

**Internet Embeddedness: Links with Online Health Information Seeking,  
Expectancy Value/Quality of Health Information  
Websites, and Internet Usage Patterns**

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## **Internet Embeddedness: Links with Online Health Information Seeking, Expectancy Value/Quality of Health Information Websites, and Internet Usage Patterns**

### **Abstract**

Although the Internet has become an important resource for health information, little is known about key factors that affect our perceptions of how the Internet is embedded in our lives and how our lives are embedded in the Internet. Increasingly, people are more reliant on the Internet to achieve a whole range of daily activities – whether it is shopping, banking, learning, staying in touch with family, socializing with friends, just taking time out to play games or listen to music, or getting help with health related issues. In many respects, it is because it is interactive that the Internet is more embedded in our lives and our lives more embedded in it than in television, radio, and newspapers. Furthermore, it is not just because we can talk via the Internet to other people, but also because, unlike with old media like television programs, people don't just consume Internet content, they also provide it (e.g., personal homepages, weblogs, Wikipedia, Yahoo!Answer+, and the posting of self-produced video clips on YouTube). All of these mean that our engagement with the Internet is much more active than it used to be. However, our heavy reliance on the Internet is often taken for granted. By considering factors such as demographics and expectancy value or quality attributes of health information websites that may influence Internet users' online health information-seeking behavior, we may begin to reflect on how health information obtained online might affect the perception of how intimately our lives are embedded in the Internet and vice versa.

To see how the Internet is actually embedded in our lives, this exploratory study examines how Internet users search the Web for important information, especially health or medical information, to make critical decisions, and how the expected quality of health

information websites intersects with our health information searches on the Web. Data from a probability sample of 569 Internet users in Hong Kong found four types of commonly sought health information clusters online which included information on (1) health improvement, (2) medical treatment, (3) family health, and (4) health issues that are difficult to talk about.

Results also show that behavior or behavioral intentions in health information seeking are in fact either a function of value expectancy or the evaluation of health information websites.

More importantly, those who often go to the Internet for health information and have high expectations of the value and quality of health information websites (especially in terms of reliability, relevance/context, and interaction) tend to be those who are more likely to perceive the Internet as playing an important role in life decisions or rate the Internet as more embedded in their lives. Implications for practitioners and policy-makers will be discussed.

Word count: 447

**KEY WORDS:** Consumer health information; Internet; Medical informatics; Quality of health care; Social sciences

## **Introduction**

Increasingly, people are more reliant on the Internet to achieve a whole range of daily activities – whether it is shopping, banking, learning, staying in touch with family, socializing with friends, just taking time out to play games or listen to music, or getting help with health related issues. Although the Internet has become an important resource for health information, little is known about key factors that affect our perceptions of how the Internet is embedded in our lives and how our lives are embedded in the Internet. However, our heavy reliance on the Internet is often taken for granted. By considering factors such as demographics and expectancy value or quality attributes of health information websites that may influence Internet users' online health information-seeking behavior, we may begin to reflect on how health information obtained online might affect the perception of how intimately our lives are embedded in the Internet and vice versa.

## ***Internet Embeddedness***

In evaluating how the Internet is embedded in our lives, Howard uses the embedded media perspective to describe how deeply our social and individual lives are involved in the Internet.<sup>1</sup> British writer Tom Standage, in his book *The Victorian Internet*,<sup>2</sup> describes technological embeddedness in terms of '*invisible technology*' -- meaning that "technology has matured to become so embedded in, or integrated to, our everyday lives that we don't really notice it any more" (p. 63). In discussing Internet embeddedness, Howard explains that the capacity and constraints of an online social life can be conceived in terms of three dimensions: *fit*, *status*, and *link*.<sup>1</sup> In terms of *fit*, the Internet is embedded in that it fits in well with the daily routines of our social lives without demanding changes in our old habits. This means that the Internet has become entrenched and immersed in the background and surroundings of our everyday lives, and we would find it difficult to give up. With respect to

*status*, the question is how we can use our ability to integrate the Internet into our lives to improve our social position and quality of life by using information to increase our understanding. Finally, in terms of *link*, this concept measures how effectively and efficiently the Internet enables (or constrains) us to link to the outside world as compared to traditional media.

### ***Health Information Seeking Online***

Health information seeking behavior can be characterized as the search for and receipt of information that helps “to reduce uncertainty regarding health status” and “construct a social and personal (cognitive) sense of health.”<sup>3,4,5</sup> Although television and other traditional media sources play pivotal roles in much of health information dissemination, the Internet may be taking over this function. During the late 1990s, the Internet exploded into a powerful social institution, p. 148,<sup>5</sup> and is now heavily relied upon for medical information on health related topics by both consumers and providers of health care services.<sup>6</sup> Although a multitude of online health information websites exists, there is little consistency in terms of how many people actually use this information, the purpose of using it, the types of health information sought, and the implications of this usage. Thus, we pose the following research question and hypothesis:

RQ<sub>1</sub>: What specific types of health information do people seek through the Internet?

H<sub>1</sub>: High Internet health information seekers will rate themselves as more embedded in the Internet than low health information seekers.

### ***The Expectancy Value Paradigm***

The expectancy-value approach suggests that “people orient themselves to the world according to their *expectation* (beliefs) and *evaluations*, p.275.”<sup>7</sup> Expectancy-value

judgments affect intentions to use media and the frequency of use mainly through their influence on attitudes.<sup>8</sup> Similarly, expectancy values or perceived quality attributes of health information websites will influence people's use of the Internet for health information.

The quality of information on health websites has been a prominent topic in medical and information science research. Frequently, the discussion has been restricted to an examination on one dimension of expectancy value or quality, namely the *reliability*, of health information in terms of its accuracy, trustworthiness, currency, and authoritativeness.<sup>9,10,11,12</sup> Meanwhile, a growing body of recent research on Internet-based health communication suggests that the *completeness* of health and medical information is perhaps one of the most important expectancy values or qualities in decision making and choice situations.<sup>13,14,15,16</sup> In a study on the quality of health information on the Web, Marton identified another important attribute – *relevance*, which is an important dimension of information source quality and its inclusion in Web user studies contributes to academic and health care practitioner discourses on the quality of online health information.<sup>17</sup> As Marton pointed out, health information can be highly reliable but completely irrelevant if it does not take into account the characteristics or the needs of the information seeker. Specific to this issue, Saracevic describes five attributes of relevance,<sup>18</sup> including relation, intention, context, inference, and *interaction*. Therefore, based on the concepts of Internet embeddedness and the expectancy value judgment framework, together with the mutually reinforcing relationships between health information seeking behavior and its antecedents, we raised two hypotheses:

- H<sub>2a</sub>: Subjects who score high on expected value/quality of online health information are more likely to seek health information from the Internet.
- H<sub>2b</sub>: Subjects who score high on expected value/quality of online health information are more likely to perceive the Internet as playing an important role in their lives.

### ***Internet Usage Pattern***

Internet usage patterns can be conceptualized as scope and intensity, which concerns the depth and breadth of people's Internet use in terms of the frequency with which they go online and the activities that they engage in. Thus, given cohort and lifecycle differences, it seems worthwhile to explore whether patterns of Internet use, especially with different functions that may provide information or contain the possibility of strengthening strong ties, are positively related to individual-level perceptions of Internet embeddedness. Therefore, we will attempt to test the following hypotheses and answer the following research question:

- H<sub>3a</sub>: Heavy Internet users have higher expectations of the value/quality of health information websites than light Internet users.
- H<sub>3b</sub>: Heavy Internet users are more likely to seek health information on the Internet than light Internet users.
- H<sub>3c</sub>: Heavy Internet users are more likely to perceive that the Internet plays an important role in their lives than light Internet users.
- RQ<sub>2</sub>: What are the relative influences of demographics, health information seeking behaviors, expected value/quality of health information websites, and Internet usage patterns in predicting the role the Internet plays in making important decisions in life?

## **Method**

### **Sample & Sampling Procedure**

Data for this study were collected from a telephone survey with a probability sample of 1,076 respondents aged 18 or above randomly chosen from the latest telephone directory in Hong Kong. The survey instrument was pilot tested before the actual fieldwork on 42 university students, which took place from August 22-26, 2006. All eligible respondents

included for analyses were PC users and had access to the Internet at home.<sup>a</sup> Of the 1,076 completed interviews, 52.9% were Internet users and 47.1% were non-users. Of the 569 Internet users, 51.7 % were male and the mean age category was between 39 and 40 years of age. In terms of income, 14.4% had median monthly household incomes between US\$3,846 and US\$5,128. About 10.6% had not completed high school, 45.2% were high school graduates, 7.3% were associate degrees holders, and about 36.4% had a university degree or higher. The response rate was 55 percent.

## Measurements

As shown in Table 1, a total of six questions were asked to assess *Internet embeddedness* (i.e., how crucial the Internet had been in some important decisions or life changes?). A 10-point scale was used with 1 = “no role at all” and 10 = “a crucial role.” Based on past literature, *health information seeking* was measured with a total of 15 items in this study to assess the types of health information Internet users usually seek online.<sup>19,20,21</sup> A composite health information seeking index was created by adding all 15 items to illustrate the intensity of health information seeking via the Internet. The reliability alpha was .90. As for *expectancy values of health information websites*, a collection of 11 items taken from previous research into the quality of health information on the Web was used.<sup>22,23,24</sup> Three specific quality attributes (reliability, relevance/context, and interaction) of health information websites were examined. Similar to Internet embeddedness and health information seeking, a composite index was also devised with data ranging from 11 to 55 and a reliability alpha of .89. *Internet usage patterns* were assessed by asking respondents how often they use a list of six Internet related functions. Each subject was then assigned an

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<sup>a</sup> The aim of this research was to assess the perceived embeddedness of the Internet in people’s lives -- involving not only how much they rely on the Internet for health-related information but also the Internet for information on school, career training, job search, making investment, and developing lasting relations. Therefore, the sample included all Internet users instead of only those who had sought health information within 12 months prior to the survey.

Internet usage intensity index, i.e., the sum of these six variables with data ranged from 6 to 30. The reliability alpha was .78. Finally, *social demographic* variables were included as control variables.

< Insert Table 1 and 2 About Here >

## **Results**

### ***Internet Embeddedness***

As shown in Table 1, the analytical frame *embedded Internet*, using six items, was employed to assess Internet embeddedness. With the exception of “link,” which was measured by a single item “developing a lasting relationship and/or finding romance,” the mean scores for the five items to measure both “fit” and “status” were all above 7.3. This indicates that respondents largely agreed that their lives are intimately immersed in the Internet. It shows firstly that the notion of relying on the Internet to help find jobs and schools “fits” well with their daily routines. Second, it suggests that people have integrated the Internet into their lives to help seek and obtain health information in order to improve and maintain good health, and to help make intelligent decisions about ways to invest in order to enhance their social and economic “status.” Third, the Internet can also provide a means for people to “link” with the outside world more efficiently and effectively, especially for establishing long-lasting relationships. All these are indicators of how we have become more embedded in the Internet. A composite index of Internet embeddedness based on these six items was also constructed with a mean of 7.38 and the reliability alpha was acceptable at .73.

### ***Health Information People Sought on the Internet***

Factor analysis results in Table 3 yielded a four-factor health information seeking structure and accounted for 64.16% of total variance. The four major health information

people sought online included: *medical treatment*, *hard to talk about health issues*, *family health*, and *health improvement*. Although past research has demonstrated that people are increasingly using the Internet to obtain health information, the majority still prefer to use doctors, pharmacists, and nurses as their main sources of information. This result is consistent with the Pew Report which emphasizes that most people in the U.S. only infrequently search for health information on the Internet.<sup>25,26</sup> This means that the Internet has become, albeit slowly, a popular resource for health information.

< Insert Table 3 About Here >

### ***Hypotheses Testing***

As shown in Table 4, a significant correlation result was found between the composite indexes of online health information seeking and Internet embeddedness. Specifically, distinct dimensions of health information seeking were found to be significantly linked to Internet embeddedness (see Table 5 for details). This indicates that the more people benefit from health information via the Internet the more they perceive that the Internet is playing an important role in their lives or the more they feel that their lives are embedded in the Internet. As a result, H<sub>1</sub> was largely supported.

Results in Table 4 also show that behavior or behavioral intentions in health information seeking was indeed a function of value expectancy or an evaluation of health information websites. In fact, additional correlation analyses show that medical treatment was significantly correlated to reliability and interaction values; hard to talk about health issues were linked to interaction; and health improvement was also associated with reliability. These findings are in line with previous research and show that media consumption is affected by an individual's control and perceptions of the probability and value of a potential consequence.<sup>27</sup> Therefore, H<sub>2a</sub> was modestly supported. As hypothesized in H<sub>2b</sub>, data support that subjects who score high on expectancy value/quality of online health information are positively and

significantly linked to Internet embeddedness. Similarly, results in Table 5 show that distinct dimensions of expectancy value/quality of health information websites and Internet embeddedness are all significantly related. This suggests that people who believe and experience online health information as reliable, accurate, relevant, easy-to-use, basic, non-technical, interactive, and having feedback mechanisms for user support are those who perceive that the Internet plays an important role in their lives. These results strongly support H<sub>2b</sub>.

Furthermore, results in Table 4 support the predictions of H<sub>3a</sub>, H<sub>3b</sub>, and H<sub>3c</sub>. In particular, intensity of Internet use was found to be significantly linked to expectations of the value/quality of health information websites, to the composite index of health information seeking on the Internet, and to Internet embeddedness respectively. This means that the more intensely people use the Internet, the higher the expectations and evaluation they will have of Internet health information websites, the more they will use the Internet to seek health related information, and the more they will perceive that the Internet plays an important role in their lives.

< Insert Table 4 About Here >

### ***Predicting Internet Embeddedness***

Results in Table 5 indicate that no demographic variable was a significant predictor of Internet embeddedness. In fact, the Internet has become widely used by all socioeconomic strata; it is equally important or embedded for all demographic groups.<sup>28,29</sup> The most powerful predictor is from the Internet usage pattern block with web search being the strongest. This means that, of all the Internet services, being able to search for information on the Web has a vital impact on Internet embeddedness perceptions or the perceived importance of the Internet in helping us to make important decisions. This block explained 10% of the variance. Relevance/context and interaction were also two significant predictors

in the expected value/quality of health information website block and explained 12% of the variance. This finding implies that the easier the medical information for non-medical professional is to understand, the more basic and non-technical the language is in the interface, the less expensive the health information available is online, and the more emotional support is available through interactive feedback mechanisms, the more Internet users perceive that the Internet is embedded in their lives. As for the health information seeking block, only medical treatment was a significant predictor and explained only 1% of the variance. This indicates that being able to obtain health or medical related information online strongly affects our perceptions of how embedded we are in the Internet. A total of 23% of the variance was explained.

< Insert Table 5 About Here >

## **Discussions**

Exploratory factor analysis successfully identified four types of commonly sought health information clusters including, in order of usage frequency: health improvement, medical treatment, family health, and health issues that are difficult to talk about. These results show that, although it is still uncommon, Internet users do perceive the Internet as an alternative source of information for health problems. With this information, they might be able to avoid a visit to a health professional, or find *empowerment* from online information within a medical encounter. This is in stark contrast to traditional health care services, where the burden is on the user to attend at a time usually determined by a professional and in an environment that is unfamiliar. Moreover, the Internet provides a means of minimizing people's perceived barriers to accessing health service/information – reducing embarrassment and providing *anonymity*, especially for health related information that is sensitive and private in nature. Similarly, past research has also indicated that the advantages people perceive from using the Internet for health information may involve not only getting

information on their health related problems, but also being *empowered* to have more control over their health decisions, to get access to support groups, and to have a greater sense of partnership in the relationship.<sup>4,30</sup> With these benefits, it is easier to explain why and how health information seeking is having observable influences on Internet embeddedness in our lives.

This study shows that those who often go to the Internet for health information and have high expectations of health information websites tend to be those who are *more* likely to perceive that the Internet plays an important role in life decisions. This suggests that there is a crucial link between Internet embeddedness and online health information seeking. In fact, the information obtained enabled high health information seekers to ‘challenge aspects of care’ and ‘weigh the pros and cons’ of treatment.

Furthermore, it is important to note that expectancy values of health information website, especially in *relevance/context* and *interaction*, were significantly associated with perceived Internet embeddedness. Such results point to the importance of health information websites for non-professionals being in non-technical language, searchable, free, and with feedback and interactive support if the Internet is to serve as a “leveler” across different socioeconomic backgrounds as such information seeking experiences may lead to the perception of being empowered and make people feel more reliant on the Internet.<sup>31</sup>

**Table 1: Internet Embeddedness**

Capacities/ Constraints	How crucial the Internet had been in some important decisions or changes in your life?	Mean	S.D.
Fit	<b><u>Education and Jobs</u></b>		
	1. Get information on school, university, or career training	7.96	1.60
	2. Help find jobs or change to a new job	7.93	1.77
Status	<b><u>Health</u></b>		
	3. Help get information to deal with a major illness or health condition	7.88	1.68
	<b><u>Investment and Finance</u></b>		
	4. Make a major investment or financial decision	7.74	1.82
	5. Find a way to make money or save money	7.31	2.37
Link	<b><u>Relationship &amp; Romance</u></b>		
	6. Develop lasting relationship and/or find romance	5.43	2.42

Note: Scale used: 1 = no role at all and 10 = a crucial role

**Table 2: Factor Analysis of Expected Values/Qualities of Health Information Online**

How important are the following criteria for choosing health information on the Web?	Factors			Mean	s.d.
	1	2	3		
<b><u>Reliability</u></b> (M=7.36)					
1. Information is accurate, reliable, and error-free	.831			7.37	2.45
2. Information is complete	.785			6.78	2.25
3. Information provider has definitive knowledge in the area	.772			7.39	2.05
4. Website is easy to navigate	.702			7.60	1.88
5. Information is up to date	.587			7.66	1.92
<b><u>Relevance/context</u></b> (M=7.32)					
6. Information is appropriate for people who are not medical professional		.749		6.80	2.01
7. Language used is basic and non-technical		.725		6.71	1.96
8. Website has search function		.632		7.86	1.92
9. Information provided is free of cost	.496	.582		7.90	1.96
<b><u>Interaction</u></b> (M=6.57)					
10. Website has feedback mechanism available			.854	6.40	2.08
11. Website provides user support if required	.440		.531	6.73	2.13
Eigenvalue	5.30	1.04	.77		
% variance explained	48.16	9.49	6.98		
Cronbach's Alpha	.86	.73	.60		

Scale: 1 = not at all important to 10 = very important.

**Table 3: Factor Analysis of Health Information Seeking Online**

How often do you look for health or medical related information online?	Factors				Mean	s.d.
	1	2	3	4		
<b><u>Medical Treatment</u></b> (M=1.69)						
1. a certain medical treatment or procedure	.776				1.64	.92
2. a specific disease or medical problem	.765				2.07	1.06
3. a particular doctor or hospital	.704				1.63	.88
4. alternative treatments or medicine	.682				1.54	.85
5. prescription or over the counter drugs	.619				1.62	.88
<b><u>Hard to Talk About Health Issues</u></b> (M=1.30)						
6. how to quit smoking		.798			1.15	.43
7. problems with drugs and alcohol		.744			1.23	.53
8. sexual health		.634			1.34	.65
9. depression, anxiety, stress or mental health issues		.550			1.47	.80
<b><u>Family Health</u></b> (M=1.34)						
10. reproduction health			.775		1.27	.61
11. baby or child care			.740		1.48	.87
12. marriage problem			.690		1.26	.60
<b><u>Health Improvement</u></b> (M=1.76)						
13. lose weight				.792	1.49	.84
14. exercise or fitness				.689	1.94	1.05
15. diet, nutrition, vitamins, or nutritional supplements				.524	1.84	1.02
Eigenvalue	6.36	1.38	1.21	1.07		
% variance explained	42.42	9.19	6.77	5.78		
Cronbach's Alpha	.85	.71	.74	.71		

Notes: Scale used: 1=Never; 2=Rarely; 3=Occasionally; 4=Often; and 5=Always; N=569

**Table 4: Correlation between Health Information Seeking, Internet Embeddedness, Expected Value/Quality of Health Information Websites, and Internet Usage Intensity**

	2	3	4
1. Health information seeking online	.16**	.09*	.37***
2. Internet embeddedness		.46***	.23***
3. Expected value/quality of health information online			.25***
4. Internet usage intensity			

# $p < .1$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; N= 534

**Table 5: Hierarchical Regression of Demographics, Health Information Seeking Online, Expectancy Value/Quality of Health Information Online, and Intensity of Internet Use on Internet Embeddedness**

	Internet Embeddedness <sup>a</sup>	
	r	$\beta$
<b>Block 1: Demographics</b>		
Age		
Gender (male=1)		
Household monthly income		
Education		
$\square R^2$		.00
<b>Block 2: Health Information Seeking</b>		
Medical treatment	.16**	.12*
Hard to talk about health issues	.12*	
Family health	.12*	
Health improvement		
$\square R^2$		.01*
<b>Block 3: Expected Value/Quality of Health Information Websites</b>		
Reliability	.36***	
Relevance/context	.37***	.21**
Interaction	.38***	.19**
$\Delta R^2$		.12**
<b>Block 4: Internet Usage Intensity<sup>b</sup></b>		
Web search	.30***	.26***
Online news	.19**	
e-mail		
Instant messaging (ICQ, MSN)	.16**	
Blogs		
Forums		
$\Delta R^2$		.10***
$R^2$		.24
Final adjusted $R^2$		.23

Notes:

<sup>a</sup> Respondents were asked to rate how important the Internet has played in roles about some important decisions or changes in life (e.g., get information on school, university, or career training, help find jobs, and get information to deal with a major illness). Scale used: 1=no role at all and 10=crucial role.

<sup>b</sup> How often do you engage the following interact activities (e.g., e-mail, MSN, forums, blogs, online news, and research)? Scale: 1=Never and 5=Very often

Figures are Pearson's r and standardized beta coefficients.

<sup>#</sup>  $p < .1$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; N = 534

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