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The Influence of Hospital Online Healthcare Information Services on Information Adoption Intention

Liu Liang, Assumption University of Thailand, Thailand*

ABSTRACT

Based on the findings of previous studies, a new theoretical model of the influence of hospital's online healthcare information services to its elderly patients' information adoption intention was formulated, analyzed, and developed in this present study. Using an online data collection method through a self-administered questionnaire, this study made use of structural equation modeling (SEM) to determine the information adoption intention of elderly patients in China. Results showed that the total effects of elderly patients' information adoption intention revolved around the quality of the online healthcare information channel and its service quality followed by the patients' cognition behaviors such as perceived ease of use and usefulness. Practical implications and recommendations for the improvement of online healthcare information services and information adoption intention in China are discussed further in this present paper.

KEYWORDS

Information Adoption Intention, Online Healthcare Information Service, Structural Equation Modeling (SEM), Technology Acceptance Model

INTRODUCTION

The ongoing COVID-19 pandemic has engendered many hospitals in China to confront the crisis by utilizing information and communication technologies that create opportunities for patients to access online healthcare information resources. This is essential as person-to-person meeting is discouraged in order to curtail the spread of the virus. These modern online application and information dissemination systems, which are constituted in the company's website, social media and live streaming platforms, and short videos aim to cater to the diversified demands of the patients, who want nothing but a regular and efficient assessment of their physical health condition, and in so doing improve their quality of life. This present study, hence, intends to investigate the influences of hospitals' online healthcare information services such as information quality, service quality, and information channel toward elderly patients' online health information intention through perceived usefulness, perceived ease of use, and information adoption intention. This is to help increase the utilization rates of these resources.

Thus far, only very few studies about online environment in Chinese hospitals have been conducted. In fact, the researcher deemed that this present study is just one of those few that ventured

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into exploring the online capacities of hospitals in China and their impact on elderly care. Thus, the findings aim to contribute to the theory and practice of online healthcare system in hospitals at the same time test the hypotheses suggested by the previous studies but by examining only the indirect and total effects among the studied variables not their direct effects.

RELATED LITERATURE AND MODEL CONSTRUCTS

Overview of Previous Studies

Table 1 presents the characteristics and findings of the previous studies with regard to hospital online healthcare information services and patients' behaviors specifically on the patients' information adoption intention in online environments. This overview focuses on studies that used quantitative and qualitative methods to evaluate theoretical causal models.

Table 1. The overview of related studies

Reference	Behavior Examined	Focus of Study	Approach/ Data Collection
Davis (1989)	To explain the individual's technology acceptance behavior	To focus on the individual's usage behavior of a technology with the concept of cognitive behavior.	Interviews/ Questionnaires on systems users
	Constructs Variables	Perceived Usefulness, Perceived Ease of Use, External Variables	
Delone & McLean (1992)	The successful factors influence information systems	To do comprehensive research on the variables that make information systems to be successful.	Literature review
	Constructs Variables	System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact	
Mohamed, Tawfik, Al-Jumeily & Norton (2011)	Investigation of how mobile health applications that are accepted by the patient's intention.	Factors that are tailored towards the patients' acceptance intention to use mobile health applications as their main medical information management and access platform.	Quantitative/Online questionnaire of high-educated students, medical practitioners, ministry of health staff, and universities staff
	Constructs Variables	Technological Factors, Sociocultural Factors, Perceived Ease of Use m-Health, Perceived Usefulness m-Health, Intention to Use m-Health	
Ruppel & Rains (2012)	Assessment of the channel characteristics of healthcare information.	Channel complementarity characteristics of health-information sources	Quantitative/Survey of health information seeker via web and telephone interview
	Constructs Variables	Access to Medical Expertise, Tailorability, Anonymity, Convenience	
Rai, Chen, Pye & Baird (2013)	Study behavior at the micro-level where consumers interact with mobile health information to perform tasks.	Causal relationships among the driving forces for mobile health usage behavior, which is a substitute channel for in-person doctor visits	Quantitative/Online survey of health consumers
	Constructs Variables	Personal Innovativeness, Perceived Health Conditions, Health Care Availability, Health Care Utilization, Demographics, Socioeconomic status, Usage Intention, Assimilation Extent, Channel Preferences	
Jacobs, Amuta & Jeon (2017)	Health information-seeking behavior in a diverse population of US adults.	To examine the factors associated with health information seeking from Internet, traditional media, and health care professionals among a diverse population of US adults.	Quantitative/National survey of US adults
	Constructs Variables	Internet Skills, Health Status, Overall Health Perception, Cancer Family History, Socioeconomic, Individual Factors	
Razmak & Bélanger (2018)	Electronic health information response	Investigation of how e-health applications influence the perspectives of healthcare information providers and their patients.	Quantitative/Survey of Canadian patients
	Constructs Variables	Attitude Toward Usefulness, Behavioral Intention, Communicativeness, Compatibility, Perceived Usefulness, Perceived Ease of Use	

Model Constructs

From the review of the studies mentioned above, it was evident that a theoretical model should be developed based on the extension of the Technology Acceptance Model with the use of six behavioral constructs organized two groups, which are hospital online healthcare information services and elderly patients' information behavior as they are considered to have important relevant influences.

The three constructs that represent elderly patients' information behavior are discussed below:

- **Information Adoption Intention:** Information adoption intention is an indication of an individual's readiness to perform a given behavior, and it is considered to be the immediate antecedent of behavior (Ajzen, 1991,2002). It means elderly patients' motivation or willingness has a significant influence on their actions to perform the target behavior (Davis, et al., 1989). Besides, this phenomenon commonly means what one usually connotes when he mentions the word acceptance as the information adoption intention is produced before information usage (Mathieson, 1991). Furthermore, another common concept of information adoption intention is from the elderly patients' satisfaction (Ives, Olson & Baroudi, 1983; Chau & Hu, 2001).
- **Perceived Usefulness:** The technology acceptance model provides a framework for perceived usefulness and it is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p.320). Generally, people evaluate the results of their actions; actions based on what they consider useful determine whether their choice of actions is desirable. This then indicates that perceived usefulness is the most important factor affecting user acceptance (Mathieson, Peacock & Chin, 2001; Acton et al., 2005). The high perceived usefulness to some system means the strong positive use-performance relationship (Davis, 1989). So, perceived usefulness was not only defined as healthcare information usage behavior leading to enhancement or gains in healthcare information behavioral consequences, but also it refers to making performance easier and more satisfying, improves efficiency and reduces costs as well as improves quality and safety of healthcare information (Venkatesh, Morris, Davis & Davis, 2003; Shekelle, Morton & Keeler, 2006), and more.
- **Perceived Ease of Use:** Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p.320). According to related researches, if the operation system is easy to use, it would increase the intention of the person to use it because perceived ease of use corresponds with the freedom from exerting too much effort and experiencing anxiety (Mohamed et al., 2011; Venkatesh, 2004). Thus, theimpact of this behavior to relevant healthcare information is instrumental to the eventual use of the patients and physicians toward the technology (Razmak & Bélanger, 2018).

Three constructs represent hospital online healthcare information services:

- **Information Quality:** The Health on the Net Foundation (1999) pointed out that the quality of online health information has a positive influence on most online participators because they noticed that the high quality of online health information always attracts the experienced online participators' attention (Klein & Ford, 2003). Thus, information quality is the main factor that could determine the success of the information system (DeLone & McLean, 1992). Furthermore, information quality in this present research can be measured by such dimensions as relevance, reliability, timeliness, accuracy, consistency and completeness (Miller, 1996; Wand & Wang, 1996). Also, there are several different instrumental approaches such as in the case of the previous studies that rate online health-care information through Mitretek System, (2002), Sandvik, (1999) and Charnock et al., (1999).
- **Service Quality:** As the discrepancy between the customer's perceptions and expectations, service quality is founded on the comparison between what the customer feels should be offered and what

is provided (Gronroos, 1982; Parasuraman, et al., 1985). Zeithaml, et al. (1990) suggested that word-of-mouth communications, personal needs, past experiences and communications by the service provider to the user are the prime determinants of expected service quality. Specifically, Information System departments in hospitals serve as the main important source of expectations because their performances, which could be measured by the dimensions of tangibles, reliability, responsiveness, assurance and empathy, directly influence the elderly patients' satisfaction and intention (Kettinger & Lee, 1994;Pitt, Watson & Kavan, 1995).

- **Information Channel:** There are various channels that can be used to obtain healthcare information such as family members, friends, magazines, newspapers, televisions, books and the Internet (Ruppel & Rains, 2012). According to channel complementarity theory, information channel in hospital's healthcare information service is a wider information search process by using multiple sources (Dutta-Bergman, 2004a, 2006). These could bemeasured by the characteristics of healthcare information sources such as (a) tailor ability and (b) anonymity if they use the internet as a main information search channel (Ruppel & Rains, 2012). Also, Ratchford et al. (2001) found that elderly patients with easy access to the Internet and related skills may view the Internet as a more productive information channel than others.

THEORETICAL MODEL

The theoretical model in Figure 1 is notated to indicate the 8 research hypotheses associated with direct causal effects. There are two groups of variables representing hospital online healthcare information services and elderly patients' information behavior. The hospital online healthcare information services' variables are exogenous, two of the three elderly patients' information behavior variables are endogenous intervening variables and the third (information adoption intention) is the endogenous dependent variable.

The eight hypotheses associated with the direct effects shown in Figure 1 are stated in Table 2 below, which includes references that prompted the formulation of this present study's hypotheses.

Figure 1. Theoretical model. Note: Throughout H1 – H8 significant refers to statistical significance at a level of 0.05 or less.

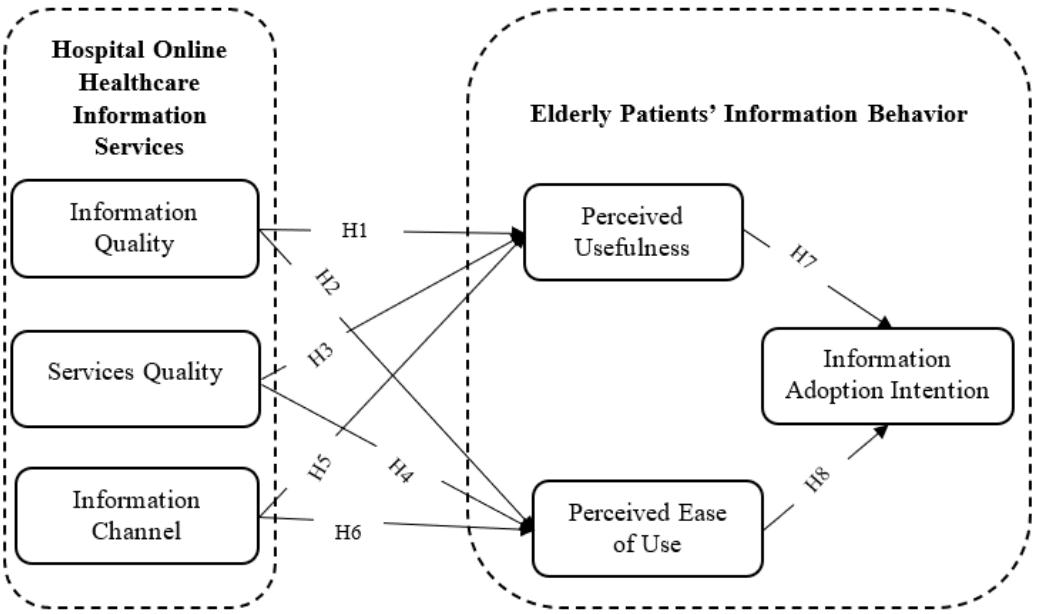


Table 2. Research hypotheses

Research Hypothesis	Reference	Research Hypothesis	Reference
Information Quality has a significant positive direct effect on: H1. Perceived Usefulness, H2. Perceived Ease of Use,	DeLone & McLean, (1992); Miller, (1996); Wand & Wang, (1996); Klein & Ford, (2003)	Service Quality has a significant positive direct effect on: H3. Perceived Usefulness, H4. Perceived Ease of Use,	Kettinger & Lee, (1994); Pitt, Watson & Kavan, (1995)
Information Channel has a significant positive direct effect on: H5. Perceived Usefulness, H6. Perceived Ease of Use,	Ruppel & Rains, (2012); Rai et al., (2013)	The direct effect on Information Adoption Intention due to: H7. Perceived Usefulness, H8. Perceived Ease of Use, Concentration is significant and positive.	Davis, (1989); Venkatesh, (2004); Acton et al., (2005); Shekelle, Morton & Keeler, (2006); Razmak & Bélanger, (2018)

Table 3 presents the operational definitions of each of the six latent variables in the theoretical model with their respective references.

Data Preparation and Descriptive Analyses

A cross-sectional field study was used to collect data using a self-administered questionnaire in Chinese version, which was designed to measure the personal characteristics of the respondents and variables in the theoretical model. The subjects were Chinese senior citizens who had online healthcare information gathering experiences. Since no reliable sampling frame was available, a purposive sampling method was used to identify the respondents. Questionnaires were distributed to the target population using online platforms.

About samples were obtained in China but 86 responses were removed due to either missing values or data entry errors. Finally, the total number of respondents were reduced to 321, which included 194 males and 127 females.

Furthermore, principal component factor analysis was used to examine the construct validity of the latent variables. This required indicators to load onto only the latent variable that were proposed

Table 3. Definitions and labels for model variables

Model Variable (Label)	Operational Definition	Reference
Information Adoption Intention (IAI)	The perceptions of individuals as to their behavioral tendency to adopt related online healthcare information.	Helia et al., (2018)
Perceived Usefulness (PU)	A measure of where the use of a trustworthy online healthcare information and related technology will bring benefits to those who use it.	Helia et al., (2018)
Perceived Ease of Use (PEOU)	The extent to which an individual perceives that online health-information-seeking and related technology are easy to learn and easy to use.	Razmak & Bélanger, (2018)
Information Quality (IQ)	Measures of information system output produced by online healthcare information providers.	DeLone & McLean, (1992)
Service Quality (SQ)	The discrepancy between customers' perceptions and expectations.	Gronroos, (1982)
Information Channel (IC)	The use of multiple sources in the process of accessing online healthcare information.	Ruppel & Rains, (2012)

to measure with a factor loading of at least 0.4 in magnitude and an associated eigenvalue of at least 1 (Straub et al., 2004). The equivalence reliability of indicators was assessed using cronbach alpha coefficients. The satisfactory results for construct validity and equivalence reliability are shown as part of Table 5.

Descriptive statistics for the distributions of the personal characteristics of the 321 participants are summarized in Table 4.

From Table 4, it could be seen that the majority of respondents are in the age range of 50 to 59 years and from urban area. The incidence of online healthcare information is decreased with age. Furthermore, there are 86.3 percent of responders who are married or have been remarried. For the financial characteristics of the respondents, most of them (56.4 percent) have monthly income greater than 4,000 Yuan. However, 1.9 percent only have monthly incomes that range from 500 to 999 Yuan with 3.4 percent receiving a monthly income of less than 500 Yuan. More than 57

Table 4. Descriptive statistics for personal characteristics of respondents

Gender	**Frequency**	**Percent**	**Married Status**	**Frequency**	**Percent**
Male	194	60.4	Single	15	4.7
Female	127	39.6	Married/Remarried	277	86.3
Age	**Frequency**	**Percent**	Separated	5	1.6
50–59	263	81.9	Divorced	16	5.0
60–69	47	14.6	Widowed	8	2.4
70–79	7	2.2	**Location**	**Frequency**	**Percent**
80–89	3	0.9	Urban Area	276	86
90 and above	1	0.4	Rural Area	45	14
Income	**Frequency**	**Percent**	**Expense**	**Frequency**	**Percent**
< 500 Yuan	11	3.4	< 500 Yuan	13	4.1
500-999 Yuan	6	1.9	500-999 Yuan	30	9.3
1,000-1,499 Yuan	12	3.7	1,000-1,499 Yuan	51	15.9
1,500-1,999 Yuan	12	3.7	1,500-1,999 Yuan	44	13.7
2,000-2,499 Yuan	26	8.2	2,000-2,499 Yuan	49	15.3
2,500-2,999 Yuan	21	6.5	2,500-2,999 Yuan	40	12.5
3,000-3,499 Yuan	27	8.4	3,000-3,499 Yuan	30	9.3
3,500-3,999 Yuan	25	7.8	3,500-3,999 Yuan	18	5.6
[3] 4,000 Yuan	181	56.4	[3] 4,000 Yuan	46	14.3
Device	**Frequency**	**Percent**	**Expense**	**Frequency**	**Percent**
Desktop Computer	49	15.3	Newspaper	42	13.0
Laptop Computer	21	6.5	Related Parties (Such as family members and friends)	11	3.5
Tablet Computer	6	1.9	Television	65	20.2
Smart Phone	194	60.4	Hospital Website	95	29.6
Other	51	15.9	Online Social Media	103	32.1
			Other	5	1.6

Table 5. Model variables: validity, reliability and descriptive statistics

Variable and Indicator		Validity/Reliability			Descriptive Statistics				Variable and Indicator		Validity/Reliability			Descriptive Statistics			
		Factor Loading	Eigen value (% of Variance)	Cronbach Alpha	Mean	Standard Deviation	Skewness	Kurtosis			Factor Loading	Eigen value (% of Variance)	Cronbach Alpha	Mean	Standard Deviation	Skewness	Kurtosis
Service Quality	SQ1	0.77	12.3 (45.7)	0.93	3.03	0.90	0.15	-0.17	Information Quality	IQ1	0.80	2.5 (9.3)	0.90	2.79	0.95	0.34	-0.22
	SQ2	0.79			3.10	0.88	-0.06	-0.22		IQ2	0.76			2.71	0.98	0.43	-0.13
	SQ3	0.80			3.15	0.88	-0.10	-0.04		IQ3	0.81			2.75	1.02	0.43	-0.13
	SQ4	0.82			3.14	0.91	-0.06	-0.27		IQ4	0.80			2.65	1.00	0.32	-0.36
	SQ5	0.79			3.03	0.87	0.11	-0.33		IQ5	0.76			2.74	0.97	0.39	-0.29
	SQ6	0.77			3.09	0.83	0.01	-0.01									
Information Channel	IC1	0.74	2.03 (7.5)	0.92	2.76	1.02	0.33	-0.33	Perceived Ease of Use	PEU1	0.82	1.54 (5.7)	0.90	2.65	1.05	0.43	-0.44
	IC2	0.72			2.84	0.97	0.25	-0.39		PEU2	0.78			2.76	0.92	0.36	-0.07
	IC3	0.78			2.84	0.97	0.15	-0.41		PEU3	0.81			2.80	0.95	0.33	-0.14
	IC4	0.73			2.67	1.05	0.33	-0.42		PEU4	0.81			2.92	0.84	0.25	0.12
	IC5	0.81			2.78	1.00	0.24	-0.26									
Information Adoption Intention	IAI1	0.72	1.4 (5.2)	0.91	2.98	0.90	0.25	-0.03	Perceived Usefulness	PU1	0.85	1.1 (4.2)	0.93	3.11	0.97	0.11	-0.47
	IAI2	0.76			2.98	0.92	0.54	-0.15		PU2	0.83			3.08	0.98	0.05	-0.29
	IAI3	0.77			2.90	0.96	0.32	-0.27		PU3	0.88			3.11	0.96	0.01	-0.38
	IAI4	0.70			2.84	0.91	0.29	-0.32									

Note for Factor Analysis: *Extraction Method:* Principal Component Analysis. *Rotation Method:* Equamax with Kaiser Normalization. Rotation converged in 6 iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy =0.948. Bartlett's Test of Sphericity Approx. Chi-Square = 6893.38, df = 351, Significance = 0.00. Components with eigenvalues less than 1 are not shown. Percentage of total variance explained = 77.65%.

percent of the respondents declared that their healthcare service expenditures range from 1,000 to 3,000 Yuan per month. For the equipment used to access online healthcare information, over 84 percent of the respondents have experienced using internet to access the healthcare information and 60.4 percent of them are using smartphone rather than computer-based technologies. The online information channels such as social media, hospital website and television are the main media channels for information transmission.

From Table 5, it could be seen that the magnitudes of skewness and kurtosis for each indicator are within the acceptable limits of 3 and 7, respectively. This is required for the use of maximum likelihood estimation in SEM analyses (Kline, 2016). For the purpose of descriptive analyses, the latent variables were converted to single interval scale measures using the weighted mean of the values of their indicators with the standard deviations as the weights. These single scale measures are used only in the following descriptive analyses. The separate values of the indicators were used in the SEM analyses.

From Table 6, all of the coefficients associated with causal effects in the theoretical model are significant and positive. There are four significant correlations, which suggest plausible effects that may be added to the theoretical model (Information Quality, Service Quality, and Information Channel → Information Adoption Intention; Perceived Ease of Use → Perceived Usefulness). These plausible additions are considered in the next section as part of the development of the model.

Model Analysis and Development

Figure 2 shows the results of the SEM analysis using Amos software to test the direct effects in the theoretical model.

Table 7 shows a range of fit statistics for the theoretical model as recommended by Kline (2016).

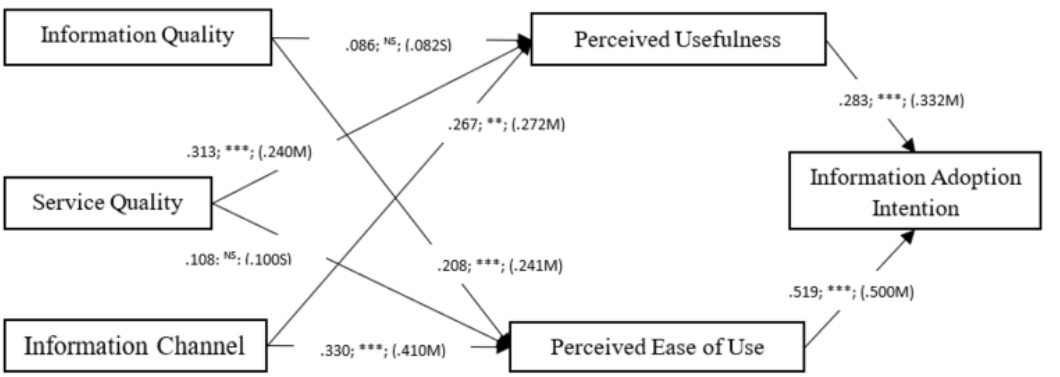
Table 6. Correlations

Variables	Gender	A	MS	ED	LA	IC	EP	IQ	SQ	IC	PU	PEOU	IAI
Age (A)	-0.026	1											
Married Status (MS)	0.073	**0.134***	1										
Education (ED)	**-0.157****	-0.097	-0.048	1									
Location (LA)	0.004	-0.086	-0.032	-0.102	1								
Income (IC)	-0.101	-0.102	-0.016	**0.349****	**-0.263****	1							
Expense (EP)	0.014	**-0.115***	-0.043	**0.320****	**-0.278****	**0.493****	1						
Information Quality (IQ)	0.034	0.032	-0.001	0.034	-0.021	0.039	0.106	1					
Service Quality (SQ)	0.039	-0.033	0.003	-0.030	0.021	0.022	0.032	**0.471****	1				
Information Channel (IC)	0.094	-0.037	0.036	0.004	0.042	0.023	0.050	**0.649****	**0.500****	1			
Perceived Usefulness (PU)	0.014	0.009	0.043	-0.033	0.099	-0.012	0.036	**0.339****	**0.376****	**0.391****	1		
Perceived Ease of Use (PEOU)	0.008	-0.007	0.031	-0.034	0.024	0.002	0.049	**0.520****	**0.390****	**0.557****	**0.401****	1	
Information Adoption Intention (IAI)	0.032	-0.013	-0.026	-0.030	-0.045	0.045	0.029	**0.590****	**0.504****	**0.666****	**0.459****	**0.547****	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 2. Direct effects in the theoretical model. Note: Direct effects are shown using the following notation: The direct unstandardized effect is shown followed by *, **, or * if the effect is statistically significant at a level of 0.05, 0.01, or 0.001, respectively; NS represents not statistically significant at a level of 0.05 or less. In parentheses the standardized effect is shown with S, M, or L to indicate that the magnitude of the effect is small, medium, or large, respectively.**



From Table 7, it could be seen that the fit statistics RMR, GFI and AGFI are slightly less than satisfactory and the effect of Information Quality on Perceived Usefulness; Service Quality on Perceived Ease of Use in Figure 2 is small and not statistically significant. Consequently, it is desirable to seek an improved model. Four additional direct effects suggested by the significant correlations in Table 6 were added to the theoretical model and together with the effect of Information Disclosure on Perceived Pleasure, these six effects were made optional in a specification search using Amos.

Table 7. Fit statistics for theoretical model

	N	Normed Chi-square (NC = χ^2/df)	RMR	GFI	AGFI	NFI	IFI	CFI	RMSEA
Theoretical Model	321	503.009/313=1.607	.068	.896	.874	.929	.972	.972	.044
		R^2: PEOU (.444); PU (.261); IAI (.469)							

The 64 models in the hierarchy were analyzed and among these the model with the least value for NC was selected as the final model (Kline, 2016). Fit statistics for the final model are shown in Table 8 and direct effects are shown in Figure 3.

The final model has improved the fit statistics, and the reasonable proportions of the variance of the endogenous variables (R^2) are explained by the model.

Table 9 shows the indirect effects, the totals of indirect effects and the totals of indirect and direct effects in the final model.

In Table 9, all of the total effects in the final model are shown to be statistically significant, positive and medium in magnitude. Considering the standardized total effects on elderly patient's information adoption intention, the order from greatest to least effect starts with the three hospital online healthcare information services (information channel, quality, and services quality) followed by the two information cognitive behaviors (perceived ease of use and usefulness). In contrast, if only direct effects are considered the order of effects on information adoption intention is quite different with information channel, quality and perceived ease of use appearing to be more important while perceived usefulness and service quality are less important.

Table 8. Fit statistics for final model

	N	Normed Chi-square (NC = χ^2/df)	RMR	GFI	AGFI	NFI	IFI	CFI	RMSEA
Final Model	321	400.689/311=1.288	.030	.915	.896	.944	.987	.987	.030
		R^2: PEOU (.407); PU (.274); IAI (.634)							

Figure 3. Direct effects in the final model. Note: Direct effects are shown using the following notation: The direct unstandardized effect is shown followed by *, **, or * if the effect is statistically significant at a level of 0.05, 0.01, or 0.001, respectively; ^{NS} represents not statistically significant at a level of 0.05 or less. In parentheses the standardized effect is shown with S, M, or L to indicate that the magnitude of the effect is small, medium, or large, respectively.**

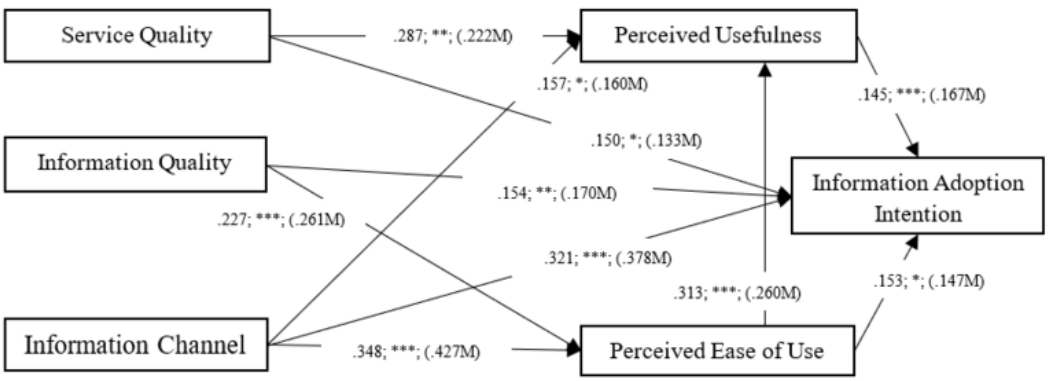


Table 9. Total effects in the final model

Causal Variable	Affected Variable		
	Perceived Useful	Perceived Ease of Use	Information Adoption Intention
Service Quality	Medium Only Direct	**Nil**	Medium Mainly Direct
Information Channel	Medium Mainly Direct	Medium Only Direct	Medium Mainly Direct
Information Quality	Small Only Indirect	Medium Only Direct	Medium Mainly Direct
Perceived Useful	**Nil**	**Nil**	Medium Only Direct
Perceived Ease of Use	Medium Only Direct	**Nil**	Medium Mainly Direct

Note: The statistical significance of indirect effects was determined following Cohen and Cohen (1983); and total effects were determined using nonparametric bootstrapping with 1,000 random samples.

Among the three hospital online healthcare information services, information channel has the strongest influence on each of the two intervening information behaviors (perceived ease of use and usefulness) and to the information adoption attention. Information quality has its strongest influence on perceived ease of use, and services quality has the strongest influence on perceived usefulness.

Research Hypotheses for Direct Effects

Table 10 presents the decisions related to the original research hypotheses (from Table 2) and the additional research hypotheses that were tested in the final model. And, from Table 6 it is evident that elderly patients who derive the most perceived ease of use and usefulness from hospital consider that healthcare information and related online service to be current, reliable, accurate, attractive and well managed.

Practical Implications of the New Findings

These new findings, however, require validation in future studies. In particular, they may highlight the importance to study the causal effects in order to analyze and report indirect effects and total effects rather than only direct effects.

From total effects in Table 9, it is possible to develop a hierarchical set of practical actions that increase information adoption intention. These are also described in Table 12 with actions 1, 2 and 3 in the decreasing order of their influence on information adoption intention.

The comments in Table 12 indicate additional direct influences on Information Adoption Intention, Perceived Usefulness and Perceived Ease of Use that act as mediators in the indirect effects of hospital information services on elderly patients' information adoption intention.

Table 10. Decisions for research hypotheses

Service Quality has a significant positive direct effect on Perceived Ease of Use.	Rejected
Information Quality has a significant positive direct effect on Perceived Usefulness.	Rejected
Perceived Ease of Use has a significant positive direct effect on Perceived Usefulness.	Accepted
Information Quality has a significant positive direct effect on Information Adoption Intention.	Accepted
Information Channel has a significant positive direct effect on Information Adoption Intention.	Accepted
Service Quality has a significant positive direct effect on Information Adoption Intention.	Accepted

Table 11. New findings for further studies

Direct effects on Information Adoption Intention due to Information Quality, Service Quality, and Information Channel are positive medium and significant.
The direct effects on Perceived Usefulness due to Information Quality is not statistically significant. The direct effects on Perceived Ease of Use due to Service Quality is not statistically significant.
The total of the indirect effects on Information Adoption Intention due to Information Quality, Service Quality, and Information Channel are positive and significant.
Total effects on Information Adoption Intention due to Information Quality, Service Quality, and Information Channel are positive, medium, and significant.

Table 12. Practical actions to increase information adoption intention

	Hospital Information Services to Increase Information Adoption Intention	Comments
1	Ensure that information channel is selected (or created) by the hospital must be: (a) expertise; (b) anonymity; (c) authoritativeness; (d) convenience and universality; (e) a positive use-performance environment; (g) being friendly and easy to operation; (h) a strong social interaction channel with an interactive search utility	The actions in 1 contribute to increasing the elderly's: (a) feeling of usefulness, unrestricted freedom, and ability to search for their interested information independently; and (b) attention to access the update healthcare information that provided by the hospital; (c) emotion to use the hospital's online healthcare information services; (d) control-ability for healthcare information
2	Ensure that information quality provided by the hospital is: (a) current; (b) reliable; (c) accurate; (d) easily understood; (e) comprehensive; (f) authoritativeness; (g) wide-ranging and well organized	The actions in 2 contribute to increase the elderly's: (a) feeling of usefulness and ease of use; (b) cognition capacity for online healthcare information authority; (c) control-ability for information
3	Ensure that information services provided by the hospital is: (a) personalized for the elderly patient with lowest costs; (b) available at anywhere and anytime; (c) reliability; (d) responsiveness; (e) timeliness; (f) assurance and empathy; (g) useful for the elderly patient	The actions in 3 contribute to achieving the outcomes same as actions in 2.

CONCLUSION

This present study has shown that in an online healthcare information environment, the most important influential factor that affect elderly patients' intention to use the online information system is information channel, which is defined by the source's expertise, authoritativeness, convenience and universality. Additionally, information quality in the healthcare information paradigm must be easily understood, authoritative, wide-ranging and well organized at the same time service quality requires service providers to have the ability to provide personalized services in the lowest costs possible, ensuring services are reliable, responsive, timely, assured and empathic.

For the hospitals, who serve as the healthcare information provider, their online behaviors are found to have indirect influences on the elderly's online healthcare information adoption intention by increasing the perceived usefulness (i.e. making sure that the access to online information services is a low cost investment; related information and services is current, reliable, comprehensive and authoritative) and perceived ease of use (i.e. the operation process must be easy and friendly; related information and services must be easily understood and operated; and maintain the attention of the information users). However, the perceived usefulness is not influenced significantly by information quality and service quality does not significantly influence perceived ease of use.

The theoretical contributions of this present study assert that (1) the effects of these variables in western societies are also evident in the context of China, and (2) additional and new theoretical findings are shown in Table 11, which require further validation but certainly highlight the advantages of analyzing indirect and total effects rather than only the direct effects. The discussion of the findings includes practical implications, which were based from the theoretical results.

However, there are limitations on the findings. The external validity must be confirmed by further studies as the respondents whose ages range from 50 to 59 formed the largest part of the sample, and consequently the elderly participants, those whose age are above 70 were outnumbered by the younger participants. It is also recommended that other hospitals and elderly patients' information behaviors should be included in the model in future studies. Nonetheless, the findings are useful and certainly contribute to the increased understanding of the relationships between hospitals and elderly patient's behaviors in online environments specifically in the context of China.

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Liu Liang received Ph.D. in Information Technology from Assumption University of Thailand . His professional interests focus on information technology application and information behavior analysis in business operation and his current projects include enterprise's online information behaviors, hospital's online information services, and online information inquiry and application.