

5-2009

# Website Complexity: Objective versus Subjective Measures

Yi Maggie Guo

*University of Michigan at Dearborn*, magyiguo@umd.umich.edu

Dianne Hall

*Auburn University*, halldia@auburn.edu

Follow this and additional works at: <http://aisel.aisnet.org/mwais2009>

---

## Recommended Citation

Guo, Yi Maggie and Hall, Dianne, "Website Complexity: Objective versus Subjective Measures" (2009). *MWAIS 2009 Proceedings*. 28.  
<http://aisel.aisnet.org/mwais2009/28>

This material is brought to you by the Midwest (MWAIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in MWAIS 2009 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# Website Complexity: Objective versus Subjective Measures

**Yi Maggie Guo**

University of Michigan at Dearborn  
magyiguo@umd.umich.edu

**Dianne Hall**

Auburn University  
halldia@auburn.edu

## ABSTRACT

Site complexity has been defined both as a single construct and as multi-dimension construct and operationalized in terms of objective measures or user perceptions. In this research, we distinguish between objective and subjective (perceived) site complexity and examine the relationship between the two. Objective site complexity is measured by how varied a website is; subjective site complexity is the perception of the user about how complex the site is. As such, we maintain that these are two distinct yet related constructs. By manipulating objective site complexity and collecting data on the user's perception, we attempt to demonstrate a linear relationship between objective and subjective complexity. Our results indicate that, while the constructs are related, they do not demonstrate the linear relationship expected.

## Keywords

Website complexity, perceived site complexity.

## INTRODUCTION

Website complexity has been an independent variable in a number of studies and its effect on other variables, such as communication effectiveness (Geissler, Zinkhan and Watson, 2001) and shopping behavior (Huang, 2000), has been examined. However, the nature of this concept has not been fully explored and there is little consensus on the definition and operationalization on the construct. Site complexity has been defined as single (Huang, 2000) or multi-dimension constructs (Nadkarni and Gupta, 2003). It also has been used in studies in terms of objective measures (Geissler et al., 2001) or user perceptions (Nadkarni, 2004). In this study, we try to probe the issue further by extending the general theory of complexity and information process to website comprehension context. The primary research focus is to distinguish two sides of the coin: objective vs. subjective (perceived) site complexity and examine the relationship between the two. Objective site complexity is how much variety inherent in a website. It consists of two sources: structure and content. On the other hand, subjective site complexity is the perception of the user about how complex the site is; it is "the degree to which users find the information cues of the Web pages at a website dissimilar and visually dense" (Nadkarni, 2004). Besides the inherent complexity in a site, other factors, such as familiarity, play roles in determine the perception. Apparently, these are two distinct albeit related constructs.

To empirically study the relationship between objective and subjective site complexity, a controlled experiment was conducted in which objective complexity was manipulated and data on Web user's perceptions were collected. Our expectation of linear relationship between them was only partially supported, which leads to interesting implications and opportunities for future research.

## BACKGROUND

Complexity can be roughly defined as the "amount of variety or diversity" in a stimulus (Berlyne, 1960, p.38). Complexity can be measured both objectively and subjectively (Campbell, 1988; Germonprez and Zigurs, 2003). Campbell (1988) distinguishes the objective complexity of a task and the subjective complexity that is experienced by people. These two are related but not necessarily identical. Several factors, such as familiarity (prior knowledge), short-term memory, and mood moderate the relationships between objective and subjective complexity. In this study, the approach was to manipulate objective complexity and to measure subjective complexity perceived by users. In the next few paragraphs, we introduce the concept of complexity based on general complexity theories, and then define complexity in terms of Web comprehension.

Based on the information processing literature, if a task is high in information load, information diversity, and rate of information change, a task is complex because it is high in cognitive demand. The complexity of a stimulus pattern depends on several properties: number of distinguishable elements, the level of dissimilarity between elements, and the level of unity among elements (Geissler et al., 2001). Similarly, objective task complexity can be described by the number of potential

alternatives, number of outcomes, conflicting interdependence, and the uncertainty of correct paths to a solution. And for a choice task, complexity is determined by the number of alternatives in a consideration set, number of attributes of alternatives, variation in values, and trade-offs of those attributes. A purchasing task such as those Web shoppers engage in is normally a choice task.

Researchers have extended theories of information complexity into the Web context to study website complexity and its relations to communication effectiveness (Geissler et al., 2001), usability (Tarasewich, in press), traffic (Bucy, Lang, Potter, and Grabe, 1999), shopping behaviors (Huang, 2000), and flow (Huang, 2003). Two sources of site complexity have emerged in research: structural complexity and content complexity.

### Site Structural Complexity

When we try to comprehend a website, two things are involved. First, we try to figure out the structure and functionality of the site, including what the pages look like, where the links lead, and the relationship among the pages. This is the design aspect of a site and the way in which information is presented and organized. Second, we try to understand the content of the site itself. We use the term “structural complexity” to refer to the cognitive demand required by the first task in comprehending a site. It also has been referred to page complexity (Bucy et al., 1999; Geissler et al., 2001), design complexity (Tarasewich in press), and form (Germonprez and Zigurs, 2003). We use “structure” to echo the “information space” metaphor of hyper documents. In this space, there is an interconnected web of nodes/pages (Marshall and Shipman, 1995). People “travel,” “navigate,” “orientate,” and “disorientate” in this space (Thuring, Hannemann, and Haaka, 1995; Otter and Johnson, 2000). The structure of the space affects cognitive overhead required by comprehension. One study shows that the text structure (hierarchical, nonlinear, and mixed) and prior knowledge affects the ease with which hypertext can be used (McDonald and Stevenson, 1998). However, a different study argues that a visitor’s mental representation reflects more of a conceptual (i.e., semantic) relationship, and not the nature of the interconnections among pages (Farris, Jones, and Elgin, 2002).

Structural complexity is a result of three factors: individual page structure, overall site structure, and links. Page structure concerns the design of page elements. A study has found correlations between site traffic and website features such as banners, page structures, dynamic elements, graphic elements, both asynchronous and real-time interactive elements, and background colors (Bucy et al., 1999). In studying home pages, Geissler et al. (2001) found that perceived complexity results from the number of links, number of graphics, home page length, and use of animation on the page. A quadratic relationship (inverted U-shape) between complexity and attention was found. Tarasewich (in press) investigates how to use complexity metrics to improve website usability. Design complexity is classified into two parts: page layout and Web specific. Page layout includes aspect ratio, percentage of white space, horizontal and vertical balances, and horizontal symmetry. Web specific metrics include the number of graphics and graphic size, number of words, number of links, number of pages, and average depth of pages. He found that websites that were redesigned according to the rules of complexity reduction were more usable (Tarasewich, in press).

Page structure refers to the design of individual pages, while overall site structure refers to the relationships between those pages. The last two Web specific metrics of Tarasewich (in press), the total number of pages and average depth of pages, are actually in this category. Additionally, coherence is one quality we should strive for in order to reduce complexity (Thuring et al., 1995). It can be achieved by applying a similar formatting style throughout the site or through groups of pages, using consistent navigation tools and cues, and/or a uniform interface for similar tasks on the site. Another important aspect concerns links (Germonprez and Zigurs, 2003). Although it is not normally pointed out, intelligently designed links make a difference when navigating through a site. Some methods of reducing complexity by proper link design include having meaningful text for the link, showing the destination of the link, and/or providing knowledge about the interrelationships between information units (Oinas-Kukkonen, 1998).

### Site Content Complexity

The nature of the content of a website is just as important as its structure. The content provided by the site is the second major cause of information overload (Thuring et al., 1995). In a study of information overload in organizations, Schneider (1987) lists several characteristics of information that contribute to overload. *Uncertainty* refers to the amount of information needed versus the amount of information available. Although Germonprez and Zigurs (2003) claim that uncertainty is irrelevant regarding Web complexity, we believe that the reverse may be true in many situations. For instance, if a piece of critical information is missing or difficult to find on a site, it will increase the mental load of visitors who are trying to use that piece of information to facilitate content understanding or to make a purchase decision. *Ambiguity* refers to the number of alternative ways to interpret information, or just a lack of clarity in the information from the users’ perspective. A similar

characteristic is information equivocality, which is the ability of information to be interpreted in multiple ways. Ambiguity and equivocality have been treated as the same (Schneider 1987) or as different properties (Germornprez and Zigurs, 2003), but we treat them as one. Of course, unclear information makes it difficult for users to comprehend a website, thus increasing its complexity.

*Novelty* of information is the inability to fit it into any exiting schema. It is somewhat related to the domain knowledge of users. For example, a person new to digital cameras will find it difficult to understand product descriptions, and this will make it harder for them to make comparisons and a final purchase decision. *Complexity* of information is the degree of the interrelatedness among units of information; it is how related groups of information are, or the logical relationships among pieces of information. Complexity of an information net increases when a piece of information relates to many other pieces of information, and the same is true in a website.

*Intensity* refers to an increase in rate/arrival of information and/or importance of the information (Schneider, 1987). We separate it into two properties: intensity and importance. In the context of Web comprehension, intensity can be conceptualized as the way content is being presented, whether in one long page or broken down into pieces; it is part of structural complexity. Importance, as one independent property, refers to the relevance of a piece of information to the user's task; that is, how critical a piece of information is. Lastly, the volume of information plays a role in complexity as well, because it presents a major cognitive demand. It is correlated with the number of pages to some extent.

### **Perceived Site Complexity**

The third aspect of website complexity is subjective complexity. Taking an integrated approach, Nadkarni and Gupta (2003) define perceived site complexity as how difficult the users find the form and content of the website is when trying to understand, process and interact with the site for certain online tasks. This definition provides a broad and holistic conceptualization of perceived site complexity. It captures not only the effects of structural and content complexity, but also cognitive and psychological views.

Perceived complexity is the subjective feeling of complicatedness when visiting a website, is influenced by objective site complexity, and reflects the cognitive aspects of individuals. It discounts the effects of familiarity and meaningfulness, and reflects real factors that impact other subjective experiences (Huang, 2000). Thus, in many studies, subjective or perceived complexity may be a more appropriate independent variable in relation to other constructs. In the current study, we focus on the relationship between these two related, but distinct, constructs: objective and perceived site complexity. Specifically, we examine whether a relationship exists between the two.

## **RESEARCH DESIGN**

Our research focus is the relationship between objective and perceived website complexity. The approach we took was to examine the effects of objectively-rated Website complexity on perceived complexity in a controlled experiment. To select existing commercial website, we followed a comprehensive procedure based on the approach of Nadkarni and Gupta (2003) and Nadkarni (2004).

### **Operationalization of Independent Variable and Website Selection**

We employed existing commercial websites in our study, instead of building our own, although the advantages of building websites are obvious. Although using existing commercial sites can be limiting in terms of design styles and manipulation over independent variables, it provides the compensating advantage of "being real." The sites used in this study are working sites with vast selections of products and real information. They represent the way websites are designed and operated in real world, and thus increase the applicability of our study's findings to practice. To build a site to attain this level of reality would be prohibitive in terms of time, budget, and technical expertise for the current study.

The first step in selecting websites for the study was to determine most and least familiar product categories. A comprehensive list of 25 product categories was compiled based on the directories of the ten most popular search engines and Web directories. A group of over 40 Ph.D. students in a large business school in the Southwest were asked to pick out five most and least familiar categories from the list. We chose the most familiar categories in our study; books/magazines, computers, clothing, movies and music, and consumer electronics. There were reasons to be cautious about the results because the sample was rather specialized: most Ph.D. students were between 25 and 35, had low incomes, lived in rented apartments and houses, and were experienced computer and Internet users; many were international students. Although this list may not be generalizable to the larger online population, it was useful for our study because college students, who were our targeted subjects, shared similar characteristics with the Ph.D. students. For each of the most familiar website categories,

five or six of representative websites were selected from the list of most popular websites in the yahoo.com directory. Thirty-two websites were included in the final website pool.

The next step was to determine the structural complexity of the websites. A group of students from upper level and graduate supply chain classes was asked to be raters of websites. For each website, the raters based their scores on information gathered from five example pages: the home page, an intermediate page, a product list page, a product page, and a search result page. Each of the 32 websites was rated by two raters on over 60 objective attributes, overall and page. Page attributes were drawn from previous research (Tarasweich, in press; Nadkarni and Gupta, 2003) and included page length, number of graphics, percentage of white space, percentage of text, number of links, page layout, and colors. Overall attributes of the site included items such as the total number of shopping aids and the average depth of pages. The scores from two raters were first averaged; page scores such as page length, number of links were then averaged across page types. A sample worksheet is available upon request.

To assess content complexity, we used the evaluations of websites on [www.bizrate.com](http://www.bizrate.com). Bizrate regularly ranks commercial websites based on items such as product information, information, popularity of the site, and user satisfaction and reports. We included three scores from their report as indicators of content complexity: ease of navigation, product variety, and clarity of product information.

K-means cluster analysis was used to classify these 32 websites in terms of complexity based on their scores on the indicators. We tried several combinations of classification variables that had been used in previous literature (Nadkarni and Gupta 2003; Nadkarni 2004) and displayed fairly large variation in our data. ANOVA tests of these variables have shown that product variety, number of products per page, average length of page, average number of links per page, and average number of image per page were more discriminative than others. Three websites from the original set were not rated by bizrate.com; they were excluded from cluster analysis. Twenty-nine sites were classified into two clusters; 11 were more complex, and 18 were relatively simpler. In certain categories, such as clothing and consumer electronics, almost all websites classified into one cluster. This suggests that little difference existed among those websites. Based on the cluster results, we selected a total of eight websites from two categories: books/magazines and computers. They represent two levels (high vs. low) of complexity, structural and content complexity combined, for two product categories, giving us a nested experimental design. Cluster test results and final list of websites can be obtained from the first author.

### **Procedure and Experimental Context**

A laboratory experiment was conducted with the eight websites. A package of documents and instructions was given to subjects when they arrived. A subject number and a site code (a Greek letter representing one of the eight websites) were written on the instruction sheet. The assignment of site codes was sequential from the first (Site Alpha) to the last (Site Lambda), and then continued from the first one again. Because the arrival of subjects was a random process, the assignment of websites was also random; the process also reduced the possibility of having uneven sample sizes between cells.

After signing a participation agreement and completing a pre-task questionnaire, the subject was directed to their assigned website through a controlled webpage developed by the researcher. To reduce potential bias toward a site, such as a prior perception, the subject was unaware until they arrived at their assigned site which site they were to visit. After engaging with the website for about 6 to 8 minutes, subjects answered a post-task questionnaire. No formal mechanism prevented subjects from clicking on the wrong link in the control page (i.e., going to the wrong site); however, mouse movements were captured by software, and an examination revealed that no subjects went to wrong website.

### **Measurement**

The pre-task questionnaire collected demographic data and assessed individual differences: general computer and Internet usage. The complexity measure was based on items from previous research, which exhibited good reliability in the past. The first five questions were derived from Geissler et al (2001). The second group of nine questions was selected from the semantic differential scales developed by Nadkarni and Gupta (2003) and Nadkarni (2004). We also added two very straightforward statements regarding the overall complexity at the end of the questionnaire. These two questions were: "I found this website was complicated" and a reverse version "I felt the website was pretty simple." Each of the questions were phrased in a 7-point Likert scale format. Please refer to Appendix A for the items.

## DATA ANALYSIS AND RESULTS

Respondents included 214 female and 143 male students, for a total sample of 357. Subjects' majors included communication, accounting, marketing, finance, management, information systems, and others. The average age was 21.2 years. No differences in responses because of gender, age, major, or level were found.

Sixteen questions regarding site complexity were compiled from various studies and used as the measure for perceived complexity in the current study. Factor analysis using the Maximum Likelihood extraction method and equamax rotation yielded a three-factor structure. Examination of the items (please refer to the Appendix) revealed clearly interpretable factors, suggesting that these three groups of items form meaningful sub-dimensions of perceived site complexity. For example, "I found this website was complicated" and "I felt the website was pretty simple" were designed to assess overall perceived complexity. "The website is complex" and "The website is overwhelming" also expressed an overall feeling toward a website. Thus, we combined these four into one factor and labeled it as "Overall Complexity." When we looked at the next group of questions, e.g., "The website is interactive," "open/cluttered," and "sparse/dense," they were more or less related to the design of the Web page. Therefore, we labeled them as "Presentation." On the other hand, the last group of questions concerned the navigational aspect of a site. For example, "logical/illogical" and "predictable/unpredictable" relate to ease of movement through the site. Those items were thus combined into three factors, summarized in Table 1. Reliabilities of the items making up each factor were acceptable according to standards discussed in Straub et al. (2004).

**Table 1. Perceived Complexity Factors**

Factors	Items	Reliability
Overall complexity	OC1, OC2, COM1, COM4	.8024
Presentation	COM2, COMN2, COMN3, COMN4, COMN9	.7673
Navigation	COMN5, COMN6, COMN7, COMN8	.8135

To see whether perceived complexity was high for websites with a high level of objective complexity, complexity scores were calculated as averages of perceived complexity factors and the differences in means were tested using ANCOVA (Table 2) with site familiarity and product familiarity as covariants. Product familiarity was significant for all perceived complexity factors, while site familiarity was only significant for the navigation aspect of perceived complexity. These results are not surprising in that the knowledge of a product is one of the important aspects of task complexity when making buying decisions. It is only natural for visitors to perceive a website to be more complex when they have little product knowledge because they have to both comprehend the content and determine the structure of the site. Category main effects on all three factors were not significant.

**Table 2. Test for Differences in Complexity**

	Overall		Presentation		Navigation	
	F	p-value	F	p-value	F	p-value
<b>Main effect</b>						
Category	.046	.831	.049	.825	.313	.576
Objective Complexity	1.116	.292	4.796	<b>.029</b>	.256	.613
Category *	.637	.425	1.815	.179	.837	.361
<b>Covariant</b>						
Site familiarity	2.637	.105	3.524	.061	4.818	.029
Product familiarity	16.273	.000	5.013	.026	16.046	.000

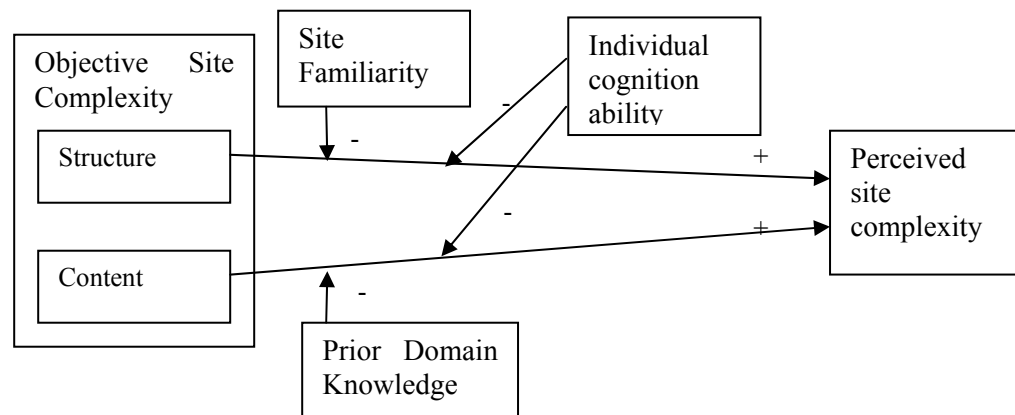
The result shows that the perceived complexity factors do not appear to be affected by objectively rated site complexity. An analysis of means show that websites with higher objective complexity have lower perceived overall complexity; however, this difference is not significant. Websites with higher objective complexity are perceived to be more complex in terms of presentation and navigation than those with lower objective complexity, but only presentation is significant.

## DISCUSSION AND CONCLUSION

While our results show that, on average, there is a relationship between objective and subjective complexity, the relationship is not as strong as we expected. There are some possibilities for our findings. For instance, it is possible that, despite our attempt to control time spent in the various websites (about 6 to 8 minutes), we were unable to control how the subject used and navigated through the sites. If a subject does not browse all parts of the site and they judge perceived complexity based on the particular parts they have experienced, they may not see a representative amount of content from which to develop an informed perception. On the other hand, the procedure for rating objective complexity includes a thorough browsing of the site by viewing five types of Web pages, which provides a broader measure.

It is also possible that having only two raters for each site in the objective ratings may have had an impact on the results. However, those raters were controlled (told which pages to examine) and the inter-rater reliability indicated agreement. Any potential impact from the method of rating would be minimal. Other factors, such as the task at hand, can also affect perceived complexity. For example, as an experienced shopper myself, normally I would not find amazon.com to be complicated although it is a vast website and has much going on in its pages. If I were looking for items in a domain I was unfamiliar with, however, I might feel it was overwhelming. In fact, we did see a relationship between site and product familiarity and perceived complexity.

Familiarity of website and product were covariates in the current study. Not surprisingly, additional regression analysis shows that they have significant relationship with perceived site complexity, showing the effect of prior knowledge on perception of complexity (McDonald and Stevenson, 1998). We targeted products that were well known within our sample population; this approach may have reduced our ability to discern perception differences. Certainly, in the future, prior knowledge should be considered not as covariate but as a main factor. Thus, its effect can be studied further so that design strategies targeting visitors with different backgrounds can be derived.



**Figure 1. Research Model of Website Complexity**

Another potential avenue for future research is a tighter focus on the cognitive differences of website visitors, of which prior knowledge is one aspect. In complexity research, cognitive mechanism (e.g., Campbell, 1998; Germanprez and Zigurs, 2003) is often recognized. Cognitive mechanism is a key involved in the transformation of the objective complexity to subjective complexity, addressing how individuals retrieve and use information (both structural and content) on a website. Constructs that have been examined include mental model development (Thuring et al., 1995; Dalal, Quible, and Wyatt, 2000; Brandt and Uden, 2003), prior knowledge and familiarity (Otter and Johnson, 2000), and human cognitive capacity (Campbell, 1998). To include such a factor into the research model would allow us to probe the underlying mechanism how objective complexity is “transformed” into site complexity, yielding a better understanding. We posit that individual differences on familiarity of site and product and cognitive ability intervene/interact with objective site complexity. A possible research model based on the discussion is shown Figure 1. Two sources of site complexity are site structure and content. The more variety a site has in its structure and content, the more the user finds it complex. However, the relationship is moderated by the user’s familiarity of the site, prior knowledge of the domain, and his/her cognitive ability. That is, if the user is more familiar with the site, he or she will not perceive the site to be complex. Similarly, prior knowledge of content domain will reduce the cognitive load on site comprehension, thus, less complicated the site appears. If the user has a higher cognitive ability, he or she would not feel the site as complex. Each of these concepts should be operationalized and addressed in future research in this area.

In the paper, we examined the relationships between perceived complexity and objective complexity, positing that these similar constructs are positively related. We posited that subjects would find a website with high objective complexity more complicated than a website with low objective complexity. We reported a study examining the relationship between objective website complexity and subjectively complexity based on user perceptions. Eight websites were selected based on their ratings on a set of objective measures; data on user perception were collected after the user visited the websites. Although the overall results indicate that there is a positive relationship between these constructs, it is a relationship that is far from simple. We have produced a foundation for future work in this area.

## REFERENCES

1. Berlyne, D.E. *Conflict, Arousal, and Curiosity*, McGraw-Hill Book Company, Inc., New York, 1960.
2. Brandt, D.S., and Uden, L. "Insight into mental models of novice Internet searchers," *Communications of ACM* (46:7) 2003, pp 133-136.
3. Bucy, E.P., Lang, A., Potter, R.F., and Grabe, M.E. "Formal features of cyberspace: relationships between Web page complexity and site traffic," *Journal of the American Society for Information Science* (50:13) 1999, pp 1246-1256.
4. Campbell, D. "Task Complexity: A review and Analysis," *The Academy of Management Review* (13:1) 1988, pp 40-52.
5. Dalal, N.P., Quible, Z., and Wyatt, K. "Cognitive design of home pages: an experimental study of comprehension on the World Wide Web," *Information Processing and Management* (36) 2000, pp 607-621.
6. Farris, J.S., Jones, K.S., and Elgin, P.D. "Users' Schemata of hypermedia: what is so 'spatial' about a website?" *Interacting with Computer* (14:5) 2002, pp 487-502.
7. Geissler, G., Zinkhan, G., and Watson, R. "Web home page complexity and communication effectiveness," *Journal of Association for Information Systems* (2:2) 2001.
8. Germonprez, M., and Zigurs, I. "Causal factors for web site complexity," in: *Sprouts: Working papers on information environments, systems and organizations*, 2003.
9. Huang, M.-H. "Designing website attributes to induce experiential encounters," *Computers in Human Behavior* (19) 2003, pp 425-442.
10. Huang, M.H. "Information load: its relationship to online exploratory and shopping behavior," *International Journal of Information Management* (20) 2000, pp 337-347.
11. Marshall, C.C., and Shipman, F.J.I. "Spatial hypertext: designing for change," *Communications of ACM* (38:8) 1995, pp 88-97.
12. McDonald, S., and Stevenson, R. "Effects of text structure and prior knowledge of the learner on navigation in hypertext," *Human Factors* (40:1) 1998, pp 18-27.
13. Nadkarni, S. "Perceived Website Complexity and Telepresence: The Moderating Role of Online User Tasks," Academy of Management Annual Conference, New Orleans, 2004.
14. Nadkarni, S., and Gupta, R. "Perceived Web site complexity: Conceptualization, measurement, and validation," Academy of Management Conference, Academy of Management, Seattle: WA, 2003.
15. Oinas-Kukkonen, H. "What is inside a link?" *Communications of ACM* (41:7) 1998, pp 98.
16. Otter, M., and Johnson, H. "Lost in hyperspace: Metrics and mental models," *Interacting with Computers* (13:1) 2000, pp 1-40.
17. Schneider, S.C. "Information overload: causes and consequences," *Human Systems Management* (7:1) 1987, pp 143-153.
18. Tarasewich, P. "An investigation into web site design complexity and usability metrics," *Quarterly Journal of Electronic Commerce*, in press.
19. Thuring, M., Hannemann, J., and Haake, J.M. "Hypermedia and cognition: designing for comprehension," *Communications of ACM* (38:8) 1995, pp 57-66.

## APPENDIX

### Perceived Complexity by Nadkarni and Gupta (2003) and Nadkarni (2004)

- COMN1. Uniform/varied
- COMN2. Open/cluttered
- COMN3. Congruent/incongruent
- COMN4. Sparse/dense
- COMN5. Coherent/incoherent
- COMN6. Logical/illogical
- COMN7. Predictable/unpredictable
- COMN8. Organized/non-organized
- COMN9. Distracting/non-distracting (reversed)



**Perceived Complexity by Geissler et al. (2001)**

COM1. The web site is complex.

COM2. The web site is interactive.

COM3. The web site is crowded.

COM4. The web site is overwhelming.

COM5. The web site has much variety

**Overall Complexity**

OC1. I found this web site was complicated.

OC2. I felt the web site was pretty simple. (reversed)