The E-Commerce Model of Health Websites: An Integration of Web Quality, Perceived Interactivity, and Web Outcomes

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Abstract—The study integrates web quality (system quality, information quality, and service quality), perceived interactivity (human-message, human-human), and web outcomes (web usage, web satisfaction, and web loyalty) to explore the e-commerce model of health websites. A survey of 1076 users of health websites was conducted to validate the proposed model. The findings show that web quality has significantly positive effect on perceived interactivity, web usage, and web satisfaction separately, which in turn influence web loyalty. This study also confirms that perceived interactivity is an important mediator between web quality and web outcomes. This study emphasizes the importance of both web quality and perceived interactivity in the progress towards success health websites. The findings may be used as theoretical base for future research and can also offer empirical foresight to executives and managers of hospitals when they initially introduce and upgrade the health websites into their organizations.

Index Terms—web quality, perceived interactivity, web usage, web satisfaction, web loyalty

I. INTRODUCTION

Ever since the Internet emerged in the 1990s, a great number of situations and modes of commercial competitions have had tremendous changes. Lots of customer-oriented service industries have started to set up the platforms and portals on the Internet to serve the customers so that the customers can be connected with the services the organizations offer at any time no matter how far they are or where they are. Moreover, many traditional commercial behaviors can also be conducted with the long-distance virtual transactions through the Internet. The Internet has changed not only the modern people’s living styles but also the transaction modes between contemporary businesses and customers. Therefore, the representative organizations, hospitals, which offer the service of medical treatments, have also gradually valued this tendency and trend.

Hospitals can take advantage of the websites to provide the patients and their families with the health information so that they can learn the latest knowledge of medicine. The mechanism of the online registration can also be utilized to create another channel to seek medical advice. Alternatively, the conferences or seminars regarding the health education can be regularly held in the hospitals and post the contents onto the websites for the general public to browse the films and download the briefings and other materials. Lots of healthcare courses can even be offered online. For instance, the prenatal healthcare course for the couples, the smoking cessation course, bodybuilding course and so on. These functions are no longer just the static introduction to each clinic and department. Instead, they have become the virtual clearinghouse for the health information. At present, numerous websites of hospitals and medical institutions have been equipped with these features.

Health website is not only a health communication channel but also a full representation of a service department to the customer. With the establishment of the reliable and popular health websites, the customers can be provided with the general healthcare information, and hospital-customer relationships can be further reinforced. In addition, studies have showed that the customers satisfied with a website would have higher level of customer loyalty. Thus, it’s critical to investigate how the websites quality to affect health web outcomes (e.g. web usage, web satisfaction, web loyalty).

In addition, Internet has transformed the traditional physician-patient relationship because those who use the Internet frequently ask their physicians more specific questions and suggest specific illnesses and treatments. Lustria also showed that the use of interactive technology could enhance learning and persuasion of content on the basis of well health web quality. Therefore, it’s very crucial to explore the issue of interactivity of health websites.

Accordingly, the purpose of the study is to examine how web quality (system quality, information quality, and service quality) and perceived interactivity (human-message and human-human) affect the websites’ loyalty through users’ attitude toward websites (website usage and satisfaction). The research model will be empirically tested using the structural equation modeling (SEM). Through the statistical analysis, we can investigate the interaction between technological and social factors, and furthermore find out the important antecedents of websites’ loyalty. In this way, we hope to provide the managers of hospitals.
and the administrators of the IS department with the insight and reference regarding the management of hospital websites.

II. LITERATURE REVIEW

2.1 Web Quality

Aladwani and Palvia [5] define website quality as users’ evaluation of a website’s features meeting users’ needs and reflecting overall excellence of the web site. Hwang and Kim [6] on the other hand define website quality as the user’s perception on the customer service and privacy based on the website interface and functions. Liu and Arnett [7] conducted a survey on the top thousand businesses as listed in Fortune magazine, and found four factors that relevantly affected the success of the website: (1) information and service quality, (2) system use, (3) playfulness, and (4) system design quality. In DeLone and McLean’s research [8] on e-commerce systems and the measurement of quality, it was found that other than system and information quality, the importance of customers support in e-commerce system was essential, thus emphasizing the importance of the quality of service. Ahn, Ryu, and Han [9] believe that the technology-focused approach sees a website as an information system and focuses on system and information quality, while a service-focused approach see a website as a service provider and includes service quality. According to the arguments of the above literature, even though measurements for website quality may be changed according to research purpose or field, the main classification still uses the categories of system, information, and service quality.

2.2 Perceived Interactivity

Most scholars agree that interactivity is a strong and important marketing characteristic of the World Wide Web as compared to other traditional media (e.g. television, newspaper, magazines, etc.). After review of 29 articles on interactivity, McMillan and Hwang [10] classified the various scholarly definitions of interactivity in four categories: (1) process, (2) feature, (3) perception, and (4) a combination of the three. McMillan [11] found that website interactivity was based on two-way communication, levels of control, user activity, sense of place, and time sensitivity. McMillan [12] further pointed out that there are three dimensions of perceived interactivity: two-way communication, controls of navigation (or choices), and time to load/time to find. Wu [13] found that perceived interactivity was the psychological state experienced by the website visitor during the interaction process. It consists of three dimensions: perceived controls, perceived responsiveness, and perceived personalization. Ko, Roberts, and Cho [14] define perceived interactivity as “the degree to which people engage in a communication process by actively interacting with mediated messages and other people.” They found that the two most frequently occurring and all encompassing dimensions were human-message interactivity and human-human interactivity.

From a healthy communication perspective on the World Wide Web, Cassell, Jackson, and Cheuvront [1] argued that the World Wide Web was suitable for persuasive communication. This type of communication is a form of social influence that can effectively affect internalization of specific attitudes and in turn affect behaviors. Also, Lustria [4] found that the users of web’s hypertext are able to freely browse through the system, and randomly access material, processing information according to individual mental models, and redefine learning structure and content. This research also showed that high levels of perceived interactivity promoted high levels of comprehension of the content of website. Thus, high levels of perceived interactivity of website would lead to strengthen the effect of online learning and persuasion so that the user feels the convenience, usefulness, and enjoyment of visiting the websites. Due to the aforementioned reasons, this study uses “perceived interactivity” to measure website interactivity. Besides, perceived interactivity includes two dimensions: human-message interactivity and human-human interactivity.

2.3 The relationship between website quality and perceived interactivity

Wu [13] suggested a conceptual structure for the antecedent and consequential variables in interactivity. That is, website factors (actual interactivity, vividness, and design), site-visitor factors (personality traits, product knowledge, and web skills), and situational factors (visit motivation, access speed, and visit location) are three types of factors that influence perceived interactivity.

Song and Zinkhan [15] manipulated 16 different versions of a website in an experiment directed at college students to prove that speed and message format (personalization of messages) would positively influence perceived interactivity. Because the response time of the website is a characteristic of system quality, and website messages are one kind of information quality, it is predicted that website quality may affect perceived interactivity. Therefore, this research proposes the following hypothesis:

H1a: Website quality has a positive effect on perceived interactivity.

According to information systems success model proposed by DeLone and McLean [16], system quality, information quality, and service quality are related to usage and user satisfaction of an information system. DeLone and McLean [8] showed that D&M IS Success Model also could be adapted to the measurement of the e-commerce systems.

Hwang and Kim [6] also showed that website quality would positively influence affective reaction of users, which is a subjective perception or judgment about whether such interaction will change their core affect or emotion toward the website. Therefore, this research proposes the following hypothesis:

H1b: Website quality has a positive effect on website usage.

Hic: Website quality has a positive effect on website satisfaction.
2.4 The relationship between website quality and perceived interactivity

Jee and Lee [17] found that perceived interactivity has positive impact on the user’s attitudes toward the website and intent of purchase. McMillan, Hwang, and Lee [18] found that “perceived interactivity” was a better predictor of user attitudes toward the website than “actual interactivity”. Similarly, Song and Zinkhan [15] also found that perceived interactivity was positively correlated with website loyalty and attitude. Therefore, this research proposes the following hypotheses:

H2a: Perceived interactivity has a positive effect on website usage.
H2b: Perceived interactivity has a positive effect on website satisfaction.

2.5 The relationship between website use, website satisfaction, and website loyalty

DeLone and McLean [8,16] argued that system usage and user satisfaction both affect the user’s net benefit. Besides, Dick and Basu [19] found that sustainable loyalty could only be achieved when the customer enjoys a high level of positive attitudes (satisfaction) toward the product as well as a high level of repetitive patronage.

In the research of virtual community websites, Kuo [20] found that there was a relationship between continuous usage and overall satisfaction, and continuous usage, satisfaction, and loyalty were also related. Otim and Grover [21] proved that product satisfaction influences customers’ repeat purchase intention (loyalty) in the context of website service. Kassim and Abdullah [22] also proved that customer satisfaction has positive direct effect on loyalty in e-commercial environments. Casalo, Flavian, and Guinaliu [2] also found that customers satisfy with previous interactions with the bank websites has positive effect on customer loyalty, and website usability has also positive effect on customer loyalty. Therefore, this research proposes the following hypotheses:

H3a: Website usage has a positive effect on website satisfaction.
H3b: Website usage has a positive effect on website loyalty.
H4: Website satisfaction has a positive effect on website loyalty.

Based on the review of the literature, figure 1 presents the conceptual framework from which the proposed research model is formed.

![Figure 1. The Proposed Research Model](image-url)

III. RESEARCH METHOD

In order to provide the public with correct and current online health information, Department of Health (DOH) hold the activities of excellent awards of health information websites to assess the websites of all hospitals in Taiwan since 2002. We mail the invitation letters to the executives of hospitals who have obtained the excellent awards to express our need for the research purpose. Of these hospitals contacted, five teaching hospitals (located in northern, central, southern Taiwan) were willing to participate in the survey. Before we can conduct the survey, it must be approved by IRB (Institutional Review Board) of hospitals. Distribution and collection of survey questionnaires was coordinated with the help of the executives, and information systems managers of the hospitals.

We used a self-report questionnaire to empirically validate the proposed research model. The questionnaire...
was pilot tested using 30 hospitals’ patients who had prior experience in online websites. These items were revised according to the feedback. After the revision, the survey was conducted to a convenient sample of 1200 patients for four months. Of the 1200 samples, the samples with incomplete responses and missing data were deleted. Finally, the eligible samples of 1076 patients were yielded, and the total response rate is 89.67%.

IV. RESULT

The data analysis proceeded according to a two-step approach [23]. First, we assessed the measurement model, which consists of the six latent factors, including the assessment of reliability, discriminant validity, and convergent validity of the scales. Second, we validated the structural model, which represents the series of path relationships linking the six constructs.

4.1 Sample Characteristics

Of these respondents, 653 respondents are women (60.7%), 37.6% are age 30 and below. The education levels of mostly respondents are university (40.8%). The majority of respondents’ career belongs to service industry (24.1%). Mostly respondents lived in northern Taiwan (49.8%). The times using the internet is mostly 10 times and above per week (32.1%), while 1~3 times and above per day (46.6%). Table I presents descriptive statistics for the seven constructs in the study. The mean scores for seven constructs are all almost on the middle point of 5-point Likert-type scales, and show a reasonable dispersion in their distributions across the ranges.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Quality</td>
<td>3.96</td>
<td>0.50</td>
<td>2.33</td>
<td>5.00</td>
</tr>
<tr>
<td>System Quality</td>
<td>4.03</td>
<td>0.61</td>
<td>2.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Information Quality</td>
<td>3.97</td>
<td>0.51</td>
<td>2.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Service Quality</td>
<td>3.90</td>
<td>0.61</td>
<td>2.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Perceived Interactivity</td>
<td>4.07</td>
<td>0.61</td>
<td>2.50</td>
<td>5.00</td>
</tr>
<tr>
<td>Human-Message</td>
<td>4.12</td>
<td>0.66</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Human-Human</td>
<td>4.01</td>
<td>0.69</td>
<td>2.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Web Usage</td>
<td>3.83</td>
<td>0.75</td>
<td>1.67</td>
<td>5.00</td>
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<tr>
<td>Web Satisfaction</td>
<td>3.98</td>
<td>0.63</td>
<td>2.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Web Loyalty</td>
<td>3.93</td>
<td>0.74</td>
<td>1.50</td>
<td>5.00</td>
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</tbody>
</table>

4.2 Measurement Model Results

To validate the measurement model, three types of validity were assessed: content validity, convergent validity, and discriminant validity. Content validity was done by interviewing senior system users and piloting the instrument. And the convergent validity was validated by examining Cronbach’s $\alpha$, composite reliability and average variance extracted from the measures [24]. As shown in Table II, the Cronbach’s $\alpha$ of every subscales range from 0.81 to 0.92, which are above the acceptability value 0.7 [25]. Besides, the composite reliability values range from 0.81 to 0.90, and the average variances extracted by our measures range from 0.52 to 0.76, are all within the commonly accepted range greater than 0.5 [24]. In addition, all measures are significant on their path loadings at the level of 0.001. Therefore, the convergent validities of all seven constructs are confirmed.

Discriminant validity of the sub-dimensions of constructs was validated by comparing the $\chi^2$ values of the CFA with original sub-dimensions of every construct against other CFAs which every possible combination of two dimensions (the correlation coefficient of two dimensions assigned to be 1) was examined. As shown in Table III, the $\chi^2$ values of the CFA with original sub-dimensions of web quality (system quality, information quality, and service quality) and perceived interactivity (human-message and human-human) were significantly better than any possible union of any two dimensions. Therefore, the discriminant validities of the sub-dimensions of the two constructs are confirmed.

Besides, according to Fornell and Larcker [26], discriminant validity can also be tested among all constructs by comparing the average variance extracted (AVE) of each construct with the squared correlation of that construct and all the other constructs. As shown in Table IV, all squared correlations between two constructs are less than the average variance extracted of both constructs. Therefore, the results confirm that the discriminant validity of constructs in the study is satisfactory.
4.3 Structural Model Results

To validate the measurement model, we used AMOS 6.0 to assess the analysis. As shown in the Table V, the goodness-of-fit indices are within accepted thresholds. Generally, these fit indexes are all greater than or equal to 0.9 for GFI, NFI, RFI, IFI, TLI, and CFI, and AGFI value is greater than 0.8. Besides, $\chi^2 / \text{d.f.}$ value is less than 5 and RMSEA value is less than 0.08. Accordingly, the summary of the overall goodness-of-fit indices indicate a reasonable fit of the model and data.
Figure 2 illustrate the results of the structural model with the estimated standardized path coefficients and path significance among constructs (non-significant paths as dotted lines). As predicted, all proposed hypotheses are supported. Table VI illustrates the squared multiple correlations ($R^2$) of all endogenous variables in the model. The estimated standardized path coefficients indicate the strengths of the relationships between the dependent and independent variable. Meanwhile the $R^2$ value represents the proportion of variance that is explained by the predictors of the variable in the model.

As expected, web quality ($\beta = 0.940$) has significant effects on perceived interactivity, accounting for 88.4% of the variance in the construct. Web quality ($\beta = 0.292$) and perceived interactivity ($\beta = 0.546$) have all significant effects on web usage, accounting for 68.2% of the variance in the construct. Besides, web quality ($\beta = 0.239$), perceived interactivity ($\beta = 0.454$), and web usage ($\beta = 0.287$) have significant effects on web satisfaction, accounting for 87.5% of the variance in the construct. Web usage ($\beta = 0.292$), and web satisfaction ($\beta = 0.627$) are both significant predictors of web loyalty, accounting for 78.9% of the variance in the construct.

The results of the structural model show that web quality (system quality, information quality, and service quality), perceived interactivity (human-message and human-human) are two key aspects affecting web outcomes of hospitals' websites (web usage, web satisfaction, and web loyalty). The results also demonstrate that web quality has significant impact on web outcomes mediated by perceived interactivity.

<table>
<thead>
<tr>
<th>Structural Model Statistic</th>
<th>Fit Indexes</th>
<th>Recommended Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$</td>
<td>1458.789</td>
<td>-</td>
</tr>
<tr>
<td>$\chi^2 / \text{d.f.}$</td>
<td>4.355</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>GFI</td>
<td>0.90</td>
<td>&gt; 0.9</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.056</td>
<td>&lt; 0.08</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.88</td>
<td>&gt; 0.8</td>
</tr>
<tr>
<td>NFI</td>
<td>0.93</td>
<td>&gt; 0.9</td>
</tr>
<tr>
<td>RFI</td>
<td>0.92</td>
<td>&gt; 0.9</td>
</tr>
<tr>
<td>IFI</td>
<td>0.95</td>
<td>&gt; 0.9</td>
</tr>
<tr>
<td>TLI</td>
<td>0.94</td>
<td>&gt; 0.9</td>
</tr>
<tr>
<td>CFI</td>
<td>0.95</td>
<td>&gt; 0.9</td>
</tr>
</tbody>
</table>

Figure 2 Final Proposed Model
V. DISCUSSION

This study proposed a research model to better understand the e-commerce model of health websites. The model considered the relationships among web quality (system quality, information quality, and service quality), perceived interactivity (human-message and human-human), and web outcomes (web usage, web satisfaction, and web loyalty). Moreover, the model aims to interpret that perceived interactivity is an important mediator between web quality and web outcomes. The results of this study are discussed below.

The results of this study suggest that web quality consists of three dimensions: (1) system quality, (2) information quality, and (3) service quality. Furthermore, positive perceptions of health web quality predict customers’ perceived interactivity, web usage, and web satisfaction. Previous studies have found similar results. Hwang and Kim [6] proposed a conceptual framework to interpret how web quality influences affective reaction. Also, Ha and Stoel [27] proposed the extended technology acceptance model of online shopping techniques to show high quality e-shopping sites should result in the perception that one’s experience is enjoyable and trust in e-shopping. It implies that online customers are more likely to feel positive affective reaction (usage and satisfaction) when they feel the health website is well-designed, knowledgeable, and responsive.

This study also confirms that perceived interactivity is an important mediator between web quality and web outcomes. Perceived interactivity has significantly positive effect on health web usage and web satisfaction. The findings also support previous empirically research (e.g. [15]). The finding proved the mediating role of perceived interactivity in affecting the effect of web quality on online customers’ perception of web usage and web satisfaction. It is consistent with the results of previous research (e.g. [28,29]). Interestingly, the empirical evidence supports again the mediating role of perceived interactivity.

The integrative viewpoint implies that an online health website is not only an information system but also a service provider/department to the customer. Accordingly, in the developing and maintaining phase of online health websites, system engineers and managers should value simultaneously system functions, health contents, and follow up service in order to pursue better web quality. On other hand, perceived interactivity plays important roles in web outcomes. It implies that online customers are more likely to continue to use a health website when they feel the health web is playful and interactive. Some strategies that managers of hospitals could use to increase the level of perceived interactivity, such as quick navigation, personalized web page, transmission of relevant messages, value-added search mechanism, bulletin boards, multi-media contents, etc.

REFERENCES


Chung-Hung Tsai is assistant professor and director of Department of Health Administration at Tzu Chi College of Technology. He received his Ph. D. degree from National Dong-Hwa University. He is currently one member of the editorial board and reviewer of Journal of Healthcare Management. His current research areas are knowledge management system, health information system, e-commerce, and telemedicine/telecare/telehealth system management. His academic papers have been published in Technological Forecasting and Social Change (SSCI), International Journal of Information Technology and Management (EI), Key Engineering Material (EI), International Journal for Quality Research (SCIIndeks), Journal of e-Business (TSSCI), Journal of Technology Management, MIS Review, Journal of American Academy of Business (ABI), Electronic Commerce Studies, Journal of Business Administration, Journal Customer Satisfaction, and Journal of Health Management.