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Acceptability of Malaysian Working Adults Towards MOH Chatbot Services in Disseminating COVID-19 Information

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Abstract. Chatbots have been popularly used nowadays as virtual conversational agents. With the latest technology facilities such as Human-Computer Interaction (HCI), Artificial Intelligence (AI), and Natural Language Processing (NLP), a chatbot can understand human language and becoming a thing now, especially after the existence of the pandemic COVID-19. The health sectors have changed ever since, and the rise of telehealth has taken place between physical interaction among health practitioners and patients. It has shifted to a chatbot medium for interaction to reduce the transmission of the disease. In line with the WHO's efforts, the Ministry of Health (MOH) Malaysia has taken initiatives to introduce and implement the chatbot facility to disseminate the latest information among Malaysians. This paper presents the findings of the acceptability of Malaysian, especially the working adults, since they are the most infected groups by the disease, and their willingness to use the MOH chatbot services. The findings are crucial for the apps developer, policy maker and the government (MOH), in order to develop the most efficient chatbot that will serve the intended purposes, so the initiative would not go wasted. The outcomes are hoped to provide insights into current health chatbot usage and acceptance, as well as any recommendations for future research in this field to address identified challenges.
Keywords: Chatbot, information dissemination, Ministry of Health (MOH) Malaysia, COVID-19

1 Introduction

The use of chatbots in disseminating information is nothing new. Most health services choose to use chatbots as their virtual conversational agents with the users, especially in the event of pandemic COVID-19, they are required to minimize physical interaction to curb the virus from spreading. Telehealth is one of the medical and health sectors that have been using chatbots for disseminating information. According to Linder (2020), chatbot technology has been implemented. and increased communication by answering simple queries without physical interaction. The ability of chatbot technology to replicate human conversational skills in various domains also provides users' satisfaction as well as effectiveness and efficiency for both parties (Casas et al., 2020). Based on research by Almalki & Azeez (2020), WHO has been using chatbot programs based on artificial intelligence (AI) to combat the virus by enabling users to interact and communicate with the organization through social media platforms.

Based on these studies, the use of chatbots has proven to be relevant in disseminating information, especially in crucial matters such as COVID-19 to ensure users are using the right medium in collecting and retrieving legit information from authorized agencies. The same application is being actively developed by the Ministry of Health Malaysia (MOH) for the same purpose to enable people to disseminate information in regards to COVID-19.

One of MOH's main concerns of introducing the official chatbot is to curb the spreading of fake news. Information and news reports about the coronavirus disease (COVID-19) have been quickly published and shared on social media and social networking sites since the existence of this pandemic. While infodemiology has been studying information patterns on the Web and in social media for at least 18 years ago, the COVID-19 pandemic has been dubbed the first social media infodemic (Ahmad & Murad, 2020). Some people unethically spread unreliable information on social media pertaining to COVID-19 and it creates panic and fear among people. They received this kind of information without going through a thorough check and generated serious negative health consequences such as psychosocial.

Studies prove that the increasing cases of mental health issues among working adults due to uncertainty and/or information overloading of Covid-19 information from random, unreliable sources have led to anxiety (Salari et al., 2020). This pandemic of COVID-19 has seemed rather harsh in each aspect of life. The acceptance of reliable information might allow this hardship to reduce, hence, the study on the willingness and acceptability of Malaysian users, especially working adults, to use and engage with the MOH's chatbot services as one of the primary sources that can provide quick information is very important and very much required to predict uptake.

To ensure the efficiency of the chatbot technology, this study's purpose is to examine the acceptability of MOH's chatbot service among Malaysian working adults in disseminating information on COVID-19. The study focuses on motivational factors involved among working adults who engage with this service. For the purpose of the study, the importance of MOH's chatbot usage could be underlined as one primary source that could provide reliable COVID-19 information effectively and efficiently.

The study is underpinned by the following objectives:

1. To determine the extent of acceptance among Malaysian working adults towards the health chatbot service that is currently available.
2. To determine the extent of willingness among Malaysian working adults to use and engage with the MOH's chatbot services.
3. To investigate the factors that motivate Malaysian working adults to use the MOH's chatbot services.

2 Literature Review

2.1 Function and Importance of Chatbot

As stated by Linder (2020), chatbots can offer more personalized healthcare information, create interactivity, and allow more control over healthcare decisions. Chatbots are typically used to enable communication between a person and an artificial agent. They receive natural language input and execute computer commands to engage with the user. A chatbot is designed to help the user interact with a variety of tasks. The type of chatbot will depend on the environment in which it is used, and the tasks it can do for the user (Fadhil, 2018).

According to Weizenbaum (1966), the first chatbot invented was ELIZA, which interacted with a psychotherapist to ensure the user kept on talking about the subject they intended to discuss. Today's chatbot is better at producing complex techniques in pattern matching by using artificial intelligence in responding to questions. Recent chatbot abilities mean it can provide updated information, do web searching and experience learning. Chatbots nowadays, such as Apple's SIRI, Google's GOOGLE ASSISTANT, Amazon's ALEXA, or Microsoft's CORTANA, are a list of chatbots that is growing. These chatbots provide real-time communication with the latest technology while people prefer to communicate by chatting rather than voice calling in queries for quick responses. Chatbot applications may support a variety of products and services, including business, education, entertainment, and healthcare. Some examples include weather chatbots for current and future weather conditions and business chatbots that can offer advice on what to do. Even a public computer museum in Paderborn, Germany used Max- a museum guide who used to engage and create a dialogue with visitors.

2.2 COVID-19 scenario in Malaysia

During the COVID-19 pandemic in Malaysia, fake news and false information contributed to infodemic confusion. Until now, police and the Malaysian Communications and Multimedia Commission (MCMC) have investigated 268 people who have been caught spreading fake news and false information (ISIS, 2020). Such fake news has been widely spread nowadays, especially on social media by articles that have been shared by unauthorized groups or people, and it might result in public exasperation. To respond to this infodemic, the Malaysian government has invested millions of ringgit

in developing MOH's chatbot services as one of the main reliable sources for disseminating COVID-19 information in Malaysia.

Starting from early 2021, there are increasing cases of COVID-19 that are coming and linked to workplaces, which are the key source of COVID-19 in Malaysia (New Straits Times, 2020). Most of the cases came from workplaces in Selangor. This report shows that working adults are the most infected group with COVID-19. Hence, the study on the willingness and acceptability of Malaysian users is highly needed to identify the acceptance rate and their readiness toward chatbot services. This group is the priority group to use and engage with the MOH's chatbot services as one of the primary sources that can provide quick information, which is very important and very much required to predict uptake. This might contribute to the success of the chatbot deployment also depending heavily on the acceptance rate of Malaysian users, especially among working adults, as well as help in reducing the cases that came from this group.

2.3 Chatbot Usage in COVID-19 Globally

Among modern technologies that are being used to combat the virus COVID-19 is a chatbot (O. Shahid et al., 2021). The Chatbot application is being used towards combating the virus by providing information on virus detection, spread prevention, and medical assistance. The chatbot is one of the machine learning (ML) based tools, along with the artificial intelligence of things (AI IoT). The function of a chatbot in this scope is to screen and diagnose the virus rather than as an option for using hotlines as communication tools. Users may initiate the conversation by either text or voice in their web application, smartphone application, channels, etc. The advantage of the use of chatbots in combating COVID-19 is that it enables information-gathering to screen patients remotely without physical interactions. Information can be updated quickly while you could also practice a new lifestyle to wash your hands repetitively and give psychological support to reduce stress from isolation and misinformation. In addition, the chatbot is also involved in information technology solutions, challenges, and suggestions for tackling the pandemic. According to He, Zhang, and Li (2021), chatbot use is applied for contact tracing apps and self-checking to monitor the level of impact, especially the rural-urban health disparities.

The novel COVID-19 disease compelled health services to make quick changes in the way they offer and coordinate care. In Brazil, 75 percent of the population is under the universal public health system (Sistema Unico de Sade—SUS) as the primary source of care. As a result of the ongoing increase in cases, the system was expected to reach saturation. The use of artificial intelligence (AI) to enable telehealth could assist in addressing this by allowing patients to access the health system in a more coordinated manner. In consonance with Morales, Guedes, Silva & Massuda (2021), to properly utilize the value in health care systems, new attempts to produce sustainable, inexpensive, and scalable solutions are required, particularly in the setting of middle-low-income nations. A chatbot implementing an AI-powered telemedicine system is used to expand accessibility while ensuring safety and maximizing value under the unprecedented effect of the COVID-19 pandemic to help alleviate healthcare congestion. The

use of chatbots is also to disseminate health information and track patients' symptom evolution as needed. During the COVID-19 pandemic, the algorithm's major purpose was to assure safety while expanding accessibility and reducing healthcare resource utilization.

3 Methodology

This paper employed a quantitative research approach to collect and analyze numerical data to support its research objectives and hypotheses. In the preliminary test and pilot test, the questionnaire was developed appropriately to analyze the research data.

The population of this research are working adults aged between 20-40 years old, working under the district of Petaling which covers the areas of Petaling Jaya, Subang Jaya, and Shah Alam. As of today, Selangor state has the highest COVID-19 caseload according to the Ministry of Health Malaysia. Following the recommended sample size, this research should have 150 respondents, thus, a set of questionnaires was distributed to 200 working adults via Google Form for better reach out. 152 responses came in with the accepted data within a duration of 30 days. Limited time to collect the data was imposed to ensure that response fluctuation was monitored. The respondents were asked about the acceptance of the MOH chatbot in disseminating information about COVID-19. The data received was then underwent the statistical data analysis from Statistical Package for Social Science (SPSS).

There were five sections in the questionnaire. Section One designed to capture the respondent's demographic information such as the gender, age, position level, period of service, and experience and frequency in using chatbot. Section Two measures the UNDERSTANDABILITY of the respondents towards the function of chatbot services. Section Three measures the RELIABILITY of the used chatbot, which it is to investigate the probability that the chatbot services will not fail within a specific time frame. Section Four measures the perception of the respondents towards the RESPONSIVENESS of the chatbot in assisting them in timely manner. Section Five measures the respondents' ASSURANCE and trust towards chatbot services. Section Six measures the perceptions towards visual components and INTERACTIVITY of the chatbot services. Section Seven measures the respondents PERCEIVE USEFULNESS of chatbot services. Section Eight measures the perception of respondents on the EASE OF USE of the chatbot services. The last section of the questionnaire measures the respondents' INTENTION TO USE the chatbot services.

4 Findings

4.1 Respondents' Demographic Profiles

The respondents' demographic information of this study, which totalled 152 people, is presented in Table 1. There were 28.7 percent men and 71.3 percent women total among the respondents, and the majority of the respondents were between the ages of

Variable Name	Total of Sample	N (%)
Gender		
Male	43	28.7
Female	107	71.3
Age		
20-25	95	62.5
36-30	20	13.2
31-35	13	8.6
36-40	14	9.2
Above 40	10	6.6
Position Level		
Top Level (TL)	8	5.3
Middle Level (ML)	27	17.8
First Level (FL)	30	19.7
Intermediate (Inter)	28	18.4
Entry Level (EL)	56	36.8
Service Year		
Below 5	98	65.3
5-10	25	16.7
10-15	13	8.7
More than 15 years	12	8.0
Have been using chatbots or any conversational interface before?		
Yes	113	74.3
No	20	13.2
Maybe	18	11.8
How often use a chatbot?		
Daily	2	1.3
Weekly	16	10.5
Monthly	9	5.9
A few times	104	68.4
Never	21	13.8

Figure 1: Respondents' Demographic Profiles

20 and 25 years old, which accounts for 62.5 percent of the total. 36.8 percent of the respondents are from entry-level positions, and the vast majority of them have less than five years of professional experience (65.3 percent). This group may be the biggest

contributor to the popularity of chatbot services since they are more open to technological applications and provision. The vast majority of people who participated in this survey, which accounted for 74.3 percent of the total, stated that they have used chatbots at least a few times (68.4 percent).

4.2 Hypothesis

To fulfill the purpose of this study, acceptance, willingness, and motivational factors of Malaysian working adults engaging chatbots to convey health information are assessed. To evaluate the aforementioned questions, Barron and Kenny's (1986) Causal Step Approach is utilized. To determine the significance of each predictor and mediator on the results, all hypotheses were evaluated. The acceptance of chatbot services for spreading information on COVID-19 via the MOH WhatsApp chatbot application among Malaysian working people is measured as detailed below.

H_1: Understandability has a positive relationship with perceived usefulness.

The hypothesis tests if understandability carries a significant impact on perceived usefulness. The dependent variable PU was regressed on predicting variable UND to test the hypothesis H_1. UND significantly predicted PU, $F = 38.252$, $p < 0.001$, which indicates that the UND can play a significant role in shaping PU ($b = .462$, $p < .001$). These results direct the positive effect of the UND. Moreover, the $R^2 = .203$ depicts that the model explains 20.3% of the variance in the PU.

H_2: Reliability has a positive relationship with perceived usefulness.

The hypothesis tests if reliability carries a significant impact on perceived usefulness. The dependent variable PU was regressed on predicting variable REL to test the hypothesis H_2. REL significantly predicted PU, $F = 18.602$, $p < 0.001$, which indicates that the REL can play a significant role in shaping PU ($b = .364$, $p < .001$). These results direct the positive effect of the REL. Moreover, the $R^2 = .110$ depicts that the model explains 11% of the variance in the PU.

H_3: Responsiveness has a positive relationship with perceived usefulness.

The hypothesis tests if responsiveness carries a significant impact on perceived usefulness. The dependent variable PU was regressed on predicting variable RES to test hypothesis H_3. RES significantly predicted PU, $F = 35.910$, $p < 0.001$, which indicates that the RES can play a significant role in shaping PU ($b = .516$, $p < .001$). These results direct the positive effect of the RES. Moreover, the $R^2 = .193$ depicts that the model explains 19.3% of the variance in the PU.

H_4: Assurance has a positive relationship with perceived usefulness.

The hypothesis tests if assurance carries a significant impact on perceived usefulness. The dependent variable PU was regressed on predicting variable ASS to test the hypothesis H_4. ASS significantly predicted PU, $F = 12.728$, $p < 0.001$, which indicates that the ASS can play a significant role in shaping PU ($b = .334$, $p < .001$).

These results direct the positive effect of the ASS. Moreover, the $R^2 = .078$ depicts that the model explains 7.8% of the variance in the PU.

H_5: Interactivity has a positive relationship with perceived usefulness.

The hypothesis tests if interactivity carries a significant impact on perceived usefulness. The dependent variable PU was regressed on predicting variable INT to test the hypothesis H_5. INT significantly predicted PU, $F = 25.180$, $p < 0.001$, which indicates that the INT can play a significant role in shaping PU ($b = .439$, $p < .001$). These results direct the positive effect of the INT. Moreover, the $R^2 = .144$ depicts that the model explains 14.4% of the variance in the PU.

H_6: Perceived ease of use has a positive relationship with perceived usefulness.

The hypothesis tests if perceived ease of use carries a significant impact on perceived usefulness. The dependent variable PU was regressed on predicting variable PEOU to test the hypothesis H_6. PEOU significantly predicted PU, $F = 90.166$, $p < 0.001$, which indicates that the PEOU can play a significant role in shaping PU ($b = .646$, $p < .001$). These results direct the positive effect of the PEOU. Moreover, the $R^2 = .375$ depicts that the model explains 37.5% of the variance in the PU.

H_7: Perceived ease of use has a positive relationship with intent to use.

The hypothesis tests if perceived ease of use carries a significant impact on intent to use. The dependent variable ITU was regressed on predicting variable PEOU to test the hypothesis H_7. PEOU significantly predicted ITU, $F = 134.915$, $p < 0.001$, which indicates that the PEOU can play a significant role in shaping ITU ($b = .698$, $p < .001$). These results direct the positive effect of the PEOU. Moreover, the $R^2 = .474$ depicts that the model explains 47.4% of the variance in the PU.

H_8: Perceived usefulness has a positive relationship with intent to use.

The hypothesis tests if perceived usefulness carries a significant impact on intent to use. The dependent variable ITU was regressed on predicting variable PU to test the hypothesis H_8. PU significantly predicted ITU, $F = 111.881$, $p < 0.001$, which indicates that the PU can play a significant role in shaping ITU ($b = .612$, $p < .001$). These results direct the positive effect of the PU. Moreover, the $R^2 = .427$ depicts that the model explains 42.7% of the variance in the PU.

Hypothesis	Regression Weights	Beta Coefficient	R^2	F	p-value	Hypotheses Supported
H_1	UND → PU	.364	.110	18.602	.000	YES
H_2	REL → PU	.516	.193	35.910	.000	YES
H_3	RES → PU	.242	.074	12.024	.001	YES
H_4	ASS → PU	.334	.078	12.728	.000	YES
H_5	INT → PU	.439	.144	25.180	.000	YES
H_6	PEOU → PU	.646	.375	90.166	.000	YES
H_7	PEOU → ITU	.698	.474	134.915	.000	YES
H_8	PU → ITU	.612	.427	111.881	.000	YES

Figure 2: Result of Hypothesis Test and Mediation Analysis

*Note: *p < 0.05 UND: Understandability; REL: Reliability; RES: Responsiveness; ASS: Assurance; INT: Interactivity; PU: Percieved Usefulness; PEOU: Percieved Ease of Use; ITU: Intention to Use*

5 Discussion and Recommendations

As far as is known, this is the first study for the Ministry of Health (MOH) that investigates the acceptability of chatbot services in disseminating health information from the perspective of Malaysian working adults. Because of recent advances in processing power, stakeholders can now utilize artificial intelligence (AI) technology such as chatbots to improve their information and knowledge management to the public and ensure their relationships with users remain consistent. Recent arguments, however, have argued that human-robot interactions are required to address the issue of chatbots' artificial personalities interfering with effective engagement with clients (Yun & Park, 2022). This study aims to shed light on how Malaysian working adults' perceptions of chatbot service could help COVID-19 information dissemination influence their propensity to utilize it.

The initial purpose of this study is to examine the acceptance level of the MOH chatbot service among Malaysian working people. All hypotheses are supported, which represents the mediating factors in the TAM model. Since all of these variables are observed to have a direct impact on it, it is hypothesized that they also influence the intention to use. Therefore, all chatbot quality parameters should be considered while analyzing the implementation of the MOH chatbot for COVID-19 information dissemination. The second purpose was to assess the willingness of working persons in Malaysia to use and interact with MOH chatbot services. This empirical study demonstrates that the TAM model's three traditional relationships can be confirmed. This finding demonstrates that both essential components of TAM (PU and PEOU) positively

influenced adult working group acceptance of MOH chatbot services for health information dissemination. In this investigation, all factors corroborated the conclusions of Li et al. (2021) and Davis (1986).

To improve the quality of responses, it is suggested that future research to incorporate experimental methods and other approaches. The results have implications that only applied to working adults between the ages of 20 and 40. Given that the COVID-19 outbreak could affect individuals of any age, future studies should explore examining the same objectives in various age groups. In addition, the scope of this study is limited to Malaysian adults who work in a single context, such as the Petaling district, which includes Petaling Jaya, Subang Jaya, and Shah Alam, and to evaluating the willingness and acceptability of using a MOH chatbot to disseminate information about COVID-19.

This may restrict the universality of the outcome. This might be viewed as an opportunity for further research that could be conducted on a larger scale, either within Selangor or in other Malaysian states, in order to determine the result variables for generalisation and objective understanding. Other scopes, such as examining the efficacy of employing chatbot services for purposes other than health information and institutions, should be considered and recommended. Furthermore, this investigation revealed some uncertainties regarding the reliability and assurance of chatbot services. The engagement and acceptance of chatbot services must be increased by enhancing both of these factors.

Finally, relevant parties should investigate alternative means of enhancing the reliability and assurance of chatbot services to maintain users' intention to engage with the service.

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