FACTORS INFLUENCING MHEALTH ADOPTION AMONG MALAYSIANS WITH
CONFIRMED COVID-19

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DEDICATION

This dissertation is dedicated to my wife, Safiqah, who has been a constant source of support and encouragement during the challenges of graduate school and life. Not to forget, to my daughter, Sofie whom I can't force myself to stop loving and to all my family, the symbol of love and giving. May Allah bless us all with health, happiness, patience and strength

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ABSTRACT

At times of COVID-19 pandemic, mHealth (mobile health) played an important role in the public healthcare delivery system. mHealth could be used to monitor patients with mild symptoms who had tested COVID-19 and on home quarantine. The objectives of this study were to evaluate the factors contributing the intention to use and usage behavior on mHealth and investigate the role of home quarantine on mHealth adoption. This study applied the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model to assess mHealth technology adoption. The study outcome explored the factors involved in mHealth technology adoption or rejection among Malaysians with confirmed COVID-19. This research applied to mixed method triangulation study design and divided into two phases. Phase one was quantitative method which was a cross-sectional study using a validated questionnaire. Subsequently phase two of this study was commenced using a qualitative method to the selected participants via convenience purposive sampling. A total of 101 respondents were eligible for the research survey and 5 individual for interview phase. Analyzed using Spearman's correlation coefficient ; Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Condition (FC), Social Influence (SI), Habit, Price Value (PV), Hedonic Motivation (HM) and Usage Behavior (USE) showed significant correlation for mHealth adoption. However no significant correlation between Home Quarantine (HQ) & mHealth adoption was demonstrated. By qualitative findings, Effort Expectancy (EE), Facilitating Conditions (FC), Hedonic Motivation (HM) and Behavioral Intention (BI) were contribute to barriers to use of mHealh technology among quarantined individuals. Findings in this study might be useful for healthcare institution, mHealth application developer and clinicians to identify major barriers of mHealh usage and finding ways for concrete solutions on remote monitoring assessment. Adoption and continuance of mHealth usage for home quarantined COVID-19 individuals were important for clinicians to assess and detecting early an abnormality to prevent silent hypoxia and worsening symptoms that lead to home mortality.

ABSTRAK

Pada masa pandemik COVID-19, mHealth (kesihatan mudah alih) memainkan peranan penting dalam sistem penyampaian penjagaan kesihatan awam. mHealth boleh digunakan untuk memantau pesakit dengan gejala ringan pada pesakit COVID-19 dan menjalani kuarantin di rumah. Objektif kajian ini adalah untuk menilai faktor-faktor yang menyumbang kepada keinginan dan tingkah laku penggunaan pada mHealth dan mengenal pasti peranan kuarantin di rumah terhadap penggunaan mHealth. Kajian ini menggunakan model Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) untuk menilai penggunaan teknologi mHealth. Hasil dapatan kajian adalah untuk merungkai faktor yang terlibat dalam penggunaan atau penolakan teknologi mHealth dalam kalangan rakyat Malaysia yang disahkan positif COVID-19. Penyelidikan ini mengaplikasi bentuk kajian triangulasi kaedah campuran (mixed-method) dan dibahagikan kepada dua fasa. Fasa satu ialah kaedah kuantitatif iaitu kajian keratan rentas menggunakan soal selidik yang telah disahkan. Seterusnya fasa dua kajian ini menggunakan kaedah kualitatif kepada peserta terpilih melalui persampelan bertujuan mudah. Seramai 101 responden layak untuk tinjauan penyelidikan dan 5 individu untuk fasa temu duga. Analisis menggunakan pekali perkaitan Spearman; Jangkaan Prestasi (PE), Jangkaan Usaha (EE), Keadaan Memudahcara (FC), Pengaruh Sosial (SI), Tabiat, Nilai Harga (PV), Motivasi Hedonik (HM) dan Tingkah Laku Penggunaan (USE) menunjukkan perkaitan yang signifikan untuk penggunaan mHealth. Walau bagaimanapun, tiada kaitan yang ketara antara Kuarantin Rumah (HQ) & penggunaan mHealth telah ditunjukkan. Mengikut penemuan kualitatif, Jangkaan Usaha (EE), Keadaan Memudahkan (FC), Motivasi Hedonik (HM) dan Niat Tingkah Laku (BI) menyumbang kepada halangan penggunaan teknologi mHealh dalam kalangan individu yang dikuarantin. Penemuan dalam kajian ini berguna untuk institusi penjagaan kesihatan, pembangun aplikasi mHealth dan perawat kesihatan untuk mengenal pasti halangan utama penggunaan mHealh dan mencari jalan untuk penyelesaian jangka panjang mengenai penilaian pemantauan kesihatan jarak jauh. Penggunaan dan penerusan penggunaan mHealth untuk individu COVID-19 yang dikuarantin di rumah adalah penting bagi doktor untuk menilai dan mengesan awal keabnormalan untuk mengelakkan hipoksia senyap dan gejala yang semakin teruk yang membawa kepada kematian di rumah.

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LIST OF ABBREVIATIONS/ACRONYMS

UTAUT2   -   Unified Theory of Acceptance and Use of Technology 2

CAC   -   COVID-19 Assessment Center

mHealth   -   Mobile health

HSO   -   Home Surveillance Order.

A-COHAT   -   Adults-COVID-19 Health Assessment Tools

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CHAPTER 1

INTRODUCTION

The globe is presently in the grip of a health epidemic brought on by a newly found lethal viral disease caused by the coronavirus 2 (severe acute respiratory syndrome) (SARS-CoV-2) (Lai et al., 2020). This disease was first discovered from Wuhan City, Hubei Province, China with the notification of unknown lung disease being reported. SARS-CoV-2, a deadly coronavirus that causes severe acute respiratory syndrome, has spread fast over the globe. Malaysia reported its first COVID-19 positive case on January 25,2020 from three Chinese citizens on 23 January 2020 from Singapore. Since then, the threat of COVID-19 become tremendously high and difficult to contain due to the highly transmission in the society. (Shah et al., 2020) A surge of vulnerable COVID-19 patients in Malaysia has put overstretch on public healthcare. Initially, all COVID-19 patients were sent to public hospitals for treatment and isolation. Intensive care unit (ICU) beds for Covid-19 at one time had reached its maximum capacity. The large number of Covid-19 cases has put burden on the public healthcare system and resources (Tan et al., 2021). Due to implementation of Movement Control Order (MCO) nationwide by the government put various sectors especially in non-essential services in jeopardy. At times of pandemic, mHealth or mobile technology has the potential role in the public health system. It can be utilized by positive COVID-19 individual to monitor his or her symptoms at home. During the quarantine period, some individuals may progress to worsening conditions and require hospitalization. mHealth technology could enable for early detection on risk stratifying and render for clinical assessment before complications arise. (Adans-Dester et al., 2020) mHealth can be defined as the emerging mobile communications and network technologies for healthcare. mHealth comprises various applications which are not restricted to smartphones, tablets and wireless devices that enable consumers to monitor their healthcare with ease. mHealth application is referred to as a software that offers health related services for mobile phones and tablets. According to World Health Organization, mHealth is defined as medical or

public health practice supported by mobile devices such as mobile phones, patient monitoring devices, personal digital assistants and wireless devices.

1.1 Background of the Study

Due to rapid penetration of mobile phone and internet connectivity, there is huge potential for mHealth systems to be used by clinicians as well as patients to increase health awareness. The Ministry of Health, Malaysia has allowed Category 1 and Category 2 (Mild) COVID-19 positive patients with specific criteria are allowed to undergo quarantine at home. The majority of people infected with the COVID-19 virus will recover spontaneously without the need for additional care. Those patients are required to update the daily health status via the dedicated mHealth application which is MySejahtera. (Zamri & Syed Mohideen, 2021) Information entered in MySejahtera would be channeled to a health district office or CAC for close monitoring and further action to be taken if needed. The purpose of MySejahtera at time of COVID-19 pandemic is to help government on breaking the chain of COVID-19 transmission, to identify health status of individual, to give input regarding health assistance and standard operating procedure if someone infected by COVID-19 and to locate nearest clinic or hospital for COVID-19 health screening and treatment. (Shukur, 2021) The minimum device requirements to install the application are smartphones operated by Android 4.0 or IOS 10 version and above with internet connection and able to receive SMS for verification purposes. Another unique feature of MySejahtera application is for contact tracing purposes. Malaysians are required to scan the QR code using smartphones which are available in various premises and locations nationwide. The captured data will be stored in the system and useful for authorities for contact tracing when there is COVID-19 outbreak in a certain area (Zamri & Syed Mohideen, 2021) In addition for tracking purposes, MySejahtera is also used as healthcare delivery tool for remote monitoring patients at home. COVID-19 positive patient will received daily pop-up messages in their mobile phones that mandated them to answer all questionnaire (A-COHAT) related to health assessment tools. Such data will be transmitted to the main server and then will be relayed

to the respective medical team which is usually on standby mode to assess all the condition of patient being monitored from a far. If patient is exhibited warning signs that need to be attended, medical team from COVID-19 Assessment Center will response accordingly by verifying the case before sending out ambulance for physical assessment at home.

1.2 Problem Statement

Due to emergence of COVID-19 new variant, there is well prevalence of asymptomatic silent hypoxia in COVID-19 patient.(Rahman et al., 2021) Silent hypoxia is described as a state in which an individual's oxygen saturation level is significantly lower than expected i.e (Normal saturation level is 95 percent or more), yet the patient has no breathing difficulties (Greenhalgh et al., 2021). Several reports mentioned that the prevalence of silent hypoxia in COVID-19 infection ranges up to 40% of cases (Rahman et al., 2021). As individuals with silent hypoxia do not experience any discomfort even when their oxygen saturation level is low, health officials must keep a close eye on them. COVID-19 individuals in Malaysia who are authorized to stay at home for quarantine must self-evaluate by submitting their daily medical status on the MySejahtera application by 9.00 a.m. every day. The feedback of daily health assessment is important for health authorities to analyze signs and symptoms related to silent hypoxia and determine the disease progression of Category 1 and Category 2 (Mild) patients. Recent data acquired from Crisis Preparedness Response Center, Ministry of Health, Malaysia estimated only 40% of COVID-19 positive home quarantine patients had responded and were compliant to daily health assessment using MySejahtera while being home quarantined. The figure is alarmingly low since less than half of eligible COVID-19 patients were responding to MySejahtera and detection of silent hypoxia may be neglected or overlooked by the health authority. If not treated, this will cause severe damage to several body tissues and can lead to life-threatening conditions in the Covid-19 patients (Rahman et al., 2021) mHealth application is one of the useful digital health application to monitor health status and it can be one of the way to expand health care services virtually and empower individual to take charge on their own health and indirectly

reduce cost of medical care. The data available for effective factors contributing to the continuance usage intention among mHealth users is still nascent. (Khalil et al., 2020) The level of interest and determinants of mHealth adoption factors are as well still lacking within the local context. (Zamri & Syed Mohideen, 2021) The study on effective use of self-care applications like the daily health assessment tools in MySejahtera is inadequate. Other than that, there is little study of using UTAUT2 instrument as theoretical models to know the user adoption of mHealth applications.(Azhar & Dhillon, 2016) For practical gap, COVID-19 Assessment Centre (CAC) may turn to be busy and hectic if many COVID-19 patients has had appointment for clinical assessment and home quarantine on particular days. Sometimes the phone lines are left unanswered due to overwhelming response from newly diagnosed COVID-19 patients that need verification of laboratory results. Due to limited number of availability of phone lines, the digital health assessment tools in MySejahtera may be the best options and may help to ease the burden of healthcare staff to know the health status of patients being quarantined at home.The initial input of health assessment via MySejahtera is important as it can be screening tools for healthcare staff to carefully monitor patients that need to be clarify further of their health status and data verification. If most patients are compliant to the compulsory digital health assessment tools during home quarantine, the incidence of late diagnosis of unrecognizable silent hypoxia may be lesser and subsequently will reduce the COVID-19 mortality rate. The result of this study will reveal the role of mHealth that could assist health practitioners on remote monitoring of individual health status and to determine the best care and treatment available based on the response received via the application. To provide a significant theoretical contribution, this research will employ an enhanced version of the Unified Theory of Acceptance and Utilization of Technology 2 (UTAUT2).

1.3 Research Questions

This research utilized the pillars of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to address the hurdles to mHealth technology adoption among

Malaysians with confirmed COVID-19. Thus, the following research questions are proposed in this study :

1) What are the major elements that influence COVID-19 home quarantined individual adoption of mHealth in Malaysia?
2) What are the predicting factors of mHealth adoption or rejection to use among COVID-19 home quarantined individuals?

1.4 Objectives of the Study

The main objective of the study is to evaluate the factors contributing the intention to use and usage behavior on mHealth and to explore factors that influence home quarantine among Malaysians with COVID-19 on mHealth adoption.

1.5 Research Scope

By the year 2021, there are nine (9) COVID-19 Assessment Centers (CACs) operating in Negeri Sembilan. For this research, CAC at Rembau District Health Office, Negeri Sembilan will be chosen as the study site. One of the medical personnel from Rembau Health Clinic will be appointed as research assistant and will supervise the data collection process at CAC.

COVID-19 patients who are eligible for home quarantine will be selected based on the criteria set up according to the criteria set up by Ministry of Health, Malaysia.

Respondents who fulfill the following criteria are suitable to be quarantined at home and will be included for this study.

1) Malaysian adults age more than 18 years old both male and female, with Category 1 and Category 2 (Mild) without or with stable/controlled pre-existing illnesses.

2) Certified fit physically and mental by medical personnel at CAC for home quarantine.

3) Must have a smartphone with device operating system of Android 4.0 and IOS 10 and above.

4) Registered with mHealth application (MySejahtera) application and it must be installed and available on the device.

5) Devices must be connected to the internet to access mHealth (MySejahtera) application .

1.6 Limitation of Study

There are certain limitations to the study's findings that may limit their application. This study is conducted in a single-site CAC situated in the district of Rembau, Negeri Sembilan. With an overall population of 49,000, the sample population of selected respondents may not provide true reflection of user's adoption of mHealth of the entire population in Malaysia.

Second, the study was done during a COVID-19 crisis, which may restrict the outcomes' generalizability in a normal context. The study's aim was to look at the UTAUT2 model in a pandemic context so that it may be used in a similar circumstance in the future.

Thirdly, the ongoing infection of COVID-19 cases is a dynamic pattern depending on the current trend which is on the rise or slowing down of community transmission of COVID-19 infection. The influx of patient visitation who come and seek treatment at CAC varies. Due to this situation, the respondents amount will be not as much as required and will be affecting the

statistical test analysis.

1.7 Significance of Study

With the emergence of numerous COVID-19 variant and posing the risk of a public health system, more Covid-19 patients will be directed to CAC for close monitoring. The sudden rise in hospitalization of Covid-19 patients will increase the burden to the healthcare system and subsequently be on the verge of collapsing if not dealt appropriately. Patients' shift from hospital-based monitoring toward home quarantine is inevitable. If patients neglect the use of daily health assessment tools via MySejahtera application, more serious complications may happen subsequently like the undiagnosing the occurrence of silent hypoxia during home quarantine period. This will result in life threatening conditions and increase of Covid-19 mortality. This study will contribute to the use of UTAUT2 as an instrument to assess user adoption for mHealth applications in Malaysia. UTAUT2 is designed for consumer centered and acceptance of technology use and findings of this research will help MySejahtera developer team and health institution particularly Ministry of Health,Malaysia to improve any shortcomings from the application itself from user perspective. Little study using UTAUT2 frameworks for mHealth applications in Malaysia and it is hoped that this paper can contribute and make a significant impact for betterment of the healthcare delivery system. As the world has embraced health technology and the need to practise new normal behavior, this study will make a contribution for the mHealth developer and health institutions to understand what factors contribute to the factors contributing the intention to use and use behavior on mHealth.

1.8 Definition of Variables and Important Terminologies

1.8.1 Variables :

From the original theoretical frameworks, there are seven independent variables, two dependent variables and four moderating variables used in previous research; Below is the list of variables of UTAUT2 and the definition used is based on previous literature. (Venkatesh et al.,2012)

1) Performance Expectancy is defined as the degree to which using a technology will provide benefits to consumers in performing certain activities.

2) Effort Expectancy is a degree of ease associated with consumers' use of technology.

3) Social Influence is the extent to which consumers perceive that important to others believe they should use particular technology.

4) Facilitating Conditions refers to consumers' perception of the resources and support available to perform a behavior.

5) Hedonic Motivation is defined as the fun or pleasure derived from using a technology.

6) Price value is defined as consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary costs of using them.

7) Habit is defined as the extent to which people tend to perform behaviors automatically because of learning.

There are three moderating variables in this framework which are age, gender and experience in the original UTAUT2 frameworks. There are two dependent variables in this study which are Behavioral Intention (BI) and Actual Usage Behavior (Use).

1.8.2 Important Terminologies

1.8.2.1 UTAUT2

Venkatesh, 2003 has developed a Unified Theory of Acceptance and Use of Technology (UTAUT) frameworks.

1.8.2.2 COVID-19

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. (Dong et al., 2020)

1.8.2.3 Confirmed COVID-19

A person with a positive RTK-Ag in pre-determined areas/locality with prevalence of COVID-19 > 10% or a person (alive or dead) with a positive molecular test (RT-PCR or rapid molecular) (COVID-19 Management Guidelines in Malaysia No.5 / 2020 ANNEX 1 : Case Definition of COVID-19 - 30/08/2021)

1.8.2.4 mHealth

Mobile health technology or mobile health applications. According to the World Health Organization, mHealth is defined as medical or public health practice supported by mobile devices such as mobile phones, patient monitoring devices, personal digital assistants and wireless devices. (World Health Organization, 2011)

1.8.2.5 CAC

COVID-19 Assessment Center. It is a health facility center to assess and determine a care plan for COVID-19 cases to be monitored at home. (Family Health Development Division, 2021)

1.8.2.6 MySejahtera

It's a mobile health app created by the Malaysia government to help with the control of the COVID-19 pandemic in the country by allowing users to assess their COVID-19 risk, especially during home quarantine period.

1.8.2.7 HSO

Home Surveillance Order. A certificate issued by health authority for obligatory home quarantine for individual due to infectious diseases under Prevention and Control Diseases Act 1988 (Act : 342)

1.8.2.8 A-COHAT

Adults-COVID-19 Health Assessment Tools.

1.9 Thesis Organization

Chapter 1 will be discussing the background of study, identifying problem statements and formulation of research objectives and research questions. On completion of Chapter 1, the conceptual framework of research is recognized based on previous studies and is synthesized and compiled for reference. Chapter 2 will be discussing literature reviews relevant to the topic and exploration of the conceptual framework of the research with thorough discussion of variables involved in this study and followed by Chapter 3 about research methodology. The cross-

sectional, validated questionnaire will be distributed to the prospective respondents. For interview part, three up to five candidates will be chosen via convenience purposive way if consented. Both quantitative and qualitative data will be merge together by triangulation design. The completion of Chapter 4 and 5 will be continued subsequently.

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