Assessing the Effects of E-quality and E-satisfaction on Website Loyalty

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Abstract: The e-quality metric needs continued development and validation when measuring customer’s satisfaction and loyalty in e-shopping environment. Adding the newly developed service quality scales E-S-Qual to the D&M IS Success Model in order to assess a websites loyalty model, a set of empirical data including 668 usable questionnaires was collected through online survey to test estimates in the model. The findings of this research indicate that the service quality and information quality have strong impacts on e-satisfaction, which, in turn, has a significant effect on e-loyalty and the mediating role of e-satisfaction is evidenced in this model.

Key-Words: D&M IS Success Model, E-satisfaction, E-shopping, E-loyalty, E-S-Qual.

1 Introduction

The literatures revealed that satisfaction is considered as an immediate and important factor affecting online shoppers’ loyalty to e-tailers. Loyal customers can bring many benefits to a firm including a continuous stream of profit [10, 21, 27]. Service profit chain model asserts that satisfied customers tend to purchase more, increasing the revenue and profits of the organization and customer satisfaction is a critical intervening variable in the model [11]. Most companies try their best to continually satisfy their customers because customer satisfaction seems to be an important barometer of customer’s behavioral intentions and has been regarded as an important antecedent of loyalty [3, 26]. In recent marketing research, the measures of perceived quality, satisfaction, and loyalty on behalf of customers have been used to assess firm’s productivity and its marketing performance in the service industry [6]. In a B2C channel satisfaction model, satisfaction is considered as an important construct because it affects participants’ motivation to stay with the channel [10]. Online service quality may impact e-tail success through online customer satisfaction and loyalty [23]. Although the relationship between satisfaction and loyalty seems almost intuitive, the relationship has been found vary significantly under different conditions [3]. An understanding the role, specifically, the mediating role of the satisfaction in the model including perceived quality, satisfaction, and loyalty must be a basic parameter used to evaluate the performance of products and services [28]. Few studies have investigated these issues in an online shopping context, so this study attempts to employ a conceptual framework to examine the effects of e-quality on website consumer satisfaction and loyalty and explain consumers’ behavioral intentions.

Based on D&M IS Success Model, Rodgers et al. [19] proposed a general model of online satisfaction including three dimensions of e-quality – system quality, information quality, and service quality. System quality describes measures of the information processing system, such as ease of access to and interaction with the system. Information quality represents measures of information system output, such as informativeness and entertainment of the information provided by the online service. Service quality measures the five dimensions of SERVQUAL, i.e., tangibility, reliability, responsiveness, assurance, and empathy. They used the model to test the effects of the three antecedents on online satisfaction and online loyalty moderated by online experience. The results of the tests of the overall online satisfaction model showed that system quality and service quality have significant effects on online satisfaction but both of them do not have direct effects on online loyalty; information quality does not have significant effect on online satisfaction but has a significant direct effect on online loyalty; online satisfaction only has weakly significant effect on online loyalty. However, the SERVQUAL metric needs continued development and validation [9]. In this study I replace the traditional SERVQUAL metric with the newly developed and validated E-S-Qual metric by the same authors of the SERVQUAL metric in the e-customer satisfaction model. Therefore, the purpose of this paper is
1. Based on the general online satisfaction and loyalty model to hypothesize a model by using D&M IS Success Model including Parasuraman et al.'s E-S-QUAL scale [16] and assess the model with empirical data;
2. To assess the mediating effects of customer satisfaction in the model;
3. To compare the relative importance of the dimensions used in measuring the three quality constructs that affect e-shopping satisfaction and loyalty.

2 Conceptual Framework and Research Hypotheses

The conceptual framework linking the three major components of quality, customer satisfaction, and loyalty is presented in Fig. 1, where I replaced SERVQUAL with E-S-QUAL construct of the e-SQ in the updated D&M IS Success Model [9, 16] and intended to assess the effects of three online quality components on the websites satisfaction and the consequences of e-customer satisfaction. Recent research revealed that the measures of perceived quality, satisfaction, and loyalty on behalf of customers have been used to assess firm’s productivity and its marketing performance [6]. Consumer satisfaction has been the subject of much attention in the literature because of its potential influence on consumer behavioral intention and customer retention [8]. Similarly, in a B2C channel satisfaction model, satisfaction is considered as an important construct because it affects participants’ motivation to stay with the channel [10]. An understanding of customer satisfaction must be a basic parameter used to evaluate the performance of products and services [28].

The extant literature suggests that service quality is strongly related to online satisfaction [4, 10]. Prior research has found that satisfaction with a product or service has been identified as an important determinant for enhancing existing customers’ loyalty. Satisfied customers are more likely to possess a stronger repurchase intention and to recommend the product/service to their acquaintances [1, 21]. Numerous studies have revealed that online customer loyalty resulted from customer’s satisfaction with the EC channel and that the positive impact of online satisfaction on loyalty was evidenced in the context of electronic commerce [3, 10, 19]. From the review of the past research, it is presumable that high satisfaction with the online shopping will yield high online purchase intentions and loyalty.

Previous studies consider overall satisfaction to be primarily a function of perceived service quality [7, 15]. Seddon (1997) finds that both information quality and system quality are positively related to online satisfaction [20]. Recently, it has attracted researchers to pay attention to the formal tests of the mediation effects of customer satisfaction in an integrated loyalty model or behavioral intentions model [e.g., 11]. Therefore the mediating effects of online satisfaction when the mediational model involves latent constructs will be tested formally in this study.

Based on the foregoing review of the relationships between the e-quality and its consequences suggests that the following hypotheses may be posited in the integrated model:

H1 : Online satisfaction (OL_SAT) will have a significant positive impact on online loyalty (OL_LOY).
H2a: Online satisfaction will be positively affected by system quality (SYSQ).
H2b: Online satisfaction will be positively affected by information quality (INFQ).
H2c: Online satisfaction will be positively affected by service quality (ESQUAL).
H3a: Online satisfaction (OL_SAT) will mediate the effects of system quality (SYSQ) on online loyalty (OL_LOY).
H3b: Online satisfaction (OL_SAT) will mediate the effects of information quality (INFQ) on online loyalty (OL_LOY).
H3c: Online satisfaction (OL_SAT) will mediate the effects of service quality (ESQUAL) on online loyalty (OL_LOY).

3 Method and Results

3.1 Data collection

In order to test the hypotheses, this study relied on five sets of constructs and their indicators. All indicators came from the items in a survey questionnaire designed with a 7-point scale from
strongly disagree (1) to strongly agree (7). The items were validated in prior studies were used with minor wording modification to apply to an online shopping context [e.g., 9, 10, 16, 17]. The online survey questionnaire was established on a survey portal provided by Chunghwa Telecom in Taiwan, where the interested online users can connect the portal. Those who complete the survey have a chance to receive one of several gift coupons prizes (about USD $30) by random drawing. A total of 668 usable questionnaires were collected and analyzed using SPSS 14.0 and AMOS 6.0 procedures. Out of the 668 participants, 69.6 % of them are business workers and only 10.8 % students; 69.8% are females, about 83.1% between 20 and 40 years of age, only 1.6% above 50. Most respondents (82.0%) have at least a college degree and most respondents (56.1%) shopped online for 1-5 times and 22.6% for 6-10 times in 2006.

3.2 Data examination
Since the maximum likelihood method used in this study can be deployed for the data with minor deviations from normality [25], even when the data deviate moderately from a normal distribution [5]. A simple check of normality, i.e., the univariate skewness and kurtosis for all items in the sample were checked and they were ranging from −1.656 to −0.473 for skewness and −0.392 to 3.591 for kurtosis, within the maximum limits of an absolute value of two for skewness and seven for kurtosis recommended by West et al. (1995). I also checked the multicollinearity when a total of 45 indicators for five constructs in the questionnaire were analyzed together in the model. The results indicated that the variance of inflation factors (VIFs) ranging from 2.066 to 5.999, which did not exceed the recommended threshold of 10 [14] and all variables were kept for further analysis.

The summed scores for the four E-S-QUAL dimensions (SEFF, SFUL, SSYA, and SPRI) were used as indicators of service quality for assessing their relative importance [16]. I also computed two summed scores (SACC and SINT) for the two dimensions of system quality and two summed scores (SIFQ and SENT) for the two dimensions of the information quality. All the eight summed scores were employed as indicators of their respective constructs in the model.

3.3 Analysis of the measurement model
A confirmatory factor analysis (CFA) was used to assess the goodness-of-fit of the measurement model, which considering three quality constructs as predictor variables, satisfaction construct as mediated variable, and loyalty construct as dependent variable. Although the items used as the indicators to measure their respective constructs in this study were based on the related literature review, the test of reliability and validity (convergent validity and discriminant validity) were important for establishing construct validity [22]. Anderson and Gerbing’s recommendations were followed first in evaluating and refining the measurement model prior to the simultaneous estimation of the measurement and structural equation models [2].

3.3.1 Reliability and validity
Using AMOS 6.0, the measurement model was assessed and refined according to the modification indices allowing some pairs of error terms to have non-zero covariance. The measurement model fit showed that all goodness-of-fit indices such as, the ratio \( \chi^2/df=3.449 \), GFI=0.945, AGFI=0.918, CFI=0.977, NFI=0.968, TLI=0.970, and RMSEA=0.061, met the generally recommended threshold levels. The results revealed that all standardized factor loadings were ranging from 0.723 to 0.930 and each individual item’s coefficient was greater than twice its standard error (statistically significant at p<0.000), reflecting that the items represent their corresponding underlying constructs. The composite reliability values, weighted by factor loadings, ranging from 0.808 to 0.942, exceeded the often used practical level of 0.70, indicating an acceptable internal consistency for each construct [12]. The variance-extracted estimates, ranging from 0.673 (ESQUAL) to 0.813(OL_SAT), exceeded the 0.50 lower limit [12]. All the three evidences supported the convergent validity of the items as measures of their respective underlying constructs.

The chi-square difference test and confidence interval test were conducted to examine the discriminant validity of the constructs in the model [2]. All the differences in \( \chi^2 \) values for the fixed and free solutions were significant at p<0.000, indicating the existence of discriminant validity of any two constructs. Besides, the confidence interval (± two standard errors) around the correlation estimate between any two constructs did not include 1.0, the discriminant validity is evidenced [2]. The results of the CFA model suggest a high statistical measurement quality associated with the five constructs.

3.4 Analysis of the structural equation model
The proposed structural equation model (Fig. 1) was tested using AMOS 6.0. The model fit indices showed that the ratio \( \chi^2/df=3.563 \), GFI=0.942, AGFI=0.917, CFI=0.975, NFI=0.966, TLI=0.969,
and RMSEA=0.062, met the generally recommended threshold levels, suggesting that the proposed model fits the data very well. The factor loadings and the hypothesized relationships among the constructs were tested using their associated t-statistics. The results reveal that all the indicators have significant loadings (0.724 ~ 0.930, all p's < 0.001) to their corresponding construct, implying that 52.4 ~86.5 percent of the variance (R^2) for indicators can be explained by their corresponding construct.

Table 1 presents the estimated path coefficients of the structural equation model and the squared multiple correlations (SMC) for dependent latent constructs OL_SAT and OL_LOY and the results of the four hypothesized relationships (H1, H2a, H2b, and H2c) among the study constructs. Three of the four hypothesized relationships were found to be significant, of which the path coefficient from online satisfaction to online loyalty was very large with p<0.000 and the hypothesis H1 was supported. Among the three quality dimensions, hypotheses H2B, and H2c were found to be significant at the 0.01 level and were supported. However, H2a predicts positive path from system quality to online satisfaction was not significant and not supported.

The relative importance of the quality dimensions can be assessed by their loadings to their corresponding construct. The results show that the effects of efficiency (SEFF) and informativeness (SIFQ) on online satisfaction (OL_SAT) are the largest two and then system availability (SSYA), fulfillment (SFUL), and interactivity (SINT).

### 3.5 Results of Mediating effect test

For testing the mediating effects of online satisfaction on the relationship between three quality dimensions (system quality, information quality, and service quality) and online loyalty, I link the paths from three quality dimensions to online loyalty to form an alternative structural equation model. The model fit indices showed that the ratio $\chi^2$/df=3.449, GFI=0.945, AGFI=0.918, CFI=0.977, TLI=0.970, and RMSEA=0.061, met the generally recommended threshold levels, suggesting that the proposed model fits the data very well. The goodness-of-fit indices of the proposed and the alternative models are almost equal. Besides, the proposed model is more parsimonious with less estimated parameters (41) than the alternative model (44). However, the alternative model can be employed to test the mediating effects of online satisfaction in the model and to spotlight the role of online satisfaction in the model. So I kept the alternative model for the mediation analysis.

The mediation analysis would be done by a structural equation modeling program when latent variables were included in the model [13]. The measures and tests of indirect effect can address mediation more directly than a series of separate significance tests not directly involving the indirect effect in the mediation model [18]. If the total effect of the initial variable (e.g., ESQUAL, one of the antecedents of the mediator OL_SAT) is significant meaning that there is an effect that can be mediated. In addition, if the direct effect is not significant in the alternative model, the mediator (OL_SAT) has a complete mediating effect on the relationship between the initial variable and the outcome variable (OL_LOY). If the direct effect is still significant, the mediator has a partial mediating effect on the relationship between the initial variable and the outcome variable [18].

<table>
<thead>
<tr>
<th>Research hypothesis</th>
<th>R^2 Path coefficient</th>
<th>t-value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: OL_SAT → OL_LOY</td>
<td>0.768</td>
<td>0.876</td>
<td>0.017</td>
</tr>
<tr>
<td>H2a: SYSQ → OL_SAT</td>
<td>0.627</td>
<td>-0.144</td>
<td>0.121</td>
</tr>
<tr>
<td>H2b: INFQ → OL_SAT</td>
<td>0.394</td>
<td>0.167</td>
<td>2.56</td>
</tr>
<tr>
<td>H2c: ESQUAL → OL_SAT</td>
<td>0.545</td>
<td>0.146</td>
<td>3.73</td>
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</table>

Using AMOS 6.0 with 5000 bootstrapping samples to assess the total, direct, and indirect effects, the results with t values were given in Table 2, showing that the total effect of service quality (ESQUAL) and information quality (INFQ) on online satisfaction (OL_LOY) were 0.559 (t=4.022, p<0.001) and 0.638 (t=3.564, p<0.001), respectively, indicating that there exist effects that can be mediated. When I checked their direct effects on online loyalty (OL_LOY) in the alternative model, I found that the direct effect of INFQ on OL_LOY was 0.346 and significant at p<0.05, meaning that the effect of INFQ on OL_LOY was partially mediated by OL_SAT. On the other hand, the direct effect of ESQUAL on OL_LOY was -0.061 and not significant, demonstrating that OL_SAT completely mediated the effect of ESQUAL on OL_LOY. Therefore, hypotheses H3b and H3c were supported. As to system quality (SYSQ), the total effect of it on OL_LOY was -0.174 and not significant, indicating that OL_SAT had no mediating effect on the relationship between SYSQ and OL_LOY. As a result, the hypothesis H3a was not supported.
### 4 Conclusion

Adding service quality scale E-S-Qual to the D&M IS Success Model for assessing the websites satisfaction model, the proposed model fits the data very well. It explains a substantial amount of variance for online satisfaction ($R^2=0.627$), which, in turn, also explains a substantial amount of the variance for online loyalty ($R^2=0.768$). The results of data analysis and hypotheses testing revealed that information quality and service quality have strong effects on satisfaction and which, in turn, has significant effect on online loyalty. It implies that the more the consumers are satisfied with the information quality provided and the service quality offered, the more the consumers are more likely loyal to the websites they visited.

E-shoppers concern more with information quality and service quality, which were significantly mediated by online satisfaction in affecting online loyalty. Besides, their significant total effects, 0.638 ($t=3.564$) for information quality and 0.358 ($t=2.224$) for service quality indicate their relative importance in affecting the online loyalty. Furthermore, the significant loadings for informativeness and entertainment on information indicate that e-shoppers concern more with the correct, real-time, latest, and complete information, which make them feel happy and enjoying when shopping online. As regards service quality, the different loadings reveal that respondents concern more with efficiency, and then system availability and fulfillment, and a little less with privacy. The addition of service quality to the model may be useful in explain online loyalty because of its significant total and indirect effects on it. However, the hypothesized positive relationship between system quality and satisfaction was not supported. In addition, the results from the test of the alternative model show that the direct effect of system quality on loyalty was also insignificant. One explanation for these insignificances might be that the advancement of technology has largely reduced the cost of the system hardware and software and upgraded the system quality to be easy to access to and interact with the e-stores websites to have quick response and a wide range of options provided are perceived by e-shoppers almost indifferent.

Although the results support the prediction that service quality is an important quality components in proposed online satisfaction and loyalty model, the relative importance for the other two components – system quality and information quality – are quite different from that reported by Rogers et al. (2005), where system quality was found significant, but information quality not significant, opposite to the findings of this study. In addition, the result revealed the insignificance of system quality as a predicator of online satisfaction in the negative sign, opposite to the hypothesized positive direction. The inconsistency of the results needs to be clarified in the future research.

### References:


