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Psychological Influence towards Health Consumers Intention to use A Malaysia National Web based Health Information Service

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Abstract

Drawing upon Health Belief Model, the study investigated the psychological predictors that determine the usage intention of the Malaysian web-based health information service, MyHEALTH Portal. The results of the measurement model show the evidences of outcome expectations and internal cues as the predictors to the portal usage, while external cues was found to be insignificant. The findings would help the Malaysia Ministry of Health in identifying significant psychological factors that influence the portal usage. This would allow them to re-strategize the portal's marketing and promotional works effectively thus to be maximally used by the public while achieving its long-term goal.

Keywords: psychological; health consumers; intention to use; web-based health information service

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1.0 Introduction

Health education is described as any combination of learning experiences designed to help individuals and communities to improve their health by increasing their knowledge or influencing their attitudes (WHO, 2014). An effective way of how to promote health education to the mass is with the support of technology (Brian, 2008). Such in the case by using online health information service which is the Web-based Health Information Service (WBHIS) to deliver up to date health information and to empowered health consumers to be able to make healthy decision making. According to Griffin *et al.* (1999, 2004), information seeking is motivated by users' information needs, which is the perception of knowledge insufficiency and their health information searches are found to be related to their individual characteristics (Lambert and Loisele, 2007). Individual characteristic consisting of psychological elements where an individual with a higher health value and an internal health locus of control tends to search more for health information (DeVito *et al.*, 1982). There are great number of empirical studies investigating well-known inhibiting factors of user's acceptance towards online health information (Rho and Choi, 2014; Kim and Chang, 2007; Wilson and Lankton, 2004; Kim and Park, 2012) however there is limited information describing on psychological factors that influence people to use online health information, although this literature base is growing (Dumitru *et al.*, 2007; Lemire *et al.*, 2008; Ybarra and Suman, 2008; Atkinson *et al.*, 2009). Thus, this paper highlights the significant psychological aspect that is relevant to the study of WBHIS as it has been shown in literature influenced health consumers' behavioral intention to use

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WBHIS. The findings may contribute to the literature by theorizing and testing how the psychological factor specifically the Health Belief Model (Rosenstock, 1974) may affect health consumers WBHIS usage intention along with the fact that there is paucity in the existing studies where psychological influence was found as limitedly studied as predictor variable within the area WBHIS and ehealth (Yun and Park, 2010; Xiao *et al.*, 2014; Torres, 2011). The paper attempted to contribute in two distinct area; first, to provide new support to existing literature on the use of HBM as the predictor for WBHIS usage intention. and; second, to produce a new instrument that measures HBM-outcome expectations and cues to action (external) due to the absence of empirical studies that investigate the constructs.

2.0 Theoretical Background and Research Hypotheses

The study which focuses on the adoption of a national WBHIS developed by Ministry of Health Malaysia in 2005 that is MyHEALTH Portal (MHP), is constructed from one of the most widely used psychological theories in health behavior research (Carpenter, 2010; Glanz and Bishop, 2010) that is Health Belief Model (Rosenstock, 1974). The HBM suggests health consumers' beliefs about their perceived benefits and barriers to the action and also the cues to action (external and internal cues) explain their engagement or lack of engagement in any health-promoting behavior (Janz and Becker, 1984; Rosenstock, 1974). As such, health behavior is more likely to be carried out if benefits can be derived from performing the behavior; there are few barriers to performing the behavior or some combination of these. Also, cues to action such as symptom perception or health communication may also prompt performance of the behavior. Several preliminary studies have highlighted HBM constructs as significant with regards to online health information seeking behavior (Xiao *et al.*, 2014; Wong *et al.*, 2012; Powel *et al.*, 2011).

As for the present study, two HBM measures are examined; outcome expectations and cues to action. Outcome expectation is comprised of perceived benefits and perceived barriers which are used together to determine the evaluation of the course of action taken, meanwhile, external and internal cues are necessary for prompting engagement in health-promoting behaviors (Rosenstock, 1974). Internal cues such as physiological cues e.g. pain and symptoms and external cues include events or information from close others, the media, or health care providers promoting engagement in health-related behaviors (Glanz *et al.*, 2008). Within this study, HBM is applied to predict intention to use MHP specifically the outcome expectations and cues to action as predictors to measure its impact on the dependent variables and to establish boundary conditions. The research framework which explains the relationship is illustrated in Figure 1.

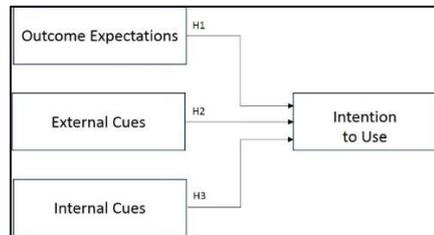


Fig. 1: Research Framework

The hypotheses included are; H₁: Outcome expectations will positively influence health consumers' intention to use MHP, H₂: External Cues will positively influence health consumers' intention to use MHP, and, H₃: Internal Cues will positively influence health consumers' intention to use MHP.

3.0 Methodology

This study utilized an online survey to answer the research hypotheses. Identified population for the study is the users of MHP that accessed the portal at the official URL, www.myhealthportal.gov.my. Meanwhile, for the target population of the study, it only includes users who used MHP during the study is conducted and regardless the number of experiences they had with the portal. The study includes users age between 18 to 55 years old which typically comprise those from undergraduates to working adults.

A non-random sampling technique was selected in recruiting respondents for the study using the convenience sampling. The number of participants for this study was considered based on Hair *et al.* (2014, 2017) estimation for PLS-SEM which originated from Cohen's rule of thumb (1992) to take account of the minimal requirements for the PLS-SEM purpose. The study survey was hosted on the official MHP website www.myhealth.gov.my and the cross-sectional survey of visitors to the MHP website was carried out using a link placed on the home page of the website. It is a web-based option-in survey of a convenience sample of respondents. There are two set of scales used in the study. The first scale was used for outcome expectations, external cues and intention to use which is on a continuum from 1 to 7. The "1" represents the level of "strongly disagree", and the "7" represents the degree of "strongly agree". Meanwhile, scale for internal cues was on a continuum from 1 to 5 with "1" generally represents the level of "very poor", and the "5" represent the degree of "very good". The absence of empirical studies investigating both constructs (outcome expectations and external cues) has led to its development primarily guided with established conceptual definitions and supported by related scientific literature concerning the constructs. The measurement items for outcome expectations were developed based on the construct definitions (Rosenstock, 1974; Glanz *et al.*, 1997) and based on the findings from qualitative studies on WBHIS' benefits and challenges from Jung and Berthon (2009),

Powell *et al.* (2011) and Moreno *et al.* (2009). The next statement highlights some of the 14 items used in the study. "The experience to find required health information using the technology are: time-saving, convenient to access, high source credibility where information comes from professionals and Less cost compare to other health information channels (e.g. visiting a doctor)". The measurement items for external cues were developed based on the construct definitions using media as the medium for health promotion activities (Janz and Becker, 1984; Carpenter, 2010). Using a seven-point Likert scale, respondents were required to answer the statements based on their level of agreement. Examples of the 13 items are; "I have seen the advertisement in local television, I have heard about the portal in the local radio station, I have read somewhere regarding the portal in local newspapers/magazines".

Construct on internal cues to action-health conditions were adopted from the validated scales of WHO Quality of Life (WHOQoL) BREF Questionnaire on Quality of Life, General Health, Physical Health and Psychological Health constructs (WHO, 1993). Two domains were adopted for this study that are physical and psychological health along with another two additional health facets that are; overall quality of life and general health which all are relevant to the scope of the study. Previous studies on WHO Quality of Life has indicated good to excellent psychometric properties concerning internal consistency, item-total correlations, discriminant validity and construct validity (Skevington *et al.*, 2004). The Cronbach's alpha for physical and psychological domains were reported as 0.82 and 0.80 (Skevington *et al.*, 2004).

The user measurement behavioral intention was adapted from Chau and Hu (2002) and Venkatesh *et al.* (2003) and had reliability value of 0.90. This study was approved by Health Education Division, Ministry of Health and registered with the National Malaysia Medical Research. Participants were informed that all participation was completely voluntary, that all information would be treated confidential and they were given the right to withdraw from it at any time.

4.0 Data Analysis

The first stage of survey data analysis dealt with data preparation which involved conducting a preliminary analysis to screen the data for incomplete or invalid data entries. These included steps undertaken to deal with missing data, suspicious response patterns, detecting outliers and assumption of normality. In the second stage, the hypotheses were tested which involved conducting the main analysis using the Partial Least Square (PLS) path modeling. Here, a two-stage analytical procedure was used to analyze the data. Firstly, a confirmatory factor analysis (CFA) was conducted to assess the measurement model followed with the structural model to confirm on the proposed hypotheses.

4.1 Preliminary Analysis.

A total of 223 participants responded to the web survey invitation and out of the 223 responses, 10 responses were found to be incomplete. This is due the respondents stop answering the questionnaire halfway through. To treat for missing data, when the amount of missing data on a questionnaire exceeds 15%, the observation is typically removed from the data file (Hair *et al.*, 2017). Besides that, the data collected also need to be checked for any suspicious response pattern. Within the study, it was found 13 out of 223 responses to be invalid due to cases have suspicious response pattern (straight lining - answered similar scales for all questions). Thus, a total number of 13 cases were deleted for further analysis. the initial perusal of z scores yielded 27 cases in excess of $> \pm 3.29$ indicating having univariate outliers. These 27 cases were omitted from the data set for further data analysis and therefore, there were only 173 cases were used in the subsequent analyses. The results from the Shapiro-Wilk test show that all variables have significant values of 0.00. This indicates that the data are not normally distributed. A further test was conducted by calculating the data skewness and kurtosis values. The result of this test confirms that the data distribution is non-normal, where about 80% of the data presented skewness and kurtosis above the recommended threshold, -1 to +1.

4.2 Descriptive Statistics

Table 1 highlights the demographic details of the respondents participated in the study.

Table 1. Demographic details of the respondents within the study

Characteristics	Classification	N	Percentage (%)
Gender	Male	60	34.5
	Female	114	65.5
Age	18-19 years	3	1.7
	20-29 years	84	48.3
	30-39 years	73	42
	40-49 years	14	8
Race	Malay	162	93.1
	Chinese	11	6.3
	Indian	1	0.6
State	Selangor	56	32.2
	Johor	16	9.2
	Pulau Pinang	9	5.2
	Perak	10	5.7
	Pahang	4	2.3
	Negeri Sembilan	3	1.7
	Kedah	3	1.7
	Melaka	20	11.5

Characteristics	Classification	N	Percentage (%)
Occupational Level	Terengganu	8	4.6
	Kelantan	4	2.3
	Sabah	2	1.1
	Sarawak	10	5.7
	Kuala Lumpur	16	9.2
	Putrajaya	12	6.9
	Professional	58	33.3
	Support	43	24.1
	Student	64	36.8
	Self-employed	6	3.4
	Unemployed	4	2.3

5.0 Results

SmartPLS 3.0 statistical software application was used to analyze the measurement and structural model (Ringle, Wende and Becker, 2015).

5.1 Measurement Model Assessment

A measurement model has satisfactory internal consistency reliability when the composite reliability of each construct exceeds the threshold value of 0.7. The composite reliability of each construct for this study ranges from 0.898 to 0.963 and this is above the recommended threshold value of 0.70. Thus, the results indicate that the items used to represent the constructs have satisfactory internal consistency reliability. A measurement model is said to have satisfactory indicator reliability when each item's loading is at least 0.7 and is significant at least at the level of 0.05 (T-value > 1.96) accounted for 95% confidence interval. There are two constructs in the measurement model exhibited indicator loadings exceeding 0.70 threshold value suggesting the items measured are reliable (intention to use and outcome expectations).

However, for cues to action constructs both external and internal cues reported several outer loadings below the suggested threshold value. The indicators are; external cues (EXC5=0.698, EXC8=0.452) and internal cues (INC1=0.648, INC2=0.611, INC3=-0.060, INC4=0.636, INC5=0.640, INC12=0.647, INC14=0.039). Following Hair *et al.* (2017), any indicator loadings that falls between 0.40 and 0.70 should be considered for removal only if the removal leads to increase in the composite reliability or the AVE values, otherwise, it does not have to be removed. For EXC5, since the difference from the threshold value is very slight that is 0.02, it is retained while for EXC8, it is removed as the AVE value for the construct (external cues) is increased after item removal.

Meanwhile Hair *et al.* (2017) also had suggested for indicators below 0.40, loadings should be eliminated. This implies to internal cues' construct - INC3 and INC14 which had outer loading < 0.40. Both items were deleted from the model. Since the threshold value of AVE for internal cues is not achieved, indicators with loadings below 0.70 also need to be removed achieve the AVE threshold value of > 0.05. This applies to INC1, INC2, INC4, INC5, and INC12. After removal, the PLS algorithm and bootstrap test are rerun and all items finally have demonstrated satisfactory indicator reliability. Following this, the measurement model's convergent validity is assessed by examining its average variance extracted (AVE) value. Convergent validity is adequate when constructs have an average variance extracted (AVE) value of at least 0.5 or more. After item deletion was made earlier due to low loadings, the new AVE value for all constructs exceeded the recommended threshold value.

Next is to assess the discriminant validity which is the degree to which items differentiate among constructs or measure distinct concepts by examining the correlations between the measures of potentially overlapping constructs. The measurement model's discriminant validity is assessed by using three measures: 1) Fornell and Larcker's (1981) criterion, 2) cross-loading and, 3) Hetetrotrait-Monotrait Ration (HTMT). All off-diagonal elements are lower than square roots of AVE. Hence, the result confirmed that the Fornell and Larker's criterion is met. Meanwhile, the loading of each block is higher than any other block in the same rows and columns. The loading clearly separates each latent variable as theorized in the conceptual model. Thus, the cross-loadings output confirmed that the second assessments of the measurement model's discriminant validity are satisfied.

Following this, all HTMT values are clearly lower than the threshold value of 0.9. Another assumption in HTMT that has to be fulfilled is by looking at the lower and upper bounds of the 95% confidence interval. Neither of the confidence intervals includes the value of 1. The values of lower and upper bound for all relationship are ranging from 0.070 to 0.878. Thus, the HTMT values and confidence intervals have confirmed that the third assessments of the measurement model's discriminant validity are satisfied. To summarize, all model evaluation criteria have been met, providing support for the measures' reliability and validity. This served as the indicator that the measurement model for this study is valid and fit to be used to estimate parameters in the structural model.

5.2 Structural Model Assessment

There are six key criteria for assessing the validity of the structural model which are: collinearity assessment, the significance of the path coefficients, level of the R^2 values, f^2 effect size, predictive relevance (Q^2) and q^2 effect size. All constructs-VIF values are below the threshold of 5 (VIF < 5), therefore no collinearity exists. The result can further conclude that collinearity among the predictor constructs is not a critical issue in the structural model and the results report can be further continued.

Outcome expectations, external cues, and internal cues are able to explain 58.6% of the variance in intention to use. R^2 values range from 0 to 1 with higher levels indicates higher levels of predictive accuracy. Following the rules of thumb, the R^2 values of intention to use (0.586) can be considered moderate (Hair, Ringle, and Sarstedt, 2011; Henseler *et al.*, 2009). The f^2 effect size measures the change in the R^2 value when specific exogenous (independent variables) is omitted from the model. It is used to evaluate whether the omitted predictor construct has a substantive impact on the R^2 values of the endogenous construct(s). The f^2 effect size of external cues was shown as no effect on the endogenous variable (0.003). Meanwhile the effect size of outcome expectation and internal cues towards the intention to use showed a medium and small effect size respectively (0.219, 0.107).

To further examine the model's capability to predict, blindfolding procedure was performed to assess the predictive relevance of the path model. The Q^2 value of the endogenous construct is considerably above zero which imply predictive relevance (Hair *et al.*, 2014, 2017). The results of q^2 effect sizes revealed outcome expectations have medium effect in producing predictive relevance for intention to use (0.152) while external cues showed no effect on the target construct (0.011). Finally, internal cues have a small effect in producing the predictive relevance with effect size value of 0.068. To confirm the significant effect of exogenous variables on endogenous variables despite the effect size and variance, a larger subsample of 5,000 is chosen to ensure the stability of results as suggested by Ringle, Wende, and Becker (2015). Based on the t-statistics output, the significant level of each relationship is determined. The results indicate that all paths are statistically significant using a two-tailed test (t-value > 1.96) except for external cues (t=0.70). Table 2. below list the path coefficients, observed t-statistics, significance level values and the confidence intervals for all hypothesized path.

Table 2. Path coefficients, observed t-statistics, significance level values and the confidence intervals for all hypothesized path

Hypotheses	Relationship	Path coefficient	t Values	P values	Significance ($p < 0.001$)
H1	Outcome Expectation → Intention to use	0.530	6.234	0.000	**
H2	External Cues → Intention to use	0.037	0.700	0.484	NS
H3	Internal Cues → Intention to use	0.218	3.533	0.000	**

$p < 0.001^{**}$, NS-Not supported

The assessment of the path coefficient in Table 2 shows supported hypotheses are significant at the level of 0.001, have expected sign directions (i.e., positive) and consist of a path coefficient value (β) ranging from 0.037 to 0.530. With regards to the predictor of health consumers' intention to use MHP, results showed outcome expectations and internal cues were found to be significantly and positively related to intention to use ($\beta=0.530$, $t=6.234$, $p<0.001$; $\beta=0.218$, $t=3.533$, $p<0.001$) and as a result, Hypothesis H1 and H3 were supported. However, the result did not provide support for the relationship between external cues and intention to use ($\beta=0.037$, $t=0.700$, $p>0.001$). This lead to the rejection of Hypothesis 2 and acceptance of the null hypothesis. Therefore, hypothesis 2 is rejected.

6.0 Discussion

This study suggested that MHP-outcome expectations positively influenced health consumers' intention towards MHP usage ($\beta=0.530$, $t=6.234$, $p<0.001$) which determined it as the key important factor towards the intentional use of MHP. This shows that within the study, MHP offered greater extent of perceived benefits compared with perceived barriers which finally contributing to the acceptance of the portal. This result clearly supported Gehlert and Bollinger (2012) who said, health behavior is more likely to be carried out if benefits can be derived from performing the behavior and outweigh the number of barriers to performing the behavior, or some combination of these (Gehlert and Bollinger, 2012).

Meanwhile, previous studies investigating this area also supports the perceived benefits of WBHIS as influenced the health consumers-intention to use such as in Powell *et al.* (2011). For example, Powell *et al.* (2011) conducted a qualitative study to know on the motivations, benefits, and barriers faced by the online health information seekers of the National Health Service (NHS) Direct website which is a major UK provider of online health information. In their findings, it was revealed that users experienced several benefits clustered around three theme areas that are the convenience, coverage, and anonymity have become the major factor of seeking the health information in the website. Compared to perceived barriers, their interviews revealed few challenges information however, no prominent theme emerged (Powell *et al.*, 2011). Another study in this area was conducted by Moreno *et al.* (2009) where their work is based on the reviews of existing literature and expert synthesis on the benefits and barriers of online health services among adolescents. Results in their reviews study discovered some potential benefits of providing online health services to adolescents including improved their access towards health care sources, the level of health literacy, and their level of ongoing care. Meanwhile few potential barriers were also captured such as information complexity, confidentiality concerns, legal issues, and management priorities, however, according to Moreno *et al.* (2009) although barriers exist to implementing adolescent access to online health services, the potential benefits gained are much more significant found within the reviews' and experts' analysis conducted. In the study also, external cues have been identified not showing significant influence on health consumers' intention to use MHP ($\beta=0.037$, $t=0.700$, $p>0.001$). This result is expected considering the low score of the construct within the study (total mean=2.66).

Several interview studies had confirmed lack of promotions and advertisements regarding the existence of WBHIS among health consumers contributed towards the result. For instance, the lack of external cues factors is consistent with the previous study that examined users' acceptance of ehealth services with regards to determinants of, and barriers to, their intention to use ehealth services (Jung and Loria, 2010). In that study, Jung and Loria (2010) had conducted an in-depth interview and found an additional finding relating to other factors that becomes cues to online health behavioral action which is the external factor highlighted as lack of awareness regarding the existence of the services was the main reason why the interviewees had not previously made use of it. Furthermore, Inthiran (2010) in his study regarding Malaysian health-seeking behavior concluded that Malaysian health consumers are unaware of

the existence of available medical domains to search for relevant health information needs. This statement also includes MHP as one of reputable local medical domain available in Malaysia. Additionally, Benigeri and Pluye (2003) had long pointed out on the shortcomings of health information on the internet where they had highlighted the most important barriers to the use of health and medical information on the internet are the difficulties in finding it and, for a large part of the population, in understanding and using it properly. This could probably due to the lack of communicating and educating on the use of the available services. Overall, due to the absence of quantitatively empirical findings relating the construct, thus it can be highlighted that the results of this study are anticipated and supported by previous literature and findings.

Finally, internal cues have been identified as significantly influenced the health consumers' intention to use MHP ($\beta=0.218$, $t=3.533$, $p<0.001$). Within the study, the result is expected considering the average score of the health construct among health consumers (internal cues) which were rated as moderate to good with higher internal cues' score indicates better physical, psychological and general health (total mean = 3.783). Overall, this result suggested that individuals' state of health meaningfully contributed towards their intention to use MHP where individuals with better health tend to engage with MHP. This result, however, was found inconsistent with previous studies that examined directly on users' health status towards WBHIS use (Wong *et al.*, 2012; McKinley and Ruppel, 2014; Xiao *et al.*, 2014; Lemire *et al.*, 2008). The inconsistencies throughout previous studies are differed by at least two diverse results, for instance, Wong *et al.* (2012) investigated the predictors of Internet use to search for online health information among Chinese older adults. In that study, physical health and psychological health were found did not significantly correlate with the behavioral intention of online health information although they possessed better physical and psychological health. In Wong's *et al.* (2012) study, he has argued this inconsistency may be explained by the cultural values of Chinese people. Chinese people greatly emphasize on food intake, medicine, and tonic supplements (Li, 1995). Their traditional culture also highly values personal effort and believes that it is an essential element that leads to success in all aspects of life, including career and health domains (Kuo and Chang, 2004). Therefore, to maintain a healthy body, they tend to acquire all relevant information and recipes available from various available sources, and not necessarily depends on internet sources. Such beliefs in health might help to explain why perceived health was not a contributing factor towards their intention to use the Internet.

In contrary, another finding has explored on how perceived severity and self-efficacy of mental health predicted college students' use and perceptions of online mental health resources (McKinley and Ruppel, 2014). Results showed that perceived severity of mental health (psychological health) was not associated with the use of online mental health resources. The result contrasts with Wong's *et al.* (2012) in which it indicates individuals experiencing the perceived severity of mental health problems is not intended to use available online mental health resources. Specifically, McKinley and Ruppel (2014) suggested that when the students perceived that their mental health problems are of serious concern, students possessing greater self-efficacy may be less motivated to use online services. One implication is that possessing higher levels of severity and efficacy leads students to take more direct treatment-seeking actions (e.g. communicating face-to-face with mental health professionals) which allows them to have direct face-to-face therapy sessions that is impossible with online resources.

While the results of the previous studies are varied, the present study indicates rather interesting outcome revealed individuals with better health tend to engage with MHP-WBHIS. A possibility may be as according to Weaver *et al.* (2010), health is positively related to the search for wellness information and negatively related to the search for illness information. Since in this study the health consumers reported moderate to a good state of physical, psychological and overall general health, the finding is significant as the result reported.

7.0 Conclusion

To conclude, the findings from the study does support HBM through its outcome expectations and internal cues constructs which have shown significant effect on intention to use technology. The findings also confirmed outcome expectations as key predictor towards health consumers' usage intention of MHP-WBHIS. Thus, the findings had supported the health theory which convinced if an individual believes that particular action will reduce susceptibility to a health problem or decrease its seriousness, then he or she is likely to engage in that particular health behavior. Also within the study, health consumers' state of health had confirmed its significant role in explaining their intention to use MHP. Except for external cues which have received no adequate support for MHP-intention to use hence, this study partially confirms that health consumers' MHP-behavioral intention is partially influenced by the psychological factor within the HBM specifically with respect to outcome expectations and internal cues factors. In general, the findings would help Ministry of Health in identifying and understand the critical success factors of MyHEALTH Portal usage which allows them to understand and further enhance and rebrand the portal so that it can be maximally used by the public in the long run. Besides that, the findings also helped in coherently understand the role of outcome expectations and external cues towards the intention to use which can significantly be benefited by the Ministry in redesigning portal's future strategy to boost MyHEALTH Portal usage among the society. Suggestion for future study is, the results would be more interesting if outputs from professionals' perspectives are also examined which consists of the key players of the industry for instances, healthcare consultants, physicians, health educators and health policymakers. The outputs derived from both parties (users and professionals) would be integrated to form a more convincing finding that leads to a conclusion beyond the traditional intention to use technological studies.

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