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Eleanor Loiacono
Worcester Polytechnic Institute

Daniel Chen
University of Georgia

Dale Goodhue
University of Georgia

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WEBQUAL™ REVISITED: PREDICTING THE INTENT TO REUSE A WEB SITE

Eleanor T. Loiacono
Management Department
Worcester Polytechnic Institute
eloiacon@wpi.edu

Daniel Q. Chen
Terry College of Business
University of Georgia
dchen@uga.edu

Dale L. Goodhue
Terry College of Business
University of Georgia
dgoodhue@terry.uga.edu

Abstract

This paper extends previous research on WebQual™, a measure of web site quality, to uncover higher-level factors that influence a web consumer's intention to reuse a web site by utilizing a second-order approach. An initial model was developed with 335 subjects and confirmed using an additional 311 participants. Usefulness, Response Time, Trust, Ease of use, and Entertainment were identified to be major higher order factors indicating WebQual™. Results from a confirmatory factor analysis using LISREL and a multiple regression analysis indicate that Usefulness, Entertainment, and Response time are the most important factors predicting reuse, Ease of use and Trust are less important.

Introduction

Web site success has of late become the focus of great interest and attention. Recently, Loiacono (2000) developed and validated the WebQual™, a web site quality measure with 12 core dimensions. These twelve components were empirically proved to be distinct, well measured, to reflect overall web site effectiveness, and to impact a consumer's intention to purchase or revisit.

There is great interest in understanding in more detail the relationship between these twelve constructs and intent to reuse a web site. However, there were significant correlations among many of the constructs (Goodhue and Loiacono, 2002) creating multicollinearity problems when examining the links between the 12 constructs and intent to reuse. Therefore we sought to understand the possible synergy amongst the underlying WebQual™ dimensions and determine if such "collectiveness" would support higher-level processes (Vandenberg, 1999; Lawler, 1996).

This study uses WebQual™ as the foundation and applies the structural equation modeling technique to answer the following research questions: 1) what are the higher order factors indicating WebQual™, and 2) what is the relationship between these factors and intent to reuse a web site. The paper proceeds as follows. The next section describes the theoretical background. The succeeding sections outline the research method including data analysis, and report the empirical findings. The article concludes by a discussion of the study's implications and future work.

Theoretical Background

WebQual™ is a comprehensive web site quality measure designed to capture those aspects of a web sit that might have influence on the user's intention to revisit. It was developed based on the Theory of Reasoned Action (Fishbein and Ajzen, 1975; Ajzen

and Fishbein, 1980), the Technology Acceptance Model (Davis, 1989), and marketing literatures. Thirty-six items comprise the 12-dimensional instrument. Each dimension, described in Table 1, reveals a critical distinct aspect of web site quality and must be considered when creating an effective site.

From these lower-order attributes, four higher-level (second-order) latent variables were predicted to exist (see Table 1). Ease of understanding and intuitive operations contribute to a site's *Ease of Use*. This concept is similar to Davis' (1989) definition that specifies the degree to which a person believes that using a web site takes little effort. Aspects such as informational fit-to-task, tailored communications, trust, and response time are thought to fall under *Usefulness*, the second higher-level concept also described by Davis, which refers to how useful the site is to users.

Two other second-order latent variables rooted in previous marketing literature are thought to exist. Visual appeal, innovativeness, and emotional appeal of the site fall into *Entertainment*, which reflects web consumers' expectation on information to be delivered in an entertainment manner (Aaker et al, 1990; Ducoffe, 1995; Eighmey, 1997). The aspects of on-line completeness, relative advantage, and consistent image are identified under *Complimentary Relationship*, a higher-level variable that specifies the degree to which companies provide services that allow customers to do business directly on the web site (Seybold, 1998).

Table 1: Initial WebQual Dimensions

Initial Higher Level Category	Dimension	Description
Ease of Use	Ease of Understanding	Easy to read and understand.
	Intuitive Operation	Easy to operate and navigate.
Usefulness	Informational Fit-to-task	The information provided meets task needs and improves performance.
	Tailored Communication	Tailored communication between consumers and the firm.
	Trust	Secure communication and observance of information privacy.
	Response Time	Time to get a response after a request or an interaction with a site.
Entertainment	Visual Appeal	The aesthetics of a Web site.
	Innovativeness	The creativity and uniqueness of site design.
	Emotional Appeal	The emotional effect of using the Web site and intensity of involvement
Complementary Relationship	On-Line Completeness	Allowing all or most necessary transactions to be completed on-line (e.g., purchasing over the Web site)
	Relative Advantage	Equivalent or better than other means of interacting with the company.
	Consistent Image	The Web site image is compatible with the image projected by the firm through other media

Research Methodology

Samples

Two sets of data previously reported by Loiacono (2000) and Goodhue and Loiacono (2002) were reanalyzed. These two samples (see Table 2), taken from different business classes at a large state university, were used to develop and confirm the second-order model. Overall, 646 subjects were included in the study. There were slightly more men than women—a fact reflected in actual web usage statistics (the largest group of Internet users—18 to 29 years old, 43 percent females and 57 percent males (Cyberatlas, 2000; 2002). Most participants had made purchases on the web prior to this research.

Measures

The subjects reviewed one of 12 pre-selected web sites and were then asked to evaluate the site using the 36-item WebQual™ instrument (see Appendix I). Each item contained in the questionnaire was measured on a 7-point Likert scale (1 being Strongly Disagree to 7 being Strongly Agree). In addition to the WebQual™ items, subjects related their overall intention to revisit or purchase from the site—again through 7-point Likert scale.

Table 2. Round Information And Subject Demographics

	Sample 1	Sample 2
Number of subjects	335	311
Average age	21	20
Gender	Male = 62 %; Female = 38 %	Male = 52%; Female = 48%
Ever made purchase over the Web	Yes = 67%; No = 33%	Yes = 64%; No = 36%

Analytical Procedure

Model Development—Exploratory Factor Analysis Of The 12 Constructs

A preparatory confirmatory factor analysis (LISREL8.5) of the structure of 36 questions loading on 12 constructs was first performed using data from sample one (n=335). The 36 items loaded cleanly on the 12 first-order factors (with loading .69 or better), which affirmed the construct validity of WebQual™ reported by Loiacono (2000). A weighted score for each first-order factor was then computed based on the factor loadings.

Bollen (1989) pointed out that exploratory factor analysis (EFA) is a good way to modify a conceptual model and improve model fit. To uncover the second-order factors, the scores of the 12 first-order factors were computed using the loadings developed in the above confirmatory factor analysis. These scores were then factor analyzed using principle component analysis with Promax rotation¹ to suggest a possible second-order latent variable structure.

Model Validation—Confirmatory Factor Analysis Of The 2nd-Order Factor Model

Bagozzi and Burnkrant (1979) argued that confirmatory factor analysis (CFA) is more stringent than other alternatives in testing convergent validity. In order to confirm the initial second-order model generated by the EFA, a CFA of data from the second sample (n=311) was run using LISREL 8.50. We tested the model fit of the complete second-order model of 36 questions loading on 12 constructs making up the suggested higher level factors.

Multiple Regression

Finally, when the measurement validity of the second-order factor model was demonstrated, we moved on to test the relationship between second-order factors and intent to reuse a web site. This last procedure entailed two steps: 1) a third CFA of data from both samples (n=646) to generate two levels of factor loadings (i.e. the 36-item measures on the 12 first-order factors, and the 12 first-order factors on the second-order factors); and 2) a multiple regression using the second-order factors to predict intent to reuse (n=646). A new weighted-average score for each of the higher-level factors was computed based on the loading estimates from step one. We also created a score of intention to reuse by averaging the scores of intention to purchase and revisit.

¹Promax is an oblique rotation method used when factors are thought to correlate (Hair et al, 1998).

Results

Results From EFA

A five factor second-order model² (with an Eigenvalue of .634) appeared to have the best theoretical and data “fit” –resulting in Ease of use, Usefulness, Trust, Response Time, and Entertainment (see the factor loading in Table 3). Though two previously theorized higher-order variables, Ease of use and Usefulness (both from TAM), did in fact surface as such, some first-order variables did not map as expected. Trust and Response Time, thought to relate to Usefulness, separated out into two new second-order variables. In addition, those first-order variables thought to pertain to Complimentary Relations separated with on-line completeness and relative advantage correlating more highly with Usefulness. As for consistent image, it appeared to relate most highly with first-order factors thought to relate to Entertainment.

Table 3. Factor Loadings from EFA

Instruments	Second-Order Factors				
	Usefulness	Entertainment	Ease of Use	Response Time	Trust
Informational Fit-to-Task	.762				
Tailored Communication	.533				
Trust					.833
Response Time				.832	
Ease of Understanding			.668		
Intuitive Operations			.701		
Visual Appeal		.909			
Innovativeness		.781			
Emotional Appeal		.572			
Consistent Image		.559			
On-line Completeness	.745				
Relative Advantage	.777				

Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization. Loading values lower than .50 are not shown.

Results From CFA

Figure 1 presents the LISREL testing model suggested by EFA. The results from CFA support the EFA finding. The 12 first-order factors each with strong loading (.55 or better) from its 3 indicators also have strong loadings (.66 or better) on their hypothesized second-order factors (see Table 4). Second-order structural estimates were also evaluated. Ease of use and Usefulness have the highest correlation with 0.83. Entertainment is correlated at 0.70 and 0.66 with Usefulness and Response Time respectively.

Since the traditional χ^2 test has well known drawbacks in large samples on complex models, we looked at other goodness-of-fit measures which are less sensitive to sample size restrictions and violations in distributional assumptions than is the χ^2 (Bagozzi and Burnkrant, 1985) and widely suggested in measurement validity literatures (e.g. Bentler and Bonett, 1980; Bagozzi and Burnkrant, 1985; Steiger, 1990; Bentler, 1990; Vandenberg, 1999). Such measures include Root Mean Square Residual (RMR),

²A two-factor matrix initially appeared when using Eigenvalue equal to one or greater. However, as mentioned earlier, theory suggests that a larger number of factors exist. Next three, four, five and six factor analyses (again using Promax rotation, with Eigenvalues of .870, .721, .634 and .552 respectively) were run. The reason for running multiple analyses was to compare the loadings on factors and to determine a structure that fit with theory as well as the data. The four factor pattern matrices were then reviewed to uncover which model had first-order constructs that loaded .50 or less on its highest loading factor.

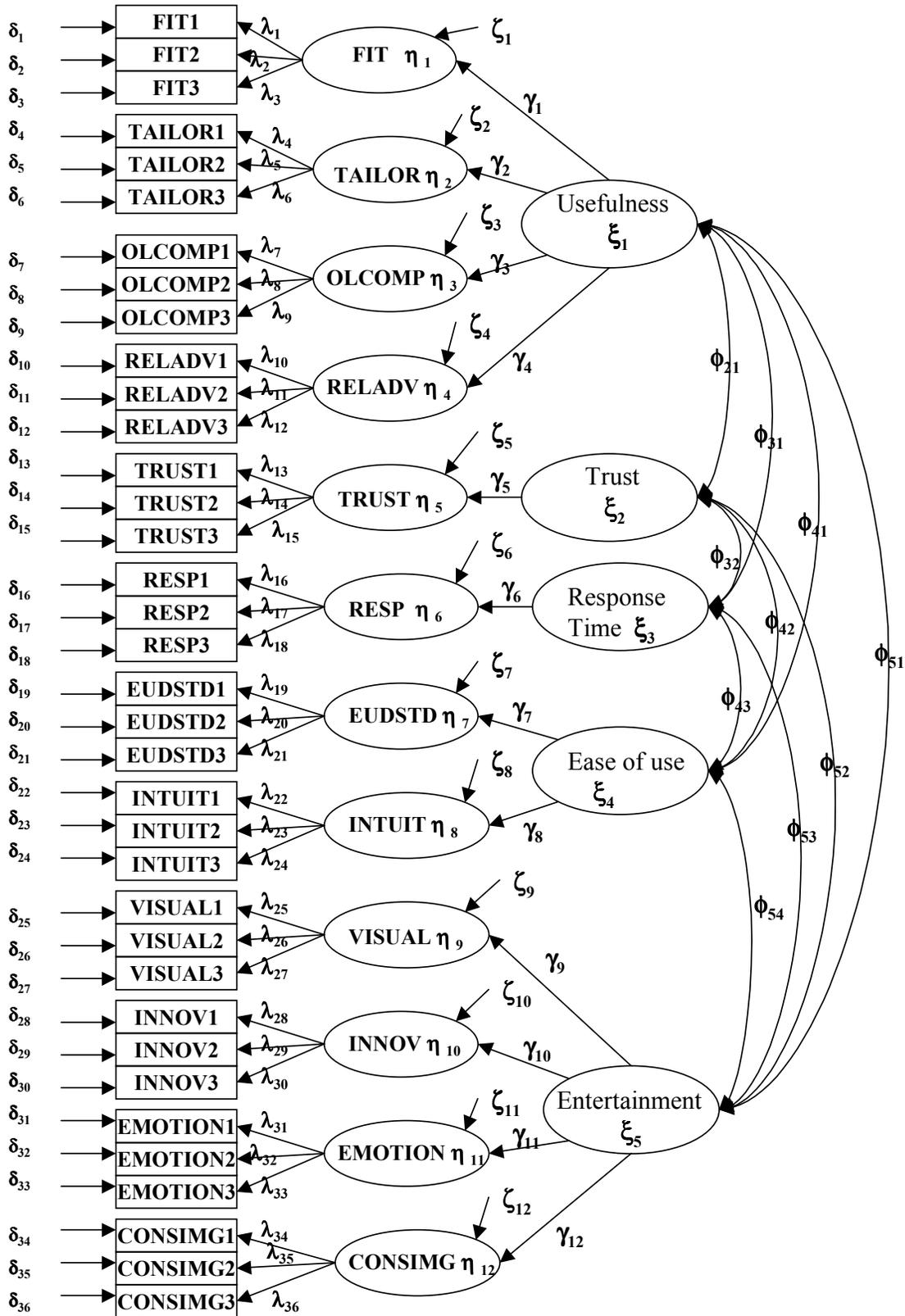


Figure 1. A LISREL second-order five-factor measurement model for confirmatory factor analysis to test convergent validity

Root Mean Square Error of Approximation (RMSEA), Non-Normed Fit index (NNFI), and Comparative Fit Index (CFI). These goodness-of-fit measures³ (see Table 5) show evidence that the second-order five-factor model provides a good fit to the data. Thus, the null hypothesis of convergent validity for a five-factor WebQual™ model is acceptable.

Table 4. Results from CFA (n=311)

Second-Order Factor	Estimate
First-Order Factor (parameter in Figure 1)	Second-Order Factor Loadings
Usefulness	
Informational Fit-to-Task (g ₁)	.93
Tailored Communication (g ₂)	.96
On-Line Completeness (g ₃)	.77
Relative Advantage (g ₄)	.66
Trust	
Response Time	
Ease of Use	
Ease of Understanding (g ₇)	.87
Intuitive Operation (g ₈)	.96
Entertainment	
Visual Appeal (g ₉)	.82
Innovativeness (g ₁₀)	.89
Emotional Appeal (g ₁₁)	.75
Integrated Communications (g ₁₂)	.82

	Second Order Structural Estimates				
	Usefulness	Trust	Response Time	Ease of use	Entertainment
Usefulness	1.00				
Trust	.62	1.00			
Response Time	.56	.64	1.00		
Ease of use	.83	.43	.61	1.00	
Entertainment	.70	.63	.66	.63	1.00

Table 5. Goodness-of-fit measures (n=311)

Goodness-of-fit criterion	2 nd -order measurement model	Recommended Cutoff
NNFI	0.91	= or >.90
CFI	0.91	= or >.90
RMR	0.063	<. 06 to .08
RMSEA	0.060	<. 06 to .08

³The results of the χ^2 test ($\chi^2 = 1221.07$, $df = 574$, $p > .000$, $n = 311$) are also acceptable given the large sample size (Hu and Bentler, 1999). However, due to the limitation of χ^2 test, we did not consider it as a goodness-of-fit measure.

Results from Multiple Regression

Table 6 provides the finding of a multiple regression using data from both samples. The results show that the five-factor second-order causal model explains 49.4% of the variance of consumer's intention to purchase or revisit, supporting the claim of predictive validity.

The regression results also illustrate that the impacts from Usefulness, Entertainment and Response Time on intent to reuse are significant, with Usefulness as the leading factor. The influences from Ease of use and Trust on intent to reuse, however, are not significant.

Table 6. Estimated Coefficients from Regressing Intent to Reuse (N=646)

	Intercept	Usefulness	Ease of use	Entertainment	Trust	Response Time	F statistic	Adjusted R ²
Coefficients	-3.85	0.162***	0.005	0.091***	0.013	0.086***	125.331	0.494

*** $P < .01$

Discussion

Second-Order Factors

The goal of this research was to identify higher-level latent variables within the WebQual™ model in order to more fully understand how to predict the intent to reuse a web site. What we found through EFA and CFA was support for a five-factor second-order model, closely relating to the four constructs hypothesized by Loiacono (2000). The multiple regression analysis suggests that Usefulness, Entertainment, and Response time have significant impact on intent to reuse with Usefulness as a dominant factor.

Though all of the components of WebQual™ are correlated with intent to reuse in a pairwise sense (see Loiacono, 2000), when we put them altogether in a regression, Trust and Ease of use don't show up as significant predictors. Davis (1989) indicated that ease of use maybe a necessary component of usefulness. The high correlation between Ease of use and Usefulness (.83) shown in our data analysis confirms Davis' finding that Ease of use seems to affect intent to reuse through its impact on Usefulness.

The lack of impact of trust on intent to reuse is an interesting question to be resolved for further research. Certainly trust is more function of the company than the web site itself, though there are things a web site could do to increase perception of trust. Even so, if there are differential amounts of trust in these companies, we would expect that to affect intent to reuse. Perhaps the subjects in this study do not have enough experience with these web sites to have definite ideas of the companies behind the web sites. In this case we might see that they tend to rely more on other types of quality and assume if those are good (e.g. useful, entertaining, responsive), the web site is probably also trustworthy. This would explain the results, but without further research we cannot know what the actual explanation is.

Limitations and Future Work

The data used in this research were from previous cross-sectional experiments among undergraduate students. Many of them had not used the assigned web sites before. A longitudinal study focusing on on-going web consumers will aid in better understanding the relevant importance of the five higher level factors in determining web site quality and their impacts on intent to reuse. On the other hand, WebQual™ dimensions reflect customer needs in general. There are some specific issues at the individual level which might impact a web visitor's perception on the quality of that site. Investigating some of these important issues (e.g. gender, age, culture, experience, expertise, knowledge, etc) is believed to be valuable to WebQual™ research.

Conclusion

As more and more commerce becomes electronic, the critical role of a web site's quality in attracting and retaining customers has been widely recognized. Our research provides empirical evidences to practitioners on this issue. Companies now understand

what are the major factors predicting web consumers' intention to reuse a web site. Among all the five factors, usefulness, entertainment, and response time, as primary indicators of web site quality, deserve more attention.

Our finding also confirms the contribution of high-order latent variable models in testing the theoretical relationships among unobservable constructs. Reddy and LaBarbera (1985) posited that hierarchical construct models circumvent problems of multicollinearity that exist among the observable variables and the first-order unobservable constructs. The application of a second-order factor model in this paper proves the effectiveness of this method.

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Appendix 1: Questions from WebQual™ Survey

(Seven point scale, end points anchored at strongly disagree, and strongly agree)

Informational Fit-to-Task (FIT)

- The information on the Web site is pretty much what I need to carry out my tasks.
- The Web site adequately meets my information needs.
- The information on the Web site is effective.

Tailored Communication (TAILOR)

- The Web site allows me to interact with it to receive tailored information.
- The Web site has interactive features, which help me accomplish my task.
- I can interact with the Web site in order to get information tailored to my specific needs.

Trust (TRUST)

- I feel safe in my transactions with the Web site.
- I trust the Web site to keep my personal information safe.
- I trust the Web site administrators will not misuse my personal information.

Response Time (RESP)

- When I use the Web site there is very little waiting time between my actions and the Web site's response.
- The Web site loads quickly.
- The Web site takes long to load.

Ease of Understanding (EUDSTD)

- The display pages within the Web site are easy to read.
- The text on the Web site is easy to read.
- The Web site labels are easy to understand.

Intuitiveness (INTUIT)

- Learning to operate the Web site is easy for me.
- It would be easy for me to become skillful at using the Web site.
- I find the Web site easy to use.

Visual Appeal (VISUAL)

- The Web site is visually pleasing.
- The Web site displays visually pleasing design.
- The Web site is visually appealing.

Innovativeness (INNOV)

- The Web site is innovative.
- The Web site design is innovative.
- The Web site is creative.

Emotional Appeal (EMOTION)

- I feel happy when I use the Web site.
- I feel cheerful when I use the Web site.
- I feel sociable when I use the Web site.

Consistent Image (CONSIMG)

- The Web site projects an image consistent with the company's image.
- The Web site fits with my image of the company.
- The Web site's image matches that of the company.

On-Line Completeness (OLCOMP)

- The Web site allows transactions on-line.
- All my business with the company can be completed via the Web site.
- Most all business processes can be completed via the Web site.

Relative Advantage (RELADV)

- It is easier to use the Web site to complete my business with the company than it is to telephone, fax, or mail a representative.
- The Web site is easier to use than calling an organizational representative agent on the phone.
- The Web site is an alternative to calling customer service or sales.

Additional questions for "intent to reuse", grouped at the end of the questionnaire:

- How likely or unlikely would you be to make a purchase from this Web site?
(1 "Very unlikely to purchase" to 7 "Very likely to purchase")
- How likely or unlikely would you be to revisit this Web site? (1 "Very unlikely to purchase" to 7 "Very likely to purchase")