Association for Information Systems
AIS Electronic Library (AISeL)

ECIS 2004 Proceedings

European Conference on Information Systems (ECIS)

2004

Measurement of User Perceived Web Quality

Ravi Seethamraju
University of Sydney, Ravi.Seethamraju@sydney.edu.au

MEASUREMENT OF USER-PERCEIVED WEB QUALITY

Seethamraju, Ravi, University of Sydney, School of Business, Faculty of Economics & Business, Sydney, NSW-2006, Australia, r.seethamraju@econ.usyd.edu.au

Abstract

Web sites are now considered an extension of the entire business, not just an additional channel or storefront or a simple information portal for the company. Creating an effective web site that gives a positive overall experience to the customers and visitors is important in business today. Measuring the quality of web site from the users' perspective, will give a fast and early feedback to the firm and enables it to take corrective actions and improve its operations. Several instruments and methodologies were developed to measure the web site performance, usability and quality in information systems, marketing and operations management literature. This study reviews the literature in web quality measurement and employs a 25 item instrument developed by Aladwani and Palvia to measure the user perceived web quality. It attempts to test the factorial validity of the instrument in Australian context using Structural Equation Modelling technique. Analysis revealed that the data set do not fit the Aladwani and Palvia's model well enough.

Key words: web site, quality, measurement, validity

1 INTRODUCTION

With millions of customers now online, the importance of web site in influencing their purchasing decisions is significant. With the company's web site having the potential to ideally become a single all encompassing access point to all the stake holders – customers, investors, employees and external partners, the management of their perceptions and the web site has become important for business success. The special features of the web characterized by the intense competition, instant availability of information about products/services, instant price comparisons, and the ability of the customer to renege from the e-commerce web site with relative ease, are forcing the companies to focus on the management of this critical interface with customers and its measurement. Measuring the quality of web site from the users' perspective, will give a fast and early feedback to the firm and enables it to take corrective actions, develop an appropriate e-business strategy and improve its operations. After reviewing various instruments available to measure the web quality, this study employed a 25 item instrument developed by Aladwani and Palvia (2002). This study attempted to test the factorial validity of the instrument in Australian context using a structural equation modelling technique and dataset, and suggested further improvements to the instrument. It confirms the multi-dimensional nature of the web quality construct.

2 BACKGROUND AND LITERATURE REVIEW

In the Net, many businesses are known only by its web sites. Whether the company is small or large, whether the goal of the web site is to serve as a sales brochure, or as a customer contact point, or serve as an additional or only distribution channel, creating an effective web site is critical in business today. Though in the initial days of internet commerce, the web sites were expected to provide some entertainment to the customers, it is considered irrelevant in today's business environment where the web sites are predominantly used as additional sales and distribution channels, except in some entertainment services web sites. The ultimate goal of a typical e-commerce web site is to attract potential customers and convert their interest into purchasing action.

A good web site must reflect the company's value proposition, and must address satisfying customer needs. In fact, a company's web site reflects its business strategy as well as its operational policies such as pricing, customer service and fulfilment (Song and Zahedi 2001). The quality of web site and its interface with the customers/visitors is important in attracting and converting the visitors into customers. Even though companies invested huge amounts of money in advertising their web sites, the conversion rate from visitors to customers is very low (Hudgins 2000), with only 3.5% of the unique visitors making purchases (Lassar and Dandapani 2003). Creating a better online experience to customers can create a sense of loyalty and generate repeat customers (Hoff, McWilliams and Saveri 1998). Customers who go onto the Net to find information and/or buy a product or service, emphasise on convenience and speed (Ody 2000) and order fulfilment. In addition to the online experience of customers and their perception of quality, companies that do business online, require additional layers of complexity in regards to security, backup and redundancy. The effectiveness and the overall quality of a web site depends on the quality of support provided by the web site to various functions such as information search, transactions for buying products and services, after sales support.

The concept of quality as 'fitness for use' and the role of users or consumers in its determination, originally from operations management literature, is adopted in the information systems research also. According to Zeithaml et al (2002), web site quality is defined as the "extent to which a Web site facilitates efficient and effective shopping, purchasing, and delivery of products and services.

Several conceptual and empirical studies were conducted on the web site quality, in quality/operations management, marketing and information systems literature. All these studies identified several factors

that contribute to the overall web site quality. Rice (1997), for example, examined what made users revisit a Web site. According to this study, the most important variables are design features such as content, layout, ease of finding information, ease of navigation, and emotional experience. Hoffman and Novak (2000) identified personalization as the key factor that attracts customers to visit the web site. Similarly, Liu and Arnett (2000) identified information quality, system use, system design quality and playfulness as four major determinants for the success of e-commerce Web sites. Sohn (2000) observed that trust, inter-activeness, ease of use, content/functionality of Web sites, reliability, and speed of delivery, were the most important service quality dimensions for customers. A number of companies that rate web sites and make comparisons between their competitors, are usually concerned with the web site design, pricing, access to web site and/or speed with which pages download.

McKinney et al (2002) has proposed nine key constructs separating web site quality into information quality and system quality for measuring the web-customer satisfaction. Synthesizing information systems and marketing theories related to customer satisfaction, key constructs were identified. Some of the constructs proposed by McKinney et al (2002) include understandability, adequacy, usefulness, access, usability and entertainment. Studying the consumer perceptions of internet retail service quality, Janda et al (2002) identified five dimensions -- performance, access, security, sensation and information. The sensation dimension measures the interactive features of the retailer's web site, while the information dimension measures the quantity and credibility of information provided by the company, and the security dimension measures the trust, privacy, and financial integrity issues.

Liu and Arnett (2000) surveyed Webmasters for the Fortune 1000 companies and identified five factors – quality of information, service, system use, playfulness and system/interface. In the examination of Internet pharmacies, Yang et al (2001) identified and measured six dimensions of consumer perceptions of service quality – ease of use, content, timeliness of response, accuracy of content, aesthetics and privacy. The factor ease of use include user friendliness, loading/transaction speed, search capability, and easy navigation. Cox and Dale (2002) has developed a conceptual model comprising of four key quality factors – ease of use, customer confidence, on-line resources and relationship services and validated their tool using a sample set of web sites. Their study concluded that the quality of a web site is reflected in a good financial performance.

Using media richness and design and usability principles, Palmer (2002) has identified and validated the measures of specific web site attributes that can be used to identify elements of successful web site design. They include download delay, organization of the site measured in terms of sequence, layout, and arrangement; web site content that includes amount and variety of product/company information; customization and interactivity that covers easy of navigation and responsiveness.

Recognising the lack of appropriate instrument to measure the web quality from users' perspective, Aladwani and Palvia (2002) developed a multi-dimensional scale for measuring user-perceived web quality. Based on an empirical study, they have explained the user-perceived web quality with the help of four dimensions – technical adequacy, specific content, content quality and appearance and validated the instrument. Using several groups of graduate students in USA as subjects, they have carried out extensive testing for the validity and reliability of the instrument and suggested generalisability of the instrument. The objective of this study is to validate the instrument developed by Aladwani and Palvia in Australian context using Structural Equation Modelling methodology. Detailed methodology employed in the data collection and analysis is explained below.

3 METHODOLOGY:

The objectives of this research study are two fold. Firstly, to examine the dimensionality of the user perceived web quality construct and to validate the instrument developed by Aladwani and Palvia and test its generalisability. In this process, a comparative analysis of the results is carried out with the original study by Aladwani and Palvia. A multi-dimensional scale developed by Aladwani and Palvia for measuring the user-perceived web quality was employed in this study. This 25 item instrument

with four dimensions namely technical adequacy, content quality, specific content and appearance, was tested for both internal validity and external validity in USA and recommended for generalisability of the instrument.

In this study, graduate and undergraduate students enrolled in electronic commerce units are the participants. As a part of their study of e-commerce, these students were expected to browse through various other web sites. These students are asked to evaluate the Amazon web site and give their agreement or disagreement in a scale of 1 to 7 (strongly disagree to strongly agree) with the 25 statements. In addition to this, the participants were asked to give their perceptions of the overall quality (global quality) of the Amazon web site from 1 to 7 (low to high).

It is expected that the perceptions of users who have purchased products/services online earlier may be different from those who have never purchased before. Similarly, the gender differences were also identified in the literature and are expected to be significant in influencing the buying behaviour and perception of the web site quality. Hence, data on various independent variables such as gender, whether the participant has purchased goods/services online before, and how many times did they purchase if they did purchase online, and from the particular Amazon web site, were also collected.

From the 161 responses received, 19 responses were found to be incomplete and removed from the data set. The 140 responses that were found to be valid were used for further analysis. The data thus collected was factor analysed to compare with the results obtained by the authors of the instrument (Aladwani and Palvia). Standard tests for the reliability and validity of the instrument were also carried out and results presented in this paper. A confirmatory factor analysis using Structural Equation Modelling was carried out to test the goodness of fit of the data and test the validity of the instrument.

Typical of any empirical study using a questionnaire survey, this study also has certain limitations. The user perception of the quality of a Web site may also depend on the distinctive nature of products/services offered online on that web site (McKinney et al 2002), the past on-line experience of customers (Zaithmal et al 2002), and technology readiness of the customers (Parasuraman 2000). Analysing these issues is beyond the scope of this study. Since the subjects in this study are students, it may have some impact on the results (Szymanski and Henard 2001) and therefore limit the generalisability of its findings to wider population. It is, however, important to note that the original study by Aladwani and Palvia in the development of the 25-item instrument to measure the web site quality was also conducted on students. It is, however, logical to consider students as genuine web users, as they are generally more net-savvy and could have purchased some products or services online in the past. As the demographic data reveals, about 55% of the respondents have purchased online earlier.

4 ANALYSIS AND FINDINGS:

4.1 Demographics

A demographic analysis of the data collected revealed that there are 46% male and 54% female respondents. Even though about 55 % of the participants have purchased some products/services online before, only about 12% of the respondents have purchased any products from Amazon. Cross tabulation of the data revealed that there are no significant differences between the male and female respondents with regard to their online purchasing decisions in the past. A distribution of the frequency of on-line purchases reveals that about 47% of the females purchased online before, while 65% of the males purchased before. Respondents were asked to give an overall rating to the quality of Amazon web site, in addition to rating the individual statements on various attributes such as – security, search facilities, ease of access, speed of loading, ease of navigation, attractiveness of web site, product information, privacy information etc . Analysis reveals that the average rating given to the Amazon web site is 4.94 (in a range of 1 to 7) with a standard deviation of 1.023. Among 25

variables in the instrument, availability got highest mean rating of 5.46 while use of multimedia/colour got lowest mean rating of 4.64 in a scale of 1 to 7.

4.2 Reliability analysis:

Study revealed that the reliability of the instrument is sound. Reliability scores for the technical adequacy, content quality, specific content and appearance factors and the overall reliability of the instrument are 0.845, 0.870, 0.861, 0.844 and 0.940 respectively and can be considered "good" as suggested by Nunnally (1978).

4.3 Correlations and validity

In order to analyse the validity of the perceived web quality construct and its four dimensions proposed by Aladwani and Palvia, the relationships between the construct scale ratings and user's overall quality rating for Amazon site are analysed and presented below. The users/respondents are asked to give an overall rating to the Amazon web site from 1 to 7.

Factors	Technical Adequacy	Content Quality	Specific Content	Appea-rance	User Perceived Web Quality	Overall Quality of Amazon
Technical Adequacy						
Content Quality	.657**					
Specific Content	.601**	.621**				
Appearance	.619**	.526**	.526**			
User Perceived Web Quality	.869**	.823**	.799**	.777**		
Overall Quality of Amazon	.574**	.493**	.412**	.298**	.517**	
Mean	5.02	4.85	5.03	4.62	4.83	4.94
Standard deviation	0.76	0.916	0.98	0.96	0.76	1.02

** Correlation is significant at the 0.01 level (2-tailed) or $p < 0.01$

Table 1: Correlations among factors and statistics

From the table above, it can be seen that all the correlations are significant between all the four factors ranging from 0.526 to 0.657. The correlation between these four factors/constructs and the overall quality rating (global quality) given by the respondents to the Amazon web site are also significant, but relatively low ranging from 0.298 to 0.574. The correlations between the four factors and the user perceived web quality (a sum of the scores for all the 25 items) are also significant and are particularly high ranging from 0.777 to 0.869. Between the overall quality rating and the perceived web quality index also, the correlation is significant and is 0.517. This analysis thus confirms the validity of the instrument and its psychometric properties.

4.4 Exploratory factor analysis:

Factor analysis helps to assess the factorial validity of the questions in the web quality instrument developed by Aladwani and Palvia (2000) and indicate the extent to which they seem to be measuring the same concepts or variables. Using the data collected from the evaluation of the Amazon web site, exploratory factor analysis was performed in order to identify the underlying dimensions. Principal components analysis with varimax rotation was used to evaluate and identify the component factors. As shown in the table 3 below, six factors that have an eigen value more than 1.0 were derived from the data and accounted for about 70.8% of the variation in the data. A cut-off point of 0.50 for item

loading, an eigen value of more than 1, and no item loading on more than 0.50 on any two factors were used to explain this convergence of items into factors, even though there are no absolute standards generally acceptable to suggest appropriate item loadings (Hair et al 1992). If the cut-off point is raised to 0.60 for item loading, 6 items do not converge on any single factor.

No	Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
1	Security	.188	.100	.160	**.708**	.085	.215
2	Ease of Navigation	.113	.060	.051	.350	.305	**.745**
3	Search Facilities	.322	.166	.042	**.542**	.312	.383
4	Availability	.218	.151	.267	**.747**	-.002	.001
5	Valid Links	.128	.367	.321	**.565**	.228	-.073
6	Customisation	.183	.185	.159	.048	**.838**	-.004
7	Speed of page loading	.383	.215	.123	.140	**.670**	.052
8	Interactivity	.150	.099	.290	.218	**.550**	.324
9	Ease of access	**.582**	.166	.073	.457	.255	.164
10	Content-Usefulness	**.678**	.291	.065	.185	.210	.269
11	Content-Completeness	**.812**	.102	.035	.023	.163	.208
12	Content-Clarity	**.771**	.159	.046	.239	.181	.250
13	Content-Current	**.781**	.307	.168	.180	.044	-.077
14	Content-Concise	**.668**	.223	.128	.198	.186	.126
15	Content-Accurate	**.545**	.287	.370	.165	.090	-.045
16	Contact Information	.109	**.693**	.259	.121	.272	.070
17	Company/General Information	.209	**.790**	.234	-.053	.115	.199
18	Details of Products and Services	.526	**.603**	.047	.194	.126	.091
19	Privacy Information	.256	**.773**	.081	.201	.054	.042
20	Customer Service Information	.273	**.729**	.055	.240	.106	.062
21	Attractive website	.300	.230	.417	.039	-.096	**.680**
22	Organised website	.469	.110	.387	-.085	-.042	**.553**
23	Proper use of fonts	.191	.208	**.742**	.302	.098	.308
24	Proper use of colour	.084	.106	**.883**	.154	.124	.033
25	Proper use of multimedia	.072	.199	**.745**	.200	.292	.091
	Eigen value	4.656	3.419	2.867	2.582	2.154	2.021
	Variance explained	0.186	0.137	0.115	0.103	0.086	0.081
	% Cumulative variance	**18.6%**	**32.3%**	**43.8%**	**54.1%**	**62.7%**	**70.8%**

Table 2. Principal component analysis with varimax rotation

As can be seen from the above table (table 2), all the items in the instrument are not converging well into the factors identified by Aladwani and Palvia. A comparison of the loading of variables on the factors observed in this study with those identified by Aladwani and Palvia are presented below.

Factors	Items converging in Aladwani & Palvia model	Items converging in this study
Technical Adequacy	Security (1), Ease of navigation (2), Search facilities (3), Availability (4), Valid links (5), Customisation (6), Speed of page loading (7), Interactivity (8) & Ease of access (9)	Security (1), Search facilities (3), Availability (4), Valid links (5)
Content Quality	Usefulness (10), Completeness (11), Clarity (12), Currency (13), Conciseness (14), & Accuracy (15)	Usefulness (10), Completeness (11), Clarity (12), Currency (13), Conciseness (14), & Accuracy (15)
Specific Content	Contact information (16), Company/general information (17), Details of products & services (18), Privacy information (19), and Customer service information (20)	Contact information (16), Company/general information (17), Details of products & services (18), Privacy information (19), and Customer service information (20)
Appearance	Attractiveness of web site (21), Organised web site (22), Proper use of fonts (23), Proper use of colour (24), and Proper use of multimedia (25)	Proper use of fonts (23), Proper use of colour (24) and Proper use of multimedia (25)
Factor 5	---	Customisation (6), Speed of page loading (7) and Interactivity (8)
Factor 6	---	Ease of navigation (2), Attractive web site (21) and Organised web site (22)

Table 3 Item loading on factors – comparison with Aladwani & Palvia model

As shown in the above table, there are two additional factors identified in this exploratory analysis. While the convergence of 19 variables is similar to the one proposed in Aladwani and Palvia's model, six other variables converge onto two different factors in this study. The convergence of 11 items on two factors – Content Quality and Specific content are exactly similar to the Aladwani & Palvia study, while 8 items are converging onto the factors 'technical adequacy and appearance' factors. Six other items, however, converged on two separate factors. Thus, the convergence of individual items in the scale is not consistent with the results obtained in the Aladwani & Palvia study.

4.5 Confirmatory factor analysis using SEM:

Exploratory factor analysis carried out earlier was useful for data reduction purposes and helped to determine the minimum number of factors required to account for all the relationships inherent in measuring user perceived web site quality. It, however, does not provide evidence of the uni-dimensionality of measures. Therefore, a confirmatory factor analysis is carried out using Structural Equation Modelling (SEM) technique with AMOS to test the reliability of the variables, and evaluate the construct validity of the scale and unidimensionality of the web quality construct. This confirmatory factor analysis model hypothesized a priori that i) the responses to the user perceived web quality can be explained by four first-order factors (technical adequacy, content quality, specific content and appearance), one second order factor (user perceived web quality), and one second order observed factor (overall quality) as suggested in Aladwani and Palvia model; ii) Each item would have a non-zero loading on the first order factor it was designed to measure, and zero loadings on the other three first-order factors. These four factors would measure distinguishable constructs; iii) Each of the four first-order factors would have a non-zero loading on the second order observed factor (overall quality) it was designed to measure; iv) Covariation among the four first-order factors would be explained fully by their regression on the second-order factor; v) The measurement error items would be uncorrelated. A diagrammatic representation of this model along with the standardised weights and squared multiple correlations values are presented in figure 1.

Different variables functioning as indicators of underlying factors (unobserved endogenous factors) are shown in the diagram (figure 1). For example, the first 9 variables function as indicators of technical adequacy factor, next 6 factors for content quality, another 5 factors for specific content

factor and the last 5 variables for appearance factor. The error terms associated with each of the observed variable represent measurement errors representing their adequacy in measuring the related underlying factors. Residual errors represent error in the prediction of endogenous factors (underlying factors) from exogenous factor (user perceived web quality). This CFA model was then evaluated by statistical means to determine the adequacy of its goodness of fit to the sample data using various measures of fit suggested in the literature (Hair et al 1992). The objective is to find out the extent to which a hypothesized model 'fits' or adequately describes the sample data and determine the misspecifications of the hypothesized model and correct it.

The degrees of freedom associated with this hypopthesized model is determined in order to ascertain its status with respect to model identification (Byrne 2001). As per the analysis, there are 351 distinct sample moments and 59 parameters to be estimated resulting in 292 degrees of freedom, and therefore resulting in an over-identified model. The report states that the 'minimum' was achieved and the data set was significant with chi-square value of 575. at a probability level of 0.000, thereby assuring that the estimation process yielded an admissible solution.

4.6 Model – goodness of fit:

The fit of the four-factor solutions was assessed by examining its loadings, goodness-of-fit indicators and factor inter-correlations and comparing them with the null model or independence model. The discrepancies between the null model and the four-factor Aladwani and Palvia model are measured to judge the fit of the observed data. The following indicators are computed to assess the potential significance of the hypothesized four-factor model. Parameter estimates and goodness of fit statistics are computed using AMOS software and presented here along with the acceptable values for a good fit generally suggested in the literature (Gefen et al 2000).

	Indices in SEM analysis	Proposed 4-factor model	Accept-able value	Comments about data fitting the model
1	Chi-square/degrees of freedom ratio	575/292 = 1.97	--	Statistically significant, high values indicate good fit
2	Bentler-Bonett coefficient	0.723	> 0.90	Inadequate convergent validity
3	GFI (Goodness of Fit Index)	0.765	> 0.90	Not a good fit
4	AGFI (Adjusted GFI)	0.717	> 0.80	Not a good fit
5	CFI (Comparative Fit Index	0.838	> 0.95	Not a good fit
6	SRMR (Standard Root Mean square Residual)	0.071	< 0.05	Good fit
7	RMSEA (Room mean Square Error Approximation)	0.084	< 0.06	Not a good fit

Table 4 AMOS Goodness of fit measures for CFA for the 4 factor model

Large chi-square value relative to the degrees of freedom indicates the need to modify the model in order to better fit the data (Byrne 2001). The values of the Bentler-Bonett coefficient ranging between 0.80 and 0.90 are considered acceptable for the convergent validity. As per the recommendation of Hu and Bentler (1999), a model can be considered fit if the CFI is equal to or more than 0.95 or the RMSEA is below 0.06 and the SRMR is less than 0.08. As shown in the above table, all the indices – GFI, CFI and RMSEA are not at an acceptable level, suggesting an inadequate fit of the data. Thus, the above results suggest that the four-factor model with 25 observed variables do not adequately fit and describe the user-perceived web quality construct. A hypothesized second-order model of factorial structure for the user perceived web quality is presented below with the standardised regression weights and error estimates.

5 DISCUSSION:

The results indicate that the four-factor model with 25 items do not provide a valid framework for measuring the web quality. Examination of the standardised regression weights in the model (figure 2) reveals that the four underlying factors – technical adequacy, content quality, specific content and appearance, are loading strongly on the second order factor, user perceived web quality (values .0.93, 0.79, 0,84 and 0.74). The loadings of individual observed variables (25 items) on their respective first order factors are also relatively strong, and vary from 0.42 to 0.90. The relationship between the global measure (overall observed quality) and the four underlying factors as well as the user perceived web quality are not strong as shown in the figure 1. For example, the global measure is loading very strongly on the factor 'technical adequacy' (0.60) and very lightly on the factors – content quality (0.04) and specific content (0.04), and negative on the factor appearance (-0.30). On the perceived quality the loading is very weak with a value of 0.19. This suggests that the response for the global measure of quality is varying significantly. Since web quality is a multi-dimensional construct, it is subject to individual interpretation and preferences. By far, the respondents view items representing technical adequacy as the real underlying factors that contribute to the overall quality of the web site. The negative loading or very low loading on factors such as specific content and content quality suggest that it is not important for the respondents. The negative value for the factor 'appearance' suggest that appearance is not a critical factor, and may at times, contrast with the technical adequacy of the web site. It also implies the general belief that a good appearance may actually disguise the technical adequacy and efficiency of the web site. Alternatively, it may suggest that 'good appearance' is a qualifier for the web site in attracting the customers to its web site.

With the significant increase in the number of web sites and the general online buying, the aesthetic and novelty aspects of the web site, are taken for granted and may be relegated to the background. Therefore, it may be important for the professional web site designers to consider focusing on the technical aspects rather than appearance. The squared multiple correlations, shown in the figure 1, represent the proportion of variance that is explained by the predictors of the variable in question. For example, 87% of the variance associated with the 'technical adequacy' is accounted by the 'user perceived web quality' construct predictor. Similarly, the factor of technical adequacy' explains 35.3% of the variance associated with its first indicator variable 'security'.

An examination of the standardised residuals suggest some possible threats to unidimensionality, especially in the pairs of items with standardised residuals far above 2.00. If the values of the residual variances is above 2.58, corresponding to the critical $p<0.01$ threshold, one or both the measurement items may not be unidimensional (Gefen 2003). These cases can be seen between the following pairs of items - 'use of multi-media and interactivity (2.58), content clarity and use of colour (2.651), organised web site and attractive web site (2.64).

Threats to unidimensional measurement are also pronounced in the modification indexes, such as between attractive web site and organised web site (23.31), complete content and use of fonts (12.03), interactivity and use of multimedia (11.55), customisation and speed of page loading (12.45), accurate content and use of colour (11.28), valid links and attractive web site (10.23). Before dropping these items and/or setting them as free parameters, it is necessary to justify that in substantial theoretical sense. Considering this, the most problematic items (use of multi-media, attractive/organised web site, and interactivity) were excluded further from the analysis one at a time and goodness of fit indices were calculated. The values of GFI (from 0.765 to 0.800), AGFI (0.717 to 0.753), CFI (0.838 to 0.872), SRMR (from 0.071 to 0.073), RMSEA (from 0.084 to 0.078) have only improved marginally.

Even after this iterative analysis, results suggest that there are still many modification indices that have a value more than 5.0. However, there are no standardised residual variances values that are above 2.58. Thus, this analysis, based on the data set used in this study, is not conclusive with regard to the unidimensionality of the instrument. While examination of standardised residuals suggests the unidimensionality of the construct, the modification indices are still large and still pose a threat to the

unidimensionality. The goodness of fit statistics, though improved marginally, do not represent adequacy of the fit considering the recommended values in the literature. With GFI < 0.90, AGFI <0.80, RMSEA > 0.06, and SRMR > 0.05, the unidimensionality of the web quality construct in this study is in doubt and it is difficult to conclude that the instrument has convergent and discriminant validity. The squared multiple correlations values range (as in figure 1) from 0.23 to 0.59, and are not significantly large and the GFI and AGFI values are not in the acceptable range of the values to validate this model. Based on this data set with a sample size of 140, this study do not support the unidimensionality of the web quality construct and validity of the model as proposed by Aladwani & Palvia (2002). Further empirical testing with a larger and varied sample sizes are necessary to draw conclusions.

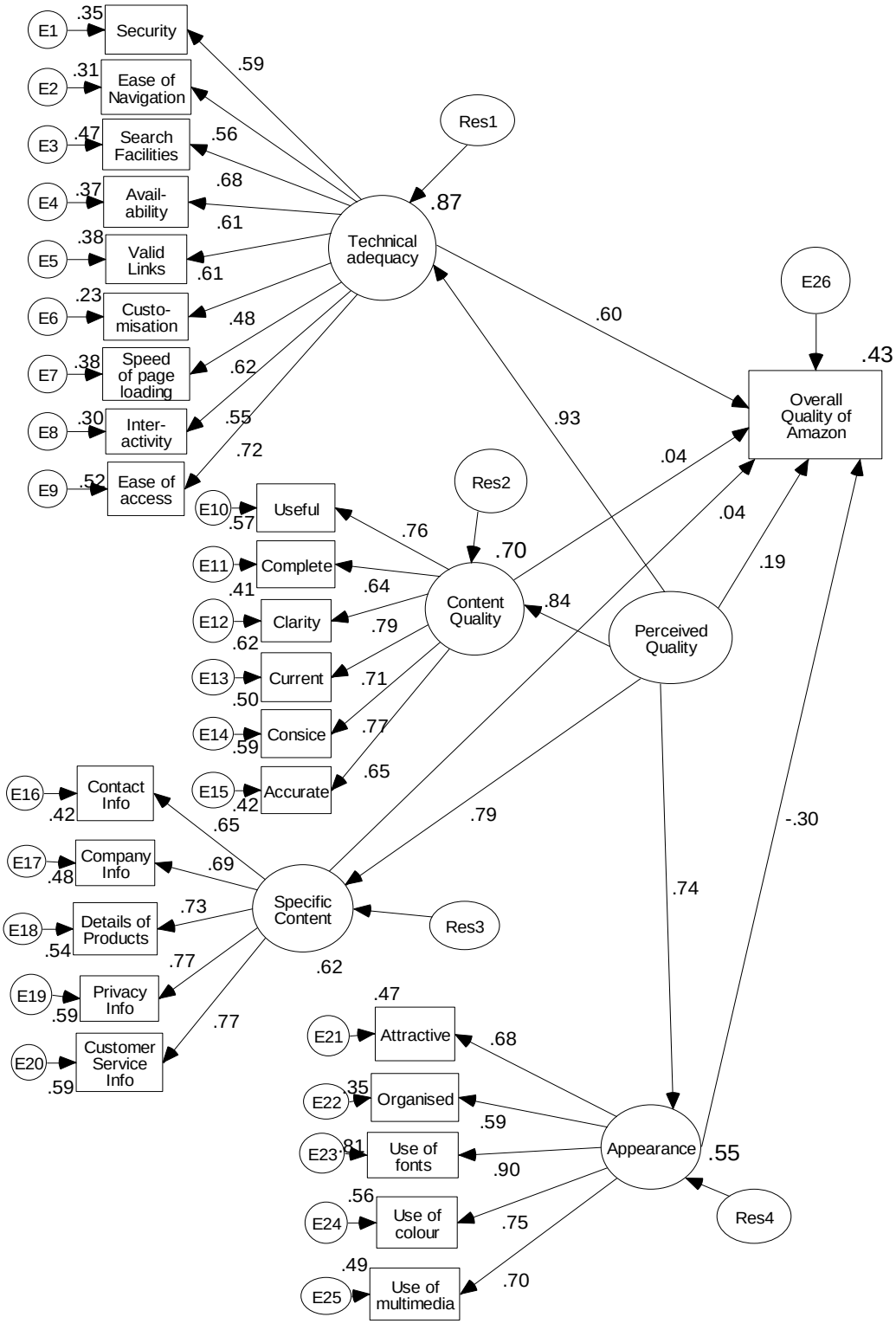

Figure 1 *Hypothesized second-order model of factorial structure for the user perceived web quality: output path diagram showing the regression weights and measurement errors*

6 CONCLUSIONS:

Web site quality is a multi-dimensional construct and measuring it using a single instrument is difficult. Depending upon the purpose and goals of the web site, type of products and services sold, the factors that contribute to the quality and customer satisfaction are different. This study, in its attempt to validate an instrument developed by Aladwani and Palvia, observed that the model do not reflect the overall construct in its entirety. While some factors such as content quality load on the overall perceived quality, the second order factor very strongly, other factors such as technical adequacy load on the user perceived web quality very strongly, other factors such as technical adequacy load less. Further refinement of the instrument with more empirical studies is necessary.

References

Agarwal, R. and Venkatesh, V. (2002). Assessing a Firm's Web Presence: A heuristic Evaluation Procedure for the Measurement of Usability. Information Systems Research, 13(2), 168-186.

Aladwani, A.M. and Palvia, P.C. (2002). Developing and validating an instrument for measuring user-perceived web quality. Information & Management, 39(6), 467-476.

Byrne, B.M. (2001). Structural Equation Modelling with AMOS – Basic Concepts, Application, and Programming. Lawrence Erlbaum Associations, Mahwah, New Jersey.

Cox, J. and Dale, B.G. (2002). Key quality factors in Web site design and use: an examination. International Journal of Quality & Reliability Management. 19(7), 862-888.

Gefen, D., Straub, D.W. and Boudreau, M. (2000). Structural Equation Modeling and Regression: Guidelines for Research Practice. Communications of the Association for Information Systems, Volume 4, article 7.

Gefen, D. (2003). Assessing unidimensionality through LISREL: An explanation and example. Communications of the Association for Information Systems, vol.12, pp.23-47.

Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C. (1992). Multi-variate Data Analysis with Readings. 3rd edition. Macmillan, New York.

Hoffman, D.L. and Novak, T.P. (2000). How to acquire customers on the Web. Harvard Business Review, 78, 179-184.

Hudgins, C. (2000). How healthy is your Web site? Information Week. 24 April, 87-93.

Lassar, W.M. and Dandapani, K. (2003). Media perceptions and their impact on Web site quality. International Journal of Bank Marketing. 21(1), 38-47.

Liu, C. and Arnett, K.P. (2000). Exploring the Factors Associated with Web Site Success in the Context of Electronic Commerce. Information & Management. 38(1), 23-34.

McKinney, V., Yoon, K., and Zahedi, F.M. (2002). The Measurement of Web-Customer Satisfaction: An Expectation and Disconfirmation Approach. Information Systems Research. 13(3), 296-315.

Nunnally, J. (1978). Psychometric Theory. 2nd edition. McGraw Hill, New York.

Ody, P. (2000). The challenging task of building strong e-loyalty: customer relationship marketing. The Financial Times.

Palmer, J.W. (2002). Web Site Usability, Design and Performance Metrics. Information Systems Research. 13(2), 151-167.

Parasuraman, A. (2000) "Technology Readiness Index (TRI): A Multiple Item Scale to Measure Readiness to Embrace New Technologies," *Journal of Services Research*, Vol.2, No.4, pp.307-320.

Ranganathan, C. and Ganapathy, S. (2002). Key dimensions of business-to-consumer web sites. Information & Management. 39, 457-465.

Rice, M. (1997). What makes users revisit a Web site. Marketing Newes. *Marketing News*, volume 31, no. 6, pp.12-13.

Sohn, C.S. (2000) "Customer evaluation of Internet-based service quality and intention to re-use internet-based services," Unpublished dissertation, Southern Illinois University, IL: Carbondale

Song, J. and Zahedi, F.M.(2001) "Web Design in E-commerce":A theory and Empirical analysis", *Twenty-second International Conference on Information Systems*, pp.205-219.

Szymanski, D.M., Henard, d.H. (2001) “Customer satisfaction: A meta-analysis of the empirical evidence,” *Journal of Academy of Marketing Science*, vol.29, No.1,pp.16-35.
Yang, Z., Peterson, R.T. and Huang, L. (2001). Taking the Pulse of Internet Pharmacies. Marketing Health Services. Summer, 5-10.
Zeithaml, V.A., Parasuraman, A. and Malhotra, A. (2002). Service Quality Delivery Through Web Sites: A Critical Review of Extant Knowledge. Journal of Academy of Marketing Science. 30(4), 362-375.