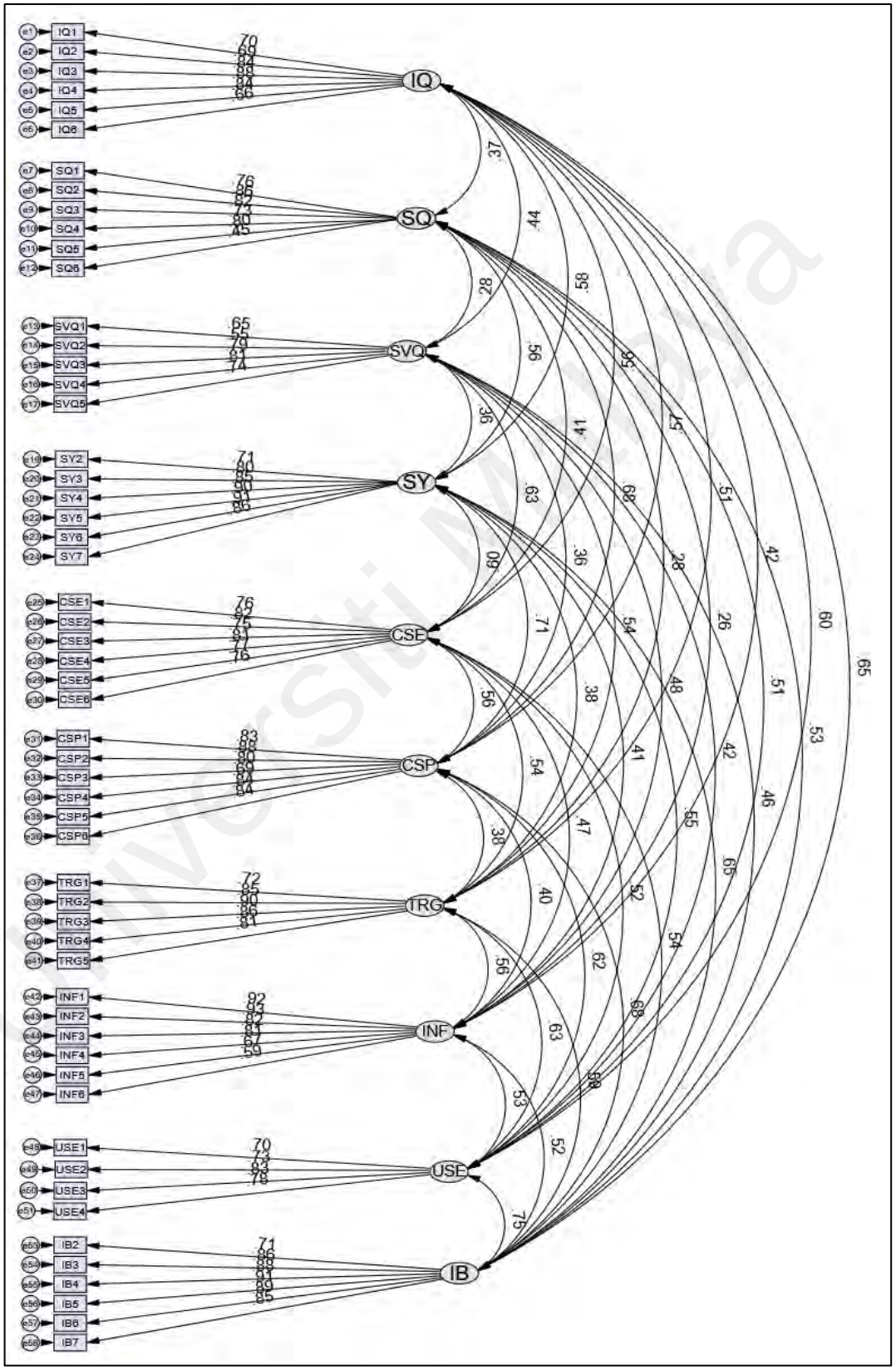

Figure 4.1: Measurement Model with the Constructs and Indicators

The item in the measurement model must have significant loadings in order to make its relevance. This means that an indicator's loading should be above 0.70, and indicators below that value will be deleted (Hair et al., 2017). Figure 4.2 shows the measurement models of this study and the factor loadings of the constructs.

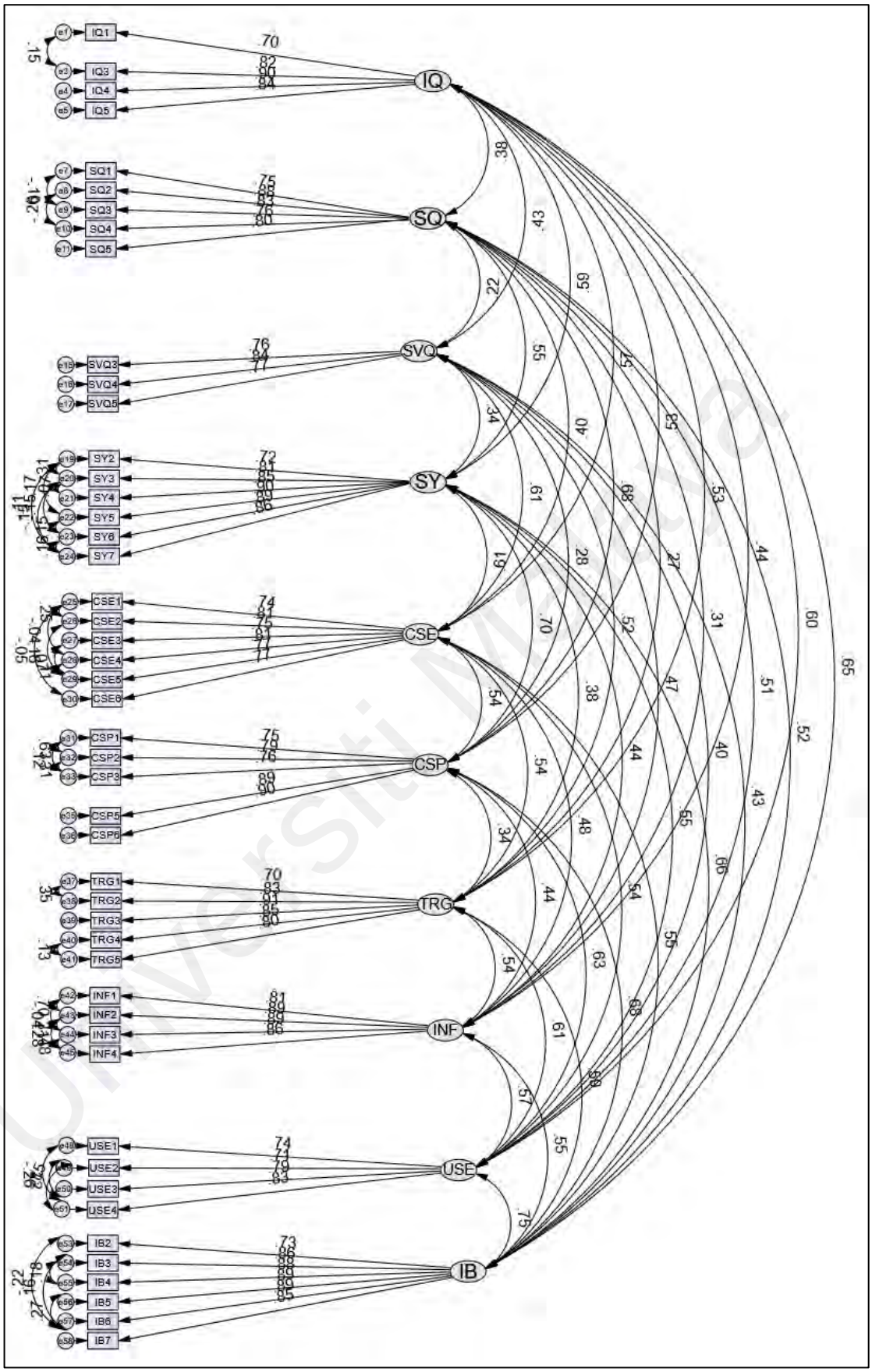

Figure 4.2: Measurement Model with Factor Loadings

As shown in Figure 4.2, most of the indicators' loadings are above the threshold value of 0.70 except for eight indicators. These indicators are IQ2 (0.692), IQ6 (0.659), SQ6 (0.455), SQ1 (0.652), SQ2 (0.554), CSP4 (0.694), INF5 (0.674), and INF6 (0.593). Therefore, all the indicators were discarded from their respective construct (Liang, Choi, & Joppe, 2018; Newaz, Davis, Jefferies, & Pillay, 2019; Hong, Hong, & Choi, 2020). By deleting those indicators, it has drastically increased the AVE of each construct.

Then modification indices are applied at threshold value four, and co-variance is successfully reduced by matching the relevant items. The next step is to assess the standardized residual co-variance by ensuring that all items have a value of less than 2.5 (Hair et al., 2019). All items of this study meet those requirements. The summary of the loadings of the indicators which retained in the model for further analysis is shown in Table 4.13.

Table 4.13: Loadings of the Indicators

Indicator	Outer Loading	Indicator	Outer Loading
Information Quality 1	0.702	Commander Support 1	0.831
Information Quality 2	0.692	Commander Support 2	0.876
Information Quality 3	0.837	Commander Support 3	0.805
Information Quality 4	0.882	Commander Support 4	0.694
Information Quality 5	0.836	Commander Support 5	0.844
Information Quality 6	0.659	Commander Support 6	0.842
System Quality 1	0.758	Technical Training 1	0.725
System Quality 2	0.862	Technical Training 2	0.851
System Quality 3	0.823	Technical Training 3	0.899
System Quality 4	0.734	Technical Training 4	0.856
System Quality 5	0.797	Technical Training 5	0.808
System Quality 6	0.455	ICT Infrastructure 1	0.921
Service Quality 1	0.652	ICT Infrastructure 2	0.929
Service Quality 2	0.554	ICT Infrastructure 3	0.823
Service Quality 3	0.787	ICT Infrastructure 4	0.811
Service Quality 4	0.809	ICT Infrastructure 5	0.674
Service Quality 5	0.741	ICT Infrastructure 6	0.593

Table 4.13: continued

Security 2	0.714	HRMIS Use 1	0.704
Security 3	0.802	HRMIS Use 2	0.730
Security 4	0.850	HRMIS Use 3	0.834
Security 5	0.902	HRMIS Use 4	0.784
Security 6	0.908	Individual Benefit 2	0.707
Security 7	0.862	Individual Benefit 3	0.858
Computer Self-efficacy 1	0.756	Individual Benefit 4	0.881
Computer Self-efficacy 2	0.817	Individual Benefit 5	0.909
Computer Self-efficacy 3	0.753	Individual Benefit 6	0.892
Computer Self-efficacy 4	0.813	Individual Benefit 7	0.850
Computer Self-efficacy 5	0.768		
Computer Self-efficacy 6	0.757		

The composite reliability measures the consistency of a construct based on its indicators (Palos-Sanchez, Saura, & Martin-Velicia, 2019). Composite reliability is a better measure of internal consistency because it avoids underestimation often detected with Cronbach's alpha and adapts differences in indicator reliabilities expected by SEM (Avkiran & Ringle, 2018). A composite reliability value greater than 0.70 is considered sufficient (Khan & Mohsin, 2017). The composite reliability values for this study were between 0.823 and 0.941, which is higher than 0.70. These values indicate that all constructs in this study have sufficient internal consistency.

Convergent validity is based on the idea that items or scales that measure a similar concept should be strongly correlated to each other, whereas other items or scales that measure unrelated concepts should have a weak correlation to one another, which indicates discriminant validity (Kouwenberg, 2019). The average variance extracted (AVE) is a common measure to examine convergent validity. AVE greater than 0.50 is preferred; this ratio implies that greater than 50% of the variance of the reflective indicators have been accounted for by the latent variable. AVE is only applicable to the reflective measurement model (Avkiran & Ringle, 2018). The AVE values for this study

were between 0.585 and 0.762, which is higher than 0.50. These values suggest that all constructs in this study have sufficient convergent validity which means that they are strongly correlated with each other. It proves that all items for each construct are loaded significantly, and at the same time, the value of the correlation construct is all lower than the square root of AVE. Table 4.14 shows all the values of composite reliability and average variance extracted (AVE) of the constructs of this study.

Table 4.14: Construct Reliability and Convergent Validity

	CR	AVE	IQ	SQ	SVQ	SY	CSE	CSP	TRG	INFRA	USE	IB
Information Quality	0.889	0.668	**0.817**									
System Quality	0.896	0.634	0.349	**0.796**								
Service Quality	0.823	0.608	0.315	0.280	**0.780**							
Security	0.909	0.709	0.501	0.550	0.297	**0.842**						
Computer Self-efficacy	0.902	0.605	0.459	0.429	0.639	0.473	**0.778**					
Commander Support	0.923	0.705	0.377	0.634	0.186	0.612	0.390	**0.840**				
Technical Training	0.917	0.689	0.509	0.288	0.578	0.321	0.530	0.176	**0.830**			
ICT Infrastructure	0.927	0.762	0.468	0.417	0.628	0.406	0.532	0.345	0.672	**0.873**		
HRMIS Use	0.849	0.585	0.585	0.517	0.380	0.487	0.419	0.461	0.574	0.619	**0.765**	
Individual Benefits	0.941	0.726	0.627	0.565	0.425	0.605	0.460	0.563	0.563	0.542	0.651	**0.852**

4.3.10.3 Model Fit

The chi-square ($\chi 2/df$) test is also called the Kai Squared. The chi-square test is one of the non-parametric statistical tests which is quite often used in research that uses two variables, where the data scale of the two variables is nominal or to test for differences in two or more sample proportions. Chi-square test is applied to cases where it will be tested whether the frequency to be observed is to prove or there is a significant difference or not with the expected frequency. The chi-square value that has a value close to 0 suggests

that the model has a perfect fit. In this study, the chi-square value was 1.670 and achieved the recommended value, which should be below 3.000.

The Tucker Lewis Index (TLI) is an incremental suitability index that compares the tested model with the baseline model. TLI is used to solve problems that arise due to the complexity of the model. The recommended acceptance value is a TLI equal or larger than 0.900. TLI is an index that is less affected by sample size. The TLI value for this study is 0.955.

The Comparative Fit Index (CFI) is an incremental suitability index. The scale of this index is in the range of 0 to 1, and a value close to 1 suggests that the model has a good level of fit. This index is highly proposed to use because it is relatively insensitive to sample size and less influenced by the complexity of the model. The proposed acceptance value is a CFI equal to or larger than 0.900. The CFI value of this study is 0.960.

The Incremental Fit Index (IFI) is used to address parsimony and sample size. Values range from 0 to 1, with greater values being better. An IFI value equal to or greater than 0.900 indicates a good fit. The CFI value of this study is 0.960.

The RMSEA (Root Mean Square Error of Approximation) is an index that can be used to recompense for the chi-square statistic in a large sample. The RMSEA value shows the likely goodness-of-fit if the model is estimated in the population. According to Ferdinand (2002), the RMSEA value which is smaller or equal to 0.080 is an index for the acceptance of a model that shows a close fit of the model based on degrees of freedom. RMSEA below 0.050 recommends a close fit of the model in relation to the degrees of freedom (Browne & Cudeck, 1993). The RMSEA value of this study is 0.040.

The Goodness Fit Index (GFI) contains the model fit index, which is frequently used as a reference for evaluating fit models. GFI is an index of the accuracy of the model in explaining the model being constructed. In order to ascertain the fit model based on GFI, the expected GFI value is ≥ 0.90. The GFI value varies from 0.00 (poor fit) to 1.00 (perfect fit) (Joreskog & Sorbom, 1993). The GFI score for this study is 0.862. Although the value for GFI does not exceed 0.9 (the threshold value), it still meets the requirements recommended by Baumgartner and Homburg (1995), and Doll, Xia, and Torkzadeh (1994), whose stated that the value is acceptable if higher than 0.80. The list of the goodness of fitness indices is shown in Table 4.15.

Table 4.15: Goodness of Fitness Indices

Quality-of-fit measure	Recommended value	Structural model
$\chi 2$/df	≤3.00	1.670
TLI	≥0.90	0.955
CFI	≥0.90	0.960
IFI	≥0.90	0.960
RMSEA	≤0.08	0.040
GFI	≥0.90	0.862

4.3.10.4 Structural Model Assessment

From the analysis, the measurement model is found reliable and valid. The next step is the assessment of the structural model, where the estimates of path coefficients and R^2 were evaluated. In the structural model, the estimated values for path relationships should be calculated in terms of sign and scale. The significance of the hypothesised relationship was assessed using bootstrapping. The bootstrap signifies another nonparametric approach for estimating the accuracy of the SEM estimate. The structural model with path coefficients and R^2 value is displayed in Figure 4.3.

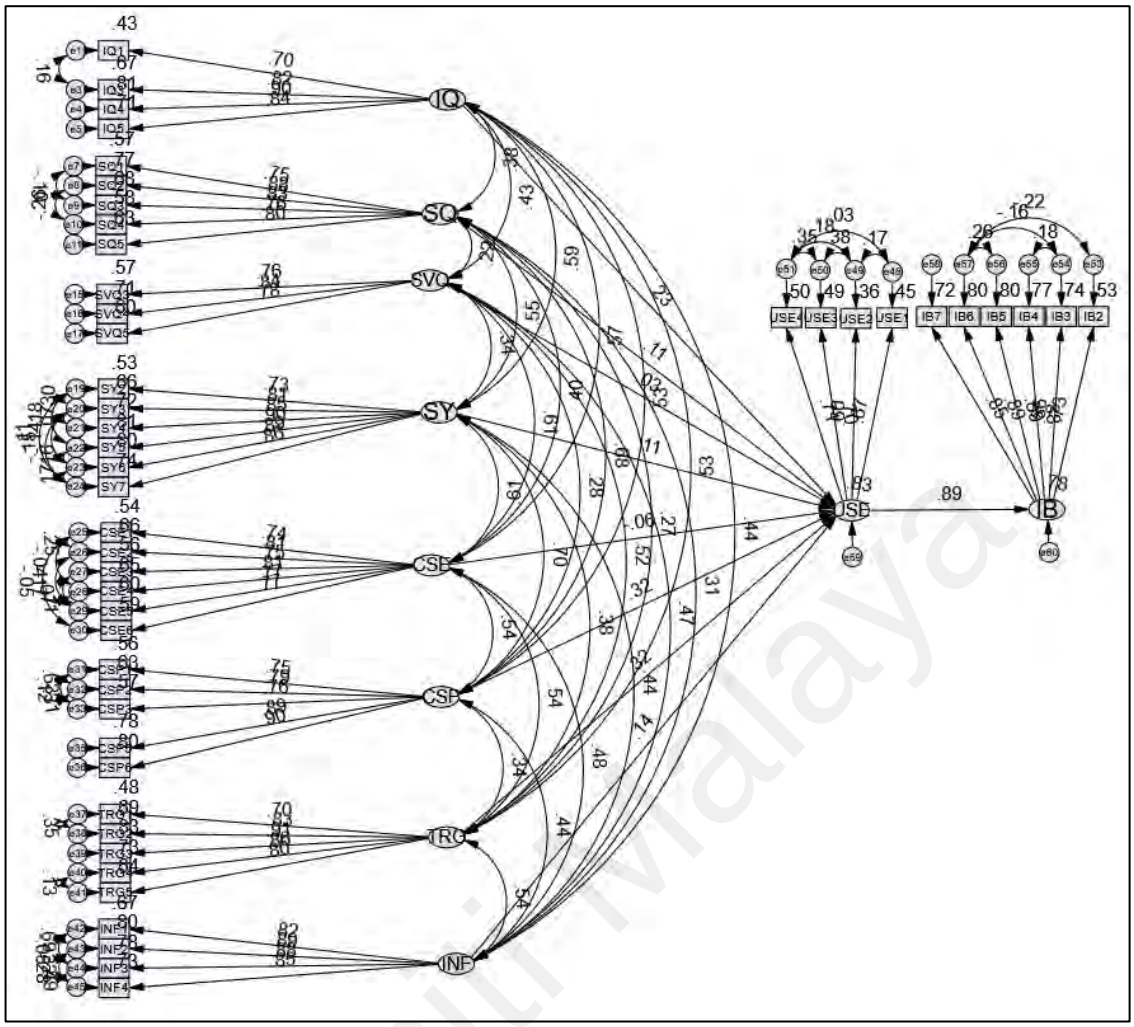

Figure 4.3: Path Coefficient Values

Coefficient of determination, R^2 (squared multiple correlations) of endogenous latent values are the most important criteria to assess the structural models. R^2 value illustrates the amount of variance supported by the other variables in the model. R^2 of endogenous latent variables varied between 0 and 1, where a greater value signifies a better path model estimation (Amin, Azhar, Amin, & Akter, 2015). According to Chin (1998), R^2 values of 0.67, 0.33, or 0.19 for endogenous latent variables in the path model are defined as substantial, moderate, or weak. The result from this study shows the R^2 value for the endogenous latent variables the HRMIS use was 0.833, and individual benefits was 0.785, which is considered as substantial.

Another essential criterion for evaluating the structural model is the estimates of path coefficients. A path coefficient is showing an independent variable's direct effect on a dependent variable in the path model. Estimated values should be measured in terms of sign and scale for path relationships in the structural model (Hair et al., 2017). Path coefficients have standardised values between -1 to +1, where the values close to +1 signifies a strong positive relationship and vice versa. In term of magnitude, the path coefficient values close to 1 indicate a very strong relationship between variables. On the other hand, very low values close to 0 denoted very poor relationship and considered as not statistically significant.

The path coefficient values exhibited that the relationship between the HRMIS usage and individual benefits might be strong, as the path coefficient value was 0.886, whereas the relationship between information quality (0.232), system quality (0.114), service quality (0.028), security (0.113), computer self-efficacy (-0.060), commander support (0.317), technical training (0.323), and ICT infrastructure (0.138) were weak as the path coefficient values were near to 0. Therefore, a bootstrapping procedure was applied to assess the significance of path coefficients by using t-value.

This procedure provides a significance test with t-value, whether a path coefficient is truly distinct from zero in the population (Hair et al., 2017). Commonly used critical values for two-tailed tests are 2.57, 1.96, and 1.65 for significance levels of 1%, 5%, and 10%, respectively. The assessment of structural model with t-values is displayed in Figure 4.4.

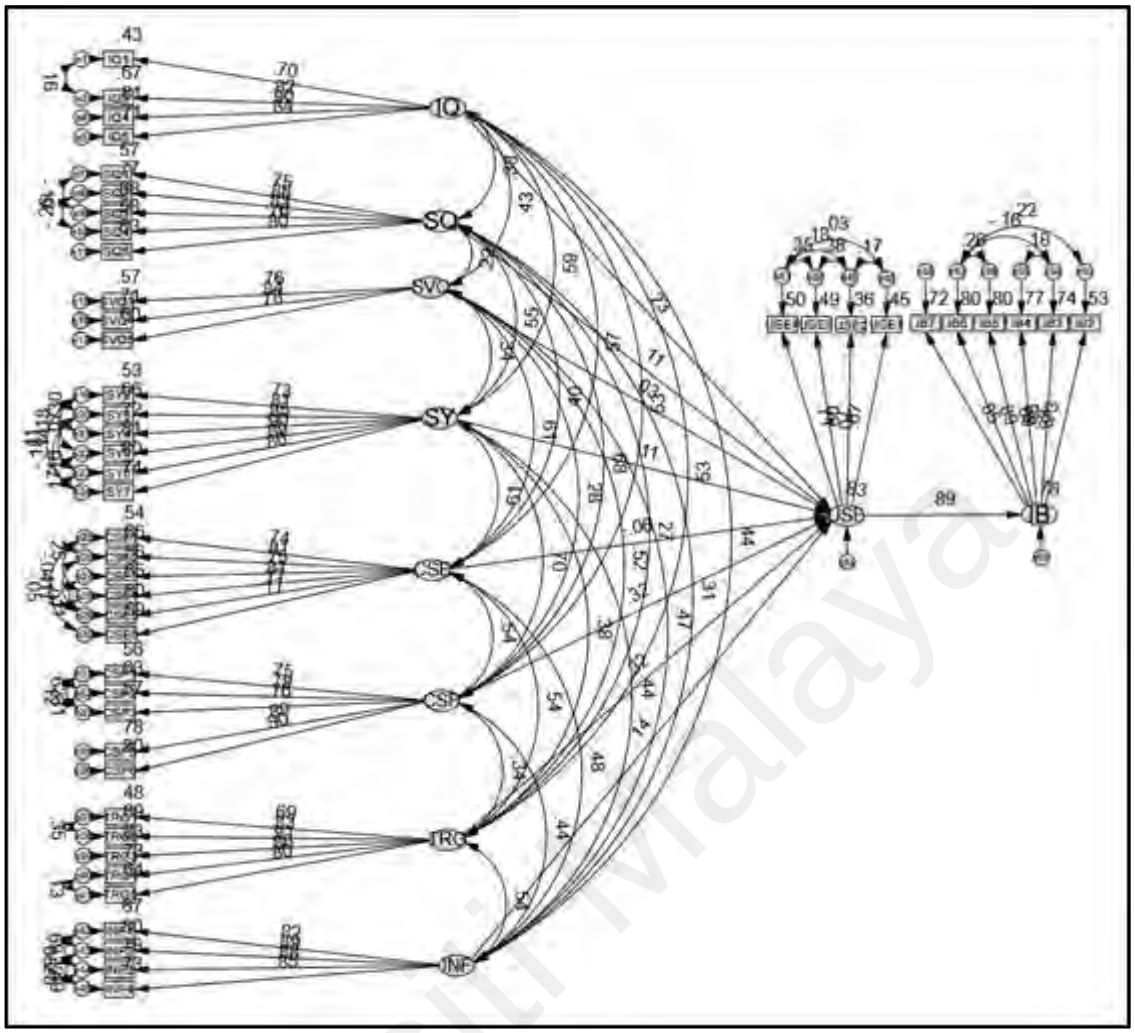

Figure 4.4: Assessment of Structural Model

The t-values results >1.96 showed that system quality and security significantly influence the HRMIS usage in the MAF. Similarly, information quality, commander support, technical training, and infrastructure with t-values >2.57 significantly influence on the HRMIS use. The HRMIS use with t-value 14.661 significantly influence individual benefits. However, t-values for service quality and computer self-efficacy are below than 1.96, and this indicates no significant relationship with HRMIS use.

4.3.10.5 Hypothesis Testing Results

The hypothesised relationships are based on the structural model as proposed in the early stage of this study. The summary of the hypotheses testing results is summarised in Table 4.16.

Table 4.16: Summary of Hypotheses Testing

Hypothesis	T-Value	P-Value	Result
H1: There is a relationship between information quality and the use of HRMIS.	4.580***	0.000	Supported
H2: There is a relationship between system quality and the use of HRMIS.	2.444**	0.015	Supported
H3: There is a relationship between service quality and the use of HRMIS.	0.569	0.569	Not supported
H4: There is a relationship between security and the use of HRMIS.	2.111**	0.035	Supported
H5: There is a relationship between computer self-efficacy and the use of HRMIS.	-1.072	0.284	Not supported
H6: There is a relationship between commander support and the use of HRMIS.	5.167***	0.000	Supported
H7: There is a relationship between technical training and the use of HRMIS.	6.489***	0.000	Supported
H8: There is a relationship between ICT infrastructure and the use of HRMIS.	3.099***	0.002	Supported
H9: There is a relationship between the use of HRMIS and individual benefits.	14.661***	0.000	Supported

*** p<0.01 (>2.58), ** p<0.05(>1.96), * p<0.10(>1.645)

4.4 Summary

This chapter describes the data analysis process for this study. The data collected were cleaned for analysis preparation. IBM SPSS Version 25.0 software is used for descriptive statistical analysis involving parameters such as frequency distribution, central tendency

measurement and variance distribution of the studied. This software is also used for EFA testing. Then, the structural equation modelling (SEM) technique using SEM AMOS Version 26.0 software was used for data analysis, using two steps: measurement model and structure model. In addition, discriminant validity and convergent validity were examined. The SEM AMOS Version 26.0 also used to test the relationships hypothesised by the research model. By using structural equation modelling and hypotheses testing on the proposed framework, it was found that seven of the nine hypothesised relationships (Hypothesis 1, 2, 4, 6, 7, 8 and 9) were significant, while two hypotheses were not significantly supported (Hypothesis 3 and 5). The six fitness indices used to test this framework, namely chi-square, TLI, CFI, IFI, RMSEA, and GFI have proven that this model achieves the recommended value.

In the next chapter, the main findings of this study are discussed in detail. These findings are compared with the results of previous research and are justified in the context of MAF. Later, the theoretical and practical contributions of this study are described. Some limitations of the study are also discussed. Subsequently, several recommendations based on the results of the study are presented for MAF consideration. Finally, a proposal is put forward to continue this study in a broader scope and context.

CHAPTER 5: CONCLUSIONS

5.1 Introduction

This chapter is the final part of this dissertation and has six sub-sections. The first section will discuss the summary of the research that has been conducted. Section two discusses the findings made in Chapter 4 and compares them with similar studies previously conducted by other researchers. Whereas section three discusses the theoretical and practical contributions made through this study. The next section is section four, which discusses the limitations of this study. Finally, section five proposes further studies that may be pursued by expanding the findings in this study.

5.2 Summary of Research

The ultimate aim of this study is to examine the factors that affect HRMIS usage among the MAF personnel and its impact on individual benefits. The methodology and procedures used throughout this study were to resolve four research questions and achieve four research objectives, as described in Chapter 1.

The study was initiated by obtaining necessary information on the problems of the information system in the MAF that could be used as the scope of this study. It was done by collecting the appropriate information at the Defence Communications and Electronics Division (DCED), MAF Headquarters. As a result of an earlier study at DCED, one of the most widely used systems is the HRMIS. It is a similar HRMIS that has been used by the Public Service Department since 1999. However, the implementation in the MAF is not satisfactory as was reported by MINDEF Internal Audit in 2017. Therefore, this study

aimed to investigate this issue in detail. Extensive literature review and content analysis have been done by obtaining as much literature as possible on the information system as well as technology adoption and technology acceptance. Content analysis that has been conducted has facilitated to comprehend the causes and factors linked with the problems in using the HRMIS by comparing the use of information systems and other technologies in the literature. Based on the outcomes of the content analysis of 229 articles, it was discovered that nearly all of the previous studies were carried out from an individual point of view. Therefore, this was one of the rationales to perform the current study on defence organisation in Malaysia, which facilitate in-depth investigation of HRMIS usage and its impact on MAF personnel.

Based on the results of the content analysis and review of literature, research questions, and research objectives were identified. The next step is to get the appropriate and accurate respondents for detailed information on usage issues related to implementing the HRMIS in the MAF. This study used focus group approach to identify factors that influence HRMIS use in MAF units. The focus group discussion is essential as it will allow users to openly generate ideas and opinions on what they feel from the HRMIS user perspective. Expert interviews were conducted after FDGs, which is to confirm and clarify the issues discussed previously in the FGDs.

Two groups of personnel were interviewed regarding the performance of the HRMIS, usage, its impact, benefits, and other issues. By using constant comparison methods, the categories were identified from the interview transcripts. Based on the FGD and interview findings, then a suitable framework for the study was identified.

The DeLone and McLean ISSM with other variables were integrated to form the research framework for the study. For the survey questionnaire, most of the items for the variables were adapted from previous studies. Only three items were developed from FGDs and expert interviews: two items for ICT infrastructure and one item for commander support. All the items were pre-tested by using the content validity process. Six experts were asked to review the draft of questionnaire items to ensure whether it was consistent and reliable with the constructs. Based on the value of content validity index (CVI), except one item, others were retained for the next analysis.

Next, a pilot study was performed with 30 respondents who are MAF personnel who had used HRMIS. It is conducted to measure the reliability of the questionnaire. The internal consistency reliability was assessed using Cronbach's alpha value. All the items were found to be reliable with Cronbach's alpha larger than 0.7. Subsequently, the questionnaire for this study was finalised. A total of 150 MAF units were selected with each unit distributed with five questionnaires by using the MAF mail system, SDS (Signal Dispatch Service).

Altogether 750 questionnaires were mailed, and 460 questionnaires were returned, giving a response rate of 61.3%. Among 460 responses, 36 questionnaires were discarded as they were incomplete during the data cleaning process. The remaining 424 responses were transferred to the IBM SPSS Version 25.0 software to perform basic analysis such as descriptive analysis, normality test, multicollinearity test, common method bias, non-response bias, and exploratory factor analysis (EFA). From the EFA, two items (SY1 and IB1) were removed because the loading factor was less than 0.5.

In this study, AMOS Version 26.0 was used for validating measurement and testing the hypotheses. The first step is to examine the measurement model and then the structural model.

In the factor loadings testing, eight indicators were below the threshold value of 0.70 and were discarded as it affected composite reliability and AVE. All the other items were preserved in the study for the next analysis. The next tests in the measurement model were composite reliability, AVE, convergent validity, and discriminant validity. For the composite reliability test, all constructs exceeded the threshold value of 0.70. For convergent validity tests, all AVE value exceeded the threshold value of 0.50. The discriminant validity achieved as all the square root AVE for each construct was larger than the correlation between constructs. This result indicated there were no issues of correlations between constructs in this study.

At the end of the measurement model assessment, only one item was removed, and all other items were retained for structural model assessment. Structural model assessment involves R^2 assessment, path coefficient and effect size. The evaluation of R^2 of endogenous latent values shows that the value is 0.833 for construct HRMIS use and 0.785 for individual benefits where it is rated as substantial whereas the path coefficient test with bootstrapping procedure showed six constructs reaching the value greater than 1.96. The constructs are information quality, system quality, security, commander support, technical training, and ICT infrastructure.

5.3 Discussion of the Findings

5.3.1 HRMIS Usage

The results show that 135 users involved in the survey have used HRMIS for more than two years. A total of 124 users have been using the system for one to two years. The rest have been using the HRMIS for less than a year. Although the system has been in the service of the MAF for more than two years, the result of this study shows that some personnel are using the system for less than a year. This may be due to the unavailability of the system in their units, especially for those who work in units that are isolated and far away from the population area. Moreover, the HRMIS usage also depends entirely on the unit commander as well as the individual or personnel themselves. Awareness of the benefit of HRMIS is the key driver to the continued use of HRMIS in every unit in the MAF.

5.3.2 Purpose of HRMIS Usage

Most of the personnel involved in this study used the HRMIS to update personal data with 372 people from 424 users. In addition, they often use this system to manage hospital admissions, especially when there is a need for themselves or for their next-of-kin. Other functions that MAF personnel use most are leave applications, documents verification, and annual work targets. While other functions such as parade attendance are not widely used because only certain personnel use the functions because of their rank and appointment.

HRMIS developers and HRMIS project team need to add other system functions that are useful to the users. This could motivate the personnel to use the system. At the same

time, it is also very important to gain feedback from HRMIS users and improve the system accordingly. This will eventually improve the usability of the system.

The findings of the purpose of HRMIS usage have answered Research Question (1), "What are the HRMIS functions used by the MAF personnel?" and achieved Research Objective (1), “To identify the HRMIS functions used by the MAF personnel”.

5.3.3 Frequency and Duration of HRMIS Usage

The frequency of use of HRMIS in this study was not so favourable as only 5.9 per cent used the system daily. Meanwhile, 46.7 per cent of 424 users use the system once a month. In terms of usage duration, most users spend between 30 and 60 minutes each time using the HRMIS.

It may be understood that HRMIS is just a tool for management, whereas as military personnel, most of MAF personnel still need to accomplish other important tasks and duties. It can also be interpreted that once the data and information have been updated, there is little time to spend each time they use HRMIS. Again, the diversity of functions in HRMIS will determine the frequency and duration of its use. To improve this, more interactive features and useful functions needs to the included in HRMIS.

The findings on frequency and duration of HRMIS usage have answered Research Question (2), “What is the rate of usage of the HRMIS by MAF personnel?” and accomplished Research Objective (2), “To discover the rate of the HRMIS usage by the MAF personnel”.

5.3.4 Factors Influencing the HRMIS Usage

The findings in this study indicated that information quality was found to have a significant relationship with HRMIS usage (P <0.01). These findings also suggested that information quality has important implications for ensuring that MAF personnel use HRMIS. These findings are coherent with previous studies that discovered information quality has a significant effect on the use of an IS (Tam & Oliviera, 2016; Wang & Yang, 2016). Previous studies findings also emphasise how service providers need to focus on information quality in user's perspective (Chen, Chua, & Deng, 2018). This requirement is important for systems involving web-related services, as this is the most popular information interface and presentation (Cheng, Wu & Chen, 2018).

The higher the quality of the information gathered from the system; the more users are likely to use it. Similarly, a system that requires user input to update its data depends on users because non-updated information will cause the information in the system to be inaccurate. It was supported by a previous study which found that if data in the system were not updated, then it would be affected the information quality of a particular system (Sinisalo, Karjaluoto, & Saraniemi, 2015).

In the context of the HRMIS MAF, the higher the quality of information contained in HRMIS, the higher the level of HRMIS usage. As such, it is the role of users to ensure their information in HRMIS is up to date. Other than that, the updated information will be used by other users to produce other document or statistics. The process of updating and verifying the data ensures that the HRMIS database contains high quality and accurate data. At present, the processes and procedures for updates are fulfilled by HRMIS users. It is the

role of each administrative officer in the MAF units to ensure that this matter continues to be practised and adhered.

Another significant determinant of the HRMIS usage that had been identified in the study is system quality ($P < 0.05$). Findings demonstrated that system quality has a positive relationship with the use of HRMIS by MAF personnel. This means that the use of HRMIS will increase with the quality of the system. These findings are also supported by previous studies which found that the use of a system is determined by system quality that includes the specifications and interfaces of the system (Wang & Yang, 2016; Ramirez-Correa, Rondan-Cataluaa, Arenas-Gaitan, & Alfaro -Perez, 2017).

MAF personnel who used HRMIS believe the system is reliable and always available to the users. The web-based and easy-to-use design facilitates the personnel to make use of HRMIS in their daily activities. In most situations, the determination of the quality of a system depends on the system developer. They should understand the user needs and improve the quality of the system to meet user expectations.

ICT infrastructure also was identified as a significant factor that influenced the HRMIS usage in the MAF ($P<0.01$). It means that the ICT infrastructure is an influential factor in encouraging users to use the HRMIS. Previous studies have also yielded similar results in which ICT infrastructure is positively related to the use of an information system (Ahmadi et al., 2016). It is well known that the infrastructure requirements, which include network infrastructure as well as computer hardware, are the underlying factors influencing the use of information systems.

In most cases, even the best systems will not succeed if not supported by a complete infrastructure. Inadequate ICT infrastructure will certainly make the system unusable for users (Ooi & Tan, 2016). During the FGDs, some respondents raised issues regarding the lack of computer terminals to access HRMIS. This should be noted by the top authorities in the MAF by making additional procurement of computer terminals to be supplied to all units in the MAF. From expert interviews, there are still units that do not have the HRMIS network due to geographical and economic factors. For those units, the option is to utilise wireless networks by using directional microwave and satellite communications which can save upfront costs.

Results from this study indicate that security had a significant relationship with HRMIS usage ($P<0.05$). These findings are also supported by previous studies found that security factors were associated with the use of systems (Salimon, Yusoff, & Mokhtar, 2017; Farooq, Ahmad, Lorenz, & Isoaho, 2020).

Most HRMIS users are confident with the management, technology, and security specifications of the system. Basically, they understand the importance of security, and the impact it has on the information resided in HRMIS. However, this understanding and awareness need to be enhanced by conducting continuous security awareness programs (Bauer, Bernroider, & Chudzikowski, 2017). HRMIS users feel that security is a big concern. They are familiar with the security features of using usernames and passwords as they are accustomed to accessing online systems or other applications (Jeske, & Van Schaik, 2017; Chaudhary, Schafeitel-Tahtinen, Helenius, & Berki, 2019).

The findings also revealed that the commander (top management) support is an essential factor that determined the use of HRMIS ($P<0.01$). These findings are in line with FGDs

and interviews conducted as well as previous studies (Wang, Li, Li, & Zhang, 2016; Aldosari, Al-Mansour, Aldosari & Alanazi, 2018). Top management supports the use of a system by issuing usage instructions to ensure the system is used by their subordinates. At the same time, they are also involved in allocating funds and resources to enable the system to be used effectively (Hermano & Martin-Cruz, 2016).

In any hierarchical organisation, the top management plays an essential role in directing the implementation of a system. Similarly, leaders in the military organisation also have specific authority in performing their job through written or verbal instructions where every instruction needs to be obeyed and must be performed without any question. In the context of the MAF, all commanders need to ensure HRMIS is used by their personnel. In addition, the commander is responsible for ensuring that the HRMIS operations in their units are functioning correctly and that they need to stay in touch with technical support in the event of system disruption.

Another important determinant of HRMIS usage is technical training ($P<0.01$). This result is supported by findings from previous studies found that technical training had a significant effect on the use of an information system (Bradford & Florin, 2003; Lee, 2008). These findings are also in line with the opinion given by the FGDs respondents who stated that the technical training they had undergone had helped them to use HRMIS. In the broader context, technical training is an important factor to enable or accelerate technology acceptance or adoption in an organisation (Gellerstedt, Babaheidari, & Svensson, 2018).

In the MAF, it is the role of the system developer as well as the procurement team to provide adequate training of HRMIS usage. The training should cover all levels for both regular users and system administrators. In addition to technical training, the training

provider in MAF also needs to implement train the trainer concept where the trained personnel are able to teach others. This approach will save MAF costs by reducing the number of courses organised by the service provider, as the unit can handle the training internally.

Two findings of this study were found to be insignificant with the use of HRMIS, namely service quality and computer self-efficacy. Service quality was the first factor found to be insignificant to HRMIS use. The finding can be inferred that the service quality will not influence the user to use the HRMIS. The result on service quality was consistent with previous study's findings stated that service quality is not always related to the usage of the technology (Petter & McLean, 2009; Chang, Pang, Tarn, Liu, & Yen, 2015; Tam & Oliviera, 2016; Fadhel et al., 2017). This finding is closely related to the failure of the service provider to achieve a certain level of users' perception regarding technical assistance (Lien, Cao, & Zhou, 2017). In addition, the IT department that manages the system is not responsive enough and not achieved the user's expectation (Choi, Kwon, & Shin, 2017).

In the context of HRMIS service quality, it involves the issues of interaction between HRMIS users and system developers as well as the HRMIS project team. Interactions should occur before, during and after HRMIS has been officially commissioned. Prior to the development of HRMIS, the developers need to interact with the personnel to understand user requirements. Similarly, when a system is being developed, the user suggestions need to be considered for system improvement. After the system has been implemented, proper services need to be provided to the users in the form of direct assistance while they are using the system. However, from this study, it was found that service quality does not have a significant effect on the use of HRMIS. This may be due

to the lack of interaction that has been mentioned earlier. This situation causes HRMIS users to be unaware and less concerned about the quality of service provided by the system developers and the HRMIS project team

The last insignificant factor was computer self-efficacy. This factor is consistent with prior studies which suggested that computer self-efficacy, not a significant factor in influencing users to use the system (Gallivan, Spitler, & Koufaris, 2005; MacLeod, Yang, Zhu, & Shi, 2017). This may be due to respondents' failure to be aware and to evaluate their ability in using any information system (Flores, Holm, Svensson, & Ericsson, 2014).

In MAF, most users are unaware that they may need technical skills to use HRMIS, as the use of HRMIS is different from other work processes. The MAF setting has caused users to be less concerned about computer self-efficacy, they still need to use the HRMIS as the higher authorities have instructed it.

Based on the findings in this study, the factors influencing the use of HRMIS by MAF personnel have been confirmed as information quality, system quality, security, ICT infrastructure, commander support, and technical training. This finding explicitly answered the Research Question (3), “What are the factors that influence the usage of the HRMIS amongst the MAF personnel?” and achieved the Research Objective (3), “To determine the factors that influence the usage of the HRMIS amongst the MAF personnel”.

5.3.5 Impact of the HRMIS on Individual Benefits

The important findings of the study are the identification of benefit gained from HRMIS usage. The findings in this study answered the Research Question (4), “How does

the use of the HRMIS benefit the MAY personnel?" and accomplished the Research Objective (4), "To investigate the impact of the HRMIS usage to the MAY personnel". The qualitative results also assisted revealed that the HRMIS had helped to improve the performance of the personnel in various ways.

As mentioned earlier, the results revealed that the HRMIS usage has a positive impact in terms of individual benefits ($P<0.01$). Furthermore, the descriptive analysis shows the mean for individual benefits items ranged from 3.89 to 4.01. The highest value item, IB2 (Individual Benefits 2), denotes that personnel who were using HRMIS have improved their skills and knowledge in term of personal record management. MAF personnel also found that HRMIS teaches them to manage personal data more systematically. They also acknowledge that by using HRMIS, the quality of their work has improved. In addition, the descriptive analysis also shows that HRMIS has helped them to improve job performance and finish the tasks faster.

According to DeLone and McLean (2004), the existence of a good level of system usage will have a positive impact on the individual and organisation. This means that only users who use a system will benefit directly from its use. The more they use it, the more benefits they get.

From the MAF personnel standpoint, the use of HRMIS will improve individual job performance. It explains how the use of HRMIS has facilitated MAF personnel to complete their work faster and achieve annual work targets. In addition, their work output will also be in better quality because HRMIS produced better results than the manual method. For example, personal performance reports provided in HRMIS is in a better format than the manual method and does not take time to produce. In addition, the same data may be used

in the future, where it will only need to be updated frequently. It is evidenced by Lu, Morris and Frechette (2015), who found that the use of technology has succeeded in producing a high-quality product by optimising the appropriate technology and organisation's resources.

At the different command level, senior officers able to make quick decisions by utilising the statistics of personnel in HRMIS. For instance, a list of personnel who will be retiring in a particular year can be produced in a shorter time; thus, they able to plan for new recruitment. It is supported by Sun, Lee, and Law (2018) which states how well managers in the modern world perform, heavily relies on the effectiveness of the technology. Therefore, it can be concluded that the HRMIS usage has helped the MAF personnel to enhance job performance, work productivity, and decision making. Table 5.1 shows a summary of the research findings.

Table 5.1: Summary of Research Findings

Research Questions	Research Objectives	Research Methods	Research Hypotheses	Research Findings	Previous Research
1. What are the HRMIS functions used by the MAF personnel?	To identify the HRMIS functions used by the MAF personnel.	Survey	-	Updating personal data, hospital admission, annual work target, document verification, leave application. Most of the users use HRMIS to update their data (87.8%)	-
2. What is the rate of usage of the HRMIS by MAF personnel?	To discover the rate of HRMIS usage by the MAF personnel.	Survey	-	Most HRMIS users use it monthly (46.4%), while 28.7% use it twice a month. 28.3% use it for 30 to 59 minutes, and 25.6% use HRMIS for 29 minutes each.	-
3. What are the factors that influence the usage of the HRMIS amongst the MAF personnel?	To determine the factors that influence the usage of the HRMIS amongst the MAF personnel.	FGDs, interviews and survey	H1: There is a relationship between information quality and the use of HRMIS.	Supported	Petter & Fruhling (2011), Estelami & Eom (2012), Gaardboe et al. (2017)
			H2: There is a relationship between system quality and the use of HRMIS.	Supported	Estelami & Eom (2012), Roky & Meriouh (2015)
			H3: There is a relationship between service quality and the use of HRMIS.	Not supported	Urbach, Smolnik, & Riempp (2010), Tam & Oliviera (2016), Felgenhauer et al. (2017)

Table 5.1: continued

Research Questions	Research Objectives	Research Methods	Research Hypotheses	Research Findings	Previous Research
			H4: There is a relationship between security and the use of HRMIS.	Supported	Jeske & Van Schaik (2017), Chaudhary et al. (2019)
			H5: There is a relationship between computer self-efficacy and the use of HRMIS.	Not supported	MacLeod et al. (2017)
			H6: There is a relationship between commander support and the use of HRMIS.	Supported	Ahmadi et al. (2016), Wang & Wang (2016)
			H7: There is a relationship between technical training and the use of HRMIS.	Supported	Amoako-Gyampah & Salam (2004), Mohamed, Abubakar, & Zeki (2018), Ayele & Birhanie (2018)
			H8: There is a relationship between ICT infrastructure and the use of HRMIS.	Supported	Limbu et al. (2014), Ahmadi et al. (2016)
4. How does the use of the HRMIS benefit the MAF personnel?	To investigate the impact of the HRMIS usage to the MAF personnel.	FGDs, interviews and survey	H9: There is a relationship between the use of HRMIS and individual benefits.	Supported (Managing personal data, task accomplishment, job performance, work productivity & output quality)	Lee at al. (2009), Petter & Fruhling (2011)

5.4 Contribution of the Study

In general, this study contributes to academic and application in the form of theoretical and practical contribution.

5.4.1 Theoretical Contribution

Many researchers have been investigating IS from an individual perspective but IS research at an organisational level has not grown as fast. This study contributed to the academic field of IS by investigating the use of HRMIS in the MAF by using quantitative methods. Thus, this study offered a deeper understanding of the use of IS in the sense of defence and security organisation.

In addition, this study that used the DeLone and McLean IS success model as a base framework and integrated it with other constructs has enriched the diversity of technology adoption frameworks so that other researchers can adapt it to their context of the study. Therefore, it can be concluded that the study of HRMIS use by MAF personnel has theoretically contributed by developing an integrated framework that can be applied in the context of defence and security organisations research.

5.4.2 Practical Contributions

Based on this study which has successfully identified factors that influence HRMIS use by MAF personnel, it is hoped that it will assist the DCED, HRMIS Project Team, and HRMIS contractors to make improvements in all issues related to these factors.

Improvements will help to increase the use of HRMIS by each level of MAF personnel where they will benefit directly from it in terms of job performance, quality of work, and so on. Optimal use of HRMIS will enable MAF personnel to systematically manage their work and thus improve their quality as credible MAF personnel. At the same time, it will also benefit MAF by enabling them to manage its personnel efficiently. This study can also have a positive impact on other information systems in the MAF as it has many similarities in terms of usage and setting.

In any IS implementation, technical support is essential to ensure the system works properly. It involves three important elements, namely the user, system developer and department of technical support group. Users need to clearly state what they need from the system to be developed. On the system developers, they always need to interact with users and technical support groups to get input for system improvements. Technical support plays a major role before, during and after system development. The technical support team must acknowledge various facet of the system that need to be developed. As the system develops, they need to be proactive towards the needs of the users. After the system is commissioned, they must be ready to support the user if there is a technical problem. The technical support team needs to be established in many locations to enable them to provide immediate assistance when users are experiencing HRMIS problems.

The aspects of computer self-efficacy among MAF personnel must be enhanced through the introduction of the ICT subject into courses which run by MAF and make it mandatory for all MAF personnel to have minimum ICT qualification. By fulfilling this requirement, all MAF personnel will improve their technical skill and knowledge, in line with their rank and appointment. Ongoing learning should be encouraged at all personnel

levels and provide appropriate incentives to those who achieve exceptional technical skills standards.

In the context of commander support, commander of a unit should play a role in ensuring that the system operating on their team is functioning correctly and optimised for use by the personnel under them. In addition, they are tasked by informing their personnel about the benefits of using HRMIS, which is available at their respective unit. The support of the commander in the unit can be enhanced by ensuring that they have appropriate awareness of the importance of HRMIS in the management of MAF human resources. Seminars and awareness programs need to be held in a continuous manner so that their momentum in directing the use of HRMIS can be enhanced.

The technical training aspect of the system introduced in every organisation is crucial where training should include all users who will be using the system. Training will also enhance their computer self-efficacy and awareness regarding their ability to operate the information system. The financial allocation for training needs to be carefully planned so that training can be provided to all users. Training should be carried out at an appropriate time, which is in the early stages of system implementation and should be carried out on a large scale. This study suggests that training should be further enhanced and continued from time to time as there are always new personnel in the MAF.

In terms of ICT infrastructure, it is acknowledged that MAF has limited infrastructure and is lagging due to location and allocation factors. The use of HRMIS will be enhanced if all units have their computer terminals and are equipped with a stable network. The current trend of allowing the use of personal computers in the office should continue. Old and obsolete computers belonging to the unit need to be replaced with new ones so that they do

not cause slow access to the system. However, the network speed and port number for accessing HRMIS need to be increased and improved across all MAF units. For areas that are not economical to use landlines, the use of satellite communications may be considered as an option.

In the context of system usage, the introduction of any system in an organisation must take into account the needs of end-users who will use the system intensively. Feedback from end-users is very important as they will determine whether the system is used. Issues regarding user requirement (UR) are among the most common issues in system procurement, especially in government organisations, as some of the system acquisitions are not adequately planned. The unrealistic project implementation period and acquisition process results in the user requirements being overlooked by system developers. As a result, the adopted system does not meet the needs of the user. In the case of HRMIS, system developers and the HRMIS Project Team should get appropriate input from users on what they want from HRMIS. The department responsible for the procurement of the system should issue guidelines or frameworks in relation to user requirements to be complied with by those making the procurement.

In order to ensure the development and acquisition of any system runs smoothly and achieves its objectives, it needs to be supported by comprehensive policies. Policymakers need to take into account all the expected issues while developing the doctrines and procedures regarding IS. As such, it will help those who plan the procurement of the system to consider all the factors critical to the success of its implementation.

5.5 Limitations of the Study

This study has limitations in terms of the number of preliminary qualitative studies; namely, only two FGDs and two interviews to obtain factors that influence HRMIS use by MAF personnel. It is due to the time constraints of the study which need to adhere to a strict schedule. However, this study managed to get a sufficient amount of input needed for the preliminary investigation.

Also, the context used in this study may not be appropriate for use in other public organisations. It is because of the organisational structure and the way it operates; cultures, values, rules, and norms of the military organisation are different from other organisations. Therefore, the context of this study should be given due consideration by other researchers when the findings are used as a reference.

This study uses HRMIS as the focus in which the findings may differ if the study was conducted with other information systems in the MAF. This study also focusing more on the application in its methodology and does not delve in-depth theory as the priority of this study is to fulfil the requirement as applied research.

5.6 Future Research

Future studies are encouraged to use the framework developed in this study by conducting similar studies in the military environment of other countries. Cross-cultural comparative studies can be carried out in the study of IS adoption in other developing countries.

In addition, technology adoption factors in this study can be applied to investigating other types of IS. In addition, this study could be expanded by associating it with specific settings, either mandatory or voluntary. This study only considers individual benefits as an impact. Further studies can be performed by considering both individual and organisational benefits as an impact of IS use. Longitudinal studies may be conducted to test the level of HRMIS usage over a period of time. This study can also be expanded to apply to other systems used in MAF and to organisations with similar settings.

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