Ying Chieh Liu[1]

EXPLORATION OF TEXT-BASED MEDICAL CONSULTATION WEBSITES — EXTENDING EXPECTATION CONFIRMATION THEORY

Medical consultation websites are online services providing consultation for diagnosing and treating health issues. Little research has focused on users' perceptions of using text-based medical consultation websites. This study forms a framework by extending expectation confirmation theory to explore the use of medical consultation websites for public. Online questionnaires were collected to validate the framework. The results reveal that perceived usefulness is the critical factor facilitating user satisfaction, and user satisfaction affects the loyalty and the motivation to recommend the websites to others. The research results provide some suggestions and references to improve users' perceived usefulness.

Keywords: *ECT; medical consultation website; continuance; recommendation; perceived usefulness.*

Ін Цзе Лю

ДОСЛІДЖЕННЯ САЙТІВ ТЕКСТОВИХ МЕДИЧНИХ КОНСУЛЬТАЦІЙ — РОЗШИРЕННЯ ТЕОРІЇ ПІДТВЕРДЖЕННЯ ОЧІКУВАНЬ

Сайти медичних консультацій — онлайн-сервіси, що забезпечують консультації з діагностики та лікування. Сприйняттю користувачами сайтів текстових медичних консультацій присвячено мало досліджень. У дослідженні сформовано платформу, яка розширює теорію підтвердження очікувань, з метою вивчення можливості використання населенням сайтів медичних консультацій. Для перевірки платформи були зібрані інтернет-анкети. Результати їх аналізу показали, що сприймана корисність є критичним чинником, який сприяє задоволеності користувачів, а задоволеність користувачів впливає на лояльність і мотивацію до рекомендації сайтів іншим користувачам. За результатами дослідження надано пропозиції і рекомендації з покращення сприйняття користувачами корисності.

Ключові слова: *теорія підтвердження очікувань; сайт медичних консультацій; постійність; рекомендації; сприймана корисність.*

Ин Цзе Лю

ИССЛЕДОВАНИЕ САЙТОВ ТЕКСТОВЫХ МЕДИЦИНСКИХ КОНСУЛЬТАЦИЙ — РАСШИРЕНИЕ ТЕОРИИ ПОДТВЕРЖДЕНИЯ ОЖИДАНИЙ

Сайты медицинских консультаций — онлайн-сервисы, обеспечивающие консультации по диагностике и лечению. Восприятию пользователями сайтов текстовых медицинских консультаций посвящено мало исследований. В данном исследовании сформирована платформа, которая расширяет теорию подтверждения ожиданий, с целью изучения возможности использования населением сайтов медицинских консультаций. Для проверки платформы были собраны интернет-анкеты. Результаты их анализа показали, что воспринимаемая полезность является критическим фактором, способствующим удовлетворенности пользователей, а удовлетворенность пользователей

[1] PhD, Assistant Professor, Department of Information Management, Chaoyang University of Technology, Taiwan.

влияет на лояльность и мотивацию рекомендовать сайт другим пользователям. По результатам исследования разработаны предложения и рекомендации по повышению воспринимаемой пользователями полезности.

Ключевые слова: *теория подтверждения ожиданий; сайт медицинских консультаций; постоянство; рекомендации; воспринимаемая полезность.*

1. Introduction. Under the conditions of improving medical technologies, public is paying more attention to medical quality. Aside from consulting doctors, online consultation is becoming popular due to the rapid development of the Internet (Jones et al., 2006). Sine and Klaus (2002) found that 20% of patients have used the Internet retrieving health information before seeing their general practitioner. People prefer electronic communication for requesting prescription renewals and obtaining general medical information because the Internet provides an easy-access channel to retrieve health information and consultations (Kleiner et al., 2002; Hassol et al., 2004). Internet-based consultation attracts more attention because of its cost-effectiveness (Finney, 1999). Some forms of Internet-based consultation have been studied, such as teledermatology (Tsang & Kovarik, 2011) and web-based messaging system (Bergmo et al., 2005). However, little research has focused on exploring users' perceptions of text-based medical consultation websites. Text-based medical consultation has the following benefits: (a) users and medical personnel do not need to link to the system at the same time; (b) users can reference the stored Q&A. Therefore, with the increasing needs and use of text-based medical consultation websites, understanding users' perceptions and behaviours helps website designers and managers create more useful and applicable functions to improve citizens' health. A text-based medical consultation website comprises users, a website system, and medical personnel. The consultation procedures are: First, users login to the website to make inquiries. An email is sent to the corresponding medical personnel to notify them of the inquiry. After the medical personnel provide answers, the system updates the replies to the database and reminds users by an email. Users can access the answers and make further inquiries. The system also provides the functions of searching through past inquiries and answers. These websites are categorized into charged and free. For example, users can upload pathology images and image studies to the Partners Online Specialty Consultations website (econsults.partners.org) and the results are posted on the website after doctors' diagnosis. To explore the users' behaviours in depth, this study extends the expectation confirmation theory (ECT) to formulate users' perceptions and behaviors of using medical consultation websites and provides managerial implications for web designers and managers.

2. Literature review and Hypotheses. Figure 1 shows the proposed framework and the following sections introduce the theoretical background and hypotheses building.

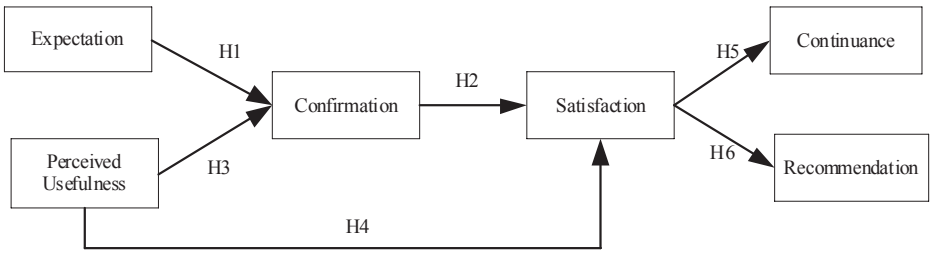

Figure 1. **Proposed framework**

2.1 Expectation-Confirmation Theory. Oliver (1980) developed Expectation-Confirmation Theory (ECT) to illustrate consumers' intention to reconsume products or services is chiefly determined by the level of satisfaction with prior experience of that products or services. ECT presumes consumers first form an initial expectation, and then develop perceptions about the services' performance after consumption. Expectation can be seen as an adaptation level and a determinant of satisfaction, it provides the baseline judgment about products or services. Adaptation level is the extent to which products and services excel, match, or lower one's expectation. Scholars (e.g., Bhattacherjee, 2001; Lin et al., 2005) focused on the post-acceptance model of IS continuance omitted expectation in their model because they presumed expectation is captured in the concept of confirmation and satisfaction. Liao et al. (2007) refers to the beliefs that their health can be improved by consulting the websites. Expectation provides the reference degree for users to develop evaluative judgements as to whether the expectation is confirmed. Thus, expectation and confirmation should be distinct factors in the context of medical consultation websites, and both should be included in the model. The expectation provides a baseline for the confirmation judgment, which originates from the associated emotional experiences. When people confirm their expectation, the positive emotion enhances the degree of satisfaction judgment. Lin et al. (2005) examined the ECT model in the web portal context and found that confirmation is positively related to satisfaction. In sum, Hypotheses 1 and 2 are introduced below:

Hypothesis 1: Users' expectation is positively related to confirmation with medical consultation websites.

Hypothesis 2: Users' confirmation is positively related to satisfaction with medical consultation websites.

2.2 Perceived Usefulness (PU). A Post-acceptance model by Bhattacherjee (2001) incorporates PU to replace post-consumption expectation. Although PU and PEOU are two salient factors affecting IS acceptance, PU affects attitude substantively and consistently across the period of IS use, and PEOU only influences the attitude at the primary stage rather than in later periods (Karahanna et al., 1999). For promoting medical consultation websites and enabling continued use, PU is significantly more important than PEOU. Therefore, PU is selected to present an individual's belief that using medical consultation websites benefits his or her personal healthcare needs. We hypothesize that PU is positively related to confirmation and satisfaction. PU captures the instrumentality of using medical consultation websites. When users perceive the services as helpful for their needs, the confirmation of their needs is formed.

Additionally, when users perceive a higher level of usefulness of a website, it is expected to have a higher level of satisfaction (Thong et al., 2006; Liao et al., 2007). Hypotheses 3 and 4 are introduced below.

Hypothesis 3: User's level of perceived usefulness is positively related to confirmation with the health consulting website.

Hypothesis 4: User's level of perceived usefulness is positively related to satisfaction with the health consulting website.

2.3. Continuance and recommendation. Prus & Brandt (1995) explained that customer loyalty is reflected in repeating purchase, purchasing more in the same company and recommending to others. Medical health websites provide information and services instead of real goods. Repeating purchase and consuming more can be seen as continuing using the services. For the sustainable operation of websites, exploring continuance and recommendation behavior is more essential and worthwhile than one-time consumption behaviors. This is especially true where website operations are competitive and it is difficult to maintain users' loyalty nowadays. Satisfaction is an important index for users' continued use of services (Shukla et al., 2010; Kima et al., 2008). According to ECT, users' repurchase intention is positively affected by their degree of satisfaction. The scenario of repurchasing and revisiting a website is similar. When users are satisfied with the services provided by a medical consultation website, the continuance intention would be higher. Therefore, Hypothesis 5 is proposed as below.

Hypothesis 5: User's level of satisfaction is positively related to their continued use of the medical consultation website.

It is also critical to attract new users for the success of sustaining medical consultation websites. Recommendation to others from the existing users is one of the important antecedents to obtain new consumers (Jones & Sasser, 1995). For health professional services, users may perceive greater risk and vulnerability due to their lack of experience and knowledge in confidently evaluating services (Schumann et al., 2010). They prefer personal sources to provide clues for their judgments, such as friend referrals, rather than commercials. Therefore, the effect of word-of-mouth (WOM) to attract new users would be important for promoting medical consultation website. Many scholars have reported that WOM referral is positively related to the evaluation of services quality (e.g., Schumann et al., 2010; Lam et al., 2009; Trusov et al., 2009). When users are satisfied with the service quality, they would have a greater intention to recommend others to use the services. In sum, we propose Hypothesis 6 as below.

Hypothesis 6: User's level of satisfaction is positively related to the recommendation of a medical consultation website.

3. Methodology.

3.1. Subjects. Taiwan e-hospital (http://www.cto.doh.gov.tw/) is a text-based medical consultation website providing free health consultations for public in Taiwan. It is administered by the Department of Health and comprises 38 public hospitals and nearly 300 doctors providing consultation services. Anonymous users can make inquiries regarding to their health issues, such as internal medicine, obstetrics and dermatology. Users can select specific medical personnel or assigned by the system to answer their inquiries. The system forwards these inquiries to the selected ones and

organizes the answers after they reply. Reminder emails prompt users to check the answers. There have been over 45,000 queries since the website was established in 2000. The most popular queries concern urology (16%) and obstetrics & gynecology (7%). The queries and answers in the database are good sources for public. Since the government manages the website, being advisors to provide public medical suggestions is included in the credit of those medical personnel's performance evaluation. Therefore, their intention to provide suggestions is stronger, even though they are busy. The return rate is 99.3%.

To validate the model and hypotheses, online questionnaire was used to collect data. We cooperated with Taiwan e-hospital and linked the questionnaire on its homepage. Emails were sent to invite the users who had made inquiries to fill in the online questionnaires. Participants were inquired about their demographic data and perceptions of using the Taiwan e-hospital website. The survey indicated that their responses would be kept confidential and only summary information would be displayed. The survey lasted 2 months and collected 376 validated questionnaires. Table 1 details the participants' characteristics.

Table 1. **Descriptive statistics of the participants' characteristics (N=376)**

Characteristics	Items	Frequency	Percent (%)
Gender	Male	157	42
	Female	219	58
Age group	<20	19	5
	20-30	126	34
	30-39	110	29
	40-49	79	21
	50-59	30	8
	>60	12	3
Education	<=High school	80	21
	Bachelor	224	60
	>=Master	72	19
Income monthly	<15	102	27
(thousand)	15~50	206	55
	50~100	57	15
	>100	11	3
Experience of using	<1 year	12	3
Internet (year)	1~2	18	5
	2~3	15	4
	>3	331	88
How they get to know	Search engine	298	79
Taiwan e-hospital	Introduced by others	41	11
	DM brochure	37	10

From Table 1, it can be seen that most participants were in the age group of 20 to 40, with a bachelor's degree (or studying), having less than 50,000NT income (monthly) and having more than 3 years of the Internet experience, which corresponds with the Internet population of Taiwan. There were more females than males, which corresponds to the finding by Umefjord et al. (2008). It can be speculated that females are more apt to search health information on the Internet and feel more comfortable asking about embarrassing health problems online. In terms of the channels to know Taiwan e-hospital, most found it through search engines.

3.2 Measurement Development. There are 6 constructs measured. Satisfaction, confirmation and continuance were adapted from Lin et al. (2005). Expectation was adapted from Bhattacherjee (2001) while recommendation was adapted from Srinivasana et al. (2002). All the items were reviewed by two professors who majored in Information Systems and a pilot examination was held with 20 master students who were asked to use Taiwan e-hospital prior to filling in the questionnaires. Some sentences were worded to clarify the statements and make it more suitable for this research. All the items used 7-point Likert scale from "strongly disagree" (1) to "strongly agree" (7). Appendix 1 presents the measurement items.

4. Data Analysis and Results. Confirmatory factor analysis (CFA) was conducted by Lisrel 8.72 to validate the measurement model. Table 2 presents the loading factors and error estimates for measurement items while Table 3 shows reliability, AVE, CR and correlation for the constructs. The 2 tables display the reliability and validity of the measurement model. 6 criteria were selected to assess the overall goodness of fit of our proposed framework. These criteria determine whether the measured variables credibly reflect the theoretical constructs introduced in section 4.2.

4.1 Assessment of Measurement Model. The model was first assessed for construct reliability and validity. The reliability was evaluated using Cronbach's alpha coefficient (α) and their values were all above 0.70 (see Table 3). According to Nunnally and Bernstein (1994), α value of 0.70 or above indicates a reliable measurement instrument. Bagozzi & Yi (1988) also suggested using Squared multiple correlation (SMC) to assess the internal structural fit. Our SMC values were all above criterion 0.5 (see Table 2), indicating good reliability. Construct validity was evaluated by convergent validity and discriminate validity. Convergent validity was assessed by 3 criteria suggested by Fornell and Larcker (1981) and Hair (1998): (a) all factor loadings should be significant and exceed 0.7; (b) Composite reliability (CR) should be over 0.7; and (c) Average variance extracted (AVE) should be greater than 0.5. Our all indicator factor loadings exceeded 0.7 and were significant at $p=0.01$ (see Table 2). CR is calculated by squaring the sum of loadings, then dividing it by the sum of squared loadings, plus the sum of the measurement error, whereas the AVE measures the variance captured by the indictors relative to measurement error. The CR values of 6 constructs were between 0.82 and 0.97, and all were above the suggested minimum of 0.70 (see Table 3). In addition, their AVE values were all above 0.5 (see Table 3). Therefore, these values provided evidence that all 3 conditions for convergent validity were met. Discriminate validity was evaluated by the square root of AVE values shown in the diagonal (in italics) in Table 3. These values were greater than the correlations between any pairs of constructs located in their horizontal lines and vertical columns, proving the AVE values for 6 constructs were higher than the variance due to measurement error. Thus, each construct was verified as distinct and the test of discriminate validity was met.

Table 2. **Measurement model**

Construct	Measurement items	Factor loading	Error	t-value	SMC
Satisfaction	Sat1	0.77	0.42	13.44	0.50
	Sat2	0.79	0.42	10.43	0.73
	Sat3	0.76	0.30	10.56	0.75
	Sat4	0.70	0.34	10.49	0.51
Confirmation	Cfm1	0.99	0.27	7.27	0.78
	Cfm2	1.13	0.22	18.75	0.86
	Cfm3	1.11	0.28	16.73	0.82
Expectation	Exp1	0.76	0.46	14.61	0.56
	Exp2	1.06	0.26	18.45	0.81
	Exp3	0.84	0.82	13.03	0.46
Continuance	Con1	1.05	0.92	10.30	0.55
	Con2	1.13	0.31	16.77	0.81
	Con3	1.07	0.35	16.37	0.77
Recommendation	Rcm1	1.03	0.16	7.80	0.87
	Rem2	1.14	0.05	28.38	0.96
	Rem3	1.03	0.45	23.56	0.70
Perceived Usefulness	Usf1	0.98	0.30	19.79	0.76
	Usf2	1.00	0.32	19.68	0.75
	Usf3	0.79	0.30	18.08	0.68
	Usf4	0.80	0.28	18.46	0.70

Table 3. **Alpha, CR, AVE and correlation matrix for constructs**

Construct	Me-an	S.D.	C1	C2	C3	C4	C5	C6	Alpha[a]	CR[b]	AVE[c]
C1 Confirmation	5.74	1.19	0.90[d]						0.93	0.93	0.81
C2 Satisfaction	5.88	1.21	0.70	0.78					0.87	0.86	0.61
C3 Continuance	5.77	1.31	0.82	0.67	0.83				0.86	0.87	0.69
C4 Recommendation	5.91	1.17	0.80	0.70	0.82	0.92			0.93	0.94	0.85
C5 Expectation	5.92	1.17	0.39	0.46	0.37	0.45	0.78		0.81	0.82	0.61
C6 Usefulness	6.02	1.05	0.81	0.63	0.75	0.76	0.46	0.85	0.91	0.97	0.72

[a] Internal Consistency Reliability (Cronbach's alpha coefficient).
[b] Composite Reliability
[c] AVE (Average Variance Extracted)
[d] The diagonal (in italics) shows the square root of the average variance extracted for each construct.

4.2 Model fitness. This study followed the recommendations of Bagozzi and Youjae (1988) and Joreskog and Sorbom (1996), 6 criteria were selected to evaluate the model fitness: X2/degree of freedom, RMSEA (root mean square error of approximation), CFI (compatative-fit index), IFI (incremental fit index), GFI (goodness of fit index) and AGFI (adjusted goodness of fit index). The value of Chi-square is influenced by a sample size as a large sample size always leads to model rejection (Jaccard & Wan, 1996). Accordingly, Bagozzi and Youjae (1988) suggested using the value of Chi-square/degree of freedom to test the model fitness and an appropriate value of below 3 (Chin & Todd, 1995) if the p-value of X2 is insignificant. McDonald and Ho (2002) suggested an RMSEA value less than 0.06 corresponds to a "good" fitness, while a RMSEA less than 0.08 corresponds to an "acceptable" fitness. Hu and Bentler (1999) claimed GFI and AGFI would be acceptable if the value is greater than 0.9. In addition, there will be a relatively good fitness between the hypothesized model and the observed data if the CFI value is greater than 0.95 (Hu & Bentler, 1999).

Table 4 shows the resulting fit indexes and indicates the model received a good model fit. The overall fit of the proposed structural model was quite satisfactory (e.g., $\chi^2 = 622.50$, df = 214, χ^2/df=2.90, RMSEA = 0.078, CFI = 0.98, IFI= 0.98, GFI = 0.88, AGFI=0.85). Although χ^2 is quite large (χ^2=622.50), the value of Chi-square/degree of freedom is less than 3 and the GFI and AGFI are close to 0.90. In addition, the RMSEA value is under the acceptable value of 0.08. CFI and IFI both present a good fitness.

Table 4. **Model fitness indices of the research model**

Statistics	Recommended value	Obtained value	Test of fitness
X^2	--	622.50	--
Degree of freedom	--	214	--
X^2/df	<3	2.90	Good
RMSEA	<0.08	0.078	Acceptable
CFI	>0.95	0.98	Good
IFI	>0.95	0.98	Good
GFI	>0.90	0.88	Close
AGFI	>0.90	0.85	Close

4.3 Path Diagram and Hypotheses Test. Figure 3 shows the path diagram of the framework. Hypotheses 1 and 2 examined the links between expectation, perceived usefulness, and confirmation. Expectation was insignificantly related to confirmation while usefulness was significantly related to confirmation. Therefore, hypothesis 1 was not supported but hypothesis 2 was supported. However, expectation and perceived usefulness explained a significant percentage of variance in confirmation (R2=0.81). Hypotheses 3 and 4 examine the effect of perceived usefulness and confirmation on satisfaction. From the path significance, the links between perceived usefulness and satisfaction, and confirmation and satisfaction were significant. Thus, Hypothesis 3 and 4 were supported. Perceived usefulness and confirmation explained 87% of the variance in satisfaction (R^2=0.87). Satisfaction significantly influenced continuance and recommendation, and explained the variance individually to 93% (R^2=0.93) and 84% (R^2=0.84). Therefore, Hypotheses 5 and 6 were supported.

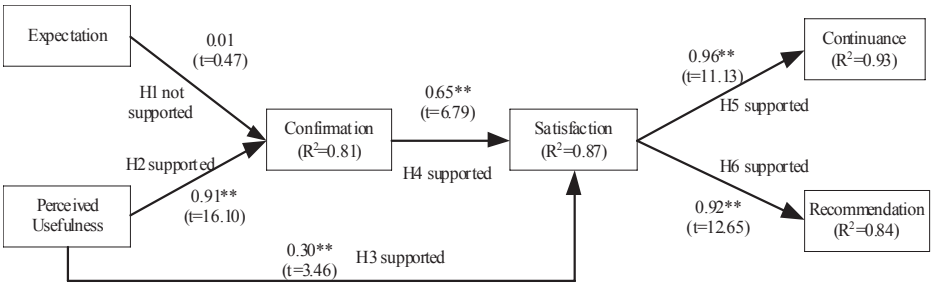

Figure 3. **LISREL analysis of the research model**

5. Discussion. The results of this study showed insignificant relationships between expectations and confirmation, but significant relationships between perceived usefulness and confirmation. This confirmed the post-acceptance model by Bhattacherjee (2001). Expectation, which is formed by first-hand experience, evolves along with their consumption. Their post-consumption expectation, which may differ from pre-consumption expectation, would be more realistic and less susceptible to

change. That is, post-consumption may replace preconsumption expectation to guide subsequent continued use and recommendation decisions. In the context of medical consultation websites, perceived usefulness would replace the role of pre-consumption expectation. This does not mean that expectation is unimportant. Expectation provides the initiative to use the services in the first place. Most our participants might have crossed the expectation-confirmation stage, and therefore the collected cross-sectional data could barely reflect the correlations. We presumed users' perceived usefulness of websites in relation to their satisfaction is important by degree after the confirmation of their expectation. The confirmation of hypotheses 2, 3 and 4 indicates users' perceived usefulness affects satisfaction in a direct and indirect ways (the intermediate of confirmation). Perceived usefulness of medical consultation websites is a vital factor to retain users. It concerns whether the functions of a website and the information provided by medical personnel are useful for their health decision making. Useful functions come from a good website structure while useful information results from rapid and detailed advice. The former helps users find existing questions and answers, properly manage their questions, and create a personal profile. The latter provides valuable references and recommendations for their health concerns, such as possible diseases or causes, and recommended treatments. Satisfaction is a strong predictor of continuance (R2=0.93) and recommendation (R2=0.84). This finding corresponds with the previous research, such as Chen et al. (2010) and Lin et al. (2008). Users with a higher degree of satisfaction would have a higher intention of continued use and a stronger motivation to recommend the websites to others. In summary, users' satisfaction is an important index for promoting medical consultation websites. Once users are satisfied with the websites, they will become loyal to it and readily suggest it to others.

6. Conclusions. This study is the first to investigate users' continuance and recommendation intention of medical consultation websites. We extended ECT by combining perceived usefulness, continuance and recommendation. This intact model well explained users' behaviors. Perceived usefulness is confirmed as a crucial factor to improve users' level of satisfaction. Users' preconsumption expectation would be subsequently substituted for perceived usefulness. Satisfaction is a major index for retaining users' loyalty and interest and motivating them to recommend the websites to others. Improving users' perceived usefulness is a key for managing medical consultation websites. Except for improving Q&A organization and search engine, facilitating the motivation of medical personnel to devote their time and expertise is the key to success. Some measures such as monetary initiative if possible, incorporating the contributions into the evaluation of medical personnel's performance, rewarding the best participants, and engaging in moral persuasion would benefit the motivation of medical personnel. While we collected the data from the users at a specific website, it could be argued that the results cannot be generalized. However, we believe users' behaviors in every medical consultation website would show a similar pattern. That is, although different websites may have different structures, procedures and functionality, users' perceptions of their services would still follow the ECT model. Additionally, our subjects, who were derived from Taiwan e-hospital, reduced the variation caused by different perceptions from different websites.

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Appendix 1. **Measurement items**

Construct	Measurement items
Satisfaction (Lin et al., 2005)	Sat1: I am satisfied with the overall experience in Taiwan e-hospital usage
	Sat2: I am pleased about the overall experience in Taiwan e-hospital usage
	Sat3: I am contented with the overall experience in Taiwan e-hospital usage
	Sat4: I am delighted with the overall experience in Taiwan e-hospital usage
Confirmation (Lin et al., 2005)	Cfm1: My experience with using Taiwan e-hospital was better than what I expected
	Cfm2: The service level provided by Taiwan e-hospital was better than what I expected
	Cfm3: Overall, most of my expectations from using Taiwan e-hospital were confirmed
Expectation (Bhattacherjee, 2001)	Exp1: I expect Taiwan e-hospital provide information about my health problems
	Exp2: I expect Taiwan e-hospital provide second opinions about my health problems
	Exp3: I expect Taiwan e-hospital provide consultation for my embarrassed health issues.
Continuance (Lin et al., 2005)	Con1: I intend to continue using Taiwan e-hospital rather than discontinue its use
	Con2: My intentions are to continue using Taiwan e-hospital than use any alternative means
	Con3: If I could, I would like to continue my use of Taiwan e-hospital
Recommendation (Srinivasana et al., 2002)	Rcm1: I say positive things about Taiwan e-hospital to others
	Rem2: I recommend Taiwan e-hospital to anyone who seeks my advice
	Rem3: I am happy to refer my acquaintances to Taiwan e-hospital
Usefulness (Davis, 1989)	Usf1: Using Taiwan e-hospital helps me manage my health problems
	Usf2: Using Taiwan e-hospital increases my sources to retrieve health information
	Usf3: Using Taiwan e-hospital enhances my effectiveness in managing my health
	Usf4: Overall, Taiwan e-hospital is useful in managing my health

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