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B2C ELECTRONIC COMMERCE WEBSITES: AN ANALYSIS OF QUALITY FACTORS

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Abstract

The development and testing of an instrument for obtaining user feedback on the overall quality of B2C electronic commerce websites, SITEQUAL, is discussed. Using previous research in information quality and service quality as a springboard, a conceptual model and an instrument to measure website quality were developed. A factor analysis was conducted which suggested that four minimum website quality factors and seven desired website quality factors are important to consumers in the retail music industry.

Keywords: Electronic commerce, information, service, quality

Introduction

The widespread adoption of computers and networking technologies by individuals and businesses has led to the growth of Business-to-Consumer (B2C) electronic commerce. However, a rapidly changing business environment has revealed the uncertainty and risk associated with undertaking a B2C project. The mere creation of a B2C website will not spell success in the marketplace. A key element in increasing the probability of website use in the B2C environment is to understand the factors that determine B2C website quality.

The focus of e-commerce research in the 1990s was on the development of the technologies and architectures that enable the construction of websites to link businesses and consumers in the “new economy.” The design of high quality websites, however, has not been a major focus of either IS organizations (Melymuka 2001) or researchers. This area is ripe for research. Major needs exist for the development of instruments to allow for evaluation of customer preferences and their effect on web design (Kalakota & Whinston 1996). Insight in this area can be derived by leveraging existing research from the fields of marketing and information systems into a coherent model of overall website quality.

The motivation for this research is the need to determine the minimum and desired levels for various service and information quality components in order to establish a baseline which could be used for comparison in future research. Literature on information (or data) quality can inform research on the data component of a website while marketing literature informs research into the processes that must be considered in a B2C website. A conceptual model of data quality (Wang & Strong 1996) provides a basis for examining the various dimensions of information products. A conceptual model of service quality (Parasuraman, Zeithaml, & Berry; 1985, 1993, 1994) informs research into customer expectations and perceptions of the processes websites must support. This model provides a validated research instrument (SERVQUAL) for examining service quality. Integration of these models provides a starting point for exploring factors affecting consumer expectations and perceptions of B2C website quality.

Conceptual Model of B2C Website Quality

A conceptual model of the factors affecting consumer perceptions of B2C websites was developed by Webb & Webb (2001). The underlying premise is that two major quality constructs, one of which focuses on the information, and the other, which focuses on the processes that deliver the information, determine B2C website quality. The Reformulated Information Systems Success Model (DeLone & McLean 2002), with its recent addition of service quality, provides conceptual support for this approach. Each

of these quality constructs has been conceptualized as consisting of a number of quality dimensions, which are listed on the left side of Figure 1.

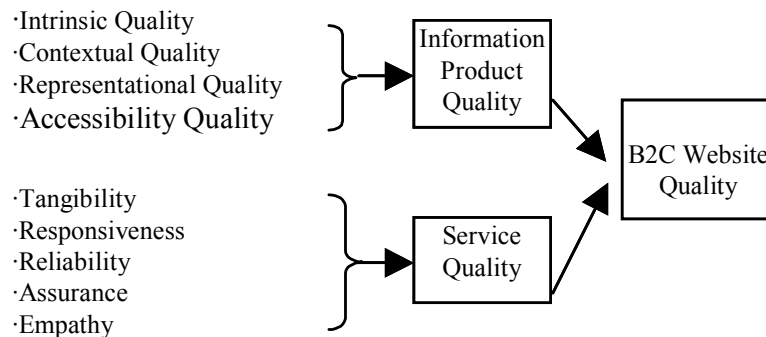


Figure 1. Factors Affecting B2C Website Quality

Service Quality

The construct service quality has been defined as the degree of discrepancy between customers' normative expectations for service and their perceptions of service performance (Parasuraman et al. 1985). Originally composed of 10 lower-order constructs (Parasuraman, et al. 1985) service quality has since been refined and operationalized via the SERVQUAL instrument measuring the difference in perceptions and expectations on the five dimensions (Figure 1). The tangibility construct relates to the physical evidence of service: facilities, equipment, and personnel. Reliability looks at consistency of performance and dependability. Responsiveness relates to timelines of service. Assurance looks at the competence and courtesy of employees and their ability to inspire confidence and trust. Empathy relates to access and understanding provided by employees (Parasuraman et al. 1988). An extension of the service quality concept is the zone of tolerance. This zone represents the range of service a consumer would consider satisfactory (Parasuraman et al. 1994). The zone of tolerance measures the consumer's expectations of desired service (what consumers believe can and should be provided) and adequate service (the minimum level of acceptable service to the consumer) in an alternative SERVQUAL format.

SERVQUAL has been validated in a number of industrial settings including some within the field of information systems research although a debate continues on its use including both cautions (Van Dyke, Prybutok, & Kappelman 1999) and validation (Jiang, Klein, & Compton 2000). The primary use of SERVQUAL, modified for IS services quality, has related to the delivery of information services by IS departments (Pitt, Watson, & Kavan 1995, 1997; Kettinger & Lee 1995). The use of SERVQUAL in exploring websites is limited and its implementation has differed in that measures of consumer expectations were omitted from one instrument, WEBQUAL (Barnes & Vidgen 2000). The implementation of WEBQUAL for B2C website evaluation, while shown to be somewhat useful in comparing competing sites, omits information needed to understand consumer expectations. More research on user expectations has been called for (Van Dyke et al. 1999) while the use and usefulness of gap scores in the IS context defended (Jiang et al. 2000)

Information Product Quality

Information quality is a construct that has been measured in various ways over the past three decades and is considered a critical construct in determining information system success (DeLone & McLean 2002). One of the most comprehensive frameworks for classifying data quality categorizes twenty data quality dimensions into four major data quality dimensions (Wang & Strong 1996). Intrinsic data quality looks at the accuracy, objectivity, and believability of data. Contextual data quality considers the timeliness, amount of data, completeness, and relevancy of data. Representational data quality examines the understandability interpretability, and consistency of data. Accessibility, the fourth dimension, examines access and security of data.

While not fully validated, this framework has been used as the foundation from which a 41-item instrument was developed to measure information quality of websites (Katerattanakul & Siau 1999). This initial effort reported some consistency with the data quality framework in the areas of contextual and accessibility information quality. Clearly more work is needed to measure the

dimensions of this multidimensional construct. One approach is to extend the concept of assessing gaps in user's normative expectations of information quality and perceptions along four major information quality constructs as well as measuring minimum acceptable levels of information quality.

Rationale for Model Integration

DeLone & McLean (2002) call for research into the major constructs that determine information success, which includes the main and joint effects of system, service, and information quality on system use, user satisfaction and ultimately individual impact. In a non-IS environment, an examination of product attributes jointly with service quality suggested that product dimensions had more of an effect on customers' perceptions than did service quality (Genestre & Herbig 1996). Similarly, an examination of an IS department provided evidence that the quality of the information product provided had a greater effect than any service quality dimension assessed using the SERVQUAL instrument (Kettinger & Lee 1995). Exploration of expectation-perception gaps among the respective dimensions of information service quality and information quality as well as the effect size of these dimensions within a single study appears to be a useful endeavor.

Service quality as it has been conceived in the marketing literature differs significantly from a conceptualization of service quality in a B2C electronic commerce setting. Intimate or person-to-person contact is not a significant aspect of service quality in an electronic commerce environment. The quality of information and its presentation must overcome the lack of personal involvement on the part of a company's salespeople. Information product quality is also different in its conceptualization in electronic commerce than in other IS settings because the people relying on the information in electronic commerce are external rather than internal consumers or users. While security may consider aspects of access such as password protection or which employee is allowed into which database in a more traditional IS setting, security in a B2C environment looks at whether customers feel that their private financial information will remain secure and private if given out over the Internet to a business.

There appears to be overlap in the dimensions of service quality and information product quality. Because of the overlap we expected the dimensions of website quality to collapse into fewer than nine dimensions. This research allowed us to determine what lower-order constructs compose website quality.

Data Collection and Analysis

A survey instrument was constructed by adapting 21 service quality items (Parasuraman et al. 1994) to the electronic retailing environment and then adding 22 items derived from the data quality literature (Wang & Strong, 1996). These 43 items were integrated into one survey using the three-column format (Parasuraman et al. 1994) that asked respondents to evaluate each item for minimum and desired qualities as well as the perceived quality of a B2C retail site they had used for either information or purchase in the past. Each item was rated on a 9 point Likert scale following the precedent of Parasuraman et al. (1994). The instrument was evaluated in a pilot study of electronic commerce students and as a result, minor edits were made in the wording and format of the survey.

A survey of B2C website users was conducted in the retail sector of music purchases (compact disc and cassettes). Users were selected via a commercial mailing list of music media consumers of Florida. A mail survey with a cover letter on university letterhead was sent to 1,950 users. The cover letter, approved by the institutional review board, stated the purpose of the survey, assured the users of anonymity, and provided respondents with an opportunity to participate in a drawing for gift certificates from a major on-line retailer. There were 215 surveys returned for a response rate of 11%, which was consistent with response rates in previous surveys using this survey format (Parasuraman et al. 1994). Of these, 178 responses were complete and usable for further analysis.

Data Analysis

The demographic profile of survey respondents indicated a mature group of Internet users who were very familiar with B2C retail transactions. Respondents reported shopping on-line with 22 companies, however five companies (Amazon, CDNow, BMG Music, Columbia House, and Barnes and Noble) constituted 81% of websites considered to be the primary site for purchase of music and CDs. 95% of respondents reported having made a purchase from the website indicated. Use of the Internet was heavy with 96% of respondents planning to use the identified website again and 92% planning on future purchases from that site. Ages

of respondents varied but were generally older than student-based surveys with 10% under 25, 30% ranging from 26 to 35, 44% were from 36 to 55 and 25% were over 55. Females made up 57% of the respondents. The highest level of education reported was high school education - 25%, college - 51%, and graduate school - 22%. Internet access was from home for 90% of respondents. 58% of respondents used dial-up modems, while 32% reported high-speed access with cable or DSL. Respondents were experienced with only 4% reporting use of the Internet for less than one year while 17% had used it for 1-2 years, 39% for 3-5 years and 40% reported over 5 years of use. The frequency of purchases using the Internet was weekly for 14%, monthly for 71% and yearly for 11% of respondents. There was considerable experience in electronic shopping with 56% of respondents making their first Internet purchase over 2 years ago while 25% were 1-2 years ago and 17% were less than a year. Only 2 respondents had never made a purchase over the Internet.

Survey data was analyzed using principle components factor analysis. A separate analysis was conducted on the consumer's ratings for each of the 43 items. The first analysis evaluated the consumer's desired level while the second evaluated the minimum acceptable level of service or information specified in each item. Each factor analysis resulted in more than one factor being detected. A varimax rotation was used to better identify and understand the factors involved.

As expected, the factor analysis resulted in fewer than nine factors, summarized in Table 1. The desired level resulted in seven factors (Table 2) while the minimum level resulted in four factors (Table 3). The desired level factors included reliability, assured empathy, tangibility, navigability, relevant representation, accuracy, and security. Four factors correspond to factors identified in the service and data quality literature. Two factors were formed that combined items contained in the factors identified separately in the service and data quality literature. Items derived from the factors assurance and empathy in the service quality literature loaded on the same factor, which was renamed assured empathy. Items derived from contextual and representational data quality in the data quality literature also loaded on a unique factor, which was renamed relevant representation. Intrinsic data quality items loaded on two separate factors, which were named security and accuracy.

For the minimum level of quality, the principle component analysis of the 43 items resulted in four factors. These four factors were reliability, assured empathy, perceived usability, and trustworthiness. The first two were consistent with the factors that emerged from the analysis of desired items. The third factor, perceived usability, was derived from a combination of items that loaded on three desired factors (tangibility, navigability, and relevant representation). The last factor primarily consisted of security plus items that loaded on accuracy in the analysis of desired items.

Discussion

The analysis of the data suggests that, as expected, a combination of quality factors derived from work in the areas of service quality and data quality are needed to evaluate both desired as well as minimal quality factors expected of a B2C website. Six of the desired quality factors are aligned with the quality factors derived from the service and data quality literature (Table 1). The five original service quality factors were collapsed into three of the seven desired quality factors of a B2C website (reliability, tangibility, and assured empathy). Three of the desired quality factors (navigability, accuracy, and relevant representation) are aligned with data quality factors. One new quality factor, security, emerged from this analysis. Although items measuring security were conceptually conceived as measuring accessibility, they clearly stand apart from navigability, a major desired quality factor.

Some of these results were unexpected. While the service quality and data quality factors did collapse into fewer than nine factors; they did not collapse in the manner anticipated in the information product quality section above. Yet, the factors found seem reasonable in that security and accuracy together can be viewed as a measure of trustworthiness, which should be relevant to consumer perceptions of website quality. The emergence of security from the standpoint of both privacy of information as well as secured transactions as a major desired website factor highlights concerns of B2C consumers. The emergence of the importance of this factor is not unexpected given major consumer alerts on viruses, hackers, identity theft, and protection of information by businesses.

As for the minimum quality factors of B2C websites, four factors emerged including reliability, assured empathy, perceived usability, and trustworthiness. The factors that emerge in the data analysis suggest that consumers consider a reduced set of desired quality factors as required. Reliability, a service quality factor, consistently emerges as a four-item factor in both analyses. Assured empathy, while a combination of two service quality factors, consistently emerges as both minimum and desired quality factor. The third factor, perceived usability, consists of items derived from both the service and data quality. The fourth quality factor, trustworthiness, primarily consists of security, the newly emerged desired factor. However, rather than being derived from accessibility, as expected from the data quality literature, security is collapsed with accuracy to form the minimum website quality factor trustworthiness.

Consumers of B2C websites appear to have set of minimum quality factors that are considered necessary, at least in the retail music environment. These websites must be reliable, considerate to user needs, be navigable, and provide accurate and secure information. Two of these minimum quality website factors are derived from items in the service quality literature, one is a combination of service and data quality items, and one is from items in the data quality literature.

While these represent the minimum acceptable levels of B2C website quality, consumers desire more from websites. These additional qualities include accuracy, relevant representation, and navigability of data. The desired quality factors are also derived from a combination of service quality items and data quality items suggesting the need to integrate these factors when designing websites and assessing overall website quality.

Conclusions and Future Research

This study concentrated on user expectations one segment of B2C retailing. Future studies are needed to see if minimum and desired factors are similar across product lines, various services (investments and banking), and with high cost products and services (autos, real estate, travel, etc.) as well as with less mature demographic segments. The development and assessment of an instrument for measuring factors affecting quality can enhance future research in the area of electronic commerce and provide industry practitioners with a diagnostic tool and feedback mechanism to aid in the identification of gaps between consumer website expectations and perceptions. More research needs to be conducted to examine the dimensions included in both information product quality and service quality to determine their relevance and relative importance in measuring B2C website quality.

While electronic commerce is still in its infancy there have already been significant failures. The development of high quality B2C information products and services is an important issue addressed through the development of a model for understanding consumer perceptions and expectations that lays the foundation for the development of a validated measurement instrument. Identification of expectation-perception gaps may be used to better understand user requirements, aid in the development of B2C systems specifications, focus testing efforts, and evaluate potential modifications to existing B2C website designs and operations. This model focuses future research on extending the knowledge of quality dimensions affecting B2C websites and calls for providing both researchers and practitioners with a tool to aid both academic research and the industrial development of B2C systems.

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Table 1. Comparison of Derived, Desired, and Minimum B2C Quality Factors

A Priori Factors Derived from Service and Data Quality Literature	Desired B2C Website Quality Factors	Minimum B2C Website Quality Factors
Service Quality Factors (Parasuraman et al. 1994):		
1. Reliability	1. Reliability	1. Reliability
2. Responsiveness		
3. Assurance	2. Assured Empathy	2. Assured Empathy
4. Empathy		
5. Tangibility	3. Tangibility	
Data Quality Factors (Wang & Strong, 1996):		3. Perceived Usability
6. Accessibility	4. Navigability	
7. Contextual	5. Relevant Representation	
8. Representation		
9. Accuracy	6. Accuracy	4. Trustworthiness
	7. Security	

Table 2. Desired B2C Quality Factor Loadings
(principle components factor analysis with varimax rotation)

Items	Relevant Representation	Assured Empathy	Tangibility	Reliability	Navigability	Security	Accuracy
reliability1	0.3101	0.1623	0.1039	0.6011	0.1303	0.4004	0.0398
reliability2	0.2246	0.1826	0.0766	0.5861	0.1587	0.0165	0.4861
reliability3	0.2184	0.2957	0.1325	0.7451	0.1191	0.1033	0.1520
reliability4	0.3290	0.1499	0.0780	0.6095	0.2782	0.1044	0.1737
responsiveness1	0.3778	0.2171	0.2256	0.4314	0.1669	0.1255	0.2296
responsiveness2	0.0764	0.3641	0.1869	0.4399	0.3143	0.3382	0.1825
responsiveness3	-0.0073	0.4473	0.0280	0.4311	0.3406	0.3032	0.0426
responsiveness4	-0.0055	0.4220	0.0870	0.5836	0.2910	0.2717	0.1605
assurance1	0.4294	0.4940	0.1970	0.3433	0.2229	-0.0696	0.1943
assurance2	0.0637	0.6495	0.0842	0.4488	0.2005	0.1066	0.0478
assurance3	0.2103	0.6577	0.1089	0.3597	-0.0301	0.3238	-0.0145
assurance4	0.1567	0.7573	0.1969	0.2227	0.1593	0.3367	0.0278
empathy1	0.3979	0.7269	0.2464	0.0764	0.0584	0.1702	0.1065
empathy2	0.2417	0.7210	0.1198	0.1448	0.3521	0.0163	0.2379
empathy3	0.3432	0.6727	0.2057	0.1331	0.4352	0.1515	0.0285
empathy4	0.2481	0.5865	0.3408	0.0043	0.2981	0.0452	0.3825
tangibility1	0.1434	0.4013	0.3465	0.1129	0.5904	0.0312	0.3677
tangibility2	0.2314	0.2326	0.6151	0.0137	0.2542	0.0994	0.3029
tangibility3	0.1384	0.2257	0.8031	0.0156	0.0616	0.0572	0.2801
tangibility4	0.2455	0.1745	0.6623	0.2775	0.3514	0.0166	-0.0918
tangibility5	0.2205	0.1750	0.7592	0.1333	0.1348	0.1367	-0.0014
accuracy1	0.1692	0.4083	0.0426	0.2310	0.7170	0.1183	0.1048
accuracy2	0.3391	0.1511	0.1519	0.1102	0.5929	0.3910	0.1516
accuracy 3	0.3565	0.2549	0.2206	0.1422	0.4773	0.4235	0.0917
accuracy 4	0.2471	0.2160	0.2967	0.2776	0.4951	0.2305	0.3116
contextual1	0.3651	0.2309	0.3016	0.0696	0.5308	0.3507	0.1579
contextual2	0.4326	0.3377	0.2198	0.2015	0.3104	0.4727	0.1978
contextual3	0.3388	0.3108	0.1668	0.1694	0.6468	0.2902	0.1489
contextual4	0.6568	0.3005	0.2575	0.1135	0.2570	0.2106	0.2862
contextual5	0.7023	0.2931	0.1374	0.1343	0.2489	0.2278	0.2089
contextual6	0.7620	0.1624	0.2266	0.1464	0.1282	0.0477	0.1722
representation1	0.5250	0.4230	0.0834	0.2185	0.3233	0.4282	0.0858
representation2	0.5460	0.3618	0.0819	0.2175	0.3477	0.4848	0.1004
representation3	0.2969	0.0346	0.3521	0.2791	0.6052	0.1432	0.3098
representation4	0.6167	0.1867	0.2276	0.2089	0.4003	0.3181	0.1006
representation5	0.6683	0.1881	0.1423	0.2012	0.2480	0.0511	0.3756
representation6	0.6611	0.2314	0.2283	0.1129	0.0916	0.2287	0.4668
accessibility1	0.3416	0.2074	0.0345	0.2443	0.4878	0.2755	0.4352
accessibility2	0.2390	0.0271	0.3496	0.1362	0.0150	0.4315	0.6502
accessibility3	0.3636	-0.0061	0.1224	0.1113	0.4097	0.1751	0.6046
accessibility4	0.3319	0.1703	0.0509	0.1970	0.2412	0.1479	0.7496
accessibility5	0.1685	0.0807	0.0875	0.1390	0.1906	0.8169	0.1969
accessibility6	0.1332	0.2647	0.0066	0.0831	0.1336	0.7996	0.1318
Explained Variance	5.9671	5.9232	3.4989	3.9030	5.1612	3.9447	3.4337
Proportion of Total Variance	0.1388	0.1377	0.0814	0.0908	0.1200	0.0917	0.0799

Table 3. Minimum B2C Quality Factor Loadings
(principle components factor analysis with varimax rotation)

Items	Perceived Usability	Reliability	Trustworthiness	Assured Empathy
reliability1	0.1497	0.7996	0.1637	0.1691
reliability2	0.1622	0.7956	0.1860	0.2157
reliability3	0.3063	0.7261	0.3350	0.2008
reliability4	0.3892	0.6862	0.2175	0.2778
responsiveness1	0.4731	0.4255	0.1161	0.5416
responsiveness2	0.4350	0.5006	0.2984	0.4702
responsiveness3	0.2941	0.5045	0.2771	0.5566
responsiveness4	0.3398	0.5371	0.2664	0.5360
assurance1	0.4057	0.3416	0.3352	0.4338
assurance2	0.2158	0.2994	0.5304	0.5024
assurance3	0.3055	0.1869	0.3043	0.6844
assurance4	0.4171	0.2445	0.1736	0.7228
empathy1	0.4772	0.1902	0.1930	0.7184
empathy2	0.4056	0.2703	0.2520	0.6611
empathy3	0.4149	0.2226	0.3690	0.6226
empathy4	0.5558	0.2287	0.3271	0.4906
tangibility1	0.5804	0.2822	0.3785	0.2468
tangibility2	0.7136	0.1896	0.1465	0.2473
tangibility3	0.7487	0.0746	0.0826	0.3725
tangibility4	0.7187	0.2377	0.1843	0.2973
tangibility5	0.7554	0.0892	0.1891	0.3511
accuracy1	0.3758	0.4133	0.6226	0.1656
accuracy2	0.4373	0.2891	0.6581	0.1469
accuracy 3	0.4126	0.3279	0.5538	0.2604
accuracy 4	0.4999	0.2626	0.5598	0.3049
contextual1	0.6416	0.3240	0.4043	0.2671
contextual2	0.6793	0.2673	0.3970	0.3382
contextual3	0.6251	0.3246	0.4706	0.2363
contextual4	0.7679	0.1999	0.2646	0.3561
contextual5	0.6993	0.2158	0.2890	0.3783
contextual6	0.7002	0.2187	0.1768	0.3541
representation1	0.5595	0.3763	0.4778	0.3104
representation2	0.5881	0.3836	0.4759	0.2540
representation3	0.6909	0.3566	0.3993	0.1245
representation4	0.6136	0.3796	0.4292	0.2167
representation5	0.6777	0.3048	0.2959	0.3358
representation6	0.7236	0.2175	0.3043	0.3518
accessibility1	0.6584	0.3510	0.3698	0.2417
accessibility2	0.7150	0.2193	0.3616	0.2158
accessibility3	0.7584	0.2659	0.1892	0.2535
accessibility4	0.7154	0.1884	0.2877	0.2637
accessibility5	0.2095	0.1409	0.8407	0.2431
accessibility6	0.2164	0.1470	0.8340	0.1867
Explained Variance	12.9581	5.8091	6.5078	6.4287
Proportion of Total Variance	0.3014	0.1351	0.1513	0.1495