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INFORMATION QUALITY OF COMMERCIAL WEB SITE HOME PAGES: AN EXPLORATIVE ANALYSIS

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Abstract

In the search for substantive relationships in the use of emerging technology, information quality is often difficult to assess. This research explores user perceptions of presentation, navigation, and quality of Web home pages for approximately 200 selected Fortune 500 companies across 10 industries. An instrument is developed to measure these constructs and is assessed for convergent and discriminant validity as well as reliability. Company Web home pages are clustered using 24 Web site features. Interpretations of the type of Web home page within a cluster are based on their characteristics. An explorative analysis is performed between types of Web home pages and user perceptions of these sites. This study provides empirical evidence of relationships between companies at different positions in the supply chain and the information quality of their Web home pages.

Keywords: Measures, exploratory study, cluster analysis, information attributes, information presentation

1. INTRODUCTION

Assessing the strategic role of technology and measuring the effectiveness of information systems has consistently ranked among the top ten issues in many surveys on information technology (Ball and Harris 1982; Brancheau and Wetherbe 1987; Dickson et al. 1984). However, studies typically ignore the use of validity procedures using empirical data for theoretical model building and verification, particularly for assessing emerging technology effectiveness (Grover and Lee 1993). This paper explores the measurement of presentation, navigation, and quality perceptions of users viewing corporate home pages. Louwers et al. (1998) report that virtually every Fortune 500 corporation has a Web site and that the quality of information at these sites is of paramount importance just as it is in a printed annual report.

Corporations have understood that information technology can provide a distinct organizational advantage (Tavakolian 1989). A corporation's Web site is an important information technology tool that can be used to achieve a variety of purposes. The need

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to assess effective Web designs of major corporations is argued by Katerattanakul and Siau (1999). In 1999, approximately 45% of the Fortune's Global 500 companies were actively recruiting through their Web site. These authors suggest that evaluation criteria be examined for Web designs and that further research focus on developing measurements of information quality of Web sites. They contend that the criteria should include three critical areas of successful Web site design: structure and layout, navigation, and orientation.

Wang and Strong (1997) suggest that information quality and user satisfaction are two major dimensions for evaluating the success of information systems. They state, "These two dimensions generally include some data quality attributes such as *accuracy*, *timeliness*, *precision*, *reliability*, *currency*, and *relevancy*." They also add the attributes *accessibility* and *interpretabilit*y as being desirable data quality attributes. This paper will be addressing perceptions of quality by a user viewing only the home page of a Web site. There does not appear to be standard evaluation criteria for assessing the perception of consumers, who must be the ultimate judge of a Web site's information quality. Software exists, such as Tetranet Software's Linkbot Pro, for testing navigation and graphical display problems (Rist 1999). Hence, this study is not focused on measuring the accuracy or errors on the home page of a Web site as that can be assessed through specialized software.

Proper Web design information can be found in numerous publications including postings on the Internet. Karp and Karp (1997) publish tips on the Internet on what successful Web sites should include. For example, they recommend white backgrounds for Web sites or a light shade of gray or, if a colored background must be used, then an earth-tone color. Alexander and Tate (1997), Alves (1997), Landsberger (1999), and Ormondroyd et al. (1995) address the difficulties of evaluating Web sites and offer suggestions as to effective Web design. Beck (1997) suggests that evaluative criteria of Web sites consider each of the following: accuracy, authority, objectivity, currency, and coverage.

Our study considers published information criteria recommended in the design of Web sites to develop constructs in our survey instrument. Only the home page of selected Fortune 500 companies is evaluated empirically. The following reasons are given for evaluating only the home page:

1. The home page needs to be designed with particular care as this page is akin to the cover of a magazine or company report.
2. An in-depth evaluation of an entire Web site including all of its links is very time consuming and difficult. Furthermore, Web site information is updated and changed frequently, but the design of the home page tends to change less frequently.
3. The home page tends to set the tone and theme of the Web site.

Company Web sites may have different characteristics based on their position in the supply chain. As Christopher (1998) explains, "A supply chain is the network of organizations that are involved, through upstream and downstream linkages, in different processes and activities that produce value in the form of products and services in the hands of ultimate consumers." Companies that are closer to the downstream end of the supply chain and thus produce for and/or to the final consumer in a mass-market industry will derive immediate benefits from a well-maintained Web site. For companies that are further upstream on the supply chain, the benefits of a well-maintained Web site are less clear. A cluster analysis on 24 features of Web home pages reveals certain insights into the types of Web home pages on the Internet. A further analysis illustrates how Web home pages differ with respect to perceptions of presentation, navigation, and quality of their home page. In addition, companies were clustered into five groups based on various features of their Web home pages and examined based on their position along the supply chain. The number of window dressing features, service, index, commercial, legal, financial, animation, and other miscellaneous characteristics of home pages allowed for easier interpretation of the five clusters of companies. Statistical analysis revealed which clusters differed with respect to user perception. The cluster with an e-commerce orientation received the highest user perception ratings.

2. CONSTRUCTS MEASURING PRESENTATION, NAVIGATION, AND QUALITY PERCEPTIONS OF WEB HOME PAGES

While many researchers investigating the Web make various conclusions as to the quality of Web pages, little attention has been given to developing valid measurement procedures for Web home page evaluation. Our study involves developing an instrument for assessing Web pages, but we evaluate only the home page of corporations of the Fortune 500 and validate the developed instrument using exploratory data analysis. This study considered three constructs mentioned in the literature as factors important to the development of an effective Web page.

The content validity of the items used to measure the constructs presentation, navigation, and quality was assessed by Web site developers for two large companies: Sprint and Sabre. Sprint is a Fortune 500 company. Sabre, although not a Fortune 500 company, is a recognized leader in providing information technology solutions for the travel and transportation industry and Web site development is an important facet of their business. In addition, justification for using the items in the survey to measure these constructs are supported by an investigation into the literature and are provided in the next three sections.

2.1 Presentation

Presentation of information on a Web home page must take into consideration graphics, colors, the amount of information displayed, and the way that the information is organized. McClure et al. (1997) considered presentation issues to consist of (1) where information was located, (2) how graphics were used, and (3) what elements on the site were distracting. Evamy (1999) states that Hambrecht & Quist predicts that the global Internet consultancy market for designing attractive Web sites will be worth $50 billion.

Huizingh (2000) explains that not much is known about proper construction of Web pages. That paper uses a research framework to study how different companies are using the Web. The framework suggests that presentation should include a style that easily flows with the right mix of graphics and information. That is, Web pages must be aesthetically appealing. Items 1, 3, 4, and 5,[1] which are used to measure presentation are supported by Huizingh's framework as well as that in McClure et al. Numerous sources such as Karp and Karp (1997) emphasize the importance of avoiding annoying and distracting design elements. Item 2 addresses this issue. Graham (2000) and Huizingh suggest that the design of a Web site should be exciting to visitors. This will entice the user to continue further into the site. Ultimately, the presentation should be entertaining enough to encourage impulse buying when the site contains e-commerce information. However, a visitor's impulse to buy from viewing a Web home page is difficult to assess and is not measured in this instrument. Instead, item 6 is included to measure a site's attractiveness to invite a user of a Web home page to proceed further into the site.

2.2 Navigation

Measuring the quality of the navigational ease of a Web home page is based on a user's perception of being able to readily find the needed hyperlinks to move around the Web site. Hlynka and Welsh (1996) list the criteria of interactivity, which include the quantity, functionality, and relevance of hyperlinks, as being important to the quality of an effective home page. McClure et al. considered navigation issues to consist of understanding what the navigation icons mean, the ease in which graphics helped the navigation process, and the ability to find pertinent information without relying on chance. Items 7, 8, and 12 consider the visitor's perception of graphics, hyperlinks, and layout in the navigation structure. Huizingh and Palmer and Griffith (1998) also examine navigation structure in their research frameworks and remark that Web site users need to be able to find information easily and quickly. Items 9, 10, and 11 address the issue of identifying and finding information.

The perception of navigational ease, which is what our study measures since respondents are asked not to click on links within the home page, is considered important because a Web page should make respondents feel comfortable in wanting to further navigate a Web site. Assessing the accuracy of the actual navigation may be more practically performed using autonomous software tools such as those used in the Scharl and Bauer (1999) study.

2.3 Quality

Defining quality for a Web home page is reported as a difficult task (December and Ginsburg 1995; Reeves and Bednar 1994). Since each user has their own definition of quality, item 15 is included to see if a Web home page would get a user's recommendation. On any quality Web page, researchers appear to agree that quality of information is paramount. McClure et al. and December and Ginsburg comment that Web site designers should seek the highest-level, most stable, and most accurate information source. Item 13, written as "Information appears to be believable," is included to measure the user's perception of the quality of information on a Web home page.

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[1]A total of 18 items are listed in the Appendix. Items 1 through 5 measure presentation; items 6 through 12 measure navigation; items 13 through 18 measure quality.

December and Ginsburg further remark that "a developer needs to use effective composition principles as opposed to forcing a user to 'construct' meaning by decoding unorganized pieces of information." Items 14 and 17 are included to measure a user's understanding of the purpose of a Web home page and of the services and products of the company. McClure et al. also included items in their instrument to measure a user's understanding of the purpose of a Web page.

December and Ginsburg comment that a quality Web site should do more than just present information; it should attract visitors to the company (Graham 2000). Item 18 is included to assess if a Web home page gives the user a good image of the company. Several authors, such as Aries and Farris (2000), emphasize that web sites should always tell their visitors how to contact the company. That is, there should be a process of continuous improvement in which Web site developers provide a way for users to give feedback. Item 16 is included to address this issue. The responses to the items for the quality construct give insight into the skill and effort necessary to produce a Web home page that is viewed as being the best by the user.

3. DATA COLLECTION PROCEDURE

To evaluate the home page of Fortune 500 companies across 10 industries, junior and senior level business students were asked to volunteer. Each respondent was randomly given two companies from each of the 10 industries, for a total of 20 Web home pages to view. The 10 industries selected were: (1) general merchandiser, (2) computer software, (3) electronics and electrical equipment, (4) telecommunications, (5) commercial banks, (6) food and drug, (7) wholesalers, (8) motor vehicles and parts, (9) specialist retailers, and (10) forest products. These industries were selected for two reasons: (1) they are a very diverse group of industries and (2) at least 20 Fortune 500 companies were found in each industry. Since Web home pages were randomly assigned to respondents, there should be little effect due to the subjects themselves in determining differences among clusters of companies. That is, differences of perceptions of Web home pages across clusters can be attributable to the three constructs measured by the instrument in the Appendix.

Demographic questions were also asked. These questions included: (1) "How would you rate your skill in navigating the WWW?" and (2) "How would you rate your experience evaluating the design and content of Web sites?" For this study, only respondents that answered a 6 or 7 on both of these questions were included. A response of 7 represented a "very high" skill or experience. With this restriction, there were 778 Web site evaluations from approximately 40 students. Therefore, the Web home pages were evaluated by respondents who self-reported that they had reasonably good skills in evaluating Web sites. During the data collection procedure, it was discovered that some Web sites were down or took an unusually long time to be displayed. Occasionally, the browser would even "crash" as a Web home page was starting to be displayed. Hence, participants did not evaluate Web home pages in which difficulty was encountered in opening the site.

A pilot study of 10 junior and senior level students was used to test a preliminary version of the questionnaire. Each respondent completed the questionnaire and provided feedback to the researchers and, after examination, several items were reworded. Researchers in this study felt that respondents were not showing bias toward specific types of firms as feedback from the students revealed that they were judging each Web home page on its own merit.

4. ASSESSING VALIDITY AND RELIABILITY OF RESEARCH CONSTRUCTS

Since this study is considered exploratory and no statistically validated instrument was available in the literature to measure constructs pertaining to the home page of Web sites, exploratory factor analysis was used to assess the validity of the instrument. While confirmatory factor analysis has emerged as a preferred approach of validating instruments, its use depends heavily on theoretical support of constructs. Since there appear to be no standard constructs measuring what good Web designs should contain, the items for this instrument were developed by investigating a number of sources and obtaining feedback from experienced Web developers and users in the pilot study.

Content validity was established by a literature review of articles examining the topics of presentation, navigation, and quality as well as feedback from experienced Web site developers from two major corporations actively involved in Web site technology: Sprint and Sabre. In addition, during the pilot study, items were further examined to ensure that the content of the questions was interpreted as designed. A limitation to this study is that the subjects used in this study may favor sites that fall nearer to the consumer end of the supply chain. Thus, this study focuses on an evaluation of home pages by consumers at the end of the supply chain.

Establishing convergent validity, discriminant validity, and reliability are considered important in determining construct validity (Peter 1981; Premkumar and Ramamurthy 1995; Venkatraman 1989). Principal component factor analysis with a varimax rotation

was used to assess construct validity. Three factors (presentation, navigation, and quality) emerged as expected from the 18 items. However, items 3, 5, 9, and 16 loaded across several factors. After removing these items, the loadings of the items for each construct were above .5 and cross loadings were less than .5. These loadings are presented in Table 1. According to Hair et al. (1998), loadings from factor analysis should be at least .5 for practical significance.

Table 1. Loadings of the Retained Items on the Constructs Presentation, Navigation, and Quality

	Presentation	Navigation	Quality
X1	0.74992	0.19806	0.33229
X2	0.70259	0.28361	0.18125
X4	0.79805	0.2321	0.16072
X6	0.64278	0.3799	0.4384
X7	0.40741	0.68757	0.25037
X8	0.34502	0.71388	0.29613
X10	0.23493	0.77476	0.29634
X11	0.17937	0.6854	0.46241
X12	0.28287	0.73087	0.38694
X13	0.26082	0.41496	0.65037
X14	0.20219	0.2938	0.84476
X15	0.39651	0.41035	0.63067
X17	0.22861	0.28844	0.82485
X18	0.42445	0.38432	0.68282

Table 2. Reliability of Constructs and Variance Explained

Constructs	Number of Items	Alpha	Variance Explained	Cumulative Percentage Explained	Minimum Factor Loading
Presentation	4	0.84	3.06	21.90%	0.643
Navigation	5	0.91	3.56	47.30%	0.685
Quality	5	0.92	3.64	73.30%	0.631

The results in Table 1, with four items removed in the factor analysis, indicate that the items load on the appropriate constructs as originally envisioned. Cross-loadings were relatively small. Hence, the principal component factor analysis exhibits convergent and discriminant validity. This approach was also used by Premkumar and Ramamurthy. Table 2 supports the reliability of the factors, with .84 being the lowest reliability. In addition, Table 2 illustrates that the three constructs account for 73.3% of the total variance of the data.

5. CLUSTERING WEB HOME PAGES

Web home pages contain numerous features such as search icons, company symbols, animation of images, commercial log-ins, privacy act protection statements, on-line surveys, etc. The presence of these features varies from company to company. We included 24 features of Web home pages. These 24 features were deemed important for capturing the following characteristics: service, index, commercial, legal, financial, number of window dressing features, animation, and other miscellaneous characteristics.

Table 3 lists the characteristics of interest in this study. The term "number of window dressing features" is used to describe the number of images, links, and colors that are built into the design of a Web home page. Images, links, and colors in themselves tend to be attractive features to dress up a Web page. Dvorak (1995) refers to window dressing features as consisting of these types of characteristics. This term will be abbreviated as "W.D. features." Each home page was categorized into a high and low category on each of these characteristics. A zero was assigned to the low category and a one was assigned to the high category. These high and low categories were determined by considering the median number of either images, links, or colors. Therefore, the variable "number of W.D. features" ranged from zero to three.

The service, index, commercial, legal, and financial characteristics also took on values 0, 1, 2, and 3. The features for these characteristics were evaluated as binary. A binary score was used since it indicated whether a feature was present (value of 1) or not present (value of 0). The score for each characteristic was the sum of the binary values for the features. For example, the score for service was the sum of the binary values of the features e-mail contact, on-line help assistance, and a section on frequently answered questions. The animation characteristic had a single variable, animation, and therefore was equal to zero or one. The final characteristic category was miscellaneous, which contained five variables and therefore ranged from zero to five. The miscellaneous category was used in clustering the companies, but was not used in further analysis to examine the clusters as it does not provide additional descriptive insight into the nature of the clusters.

Table 3. Web Home Page Characteristics

Web Home Page Characteristic	Feature on Web Home Page
Service	e-mail on-line help frequently asked questions
Index	search site index listbox
Commercial	e-commerce log-ins advertisements
Legal	legal privacy copyright
Financial	news investor information stock price
Number of window dressing features	colors links images
Animation	animation
Miscellaneous	jobs, career information Y2K information foreign language chat room national news

In this study, 197 companies were used instead of 200 because three of the companies' Web home page would not properly appear and, therefore, were not evaluated. To cluster the approximately 200 Fortune 500 companies selected for this study, the Jaccard coefficient is used on the 24 features measured from each home page. This coefficient has been widely used, was reported as a viable similarity measure as early as 1912 (Jaccard 1912), and is a recommended measure of similarity (Anderberg 1973). Famili

et al. (1997) used this coefficient in fuzzy adaptive resonance theory (ART) modules to cluster isolated words into semantic classes, starting from a database of raw text. The Jaccard coefficient is used in our study as a measure of similarity between two home pages and is defined as the number of features that are common to the two home pages divided by the number of features present on both of these pages. This coefficient is converted to a distance measure by subtracting it from one. From this matrix of distances, Ward's minimum-variance method (Johnson and Wichern 1998) was used to form clusters.

Ward's method was selected because it maximizes the likelihood at each level of the hierarchical clustering procedure under standard assumptions of normality. This clustering procedure tends to produce clusters in which the assumptions of ANOVA hold approximately. Thus, using ANOVA to test for differences across clusters is appropriate. The number of clusters selected using this clustering procedure was five, based on size of clusters. By using five clusters in the cluster analysis procedure, the smallest cluster size was 16. As the number of clusters increases, the cluster size decreases, thus making interpretation and hypothesis testing across clusters untenable. Therefore, a larger number of clusters was not selected. The means for the Web home page characteristics and user perceptions are presented in Table 4. Only the variables that loaded highly on the constructs presentation, navigation, and quality were used to obtain the averages for these constructs. Multivariate analysis of variance results, displayed in Table 5, reveal that significant differences exist across clusters with respect to Web home page characteristics and also with respect to the user's perception of presentation, navigation, and quality.

Table 4. Cluster Means

Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Web Home Page Characteristics					
Service	1.07	1.38	0.78	1.53	1.15
Index	1.28	1.78	0.14	1.30	0.22
Commercial	0.26	0.43	0.32	1.97	0.39
Legal	1.48	1.63	0.86	2.13	0.19
Financial	2.05	2.16	0.80	0.87	2.09
W.D. Features	0.65	1.95	0.14	1.11	0.32
Animation	0.43	0.54	0.07	0.25	0.33
User Perceptions					
Presentation	5.08	5.19	5.31	5.34	4.70
Navigation	5.05	5.27	5.18	5.47	4.42
Quality	4.99	5.28	5.17	5.46	4.38

Table 5. MANOVA Results for Testing Differences across Clusters

Statistics	Value	F Value	Num DF	Den DF	Pr > F
Dependent variables: presentation, navigation, and quality					
Wilks' Lambda	0.92839462	5.68	12	2392.1	<.0001
Pillai's Trace	0.07197709	5.57	12	2718	<.0001
Hotelling-Lawley Trace	0.07672830	5.77	12	1577.7	<.0001
Roy's Greatest Root	0.07122303	16.13	4	906	<.0001
Dependent variables: service, index, commercial, legal, financial, W.D. features, and animation					
Wilks' Lambda	0.10413584	101.18	28	3246.4	<.0001
Pillai's Trace	1.53108232	80.00	28	3612	<.0001
Hotelling-Lawley Trace	3.66625246	117.69	28	2240.3	<.0001
Roy's Greatest Root	1.95274264	251.90	7	903	<.0001

The Student-Newman-Keuls multiple comparison procedure with a significance level of 5% was used to determine which clusters differed for each of the variables used to describe characteristics of the Web home page and the perceptions of presentation, navigation, and quality. The clusters listed in Table 6 with the same letters are not significantly different. The clusters were reordered as 5, 1, 3, 2, and 4 to agree with the rank order of the means of the quality dimension of user perceptions as presented in Table 4. Cluster 5 has the lowest quality rating and cluster 4 has the highest quality rating.

Table 6. Results of the Student-Newman-Keuls Multiple Comparison Procedure

Cluster	Service	Index	Commercial	Legal	Financial	W.D.Features	Animation	Presentation	Navigation	Quality
5	B	C	B	D	A	D	B C	B	C	C
1	B	B	B	B	A	C	B	A	B	B
3	C	C	B	C	B	E	D	A	A B	A B
2	A	A	B	B	A	A	A	A	A B	A B
4	A	B	A	A	B	B	C	A	A	A

For insight into the composition of the clusters, Table 7 was created. In this table, the mean scores for presentation, navigation, and quality were ranked across clusters. For each of the Web home page characteristics, high (H) and low (L) were marked for the clusters at opposite extremes. In a couple of cases, very high (VH) and very low (VL) were used because the mean scores were so much larger/smaller than the others. This table facilitates interpretation of the clusters. Cluster 4 can be perhaps labeled the e-commerce oriented cluster. Cluster 2 appears to have high values for several characteristics, including "number of window dressing features." Thus it is labeled the "high W.D features" type of Web home page design. Cluster 3 has low values for most of the characteristics and, therefore, is labeled as the "plain" type of Web home page. Cluster 1 only has one high value (financial) and one low value (commercial) and appears to be not at either extreme for most of its characteristics. Therefore, it is labeled as a "conservative site, with investor orientation and low e-commerce orientation." Cluster 5 is interpreted as consisting of company home pages with an orientation toward making information available to the investor.

From viewing Table 7, several interpretations can be made regarding insight into perceptions of different types of home pages. Legal should be high for a cluster that is e-commerce oriented and low for a cluster in which Web home page sites are mostly furnishing financial information. Thus, the presence of legal statements has a high association with the presence of commercial features on the Web home page. The home pages of commercially-oriented Web sites appear to have the highest user perception in all three areas of presentation, navigation, and quality. Also, the commercially-oriented Web sites do not appear to be the most complex. Interestingly, the "plain-Jane" home pages do not get the lowest marks. The user ratings on these home pages are close to the ratings of the home pages with a high number of window dressing features.

The home pages that appear to be more investment focused with the presence of financial information on the home page have the lowest user perception in all three perception categories of presentation, navigation, and quality. This may be simply due to these companies being at a different point on the supply chain—perhaps they are not as concerned with the consumer at their Web home page site. Table 8 illustrates where companies are along the supply chain.

Weill and Broadbent (1999) provide four views of management objectives of information technology. These views can be categorized as informational, strategic, transactional, and infrastructure. The informational objective emphasizes providing company information or presenting news or summaries relating to how the economy, industry, competitors, or company decisions will affect the company. The strategic objective is concerned with increased sales and market positioning. The transactional objective attempts to develop systems that support order processing, inventory control, or any transactions made within the company. The infrastructure view is concerned with the foundation of information technology. The infrastructure objective provides business integration and standardization. One or more of these objectives may be motivating the basic design of home pages for Web sites.

Table 7. Low and High Web Home Page Characteristics for the Clusters

Cluster	Service	Index	Commercial	Legal	Financial	W.D.Features	Animation	Presentation	Navigation	Quality
5 (Mostly investor oriented, low in legalese and search tools)		L	L	VL	H			1	1	1
1 (low e-commerce, high financial orientation, with conservative designs)			L		H			2	2	2
3 (Plain designs, very low animation)	L	L	L		L	L	VL	4	3	3
2 (Many links, good search tools, investor oriented, very high animation, high number of window dressing features)	H	H	L		H	H	VH	3	4	4
4 (E-commerce oriented, high in legalese, good contact and search tools, low on investor information)	H		VH	H	L			5	5	5

Table 8. Frequencies of Industry Within Each Cluster

Industry / Cluster	Cluster 5 (Mostly investor oriented, low in legalese and search tools)	Cluster 1 (low e-commerce, high financial orientation, with conservative designs)	Cluster 3 (Plain designs, very low animation)	Cluster 2 (Many links, good search tools, investor oriented, very high animation, high number of colors and images)	Cluster 4 (E-commerce oriented, high in legalese, good contact and search tools, low on investor information)	Total
General Merchandiser	3	5	1	2	8	19
Computer Software	1	5	0	10	4	20
Electronics	2	7	1	7	3	20
Telecommunication	3	4	0	6	7	20
Commercial Banks	0	8	0	2	10	20
Food and Drug	3	6	2	2	5	18
Wholesalers	5	3	4	5	3	20
Motor Vehicles and Parts	3	11	1	5	0	20
Specialist Retailers	1	2	6	2	9	20
Forest Products	2	11	1	5	1	20
Total	23	62	16	46	50	197

Cluster 4 is dominated by commercial banks, general merchandisers, and specialist retailers. These companies appear to be closer to the consumer end of the supply chain and thus have a greater emphasis on profit. Consequently, these companies benefit the most by having a Web home page with high presentation, navigation, and quality characteristics. Cluster 4 appears to have companies that are mostly concerned with strategic and transactional objectives. These companies derive strategic and transactional benefits from having a Web home page with an e-commerce presence.

Cluster 2 consists of companies from a variety of industries among which are computer software, electronics, and tele-communications. These companies tend to be at the forefront of technology. Thus, they benefit from displaying a home page with a higher number of window dressing features. These companies may hope that their Web users find their Web home page to be an exciting place to obtain information. Their objective appears to be closer to the informational view of information technology, but may be a blend of both strategic and informational. The number of window dressing features in their Web home page sites reveals that they are concerned about impressing the consumer. While these companies may not be indulging in as much e-commerce as the companies in cluster 4, they appear to have the consumer in mind in the design of their Web home page. The perceptions of presentation, navigation, and quality rank second among the clusters.

Cluster 3 appears to have only plain designs. These companies may be pressured to have a Web home page because of their competitors. Only a few companies from each industry fall in this category. For this cluster, management's objective of having a Web home page appears to be the infrastructure view.

Clusters 1 and 5 appear to have an investor/financial orientation. Management's objective of having a Web home page for these companies appears to be more informational. At least half of the forest products and motor vehicles and parts companies fall in cluster 1. These companies appear to be further upstream on the supply chain. These companies may feel that their Web home page benefits the consumer/investor by providing information about the company with a mostly conservative design. Companies from other industries also fall in this cluster. Commercial banks that are not active in e-commerce fall in this cluster. Cluster 1 has the highest overall frequency of any cluster. Cluster 5 does not have a very high frequency for any one company, but it does have 25% of the wholesalers. Combined, clusters 1 and 5 illustrate that a large number of companies have an informational objective in the design of their Web home page site.

6. CONCLUSIONS

The exploratory analysis and evaluation approach described in this paper compares Web home page site designs between groups of companies with different information technology objectives for their home page. While much information is available on what effective Web sites should look like, little research has been devoted to the development of measurement scales for the quality of Web home pages. McClure et al. (1997) suggest further research consider testing internal validity (convergent/discriminant validity) of an instrument to evaluate Web sites. This paper uses an exploratory approach to assess the validity of a newly developed instrument. This contribution provides a framework for future research to investigate more complex modeling of Web home page characteristics across industries.

The findings of this study illustrate that differences exist among certain types of Web home pages with respect to perception of presentation, navigation, and quality. The approach employed in this paper assesses the measurement properties of the constructs presentation, navigation, and quality and validates their unidimensionality. The cluster analysis revealed five types of companies with varying objectives for Web home pages. Interpretations of the type of Web home pages within a cluster are based on their characteristics. An explorative analysis reveals that companies with transactional and strategic objectives for their Web home page receive high marks for user perceptions of presentation, navigation, and quality. This study provides empirical evidence of relationships between companies at different positions in the supply chain and the information quality of their Web home page.

Many issues still need to be considered in the evaluation of Web sites. Our study only considered the viewer's perception of the home page and not the entire Web site. Further research is needed to examine the Web sites in-depth. Developing criteria for the evaluation of a Web site may evolve just as Web sites themselves evolve. Web masters are often forced to design sites for the general population. As industries find that extra attention given to Web site development may lead to a distinct technological advantage, validated evaluation criteria will be critical in future decision making on Web design, particularly for "high traffic" pages such as the home page. Interpretation of Web home pages from cluster analysis is subjective. Further research should confirm the presence of these types of Web home pages and analysis should be performed to understand differences among user perceptions across those Web home pages.

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Appendix

Instructions: Please answer the following questions by ONLY VIEWING the company homepage (i.e. do not click on links within the homepage).

Presentation	Strongly Disagree			Neutral			Strongly Agree
1. The use of graphics is very appropriate for this site.	1	2	3	4	5	6	7
2. The design elements are not annoying or distracting.	1	2	3	4	5	6	7
3. The amount of information displayed is just right.	1	2	3	4	5	6	7
4. The colors in this Web site are pleasant.	1	2	3	4	5	6	7
5. This site organized its information in a way that is easy for me to understand.	1	2	3	4	5	6	7
6. This site's attractiveness invites me to go further into this site.	1	2	3	4	5	6	7

Navigation	Strongly Disagree			Neutral			Strongly Agree
7. The graphical presentation appears to be helpful in navigating.	1	2	3	4	5	6	7
8. I like the way the hyperlinks are embedded in this site's design.	1	2	3	4	5	6	7
9. Someone without knowledge about this company could easily find information.	1	2	3	4	5	6	7
10. Information links are located where I would expect them to be.	1	2	3	4	5	6	7
11. This site would enable me to get precise information quickly.	1	2	3	4	5	6	7
12. This Web site has a navigationally efficient layout.	1	2	3	4	5	6	7

Navigation	Strongly Disagree			Neutral			Strongly Agree
13. Information appears to be believable.	1	2	3	4	5	6	7
14. I understand the purpose of this site.	1	2	3	4	5	6	7
15. I would recommend this site to a colleague.	1	2	3	4	5	6	7
16. This site appears to make it easy to correspond with the company.	1	2	3	4	5	6	7
17. I clearly understand the services and products of this company by looking at this site.	1	2	3	4	5	6	7
18. Viewing this site gives me a good image of the company.	1	2	3	4	5	6	7