

# **MODELS OF BEHAVIORAL INTENTION AND USAGE BEHAVIOR TOWARDS DIGITAL HEALTHCARE PLATFORM**

**Joseph Michael D. Nepomuceno, DBA**

St. Elizabeth Hospital Inc., National Highway, General Santos City 9500, South Cotabato  
Ateneo de Davao University, Roxas Ave., Poblacion District, Davao City 8000, Davao del Sur

**Marvin M. Cruz, DBA**

Ateneo de Davao University, Roxas Ave., Poblacion District, Davao City 8000, Davao del Sur

## **I. BACKGROUND**

The first incident of COVID-19 in the Philippines was reported last January 30, 2020. From then on, it sporadically spread and reached other key cities in the south such as Cebu and Davao. Major hospitals in Metro Manila reached their full capacity as early as July 2020. In Visayas, a hospital was put in lockdown last June 2020 after the virus infected six doctors. In the Davao Region, at the onset of the pandemic, Davao City managed the incident differently. Since the number of incidents is relatively low compared to Metro Manila, Cebu, and neighboring key cities, the country's Durian capital mandated that all COVID-19 patients be admitted in the biggest private hospital, the Southern Philippines Medical Center (SPMC). The strategy was to ensure continuous medical access for non-COVID-19 patients in the private hospital.

As the story unfolds, the impact of the pandemic on the general public's behavior became more evident. Most of the consumers were afraid to go out, while others were limited by several safety measures and strict local policies. No industry was spared from the devastating effect of the pandemic, not even the healthcare industry. The hospitals, which were for the longest time viewed as the epitome of safety, became an area of potential contamination from the perspective of the majority. This current mindset limited the hospital visits, including patients who are in dire need of regular consultation and treatment such as cancer and dialysis patients. The complex operation of hospitals became a lot more difficult, and the pandemic pushed their expenses a little further due to safety-related initiatives such as additional personal protective equipment, additional medical devices (e.g., X-ray and laboratory apparatus), and other infrastructure-related investments (e.g., laboratory expansion, new isolation areas, information technology, among others). All these initiatives and investments have yet to pay off because of the current consumer (patient) behavior. This cycle placed the employment of healthcare workers at risk as well. Some hospitals have already made pay cuts and have laid off employees to make their operation sustainable. Ultimately, this pattern will have a tremendous impact on the quality of life and length of life of immunocompromised patients (e.g., cancer and dialysis patients) who had to delay their treatment due to anxiety and fear. The healthcare industry understands that while COVID-19 is steadily increasing, the incidence of cardiovascular diseases, other respiratory illnesses, cancer cases, and kidney problems are increasing as well. Thus, collective effort must be made to allow continuous medical access for these non-COVID-19 patients and an alternative medical lifestyle must be embraced.

Looking closely at the Davao Region, 3,435 people have been infected as of October 8, 2020. The total number of active cases is 604, and most of them are admitted in Davao City (SPMC). An increasing trend has been reported as early as July 2020, which led to appointing



Davao Doctors Hospital Dumoy Satellite as the first private hospital to admit COVID-19 patients. As of October 2020, the SPMC ICU ward was fully occupied and the ward station was already at 93% occupancy. The increasing number of COVID-19 patients led to the implementation of Executive Order (EO) 153A last September 25, 2020. The EO requires patients from outside Davao City to undergo initial screening to ensure negative chest X-ray and RT-PCR results prior to hospital admission and surgery in any hospitals of the city. While the EO only pertains to patients for possible admission, this caused confusion to patients seeking outpatient services and led them to delaying hospital visits for checkup, diagnostic procedures, and regular treatments.

Even before the pandemic, the Department of Health (DOH) has already identified several variables that affect hospital visits, which includes cost and geographical considerations, among others. It is for this reason that several programs such as improved insurance coverage on common diseases via the Philippine Health Insurance Company (PHIC) and the Doctor To The Barrio (DTTB) Program have been implemented. Considering the geographic nature of the country, information technology has been identified as a significant tool that can help the challenging landscape of healthcare delivery. According to the World Health Organization (WHO) report in 2016, a policy for Hospital Information System (HIS) has been in place in the Philippines since 2007. In 2013, the framework for e-Health was prepared to align the country with the recent global trend. The WHO defined e-Health as the application of information and technology system in healthcare. The e-Health framework supports *m*-Health or the use of mobile devices for health-related applications. While the country is still in the early stages of digital healthcare transformation, this did not stop the healthcare industry from adopting this trend that offers patients a different engagement platform. However, these projects were received poorly before the pandemic. Patients preferred the traditional healthcare engagement and used the digital healthcare platform with reservations.

The pandemic highlighted the need for a digital healthcare platform. Neighboring Asian countries, such as South Korea and Vietnam, have set an example of how this tool can be effectively used for surveillance and monitoring of COVID-19 patients. In the Philippines, both private and government sectors are now encouraging the use of a digital healthcare platform such as telemedicine or remote doctor consultation, online prescription, online medicine delivery, online appointment for diagnostic procedures, and online diagnostic results. Some hospitals are now doing their role in cultivating a new culture of healthcare engagement. Now the questions are as follows: Is the general public in the Davao Region ready to accept this new medical lifestyle? What are the factors that hospital administrators have to consider to allow a continuous outpatient engagement using a digital healthcare platform? Answering these questions will allow hospitals to design a digital healthcare transformation program that will nurture this culture and will play a major role in their sustainability during and even after this pandemic.

### *Conceptual Framework*

By testing and applying a well-grounded theory, the researcher seeks to understand the factors affecting the behavioral intention and usage behavior towards a digital healthcare platform in the Davao Region. This ensures that both government and private healthcare service providers can sustain operations and provide medical needs for COVID-19 and non-COVID-19 patients alike, which will also provide continuous work for health workers. The paper seeks to understand the ways to convert regular outpatient to e-Patient. Tom Ferguson coined the term e-Patient in 2006 to categorize individuals who are equipped, enabled, empowered, and engaged in their health and healthcare decision (Stanford University, 2006). In 2018,

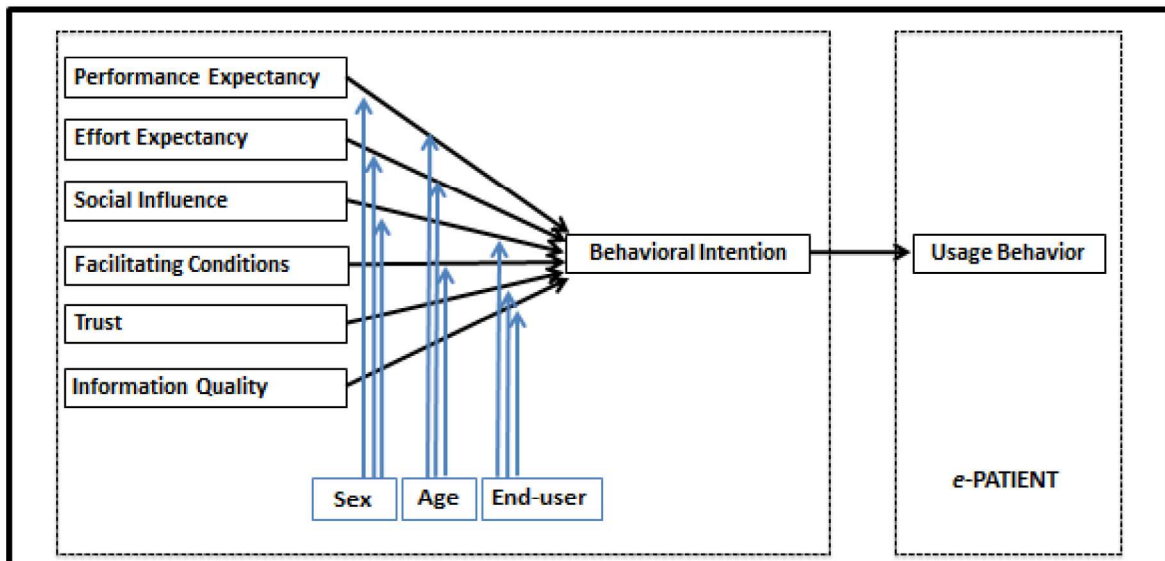


however, S. Rigarré used *e-Patient* to describe patients who seek information online, which provides improved health information and services and different relationships with their doctors (Rigarré, 2018). For this paper, *e-Patient* is defined as an outpatient (any member of the general population seeking medical services not needing hospital admission) who is equipped, enabled, empowered, and engaged by digital healthcare platforms (*e-Health* and *m-Health*) in attending to their medical needs. Digital healthcare platforms are the applications formed by *e-Health* and *m-Health* that allow and promote remote healthcare engagement such as online consultation, online prescription, online medicine delivery, online appointment, and online results viewing, among others.

Synthesizing international and local papers forged the conceptual paper of this study. Considering that the objective of this study focuses on the digital healthcare platform, the definitions of the constructs were operationalized for context fit. In addition to the original constructs of UTAUT, the additional constructs empirically tested by Nisha et al. (2016), i.e., trust and information quality, will be added in the UTAUT model for the local study. This is also substantiated by the recent social events such as the poor acceptance of the Philippine Identification System and the non-acceptance of experts in using artificial intelligence for the screening of COVID-19 patients using CT scan images. The operational definitions of the constructs are as follows:

- Performance expectancy is the degree of usefulness of the digital healthcare platform.
- Effort expectancy refers to the degree of ease of use of the digital healthcare platform.
- Social influence pertains to how other individuals affect the use of the digital healthcare platform.
- Facilitating conditions are the resources and infrastructures that support and aid the use of the digital healthcare platform. In this study, FC will be a direct determinant of BI.
- Trust is the perception of credibility of the digital healthcare platform.
- Information quality is the perception of the quality of the information provided by the digital healthcare platform.
- Behavioral intention is the direct determinant of the usage behavior towards the digital healthcare platform.
- Usage behavior is the actual use of the digital healthcare platform.

Moderating variables will be used in this study. Two of which were derived from the original model: age and sex. The use of age and sex was supported by the TAM and TPB. A new moderating variable will be tested—the “end-user classification.” The new moderating variable was identified during the public consultation last August 2020. Three experts, i.e., a senior vice president of a hospital, a psychologist, and a radiation oncologist, recommended that it would be good to understand if having a clinical background will significantly affect the relationship between the independent and dependent variables.



**Figure 1. UTAUT model.**

Figure 1 shows the relationships of the constructs. On one hand, behavioral construct has six formative constructs (PE, EE, SI, FC, TR, and IQ). On the other hand, the behavioral construct functions as a direct determinant of usage behavior. For the moderating variables, TAM showed that PE affects the male population, while EE affects the female population. The result of TPB showed that SI affects women at the onset of technology adoption. The study will check if gender also affects the relationship of PE, EE, and SI in the local context. The theory of planned behavior also presented that age affects the FC construct. With this, the study will assess the impact of age on FC, PE, and EE. The constructs PE and EE are also included because there is a notion that older people have a hard time adapting to the use of new gadgets, such as smartphones or tablets, which are fundamental aspects of digital transformation. For the new moderating variables, the current social events showed that end-user classification might have an impact on the adoption of new technology. This is the reason why the impact of the “end-user” in the relationship of SI, TR, and IQ to BI will be assessed.

## II. REVIEW OF RELATED LITERATURE

Healthcare has become a thriving niche for information systems and technology development. The complexities of healthcare services such as data storage and retrieval of diagnostic images and patient results, improving waiting time in the Emergency Room and other outpatient services, Operating Room scheduling system, digitalization of patient engagement feedback, and computerized inventory monitoring necessitate an understanding of how process improvements using the digital platform are being accepted and utilized by the stakeholders. The pandemic caused the healthcare industry to evolve rapidly to continuously perform its core function of providing quality health services. With strong support from the government, it has become a necessity to help educate the general public on the transition from traditional healthcare services to digital healthcare. Several studies using the UTAUT model in addressing healthcare issues have been made and they are focused on patients and healthcare workers (doctors and allied healthcare staff).

Some UTAUT constructs were redefined after being applied in the health industry. In 2013, Sun et al. associated PE in healthcare as the “usefulness” that can only be captured by



the extent to which it can help users solve their health-related issues. For effort expectancy, several studies claimed that it has a considerable impact on attitude towards the adoption of *m*-Health or any healthcare-related technology. Lastly, Jung (2008) and Sun et al. (2013) empirically showed that there is a significant positive relationship between SI and the adoption of *m*-Health.

Research aiming to understand the use of information technology in the Philippine healthcare industry still remains to be of interest due to lack of timely and evidence-based study (Nillos, 2016). Thus, a need to further evaluate this area requires a review of recently published papers in the local context. In 2014, Dino and de Guzman made a study using the UTAUT model with four constructs: PE, EE, SI, and BI. Using 82 elderly Filipinos as respondents, the study showed that UTAUT constructs, particularly effort expectancy, have a significant impact on behavioral intention (Dino & de Guzman, 2014). The paper did not include facilitating condition as a direct determinant of BI based on the original model of UTAUT. After two years, Nillos studied the factors that influence rural health workers in using wireless access for health (WAH). As a descriptive research, the study utilized correlation analysis and ANOVA to test the relationships between preselected variables. The study concluded that all four constructs from the UTAUT2 model have an impact on behavioral intention, i.e., PE, EE, SI, and FC (Nillos, 2016).

In the same year, a study was commissioned by the NTHC of the National Institutes of Health, University of the Philippines to understand the acceptance of telemedicine in the country. The study used a modified UTAUT model. Instead of using the standard four direct constructs for BI, Pasco (2016) added attitude construct in his study. The attitude construct pertains to the notion that using information technology is a good idea and makes work interesting. With 37 respondents, Pasco used regression analysis to process the response and found that, for young physician, social influence had the highest correlation coefficient (0.608) with BI. The modified UTAUT model used was able to explain 54.8% of the variance in the decision to use telemedicine (Pasco, 2016).

The three local studies about UTAUT and its healthcare application are conducted in Luzon. Considering the geographic aspect and difference in demographics and culture, this supports the need to have further understanding of the healthcare and information system in Visayas and Mindanao.

Aside from empirically testing the UTAUT model, the importance of two constructs—information quality and trust—will be empirically tested to check its applicability in the local setting. Two moderating variables (age and sex) identified by Venkatesh et al. (2003) will be used as these apply in the local context as well. In addition, “end-user” will be used as a moderating variable to understand if the result will be different for medical doctors and outpatients. A total of five new measured scales were also formulated to have a 5:1 ratio of measured scales per construct. The new measured constructs was tested and validated in the study. The minimal number of researches in the country highlights the need to understand this issue particularly in the areas outside Luzon. Table 2.1 summarizes the latent variables used in the study.



**Table 2.1 Operational Definition of Constructs**

<b>Constructs</b>	<b>Operational Definition</b>	<b>References</b>
Performance expectancy	PE is the perceived usefulness and relative advantage of using a digital healthcare platform.	Holden & Karsh, 2010 Jimison & Sher, 2008 Sun et al., 2013 Venkatesh et al., 2003
Effort expectancy	EF is the ease of using a digital healthcare platform.	Boontarig et al., 2012 Phichitchaisopa & Naenna, 2013 Sun et al., 2013 Venkatesh et al., 2003
Social influence	SI is the subjective norm and social factors that affect the use of a digital healthcare platform.	Jung, 2008 Kohnke et al., 2014 Sun et al., 2013 Venkatesh et al., 2003
Facilitating condition	FC is the perceived behavioral control and the factors in the environment that make adoption of a digital healthcare platform easy.	Sun et al., 2013 Venkatesh et al., 2003
Trust	TR refers to the perceived credibility of the healthcare provider that uses the digital healthcare platform for engagement and medical information	Dhagarra et al., 2020 Gefer & Straub, 1997 Jung, 2008 Klein, 2007 Lanseng & Andreassen, 2007 Pavlou, 2003
Information quality	IQ is the quality of healthcare information provided by the digital healthcare platform.	Chae et al., 2012 Jung, 2008 Masrek et al., 2012 Natzdorf, 2010 Nisha et al., 2016
Behavioral intention	BI refers to the intent to use a digital healthcare platform.	Han et al., 2004 Kijisanayotin et al., 2009 Venkatesh et al., 2003
Usage behavior	UB is the actual use of a digital healthcare platform for healthcare engagement and information.	Venkatesh et al., 2012

### III. METHODOLOGY

The paper studied the applicability of the UTAUT model in the Davao Region, Philippines. Considering the objective of this study, descriptive-correlational research was used. On one hand, the descriptive part focused on understanding the key demographics of the respondents. On the other hand, correlational research was used to statistically measure the relationships of the constructs and its corresponding measured variables to determine its dependence or independence (Te et al., 2019).



### 3.1 Units of Analysis

The first relationship of the framework has a total of six latent, independent variables (exogenous constructs): performance expectancy, effort expectancy, facilitating conditions, social influence, trust, and information quality. The latent, dependent variable (endogenous construct) is the behavioral intention. For the second relationship, the behavioral intention functions as exogenous construct to the endogenous construct usage behavior. Following the modified UTAUT model of Venkatesh et al. (2012), FC was treated as a direct determinant of BI only. The measurement scales strictly adhered to the three-indicator rule by setting the 5:1 ratio of measured scales per construct. This ensured that the measurement model is congeneric. A total of 40 measured variables were used; 35 were adapted from previous studies and five were newly prepared. Permission to use was approved by the principal author and publisher. All measured variables were treated as interval scale. As discussed by Janssens et al. (2008), the Likert scale can be transformed from ordinal to interval with the assumption of “equal appearing interval.” The questionnaire was designed using a reversed code response anchor. According to Weijters and Baumgartner (2012), reversed items are implicitly correct for acquiescence. The approach is expected to improve the scale validity by functioning as cognitive “speed bumps” that will result in a slower, more careful reading. To avoid confusion, a face-to-face guided approach was performed during data collection using a traditional survey.

### 3.2 Survey Instrument

Survey-based research is widely used to elucidate inference about the dimensions of the general population from the pre-identified sample size. According to Kerlinger and Lee (2000), information derived from survey-based research is accurate. The approach offers a lot of information by capturing the respondents' attitudes and perceptions. In addition to the 40 measurement variables, demographical information such as sex, age, and end-user classification were collected to check if they moderate the result. Prequalifying questions were also included to confirm if the respondents fit the *a priori* requirements.

Data were collected and analyzed using a validated and pretested survey questionnaire. Four experts did the validation process to guarantee content validity. The questionnaire was assessed using standard content validity indicators as follows: (1) clarity of direction and items, (2) presentation/organization of items, (3) suitability of items, (4) adequateness of items per category, (5) attainment of the purpose, (6) objectivity, and (7) scale and evaluation of rating system. The Cronbach alpha values for each construct were mostly excellent ( $\alpha > 0.9$ ), except for that of UB at  $\alpha = 0.884$  which is only “good.” Overall, the questionnaire has a Cronbach alpha of 0.980, implying excellent reliability.

The final pretest and reliability assessment consisted of 50 valid outpatient respondents, with 33 respondents collected using traditional survey from three different hospitals and 17 respondents from online survey. The result yielded a better outcome. All single constructs exhibited excellent reliability. The questionnaire overall increased its Cronbach alpha from 0.980 to 0.993, still suggesting excellent reliability.

### 3.3 Respondents

The respondents for this study are the end-users of the digital healthcare platform, the medical doctors and outpatients. The “outpatient” refers to any member of the public, regardless of their profession, seeking healthcare service such as medical consultation, treatment, or diagnostic procedure. The respondents must be 18 years old and above. To be a valid



respondent as outpatient, he or she must have a consultation, treatment, and/or diagnostic procedure from July 2020 to January 2021. Outpatients who do not have adequate cognitive function (i.e., able to read and write) are excluded from the study.

The study used probability sampling particularly the stratified, proportionate sampling technique to complement the intent of assessing how the three moderating variables affect the result. The sampling frame is based on the latest official population distribution reported by the Philippine Statistics Authority. Since the recent PSA population report was prepared last 2015, the population was treated as unknown and the Cochran formula was used to compute for the sampling size. The result is 385 respondents, computed with the desired level of precision set at 95%. The study collected a total of 538 valid survey questionnaires after the 3 month data collection period.

### 3.4 Statistical Treatment

The conceptual framework for this study has constructs with multiple dependence relationships. Considering this and the primary objective of confirming the applicability of UTAUT in the region, the confirmatory factor analysis and structural equation modeling were selected to analyze the data. The confirmatory factor analysis is a multivariate technique that confirms pre-defined relationships, the UTAUT framework. The structural equation modeling, on the other hand, is a multivariate tool that simultaneously examines different relationships.

The paper used the six-stage research design for structural equation modeling by Hair et al. as the benchmark for the statistical process (Hair et al., 2014). In addition, bootstrapping technique of Bryne is added to ensure compliance to normality assumption using CB-SEM (Bryne, 2010). Lastly, to answer the hypothetical inquiry related to moderating variables, the procedure of Awang was utilized using AMOS software (Awang, 2012). The modified research design now comprise of eight stages. This commenced with the four-stage confirmatory factor analysis and followed by the SEM procedures: (1) defining the individual constructs; (2) developing and specifying the measurement model; (3) designing a study to produce empirical results; (4) assessing measurement model validity, followed by measurement model validation; (5) specifying the structural model; (6) multivariate normality assessment; (7) assessing structural model validity; and (8) assessment of moderating variables.

## IV. RESULTS AND DISCUSSION

### 4.1 Confirmatory Factor Analysis

Comparative assessment of GOF parameters was made between the original UTAUT constructs and the modified UTAUT constructs. The result showed that both models are acceptable in the local context, but the model fit criteria favors the proposed UTAUT (RMSEA = 0.083, SRMR = 0.034, and normed  $\chi^2 = 4.74$ ). The respecification of the proposed model was made using the model diagnostics output of AMOS, the modification indices (covariance and regression estimate). The outcome of the confirmatory factor analysis revealed that only four measured constructs can be used for the exogenous construct UB. The result is acceptable and does not require additional data set for validation, and it did not violate the congeneric model requirement for structural equation model analysis.

The conclusions for the CFA analysis are as follows:

1. The UTAUT model of Venkatesh et al. (2003) is applicable in the local setting.



2. The modified UTAUT model of Nisha et al. (2016) provided a better model fit compared to the original model of Venkatesh et al. (2003).
3. A total of five new measured scales have been introduced for the constructs trust, information quality, and usage behavior (TR5, IQ4, IQ5, UB4, and UB5). With this, a total 39 measured scales were established to fit in the local context.
4. Measured scale UB3 did not meet the required regression estimate and variance explained to be used in the study. The question was deemed not applicable for areas where digital healthcare transformation is still on its early stage.

#### 4.2 Structural Equation Modeling

The original objective of the paper is to validate the applicability of a proposed UTAUT model. Guided by the SEM framework of Hair et al., the modified statistical treatment gave birth to not one but two models that describe the behavioral intention and usage behavior of people in Davao Region towards DHCP: the proposed model (Figure 4.1) and MOD2 (Figure 4.2). The second model (MOD2; EE- and UB  $\leftarrow$  FC) departs completely from the established relationship of EE to BI. But considering the statistical output, this model is still considered valid, and recommended to be tested further. Tables 4.1 and 4.2 show the decision criteria for the proposed UTAUT and MOD2 models.

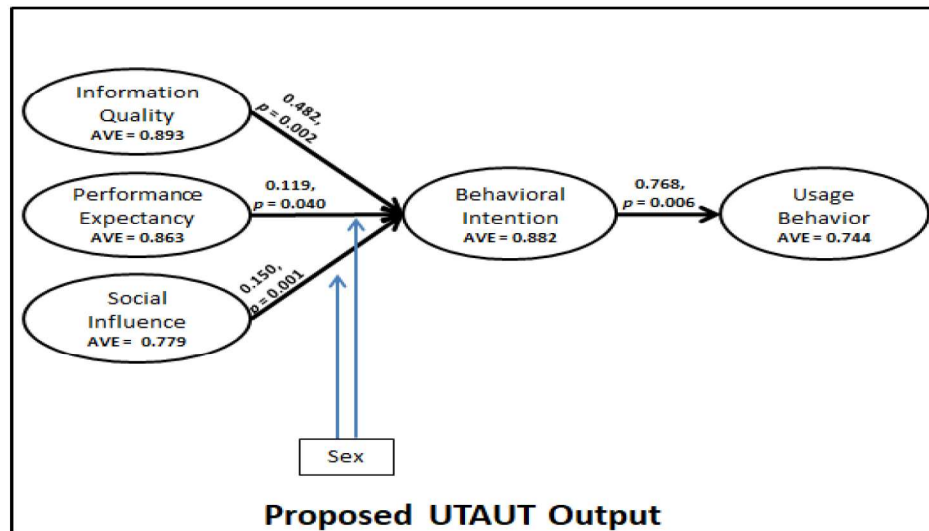


Figure 4.1 The Proposed UTAUT Model



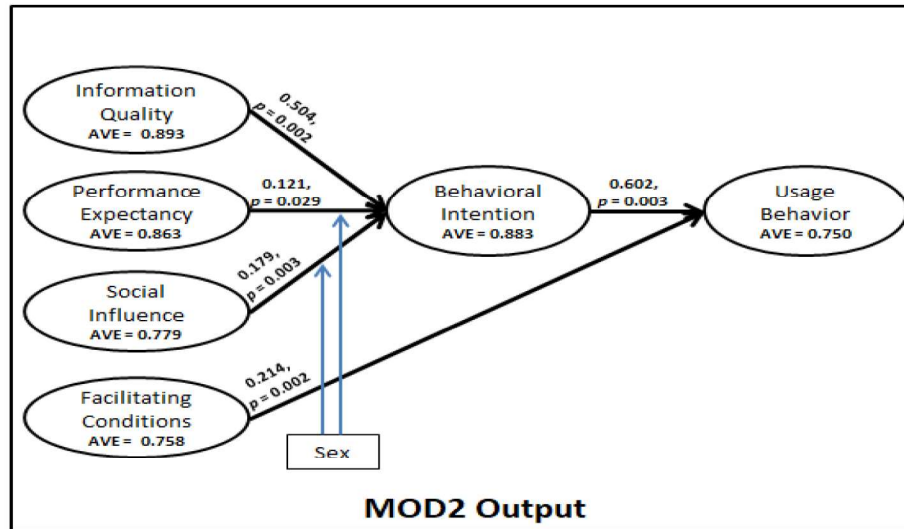


Figure 5.2 The MOD2 UTAUT model

Table 4.1 Decision criteria for the Proposed UTAUT model.

Hypotheses		Indicators	Value	Interpretation	Decision
<b><i>H<sub>a</sub></i></b>	The UTAUT model does not apply in the context of Davao Region.	X <sup>2</sup>	3066 (DF = 680, <i>p</i> = 0.000)	Not Acceptable	Reject <b><i>H<sub>a</sub></i></b> ,
		RMSEA	0.081	Marginal	
		SRMR	0.040	Acceptable	
		Normed X <sup>2</sup>	4.508	Acceptable	
		CFI	0.928	Acceptable	
		PNFI	0.834	Acceptable	
Hypotheses		Relationship	Estimate	p-value	Decision
<b><i>H1</i></b>	PE does not positively relate to BI	BI ← PE	0.119	0.040	Reject <b><i>H1</i></b>
<b><i>H2</i></b>	EE does not positively relate to BI	BI ← EE	<b>-0.017</b>	<b>0.790</b>	Accept <b><i>H2</i></b>
<b><i>H3</i></b>	SI does not positively relate to BI	BI ← SI	0.150	0.001	Reject <b><i>H3</i></b>
<b><i>H4</i></b>	FC does not positively relate to BI	BI ← FC	0.100	<b>0.300</b>	Accept <b><i>H4</i></b>
<b><i>H5</i></b>	TR does not positively relate to BI	BI ← TR	0.179	<b>0.183</b>	Accept <b><i>H5</i></b>
<b><i>H6</i></b>	IQ does not positively relate to BI	BI ← IQ	0.482	0.002	Reject <b><i>H6</i></b>
<b><i>H7</i></b>	BI does not positively relate to UB	UB ← BI	0.768	0.006	Reject <b><i>H7</i></b>



**Table 5.2 Decision criteria for MOD2.**

Hypotheses		Indicators	Value	Interpretation	Decision
<b><i>H<sub>a</sub></i></b>	The UTAUT model does not apply in the context of Davao Region.	X <sup>2</sup>	2497 (df = 511, p = 0.000)	Not Acceptable	Reject <b><i>H<sub>a</sub></i></b>
		RMSEA	0.085	Marginal	
		SRMR	0.036	Acceptable	
		Normed X <sup>2</sup>	4.886	Acceptable	
		CFI	0.930	Acceptable	
		PNFI	0.320	Acceptable	
Hypotheses		Relationship	Estimate	p-value	Decision
<b><i>H1</i></b>	PE does not positively relate to BI	BI ← PE	0.121	0.029	Reject <b><i>H1</i></b>
<b><i>H2</i></b>	EE does not positively relate to BI	BI ← EE	NA	NA	NA
<b><i>H3</i></b>	SI does not positively relate to BI	BI ← SI	0.179	0.003	Reject <b><i>H3</i></b>
<b><i>H4</i></b>	FC does not positively relate to BI	BI ← FC	NA	NA	NA
<b><i>H5</i></b>	TR does not positively relate to BI	BI ← TR	0.204	<b>0.163</b>	<b>Accept <i>H5</i></b>
<b><i>H6</i></b>	IQ does not positively relate to BI	BI ← IQ	0.504	0.002	Reject <b><i>H6</i></b>
<b><i>H7</i></b>	BI does not positively relate to UB	UB ← BI	0.602	0.003	Reject <b><i>H7</i></b>
	FC does not positively relate to UB	UB ← FC	0.214	0.002	Reject

By subjecting the proposed UTAUT model to SEM analysis using the 39 measured scales as identified by the CFA analysis, we can conclude the following:

1. The proposed UTAUT model yielded acceptable GOF parameters implying that it is applicable in the Davao Region.
2. The positive regression estimate for BI  $\leftarrow$  PE with *p*-value of 0.040 suggests that the exogenous construct PE relates positively and significantly with endogenous construct BI.
3. The negative regression estimate of BI  $\leftarrow$  EE with *p*-value of 0.790 suggests that the exogenous construct EE relates negatively with endogenous construct BI. The relationship is not statistically significant at 95% level of significance.



4. The positive regression estimate for  $BI \leftarrow SI$  with  $p$ -value of 0.010 suggests that the exogenous construct SI relates positively and significantly with construct BI.
5. The positive regression estimate for  $BI \leftarrow FC$  with  $p$ -value of 0.300 suggests that the exogenous construct FC relates negatively with endogenous construct BI. The relationship is not statistically significant at 95% level of significance.
6. The positive regression estimate for  $BI \leftarrow TR$  with a  $p$ -value of 0.183 suggests that the exogenous construct TR relates positively with endogenous construct BI. The relationship is not statistically significant at 95% level of significance.
7. The positive regression estimate for  $BI \leftarrow IQ$  with a  $p$ -value of 0.002 suggests that the exogenous construct IQ relates positively and significantly with endogenous construct BI.
8. The positive regression estimate for  $UB \leftarrow BI$  with a  $p$ -value of 0.006 suggests that the exogenous BI relates positively and significantly with endogenous construct UB.
9. For MOD2, the positive regression estimate for  $UB \leftarrow FC$  with a  $p$ -value of 0.002 suggests that the exogenous FC relates positively and significantly with endogenous construct UB.

The proposed UTAUT model identified the following factors to be significant in Davao Region: performance expectancy, social influence, and information quality as determinants of the behavioral intention and usage behavior. The result of assessing the proposed UTAUT gave birth to another possible model that can be used in Davao Region. The alternative model modified the relationship of FC towards UB. This modification was supported by the original UTAUT model of Venkatesh et al. The deletion of endogenous construct EE in the UTAUT and treating FC as determinant of UB (MOD2) resulted to marginal fit RMSEA. The alternative model has a similar result with the proposed model except that FC has been established to be a direct determinant of usage behavior.

#### 4.3 Moderating Variables

The summary of assessment of moderating variables using AMOS is presented in Table 4.3. Sex is the only moderating variable that showed significant statistical result. Zainudin Awang noted on his book, entitled A Handbook of SEM, that it is complex to analyze the moderating effects for model with latent variables. For this reason, it is recommended that this aspect be performed using multigroup analysis in future research.

The analysis of moderating effects of key demographic variables is concluded as follows:

1. Sex does partially moderate the effect of  $BI \leftarrow PE$  and  $BI \leftarrow SI$  (for proposed UTAUT and MOD2 models)
2. Sex does not moderate the effect of  $BI \leftarrow EE$  (for proposed UTAUT only).
3. Age does not moderate the effect of  $BI \leftarrow PE$  and  $BI \leftarrow FC$  (for proposed UTAUT and MOD2 models).



4. Age does not moderate the effect of  $BI \leftarrow EE$  (for proposed UTAUT model).
5. Age does not moderate the effect of  $UB \leftarrow FC$  ( for proposed UTAUT and MOD2 models).
6. End-user classification does not moderate the effect of  $BI \leftarrow SI$ ,  $BI \leftarrow TR$ , and  $BI \leftarrow TR$  (for proposed UTAUT and MOD2 models).

#### 4.4 Recommendations

The success of converting regular outpatient to e-patient means higher chances of increasing the number of hospital admission and emergency room procedures. The DHCP, if properly implemented, is expected to bridge the challenges brought by geographic nature of the region and the pandemic; thus continuously establishing brand loyalty and patient engagement. This scenario will ensure a sustainable healthcare industry that will also benefit the locality.

**Table 4.3 Moderating variables applicable for MOD2 (No EE,  $BI \leftarrow FC$ ).**

Hypotheses		Path	Estimate	p	Interpretation
<b>H8</b>	Sex does not significantly moderate the effect of the PE to BI	$BI \leftarrow PE$	0.984	***	Reject <b>H8</b> , no moderation effect; Partial moderation.
		$BI \leftarrow Sex$	0.316	0.12	
		$BI \leftarrow PE\_Sex$	-0.124	0.035	
<b>H9</b>	<i>Sex does not significantly moderate the effect of the EE to BI.</i>	$UB \leftarrow EE$	0.941	***	Accept <b>H9</b> , no moderation effect
		$UB \leftarrow Sex$	0.275	0.196	
		$UB \leftarrow EE\_Sex$	-0.117	0.057	
<b>H10</b>	Sex does NOT significantly moderate the effect of the SI to BI.	$BI \leftarrow SI$	1.034	***	Reject <b>H10</b> , no moderation effect; Partial moderation
		$BI \leftarrow Sex$	0.336	0.134	
		$BI \leftarrow SI\_Sex$	-0.129	0.038	
<b>H11</b>	Age does NOT significantly moderate the effect of PE to BI.	$BI \leftarrow PE$	724	***	Accept <b>H11</b> , no moderation effect
		$BI \leftarrow Age$	-0.019	0.825	
		$BI \leftarrow PE\_Age$	0.019	0.421	
<b>H12</b>	<i>Age does NOT significantly moderate the effect of EE to BI.</i>	$UB \leftarrow EE$	0.691	***	Accept <b>H12</b> , no moderation effect
		$UB \leftarrow Age$	-0.07	0.452	
		$UB \leftarrow EE\_Age$	0.021	0.412	
<b>H13</b>	Age does NOT significantly moderate the effect of FC to BI.	$BI \leftarrow FC$	0.865	***	Accept <b>H13</b> , no moderation effect
		$BI \leftarrow Age$	0.008	0.915	
		$BI \leftarrow FC\_Age$	-0.016	0.462	
<b>H14</b>	End-user classification does NOT significantly moderate the effect of SI to BI.	$BI \leftarrow SI$	0.786	***	Accept <b>H15</b> , no moderation effect
		$BI \leftarrow End\_user$	-0.062	0.872	
		$BI \leftarrow SI\_EU$	0.032	0.77	
<b>H15</b>	End-user classification does NOT significantly moderate the effect of TR to BI.	$BI \leftarrow TR$	0.891	***	Accept <b>H16</b> , no moderation effect
		$BI \leftarrow End\_user$	0.242	0.392	
		$BI \leftarrow TR\_EU$	-0.006	0.948	
<b>H16</b>	End-user classification does NOT significantly moderate the effect of IQ to BI.	$BI \leftarrow IQ$	1.006	***	Accept <b>H17</b> , no moderation effect
		$BI \leftarrow End\_user$	0.45	0.095	
		$BI \leftarrow IQ\_EU$	-0.117	0.13	

In the formulation of DHCP strategy, it is recommended that the hospital review the commonly used DHCP platforms in each region presented. This will give them an idea which platform should they concentrate their resources that will address their immediate operational concerns. A technology roadmap must be formulated as well that will serve as a guide in the future direction of DHCP in their hospital. This must be prepared with all the stakeholders, i.e., hospital management, medical doctors, hospital staff, and community representatives (patient and family members). This strategy is also applicable to local government agencies.

For information quality, a quality assurance and quality control program must be in place in diagnostics centers to ensure that all medical results have been reviewed prior to issuance to patients. Applied in Marketing Department, the information quality can be enhanced by closely working with clinical and technical experts to make sure that all the contents published in the websites and other digital platforms are accurate and updated. The medical doctors are considered the best social influencer with regard to DHCP. Together with the allied healthcare workers, the medical doctors can help navigate patients as their medical journey progresses. As frontliners they are in the position to orient and encourage patients and family members to use DHCP by highlighting its convenience and efficiency. The role of human resource and training department will be essential in making sure that all hospital staff are well-oriented on different DHCPs available in the facility. No process is perfect and this is the reason why continuous patient engagement survey is encouraged that will help set the performance expectation of the patients. The paper highlights the importance of facilitating conditions as it directly affects the usage behavior. A balance between cost and benefits should be considered because this aspect usually requires investment in terms of technological infrastructure and additional manpower. For the analysis of moderating variables, DHCP designed for specific for male or female population can also be considered since sex has been established to modify the relationship of performance expectancy and social influence towards behavioral intention.

All the efforts of a hospital or the healthcare industry, in general, will not be successful if it is not backed up by good healthcare policies. An interagency collaboration including Department of Health, Department of Information, Communication, and Technology, and Department of Science and Technology will allow DHCP to develop even more. The role of policymakers is also important. Recommendations given by WHO last 2016 related to e-Health should be revisited and be given the attention it truly deserves.

On a theoretical front, two models produced in the study are recommended to be tested using new data set to further examine its generalizability. Based on current sociopolitical environment, it is also encouraged that UTAUT constructs formulated recently such as hedonic motivation, cost, and habit, be tested if applicable in the local context. The result of moderating variables analyses is suggested to be further evaluated using the multigroup analysis technique. Aside from bootstrapping, the multivariate non-normality noted in the study can also be addressed by running the data set using PLS-SEM.

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