Understanding Factors Affecting Malaysians' Intention to Vaccinate Against COVID-19

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Abstract

This study aims to understand the factors influencing Malaysian's intention to vaccinate against COVID-19 by utilizing Theory of Planned Behaviour and Extended Theory of Planned Behaviour framework. Quantitative research in the form of questionnaires was employed for this study. Through an online questionnaire survey, a total of 432 responses were obtained. The data was studied with the aid of the statistical tool, SmartPLS. Four of the five characteristics investigated in this study had a substantial impact on Malaysians' willingness to vaccinate against COVID-19. Attitude, Subjective Norms, Perceived Behavioural Control, and Anticipated Regret are the factors. The link between Attitude and Behavioural Intention is not moderated by knowledge. Behavioural Intention is not significantly influenced by knowledge. Theoretical frameworks that uncover elements that influence pandemic influenza vaccination decisions are beneficial. The findings of the study provide a valuable framework for future efforts aimed at increasing pandemic flu vaccination uptake. The research's significance is examined in order to maximise any future pandemic influenza vaccination uptake through theoretically driven applications. This study poses new elements, Knowledge and Anticipated Regret into Theory of Planned Behaviour to establish Extended Theory of Planned Behaviour that examines the factors that influence Malaysians in undertaking COVID-19 Vaccination.

Keywords COVID-19, Vaccination, Anticipated Regret, Extended Theory of Planned Behaviour

Introduction

A novel pneumonia disease, an infection that leads to significant impact alongside with the swift development of hypoxemia and death for at-risk populations started from Wuhan, China known as Coronavirus disease 2019 or Severe Respiratory Acute Syndrome 2 (SARS-CoV-2) has been affirmed by World Health Organization (WHO) on 12th January 2020 before it has become an outbreak in all countries around the globe (Alvarado-Socarras, et al., 2021; Shah,

et al., 2020).

Early stage of mass production in vaccine started in early December 2020 and according to Bloomberg (2021), COVID-19 administered for the biggest vaccination campaign in history as there have been more than 689 million doses administered across 153 countries. Vaccine has been foreseen by WHO as the terminal strategy in protecting the unprotected (Alvarado-Socarras, et al., 2021). From February to April 2021, the first phase of Vaccination Roll-out in Malaysia will cover 500,000 frontliners. Phase 2 will continue from April to August 2021, covering 9.4 million individuals, including senior citizens (60 years and older), persons at high risk for chronic conditions, and people with disabilities. Phase 3 will cover the remaining individuals and will run from May 2021 to February 2022, covering 13.7 million people. All adults above the age of 18 will be included in this. All citizens and non-citizens are eligible for the immunisation which is provided free of charge (Yusof, 2021).

Up to now, there is not a specified treatment for COVID-19 infection has not been found while the disease continues to circulate widely, intimidating to become endemic (Alvarado-Socarras, et al., 2021). Continuous effort has been made to furnish ideal care and treatment for those that are severely ill while preventing disease progression. Vaccine has played an important role in the latter scenario (Bhagavathula, 2020). Vaccine has been foreseen by WHO as the terminal strategy in protecting the unprotected (Alvarado-Socarras, et al., 2021). Encouraging herd immunity as a strategic approach was developed in part to reach out to people who are hesitant to get vaccinated due to vaccine-related fears and beliefs (e.g., doubts about vaccine efficacy or safety, religious convictions) by addressing both individual and collective responsibility for community health (Kim, 2021).

Some studies that explore “intention to vaccinate” has shown rather unpleasant resultsthat not all groups will be accepting the vaccination once it is made widely available (Neumann-Böhme, et al., 2020; Dodd, et al., 2020). Perhaps this is because flu vaccination is regarded as an option rather than a necessity (Kim, 2021).

Based on a survey done by WHO (2021), 5,916 Malaysians have revealed that their attitude towards the virus are improving which this result also reflects that there is more understanding about vaccines and how severe this disease is than it is portrayed. Hence, it is important to investigate the factors that affect the intention of having a vaccine among the general population of Malaysia in order to better control any future pandemics. The current research was conducted on investigating the intention to vaccinate in a Malaysian adult population.

The following sections of this paper will follow an organization that starts from literature review to conceptual framework and after that, hypotheses development that features influencing factors from Theory of Planned Behaviour and, Knowledge and Anticipated Regret as Extended Theory of Planned Behaviour factors.

Literature review, conceptual framework, and hypotheses development

Theory of Planned Behaviour

Due to the limitations of Theory of Reasoned Action (TRA) in assessing the behaviours of people when they lack complete control in the act of willing, Theory of Planned Behaviour (TPB) has become an extension to TRA (Ajzen, 1991; Ajzen, 1985). Furthermore, the TPB claims that behavioural intention, or a person's assessment of whether or not they intend to perform a specific behaviour, is the most important and immediate antecedent of that behavior's actual performance (i.e., stronger intentions predict a higher likelihood of performing the behaviour). According to the TPB, the three variables predicting behavioural intentions are an individual's Attitude toward the conduct, Subjective Norms of behaviour, and Perceived Behavioural Control over the conduct (Ajzen, 1991). TPB has also been used in various studies to predict several behavioual intentions, for example, predicting healthy eating among Danish adolescents (Grønhøj, et al., 2012), healthy eating behaviours (Brouwer & Mosack, 2015), and halal food purchasing intention (Shah Alam & Mohamed Sayuti, 2011).

From the studies done by Myers and Goodwin (2011, 2012), TPB has been applied to determine the intention of the general public and groups of elderly to vaccinate against pandemic swine flu in the United Kingdom (UK). TPB depicts that the proximal determinants of behaviour. According to this paradigm, TPB consists of the intention to execute the behaviour and Perceived Behavioural Control (the person's subjective perception of whether or not they can accomplish the behaviour), Attitudes toward the behaviour (a favourable or unfavourable assessment of the specific behaviour) and Subjective Norms (perceived social norms) (Ajzen, 1991; Connor & Sparks, 2005). In short, the intention to carry out a given behaviour defines a person's actual behaviour for a certain task and according to TPB, the following components influence a person's behavioural intention which are Attitude (AT), Subjective Norms (SN), and perceptual behaviour control (PBC).

TPB has been utilized in many other studies that portrays relation towards health - related behavioural intention (Armitage & Connor, 2001; Godin & Kok, 1996) and also in several research of vaccination intention (Myers & Goodwin, 2011; Myers & Goodwin, 2012; Liao, et al., 2011; Gallagher & Povey, 2006). Thus, it has been proven that TPB is a viable model which it

associates with factors: Attitude, Subjective Norms and Perceived Behavioural Control having significant influence on behavioural intention of health-related behavioural intention.

Extended Theory of Planned Behaviour (ETPB)

Applications of TPB to an extended range of health-related behaviours has also been done (Conners & Sparks, 2005) and it might probably be the most stoutly built and consequential social cognition model in its ability to predict and explain health behaviours (Armitage & Connor, 2001). Despite the Theory of Planned Behaviour's success in forecasting intention and behaviour, new components are added to the model on a continuous basis to improve its utility. There are only a few researches that look into intentions in the uptake of influenza vaccination (Myers & Goodwin, 2011; Agarwal, 2014; Gallagher & Povey 2006). Hence, the Extended TPB (ETPB) has been used as a medium to fully investigate the motivating factors that underlies in decision making of vaccination on whether it has the potential to improve vaccination uptake among older adults (Gallagher & Povey, 2006). Ajzen (1991) acknowledged that new components might be added to the models to improve the prediction capability of a certain behaviour. As commented by Cheng and Ng (2006), it is possible that by incorporating parts from other theoretical models, it will result in improvements.

Attitude. The first independent determinant of intention is Attitude, which relates to how positive or negative a person's opinion or judgement of the behaviour in question is (Ajzen, 1991). In the study by Myers and Goodwin (2011), Attitude poses significant importance as avariable in the study, alongside with other studies by Myers and Goodwin (2011); Gallager and Povey (2006) for vaccination intention for priority groups and Caso, et al. (2019) in Italian Mother's intention in vaccinating sons against HPV as well as in the study by Twum et al. (2021). Besides, Attitude is a significant predictor of intentions in the model of TPB (Ajzen, 1991).

H_1: Attitude positively influences behavioural intention of Malaysians to be vaccinated against COVID-19

Subjective Norms. Subjective Norms relates to an individual's concerns about the reference group's perceptions of their behaviour, since the behaviour would be altered to match the expectations of the reference group (Ajzen, 1991). Subjective Norms were associated with vaccination intention in the study by Gallagher and Povey (2006) as an independent predictor,as supported by Myers and Goodwin (2011, 2012), Caso, et al. (2019) and

Cheng and Ng (2006).

H_2: Subjective Norms positively influence behavioural intention of Malaysians to be vaccinated against COVID-19

Perceived Behavioural Control. According to the TPB, the proximal antecedents of action are behavioural intention and Perceived Behavioural Control (PBC) (Abraham & Sheeran, 2003). Perceived Behavioural Control (PBC) refers to a person's assessment of how easy or difficult it is to do a specific behaviour (Ajzen, 1991). The availability of the necessary resources to approach a particular behaviour, such as money and time, is referred to as PBC, and it is a crucial predictor of health behavioural intention. Perceived Behavioural Control wasa significant predictor for the studies by Myers and Goodwin (2011, 2012), Caso, et al. (2019), Gallagher and Povey (2006) and Twum, et al. (2021).

H_3: Perceived Behavioural Control positively influence behavioural intention of Malaysians to be vaccinated against COVID-19

Knowledge. As per previous literature, Knowledge (towards general vaccination) has been included as a variable to study the association of the variable towards Attitudes. However, Knowledge has posed a different effect on behavioural intention in different studies which it was not significant for the study by Myers and Goodwin (2011, 2012), Ruiz and Bell (2021) and Cheng and Ng (2006). Besides, Empirical study for Knowledge as an additional variable in extended TPB has shown mixed results. According to Ajzen (2020) and Ajzen, et al. (2011), Knowledge poses no significant effect towards behavioural intention due to subjective measurements by researchers. However, in the study by Rosso, et al. (2019), Knowledge has significant impact towards the Attitudes of pregnant women in vaccinating the newborns.

H_4: Knowledge positively influences behavioural intention of Malaysians to be vaccinatedagainst COVID-19

Anticipated Regret. The expectation of feeling regret or distress if one does or does not engage in specific behaviours is known as Anticipated Regret. Anticipated Regret's implications may not be adequately explained in the TPB's expectancy value model of Attitudes (i.e., the sum of possible implications multiplied by their evaluations) (Abraham & Sheeran,

2003). The TPB's ability to predict behavioural intentions is improved by Anticipated Regret as argued by Buunk, et al. (1998), Parker, et al. (1995) and Richard, et al. (1996, 1998).

Anticipated Regret has been discovered to be a major predictor of seasonal influenza vaccination uptake (Chapman & Coups, 2006; Weinstein, et al., 2007). Anticipated Regret is a valuable predictor in the study by Gallagher and Povey (2006), Myers and Goodwin (2011), Caso, et al. (2019) and Liao, et al. (2011).

H_5: Anticipated Regret positively influences behavioural intention of Malaysians to be vaccinated against COVID-19

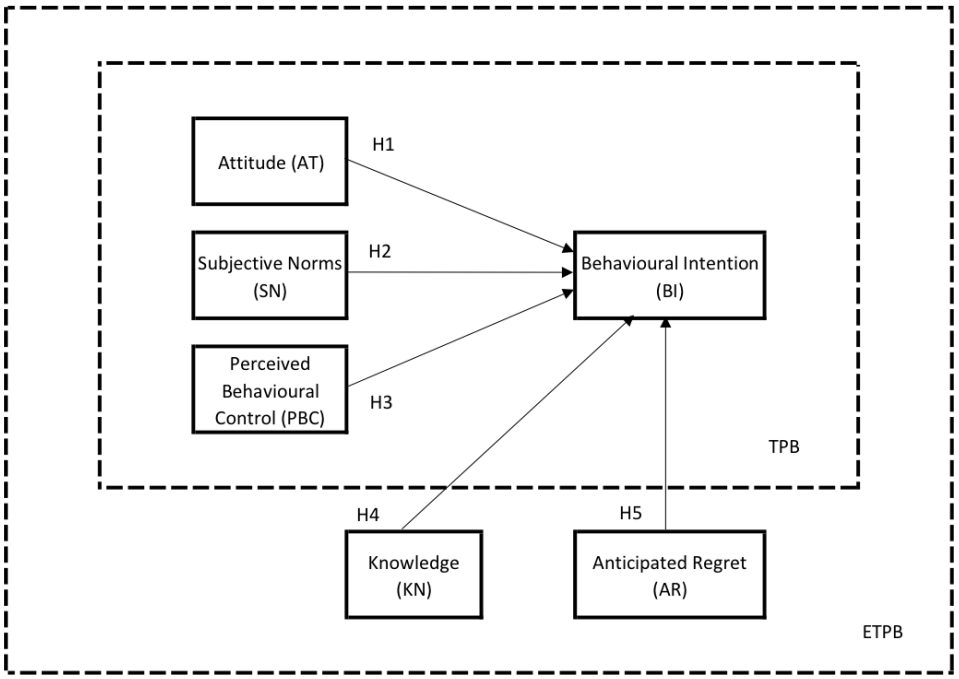

Figure 1 Conceptual Framework of this Study

Note. Adapted from the Theory of Planned Behaviour (Ajzen, 1991).

Methodology

Research Sample

In 2021, the estimated population of Malaysia is at 32.77 million (*Malaysia Population 1950–2021*, 2021) with 6.7 million males and 6.6 million females ranged from 25 to 54 years of age, which also composite of 40.86% of the total population (*Malaysia Age Structure -*

Demographics, 2020). Thus, a non-probability sampling method had been chosen for this study as the population of Malaysia is too enormous and there is a slim possibility to obtain reply from each and every targeted citizen. The table developed by Krejcie and Morgan (1970) was utilized in this paper to determine the sample size needed for this study. It should be observed that as the population grows, the sample size grows at a slower rate, eventually stabilising at little more than 380 cases. There are approximately 25.1 million of population above 15 years old in Malaysia during 2020 (Mahidin & Department of Statistics Malaysia, 2020). Hence, based on Table the limitation of the table, the current sample size estimated for this study would be 380. In the context of this study, the unit of analysis would be of individual level. Hence, adults, which is above 18 years old will be selected to analyse for the outcome as this is the current minimum age of COVID-19 vaccine eligibility. A compilation of survey questions willbe handed out to Malaysians, above 18 years old, with different demographic backgrounds, within 6 regions of Malaysia.

Research Design

This research will be a quantitative research study that takes a hypothetical deductive method to test the theory by gathering vast quantities of data from respondents and creating hypothesesfor testing. This study utilizes the Internet and social media in search for more possible responders and distribution of the Google Form survey questionnaire. Convenience sampling method is used in this study, where the data is gathered from members of the population who are readily available to do so (Sekaran & Bougie, 2016). The period of data collection is about4 months. Behavioural Intention refers to the intention of general public's intention to obtain COVID-19 vaccination while Attitude, Subjective Norms, Perceived Behavioural Control, Knowledge and Anticipated Regret was utilised to understand whether each factor has influence on the behavioural intention.

All items in the questionnaire will be assessed with 7 -point Likert scale unless otherwise stated. Osgood, et al. (1957) had reported that 7-point Likert scale is a better choice for evaluations after going through studies with a multitude of potential response options. The practical issue is that an electronically distributed survey with 5-point Likert items may not be able to fully capture data (Finstad, 2010). In short, a 7 -point Likert item appears to be more likely than a 5-point item scale to reflect a respondent's real subjective judgement of a usability questionnaire item (Finstad, 2010). Measurements of variables are as constructed in Table I.

Attitude variable is measured with semantic differential scales, which is also known as 7-point bipolar adjective scale (Ajzen, 2020). Subjective Norms was measure with 5 indicators

where indicators 1 to 3 (SN1 to SN3), approve will be anchored at (1) while disapprove will be anchored at (7) while for indicator 4 and 5 (SN4 and SN5), strongly agree will be anchored at (1) and strongly disagree anchored at (7). An established instrument was utilized to assess Knowledge about COVID-19 in a cross-sectional study by Azlan, et al. (2020). 13 items will be used to understand respondent's Knowledge towards COVID-19. Participants' understanding of COVID-19 clinical manifestations (items 1–4), transmission channels (items 5–8), and prevention and control (items 9–13) are among these items. To these questions, participants might respond with "true," "false," or "not sure." A correct response to an item received one (1) point, whereas an incorrect/unsure response received zero (0) points. Behavioural Intention was measured with a 5-point Likert scale from Strongly disagree to Strongly agree.

Table 1 Measurement of Variables

Variable	Items	Sources adapted from
Attitude(AT)	If I were to have a vaccination for COVID-19, itwould be: AT1: Wise – Foolish AT2: Worthless – Valuable (reverse score) AT3: Beneficial - Harmful AT4: Satisfactory – Unsatisfactory AT5: Bad – Good (reverse score) AT6: Positive – Negative	Myers and Goodwin, 2011
Subjective Norms (SN)	SN1: People who are important to me would...of me having a COVID-19 vaccination SN2: People who are my family would... of me having a COVID-19 vaccination SN3: People who are my friends would... of me having a COVID-19 vaccination SN4: I feel under social pressure to have a COVID-19 vaccination SN5: People who are important to me influence my decision to have a COVID-19 vaccination.	Myers and Goodwin, 2011

Variable	Items	Sources adapted from
Perceived Behavioural Control (PBC)	PBC1: The number of events outside my control which would prevent me from having a COVID-19 vaccine are: (reverse score) Numerous – Very few PBC2: It is mostly up to whether or not I have COVID-19 to vaccinate for. (Reverse score) Strongly disagree – strongly agree	Myers and Goodwin, 2011
Knowledge (KN)	KN1: The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and body aches. [True] KN2: Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus. [True] KN3: There currently is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients recover from the infection. [True] KN4: Not all persons with COVID-2019 will develop to severe cases. Only those who are elderly and have chronic illnesses are more likely to be severe cases. [True] KN5: Eating or touching wild animals would resultin the infection by the COVID-19 virus. [False] KN6: Persons with COVID-19 cannot infect thevirus to others if they do not have a fever. [False] KN7: The COVID-19 virus spreads via respiratory droplets of infected individuals. [True] KN8: The COVID-19 virus is airborne. [False] KN9: Ordinary residents can wear face masks to prevent the infection by the COVID-19 virus. [True] KN10: It is not necessary for children and young adults to take measures to prevent the infection by the COVID-19 virus. [False] KN11: To prevent the infection by COVID-19, individuals should avoid going to crowded places	Azlan, et al., 2020

Variable	Items	Sources adapted from
	and avoid taking public transportations. [True] KN12: Isolation and treatment of people who are infected with the COVID-19 virus are effective waysto reduce the spread of the virus. [True] KN13: People who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the isolation period is 14 days. [True]	
Anticipated Regret (AR)	AR1: If I did not have the COVD-19 injection this year, I would feel regret. AR2: If I did not have the COVD-19 injection this year, I would feel upset. Definitely no – Definitely yes	Gallagher and Povey, 2006
Behavioural Intention (BI)	BI1: I intend to vaccinate myself against COVID-19. BI2: I plan to vaccinate myself against COVID-19. BI3: I want to vaccinate myself against COVID-19.	Caso, et al., 2011

Data Analysis Method

This study's data analysis method was based on Sekaran and Bougie (2016). To begin, descriptive analysis was done to break down the characteristics of respondents in order to better understand the distribution of respondents. The construct validity and research hypotheses were then tested using a measuring model and a structural model. Smart PLS (Version 3.2 .8) was utilised to evaluate the measurement and structural model, while Microsoft Excel was used for data entry and preliminary analysis. The indicator, convergent, and reliability validity were tested using factor loading, average variance extracted (AVE), composite reliability (CR), andCronbach's alpha, while the discriminant validity was tested using the Heterotrait-Monntrait (HTMT) ratio.

Convergent validity is critical for confirming the study's confidence that a trait is well measured by its indicators, whereas discriminant validity is the degree to which the model's assessments of distinct qualities are unrelated. The bootstrapping approach was also employed in this work to give accuracy measurements to sample estimates in terms of bias, variance, confidence intervals, and prediction errors. Finally, the hypotheses were tested using structural equation modelling (SEM).

Results

Respondents' data

In total, there are 432 respondents, which is 52 more respondents from what has been interpreted in the previous sections. The demographic background of respondents is summarized in Table 2.

Table 2 Demographic background of respondents

Characteristics	Frequency	(%)
Gender		
Male	115	26.62
Female	317	73.38
Ethnicity		
Malay	81	18.75
Chinese	296	66.20
Indian	65	15.05
Others	0	0
Age		
18 – 24	268	62.04
25 – 34	85	19.68
35 – 44	41	9.49
45 – 54	22	5.09
55 – 64	15	3.47
65 and above	1	0.23
Region that is currently residing		
Northern Region (Penang, Perak, Perlis, Kedah)	110	25.46
Central Region (Selangor, Kuala Lumpur, Negeri Sembilan, Putrajaya)	124	28.70
Southern Region (Melaka, Johor)	69	15.97
East Coast (Pahang, Kelantan, Terengganu)	45	10.42
Sabah	40	9.26
Sarawak	44	10.19

Characteristics	Frequency	(%)
Marital Status		
Single	368	85.19
Married	49	11.34
Divorced	15	3.47
Education Level		
Secondary or less	43	9.95
Diploma	89	20.60
Bachelor's Degree	234	54.17
Post-graduate Degree	60	13.89
Others: Foundation, STPM, Professional certification	6	1.39
Household Income Level		
RM2,500 or less	141	32.64
RM2,501 ~ RM4,849	98	22.69
RM4,850 ~ RM10,959	118	27.31
RM10,960 ~ RM15,039	7	1.62
RM15,040 or more	13	3.01
Rather not disclose	55	12.73
Preferred vaccination brand		
Pfizer-BioNTech (US)	226	52.31
AstraZeneca (UK)	57	13.19
Sinovac (China)	97	22.45
CanSino Biologics (China)	28	6.48
Sputnik V (Russia)	24	2.56
Preferred Method of Vaccination Uptake		
Walk-In	85	19.68
Appointment via MySejahtera App	301	69.68
Appointment via dedicated website	41	9.49
Others: Private	5	1.16

Measurement Model

Table III shows the outcomes indicator, internal consistency, convergent and discriminant validity. The outer loadings of each item on its respective variable were examined as part of the indicator reliability analysis. All six variables in this investigation had factor loadings thatwere higher than the rule of thumb, ranging from 0.737 to 0.967. Internal consistency is indicated by the fact that each variable's CR and Cronbach's alpha readings are all over 0.7, implying good consistency reliability (Henseler, et al., 2009, 2017). The variables were examined for convergent validity to determine the level of correlation of each indicator in assessing the same variable. All of the variables' AVE values ranged from 0.625 to 0.926, exceeding the minimum requirement of 0.5, suggesting that the model had convergent validity.

The discriminant validity of the measurement model was tested by measuring the Heterotrait-Monotrait (HTMT) ratio as the final stage in the evaluation process. Discriminant validity is a measure of how dissimilar each variable is from the others, and it should be less than 0.90 to be considered acceptable. The HTMT ratio in this study ranged from 0.301 to 0.776, showing that the items measured are distinct from one another and that discriminant validity has been demonstrated.

Table 3 Results of the measurement model for indicator, internal consistency, convergent and discriminant reliability.

Variable	Loadings * >0.70	Cronbach Alpha * >0.70	Composite Reliability * >0.70	AVE * >0.50
Attitude		0.857	0.896	0.632
AT1	0.794			
AT2	0.849			
AT3	0.737			
AT4	0.786			
AT5	0.806			
Subjective Norms		0.933	0.957	0.882
SN1	0.943			
SN2	0.937			
SN3	0.937			
Perceived Behavioural Control		0.701	0.833	0.625
PBC1	0.779			

Variable	Loadings * >0.70	Cronbach Alpha * >0.70	Composite Reliability * >0.70	AVE * >0.50
PBC2	0.747			
PBC3	0.842			
Knowledge		1	1	1
KN7	1			
Anticipated Regret		0.92	0.962	0.926
AT1	0.967			
AT2	0.958			
Behavioural Intention		0.946	0.965	0.903
BI1		0.943		
BI2		0.957		
BI3		0.951		

Note: AT6, SN4, SN5, KN1 till KN6 and KN8 till KN13 loadings were not recorded as itdid not surpass the minimum threshold of 0.70
*meant the indicator's minimum threshold

Structural Model

The VIF (Variance Internal Factor) measurement revealed that there is no possibility for collinearity in this study because all variables have a VIF value of less than 3.3. (Kock & Lynn, 2012; Kock, 2015). The model's degree of fit was assessed using the Coefficient of Determination (R^2). Hair, et al. (2016) defined the impact R^2 range as 0.25 for weak, 0.5 for moderate, and 0.75 for significant. The R^2 for the direct effect was 0.34, indicating that the constructs can explain 34 percent of the variance in behavioural intention.

Effect Size (f^2) can be used to determine whether an omitted exogenous construct has an impact on the endogenous constructs. Small, medium, and high impacts on external latent variables are represented by f^2 values of 0.02, 0.15, and 0.35, respectively (Hair, et al., 2017). Table IV shows the outcome of f^2 and VIF assessment. Table IV shows that Subjective Normsand Anticipated Regret has high effect size on behavioural intention.

The derived hypotheses were examined using path analysis, and the theoretical model developed using SmartPLS was validated using bootstrapping analysis. This study tested the direct effect of independent variables (Attitude, Subjective Norms, Perceived Beh avioural Control, Knowledge and Anticipated Regret) towards dependent variable (Behavioural Intention). Based on

Table 5, all the variables show significant relationship towards behavioural intention except for the variable Knowledge as the t-statistics of Knowledge is less than 1.645 (*t*-values = 1.236, $p < 0.05$).

Table 4 Assessment of f square and variance internal factor

	Endogenous Variable Behavioural Intention	
Exogenous variable	*f2*	VIF
Attitude	0.011	2.237
Subjective Norms	0.059	2.228
Perceived Behavioural Control	0.008	1.564
Knowledge	0.003	1.247
Anticipated Regret	0.037	1.355

Table 5 Summary of hypotheses results

Hypotheses	Path Coefficient	*t* statistics	*p*-value	Decision
H1: Attitude → Behavioural Intention	0.125	2.095*	0.018	Supported
H2: Subjective Norm → Behavioural Intention	0.294	4.569*	0	Supported
H3: Perceived Behavioural Control → Behavioural Intention	0.090	1.801*	0.036	Supported
H4: Knowledge → Behavioural Intention	-0.046	1.236	0.108	*Not supported*
H5: Anticipated Regret → Behavioural Intention	-0.181	2.933*	0.002	Supported

Note: *Significant at $p = 0.05$ level

Discussion and conclusion

This study is carried out based on the TPB and ETPB theory to analyse the factors that may affect Behavioural Intention of Malaysians in the up taking of the COVID-19 Vaccination. There are limited studies carried out in Malaysia in investigating the vaccination intention especially as prevention and achievement of herd-immunity towards COVID-19. Hence, this paper aims to fill

the gaps by examining factors affecting vaccination intentions among Malaysians to aid in future efforts of government in better pandemic control in the future.

In terms of TPB and ETPB factor evaluations, it is shown that all the variables have predictive capabilities of the Behavioural Intention to vaccinate against COVID-19. However, Knowledge was not a significant predictor of Behavioural Intention.

As per previous studies by Ajzen (1991), Myers and Goodwin (2011), Gallager and Povey (2006) and Caso, et al. (2019), Attitude is proven to be a significant predictor of intentions. Hence, H_1 is supported as well in this study. In terms of Subjective Norms, this variable was supported by studies done by Ajzen (1991), Gallagher and Povey (2006), Myers and Goodwin (2011, 2012), Caso, et al. (2019) and Cheng and Ng (2006) and H_2 is also provento be supported in this study. For Perceived Behavioural Control, as predicted by Myers and Goodwin (2011), Caso, et al. (2019) and Gallagher and Povey (2006), Perceived Behavioural Control is a significant predictor of Behavourial Intention in this study as well. Therefore, H_3 is proven to be significant. In this study, Knowledge (towards general vaccination) has been added as a variable to explore the relationship between the variable and Behavioural Intention, as has been done in prior research. However, in different investigations, although Knowledge has had a distinct effect on behavioural intention, it was not significant in the studies by Myers and Goodwin (2011, 2012), Ruiz and Bell (2021), and Cheng and Ng (2006). In this study, Knowledge of Malaysians has been featuring 13 questions measuring general COVID-19 knowledge, adapted from the study by Azlan, et al. (2020) where it has not shown any significant predictive capability towards Behavioural Intention, which in this case, the uptake of COVID-19 vaccination. As supported by Ajzen (2020) and Ajzen, et al. (2011), in the context of this study and the measurements used, Knowledge poses no significant effect towards Behavioural Intention. Therefore, H_4 is not supported as opposed to the study done by Rosso, et al. (2019). Lastly, on Anticipated Regret, it is a significant predictor of Behavioural Intentionin the studies done by Chapman and Coups (2006), Weinstein, et al. (2007), Gallagher and Povey (2006), Myers and Goodwin (2011), Caso, et al. (2019) and Liao, et al. (2011). In the context of this study, Anticipated Regret is also a major predictor of COVID-19 vaccination uptake and hence, H_5 is supported.

In this study, there are more Female respondents compared to Male as this study has aimed to be able to collect the intention of those residing in Sabah and Sarawak, regardless of their gender hence might be the reason in more female respondents than male respondents that responded during the stage of data collection. This study also has more respondents that are aged 18 to 24 and mostly of which are degree holders. This demographic background, however, do not justify for Knowledge's influence towards Behavioural Intention. As suggested by Ajzen (2020) and Ajzen, et al. (2011), knowledge's predictive capabilities are dependent on the measurements established by individual researchers. It this study, it is shown that by measuring respondent's

knowledge towards COVID-19 does not pose significant effect towards behavioural intention.

In practical terms, this study that features TPB and additional variable of Anticipated Regret alongside with Knowledge as a moderator in understanding the relationship between Attitudes with behavioural intention among Malaysians to uptake COVID-19 vaccination could provide better insight to pharmaceutical companies and public health personnel in exploring the factors that induces the consumers behaviour. Based on empirical searches on Google Scholar, there are less studies that uses TPB and ETPB as a theoretical framework to predict COVID-19 vaccination intention, especially in Malaysia. This study could fill a research gap and in turn provide to concerned party information to improve COVID-19 vaccination uptake among the general public and improve COVID-19 vaccination rates in Malaysia. This study could also serve its purpose in investigating whether people's knowledge,attitudes, and behaviours about the disease all have a role in a society's willingness to adopt behavioural change initiatives from health authorities. In short, this study also provides a general picture of Malaysian COVID-19 preventative practices, which can help the government better prepare for future infectious disease crises. The findings of this study will hopefully assist in guiding future efforts aimed at increasing public readiness to comply with pandemic management measures.

Future researchers that would like to extend this study could establish a relation between ethnicity, income, education level and vaccine brand preference relation as a factor influencing vaccination intention as it was not done in this study due to time constraints. Future researchers could also integrate Health-Belief Model to current Theory of Planned Behaviour framework to test its predictive ability of the factors towards vaccination intention.

Theoretical, managerial and social implications

In the current era of Internet dominance, advancement of technology and the global trend that head towards digitalization, the public has been receiving abundance of information especially during this COVID-19 era. The media has a related responsibility towards the spreading of accurate vaccine information (Dubé, et al., 2013). Thus, the general public may be influenced by the available information on the web or media which could in turn induce them to perform certain behaviour. With the addition of Knowledge as moderator in examining the relationship between Attitude and Behavioural Intention, this paper could provide more information on how knowledge of the public could influence their attitude towards their vaccination intention. This study also examines how Anticipated Regret serves as a variable in predicting vaccination behavioural intention among Malaysian. All in all, an insight to the public can be provided by this paper by investigating the health behaviour predicting factors that influences the general public in Malaysia to vaccinate against COVID-19.

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