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Anjala Krishen
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PERCEIVED VERSUS ACTUAL COMPLEXITY FOR WEBSITES: THEIR RELATIONSHIP TO CONSUMER SATISFACTION

Anjala Krishen, University of Nevada Las Vegas
Kunal Kamra, Freddie Mac

ABSTRACT

This article aims to further the understanding of how visual and decision-making complexities in websites impact the subjective experiences individuals have as they traverse them. More specifically, we attempt to understand subtle yet important differences in how consumers perceive complexity of a website and how that perception then impacts their satisfaction and liking of that website across two different types of products, hedonic and utilitarian. The most important contribution of this article is the idea that complexity per se is not simply a perceptual phenomenon but is also governed by situational and contextual factors. In essence, the subjective outcomes of satisfaction and liking that individuals experience as a result of variations in degrees of complexity of websites, though difficult to predict, can be managed with careful target marketing.

INTRODUCTION

E-commerce has been the object of research and empirical study since its conception, not only due to its widespread sales impact, but also because of the plethora of data that can be gathered "behind the scenes" on unknown consumers. Even though websites are often a source of advertisement, there is an adaptive aspect to the internet that extends beyond a static image or a non-user specific commercial, i.e. "interactivity and the ability to provide information on demand." (Peterson et al. 1997) In the context of e-commerce, if this interaction is viewed as dynamic and bidirectional, a website can be paralleled to a salesperson. This would mean that websites, in order to create attitude change, attempt to convey a persuasive message to consumers. Although this is also true of other forms of advertisement, persuasion theory focuses more on "living" relationships as opposed to static images. In essence, much like any visual stimulus, a website must deliver the optimum level of excitement and yet not create so much confusion for the perceiver that it leads to disinterest or frustration. Instead, a website must be persuasive and impactful enough to make its visitor want to return and interact again. As part of this excitement/confusion dilemma, website designers are constantly confronted with the question of how much information to convey on their sites without creating confusion for their visitors. One measure of the amount of information presented per unit of space on a website is actual versus perceived website complexity, which is the subject of the present research.

This article aims to further understand and clarify how visual and decision-making complexity in websites impacts the subjective experiences individuals have as they traverse them. Of particular interest is the delineation between actual and perceived complexity, as those have not been well studied to date. In fact, ample research classifies complexity per se as an individual perceptual phenomenon, making it a very difficult and evasive construct to define and measure. The main research question for this article is if and how consumer perceived website complexity, satisfaction and liking, (or alternatively, website effectiveness) is a function of two key factors: actual website complexity, and website context (i.e. hedonic versus utilitarian product websites).

The rest of the article is organized as follows. The next section summarizes the relevant literatures on: (1) visual complexity

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theory; (2) the relationship between complexity and satisfaction; and (3) the basic problem of information overload. The following section develops the conceptual framework and research hypotheses for the main study which was conducted. Next is a section on the pretest to determine actual variety of the websites, followed by the main study methodology, results, and discussion. Finally, the conclusions, implications, limitations, and future research are discussed.

LITERATURE REVIEW

Visual Complexity Theory and the Importance of Context

Whereas consumer perceptions may not always be completely predictable (i.e. perceptual and "actual" complexity may not always match), research has shown that context can play a large role in further clarifying why they may not. Namely, in terms of service performance, expectation-disconfirmation theory shows that under certain circumstances, consumers expect to be faced with certain settings and their perception of what they get faced with in reality is compared with those expectations (which are based on their prior experiences) (Oliver 1980). Thus, website complexity perceptions should also be largely influenced by the context, brand, or product which is represented in the website itself. To that end, whether a product is hedonic (i.e. a "want") or utilitarian (i.e. a "should"), in nature, should have an influence on how a consumer perceives the complexity of its accompanying website. As will be explained later in this article, the delineation of a website as hedonic versus utilitarian (see Table 3) will be used as a mechanism to test the importance of context in complexity perceptions.

Visual complexity has impact in several fields such as computer science, human factors, psychology, and marketing, and thus is the subject of many streams of research that have been conducted for many years. Trying to understand the concept of perception itself began with empiricists, psychophysicists and psychometricians (Murray 1908; Stevens 1975) and then progressed to gestalt psychologists (Koffka 1935). The gestalt psychologists recognized the concept of the situational conditions surrounding the perception of a stimulus and the motivations of *simplicity* and *homogeneity* as guiding principles behind human perceptions of ambiguous objects (Hochberg 1957). Donderi (2006) summarizes the literature on visual complexity by drawing together many ideas including those of gestalt psychologists, information theorists (such as algorithmic information theory), and neuro-physiologists who study the central nervous system. He concludes that a measure of visual complexity has yet to be successfully defined but that such a measure would require understanding of the interplay between the data or stimulus itself and the task given to an individual, as both would combine to impact individual perceptions. Recognizing the clear distinction between perceived and actual complexity, the present research attempts to further empirically understand the extent to which individuals are calibrated in their perceptions. Of further importance is the fact that website complexity is even more precarious an idea than the simplest form of visual complexity which Donderi (2006) discusses in stimulus-based psychological research where individuals are presented with pictures. Websites not only contain an initial image followed by many more, but further complicate matters by requiring people to traverse their often complex pathways in order to accomplish some sort of goal.

As explained earlier, any perceptual measure of visual complexity must account not only for the stimulus itself but also for the task required of the individual. In line with this, Fischer, Schulz-Hardt, and Frey (2008) explain that the need for consistency, i.e. the preference for consistent information, which is a basic individual motivation, actually increases in intensity as the amount of

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complexity in the decision-making task increases. Fischer and colleagues further suggest that as complexity in the decision increases, the need for closure increases (Kruglanski and Webster 1996), triggering individuals to want to reduce their decisional complexity by reaching a choice (or "freezing") as quickly as they can. Thus it is important for website designers to realize that by increasing the actual complexity of their websites, they might inadvertently lead individuals to make hastier decisions.

Martin, Sherrard, and Wentzel (2005) relate the individual differences variables of sensation seeking and need for cognition to website complexity perceptions in individuals. The important idea in their research for the present article is that again, actual and perceptual complexity are not, by any means, synonymous for all individuals at all times. Whereas researchers can use tools, such as Webtango (Ivory, Sinha, and Hearst 2001) to measure the actual complexity of a website, such tools will not take into account individual motivations, salience of the website, or even the personality factors of the perceiver. Thus a simple standalone measure of actual complexity will fail to recognize the key situational factors which impact perceptual complexity.

In an advertising context, Geissler, Zinkhan and Watson (2006) empirically examine how the complexity of a website impacts consumer attitudes, purchase intentions and attention to that website. They present three levels of complexity and find support for the inverted U relationship between complexity and pleasure, i.e. the idea that there is an optimal complexity level beyond which pleasure decreases for the perceiver (Berlyne 1960).

Complexity and Satisfaction

There is little doubt that websites that provide users a satisfying experience can act as differentiators in a crowded marketplace and can provide online retailers with a sustainable competitive advantage (Kotha et al. 2004). Therefore understanding how the information cues presented at a website affect user experience is critical for the success of online companies.

Research in the field suggests that several elements of PWC (perceived website complexity) affect important user outcomes such as perceived web-information and web-system quality (McKinney et al. 2002), communication effectiveness (Geissler et al. 2001), and satisfaction (Stevenson et al. 2000). The research can largely be categorized into three schools of thought because of varied interpretations. First, studies suggest that simpler websites are easy to use and effective (Agarwal and Venkatesh 2002; Shneiderman 1998), arguing that greater PWC creates confusion and frustration in users, resulting in a negative impact on key user outcomes such as perceived ease of use. A second school of thought suggests that complexity increases the richness of information presented and thereby increases user satisfaction (Palmer 2002). The third school of thought suggests that there exists an inverted-U relationship between website complexity and communication effectiveness (Geissler et al. 2001; Stevenson et al. 2000), such that low levels of PWC create boredom for users, whereas high levels of PWC create confusion and conflict for users. Different studies present conflicting findings and, it is largely unclear whether website complexity *enhances* or *inhibits* user satisfaction. The present research speaks to this discrepancy of findings from previous research by contending that *context* plays a key part in consumer expectations of website complexity. Hence, as further justification for the present research, clarification of these conflicting results may enhance existing empirical research by further expanding extant knowledge of the complex relationships between actual and perceived complexity and consumer subjective states of satisfaction and liking.

Nadkarni and Gupta (2007) propose a "Task-Based Model of Perceived Website

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Complexity" where PWC (perceived website complexity) is a function of three parts: *component* (density and dissimilarity of visual features such as text, graphics, video, and animation presented on the website), *co-ordinative* (range of topics covered by the website and interrelationships between these topics), and *dynamic* (ambiguity and clarity of action outcome relationship in a hyperlink). Their study shows that the relationship between objective website complexity and PWC is moderated by user familiarity. Further, that online task goals—goal-directed (focused on information gathering to achieve a predetermined end goal) and experiential goals are important in understanding the relationship between PWC and user satisfaction. They suggest that medium levels of PWC will maximize user satisfaction by arousing users' curiosity and engaging them in the navigation process without excessively burdening them. Thus, their research supports the inverted-U relationship between complexity and satisfaction.

The Problem of Information Overload

In empirical settings, many researchers have explored how the presentation of too many choices or product attributes leads to negative outcomes for individuals, such as suboptimal decisions or negative subjective mental states (frustration or dissatisfaction) due to information overload (Jacoby and Malhotra 1984; Keller and Staelin 1987). Over-choice as a phenomenon has been studied in terms of the effort-accuracy framework, with the underlying argument centering on its adverse affect on choice quality (Payne, Bettman and Johnson 1993). Previous research on choice set construction has shown that when the amount of information displayed is structurally varied, information overload, resulting from less information acquisition, can result in lowered decision quality (Keller and Staelin 1987; Lurie 2004).

Iyengar and Lepper (2000) find that larger choice sets create greater levels of frustration and regret and post-choice lowering of satisfaction in comparison to smaller choice sets. The overchoice effect, as presented by Gourville and Soman (2005) is more likely to occur in sets of items in which conflict within the items is greater, i.e. nonalignable assortments, and can result in lowered brand choice. More recently, Mick, Broniarczyk and Haidt (2004) discuss the deleterious consumer outcome effects of hyperchoice such as increased stress, negative emotions, and decreased satisfaction. As a possible remedy to this phenomenon, Chernev (2003) suggests that when providing consumers with a large choice set, the presence of an ideal point allows them to simplify the choice process and leads them to a stronger preference for their selected alternative.

In contrast to the over-choice effect, the research of Oppewal and Koelemeijer (2005) uses twelve items as their largest assortment, but finds that more choice is always regarded as better, regardless of the similarity of the items and whether the choice set already contains a preferred alternative. Although this finding conflicts with most previous studies regarding the over-choice phenomenon, the degree of similarity between the items is not directly discussed for the choice sets. Clearly, whether labeled information overload, over-choice, or hyper-choice, the negative consequences of this phenomenon have been reported extensively in the consumer behavior literature.

The law of diminishing returns, stated as "When increasing amounts of one factor of production are employed in production along with a fixed amount of some other production factor, after some point, the resulting increases in output of product become smaller and smaller" (Johns and Fair 1999). Although this law was originally proposed to explain productivity in farming situations, it has continued to be applied to consumer choice models to explain, for example, attribute valuation. Economics literature has intro-

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duced cost-benefit analysis, which has been applied to consumer decision making strategy (Payne, Bettman, and Johnson 1993) in terms of the trade-off between effort (cognitive load) and accuracy (choice quality). This framework suggests that compensatory decision making strategies are often bypassed in order to save effort and use noncompensatory heuristic ones, leading to a possible decrease in decision accuracy (Luce, Bettman and Payne 2001).

Thus the harms of information overload due to excessive complexity are well documented in the literature. Not only can website visitors experience a range of negative subjective states such as dissatisfaction and frustration, but they can also be forced to make premature decisions (freezing), use noncompensatory choice strategies, or make suboptimal decisions.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

For the purpose of trying to understand subtle yet important differences in how consumers perceive complexity of a website and how that perception then impacts their satisfaction and liking of that website, the present research uses two product domains, namely cameras and books. Using these two product categories will show that subjective perceptions of complexity are far more domain-specific and are based on more than the simple presentation characteristics of a website. This article contends that whether a purchase is high-technology or hedonic versus more utilitarian and thus mundane will impact the expectations of complexity for a website. These consumer expectations, in turn, may show that even if a website is perceived as too complex, a consumer's satisfaction and liking of it may not be negatively impacted. Although both cameras and books should be similar in their usefulness to consumers, they may not be viewed as completely parallel purchases. Whereas books would be considered utilitarian products, as a general rule, especially among college students, cameras would be considered more hedonic purchases (Crowley, Spangenbert, and Hughes 1992; Voss, Spangenbert, and Grohmann 2003; Okada 2005). Due to the fact that participants were presented with two product domains, perceived complexity of the websites will not match the normal expectation given with the actual complexity ratings. Because of consumer expectations of higher complexity for high technology hedonic products, there should also be a main effect for the website type factor. Thus the main study presents the following research hypotheses:

H1a: There should be no main effect for actual complexity for the perceived complexity dependent variable.

H1b: There will be a main effect for the website type factor such that utilitarian websites will have lower perceived variety than hedonic websites regardless of their actual complexity levels.

H1c: Given H1a and H1b, it is not predicted that there will be an interaction effect between the actual complexity and website type factors for the perceived complexity dependent variable.

Geissler et al. (2001) use a combination of research methods (focus groups, interviews, and experiments) to identify design elements that influence consumers' perceptions of web page complexity. Their study reports that perceived complexity is a result of four major factors: number of links, number of graphics, home page length, and animation. Their results show that complexity increased with the number of distinguishable elements, the dissimilarity between the elements, and that there is a curvilinear relationship between complexity and communication effectiveness. They demonstrate that an optimal *zone* of relatively moderate complexity exists and that within

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this range of moderate complexity, higher communication effectiveness (i.e. higher attention and attitude-toward-the-ad levels) is evident. They also suggest that goal-directed consumers seeking product information are more attentive. The main implication of their research is that the level of website complexity should be a critical consideration when designing a website.

Bansal et al. (2004) study e-satisfaction and its relationship to behavioral outcomes in an online setting by looking closely at customers' stated purchasing behavior and their actual purchasing behavior. They find that website attributes are significantly related to overall website satisfaction. Further, that overall website satisfaction is significantly related to stated behavioral outcomes (referral, retention, and conversion) and actual behavioral outcomes (site visits per person, time spent, and number of pages viewed). The major implication of their research is that website characteristics are the most important driver of behavioral outcomes.

Given the extant literature summarized above, it becomes clear that there are mixed findings on the relationship between complexity and satisfaction. The present research aims to clarify some of these mixed findings by separating actual and perceived complexity to differentiate between their effects on consumer satisfaction and liking. Given the nature of the purchases, as outlined in the first set of hypotheses, cameras being more hedonic purchases than books, the following research hypotheses are thus presented for satisfaction:

H2a: There will be a significant main effect for actual complexity such that participants should have lower satisfaction when websites have higher actual complexity.

H2b: Participants will have higher satisfaction in their interactions with hedonic websites than in their interactions with utilitarian websites.

H2c: Given H2a and H2b, there will be an interaction effect between actual complexity and website type for the satisfaction dependent variable.

Consumer liking of the websites is hypothesized to be consistent with consumer satisfaction and therefore, the hypotheses will be consistent with this notion. It is therefore hypothesized that:

H3a: There will be a significant main effect for actual complexity such that participants will have lower liking when websites have higher actual complexity and higher liking when websites have lower actual complexity.

H3b: As liking is expected to be highly positively correlated with satisfaction, participants will have significantly higher liking of hedonic websites than utilitarian websites.

H3c: Given H3a and H3b, there should be an interaction effect between actual complexity and website type for the liking dependent variable.

All of the above-detailed is summarized in a research model portrayed in Figure 1.

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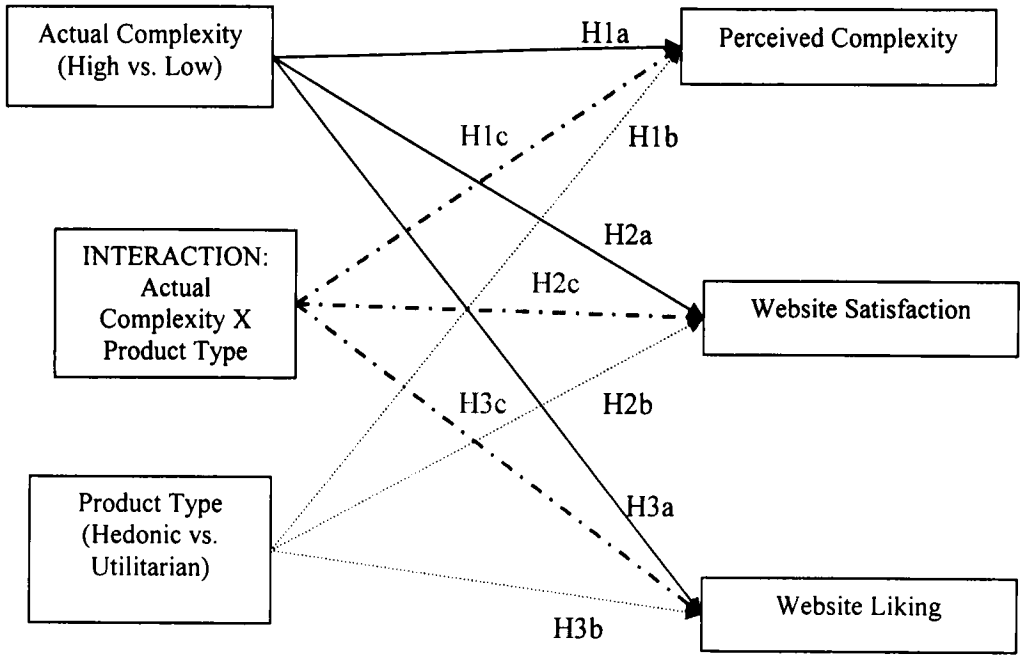
FIGURE 1

Research Model



PRETEST: DETERMINATION OF ACTUAL VARIETY

The first step taken in the pretest was to determine the actual complexity of several websites from two product domains, namely books and cameras. To accomplish this, software called *Webtango* (which was created at the School of Information at University of California, Berkeley) was used. The goal of this software program is to be able to attain website quality ratings without the use of subjective scoring. To that end, Ivory, Sinha, and Hearst (2001) tested this software on several websites and determined a key set of metrics from their Webtango software. In the present research, Webtango is utilized to provide actual average complexity, reading complexity, and overall reading complexity for a set of ten websites, five camera ones and five books ones. The results, given in Table 1, show that Westviewpress and Fujifilm are low actual complexity websites whereas Akpeters and Vivitar are high actual complexity websites.

THE MAIN STUDY

Overview of Study and Independent Variables

All participants were required to complete tasks on four websites and then fill out a survey following each website. As this was a within subject design, each participant visited a total of 4 websites, which were presented in counterbalanced randomized order. Table 2 shows the four conditions and their corresponding tasks. The tasks were created and pretested to take approximately the same amount of time per website so that exposure time was controlled. The experiment employs a 2 (actual complexity level: high/low) x 2 (website type: cameras/books) within-subjects factorial design. Both of the independent variables, actual complexity and website type, were determined based on the pretest results.

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TABLE 1

Actual Complexity per Website using Webtango

Reading Complexity	Overall Reading Complexity	Average complexity	Remote (original) URL for the page	Content	
11.5	19.2	15.35	http://books.mcgraw-hill.com/	books	
-1	-1	-1	http://www.westviewpress.com/	books	lowest
16	22.1	19.05	http://www.akpeters.com/	books	highest
12.2	14.5	13.35	http://www.oup.com/us/collections/owc	books	
17.5	17.6	17.55	http://www.wiley.com/	books	
10.7	17.1	13.9	http://www.quantumbooks.com	books	
-1	-1	-1	http://www.fujifilm.com	cameras	lowest
-1	-1	-1	http://www.kyoceraimaging.com	cameras	
18.6	19.3	18.95	http://www.vivitar.com	cameras	highest
-1	-1	-1	http://www.pentax.com	cameras	
-1	19.5	9.25	http://www.ezonics.com	cameras	
-1	-1	-1	http://www.sigmaphoto.com	cameras	

SAMPLE AND PROCEDURE

A total of 84 marketing undergraduates, enrolled in an introductory level marketing course at an eastern-based university, participated in this study. In this convenience sample, college students were chosen as the target population due to the purpose of the study (with its focus on establishing internal validity) and the salience caused by exposure they already receive to websites in their daily activities. All participant identification information and responses were kept confidential throughout the study to protect the anonymity of the subjects.

The respondents were approximately half males (53.9%) and half females (44.7%) with a median age of 19-21 years. The students' undergraduate standing was mainly junior in both groups (around 80%). Caucasian (80.3%) represents the predominant race/ethnicity followed by Asian or pacific Island (13.6%), African American (4.4%), and Hispanic (1.8%).

Stimuli

Product domains. Marketing researchers have studied hedonic and utilitarian products and consumer motivations in various contexts. The findings indicate that even though products themselves get classified as broadly hedonic versus utilitarian (i.e. "wants" versus "needs"), context can play a large role in altering these classifications. For example, an "apartment with a view" would be seen as more hedonic whereas an "apartment close to work" would be considered more utilitarian (Dhar and Wertenbroch 2000). In order to select the product domains for the current research, a thorough literature review of hedonic and utilitarian product classifications from extant literature was conducted. Table 3 shows the results of scholarly research on such classifications.

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TABLE 2
Tasks Given to Subject per Website

AKPETERS: http://www.akpeters.com/ **Task:** 1. Go to http://www.akpeters.com/ 2. Find the Mathematics section of the catalog. 3. Go to the 'Recreational Math' section and sort the books by 'Bestselling'. 4. There are four different volumes of "Winning Ways for Your Mathematical Plays". 5. Which volume is the most expensive? Remember this for a few minutes and the survey will ask you about this. 6. Close the AKPETERS window. 7. Fill out the survey at the designated link & please answer the questions regarding this website.	**FUJIFILM**: http://www.fujifilm.com/ **Task:** 1. Go to http://www.fujifilm.com 2. Find the category "Digital cameras and accessories". 3. Under the digital cameras showcase, there are different categories for the different models of the cameras. 4. Compare the different cameras under the 'Sophisticated' category and choose the best one based on the information given. Think of a short reason for your choice. Remember this for a few minutes and the survey will ask you about this. 5. Close the FUJIFILM window. 6. Fill out the survey at the designated link & please answer the questions regarding this website.
WESTVIEWPRESS: http://www.westviewpress.com/ **Task:** 1. Go to http://www.westviewpress.com/ 2. Browse the content on the website by subject. 3. Find the Sports & Recreation section. 4. Pick a book that has to do with your favorite sport. Remember the book and the price of that book for a few minutes and the survey will ask you about this. 5. Close the WESTVIEWPRESS window. 6. Fill out the survey at the designated link & please answer the questions regarding this website.	**VIVITAR**: http://www.vivitar.com/ **Task:** 1. Go to http://www.vivitar.com/ 2. Browse the content on the website. 3. Find the category for digital cameras and view the catalog. 4. Among the different cameras listed for 2004, choose the best camera out of the four and five mega-pixel models. Think of a short reason. Remember this for a few minutes and the survey will ask you about this. 5. Close the VIVITAR window. 6. Fill out the survey at the designated link & please answer the questions regarding this website.

Cameras have been found to be hedonic purchases, and thus are currently used as a hedonic product. Due to the choice of college students as the sample, the contention of this research is that books are considered salient as utilitarian products for students. In the classroom setting, the average student should evoke a *classroom* schema when thinking of books. Although this may not be the case with every student, as previous literature has shown, overall classifications of books as utilitarian and cameras as hedonic should be appropriate.

Choice of actual websites. Similar to the procedure followed in previous internet research, the present study uses existing websites, which were identified via Webtango software, during a pretest. For example, McMillan, Hwang, and Lee (2003) study informational versus transformational creative strategies on websites (namely, Sterling-hotel.com, Treasurebay.com, Marriott.com, and Hilton.com), and document the use of a sorting technique to select the websites. Other research, such as Ha and Janda (2008), asks respondents to recall an actual website purchase and answer questions regarding their recent experiences.

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TABLE 3

Prior Research on Hedonic and Utilitarian Purchasing

Authors	*Hedonic Product Choices*	*Utilitarian Product Choices*
Khan, Dhar, and Wertenbroch (2004)	Flowers, designer clothes, music, sports cars, luxury watches, chocolate	Microwaves, detergents, minivans, home security systems, personal computers
Dhar and Wertenbroch (2000)	M&M's, audio tapes, apartments with a view	Glue stick, computer diskettes, apartments close to work
Patrick and Park (2006)	Vacation, home-entertainment system	Washer/dryer, pest control service
Voss, Spangenberg, and Grohmann (2003)	Tobacco, beer, video games, television sets	Disposable diapers, shoelaces, alkaline batteries, article clips
Okada (2005)	Bailey's Irish Cream Cheesecake, $50 dinner certificate, camera, Sony Discman, PDA, sparkling red S2000	Cheesecake deLite, $50 grocery certificate, Casio scientific calculator, Webster's dictionary, Pilot EX sports-utility vehicle

Measures

Based on construct definitions, we reviewed the literature for existing scales, adjusted them to fit the website context where appropriate, and pretested them within the sampling context. The resulting survey instrument consisted of several items measuring perceived complexity, website satisfaction, and website liking. As a control variable, each respondent was also asked whether they were familiar with the type of website they just visited (cameras or books, respectively) as a "yes or no" question. Each measure is briefly described next (a detailed list of scale items & reliability is presented in Appendix A).

Effects of actual complexity and website type were assessed across the dependent variables of perceived complexity, satisfaction, and liking. *Perceived complexity* was measured with an eight-item seven-point semantic differential scale which has been previously used in a website context (Geissler, Zinkhan, and Watson 2001). *Satisfaction* was measured with a four-item seven-point semantic differential scale to measure the subject's degree of satisfaction with their experience with the website (Bruner et al. 2001). *Liking* (Murry and Dacin 1996), adapted for websites, was measured with a six-item Likert scale anchored by endpoints strongly disagree/ strongly agree.

RESULTS

Within subjects analysis of variance was conducted to assess the effects of actual complexity and website type. Results are presented in Tables 4 and 5.

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TABLE 4

Experiment: Effect of Actual Complexity and Website Type Conditions on Perceived Complexity, Satisfaction, and Liking

	F-Values		
Main Effects:			
Actual Complexity (AC)	0.97	3.51[c]	9.93[a]
Website Type (W)	10.87[a]	15.35[a]	21.23[a]
Interaction Effects:			
AC X W	1.40	19.53[a]	29.92[a]

[a] $p < .001$, [b] $p < .05$, [c] $p < .10$

TABLE 5

Experiment: Dependent Variable Means for Perceived Complexity, Satisfaction, and Liking

Independent Variables		Perceived Complexity	Satisfaction	Liking
Actual Complexity Condition				
	Low	3.83	4.74	4.41
	High	3.71	4.51	3.92
Website Type Condition				
	Books	3.55	4.41	3.84
	Cameras	3.98	4.84	4.49

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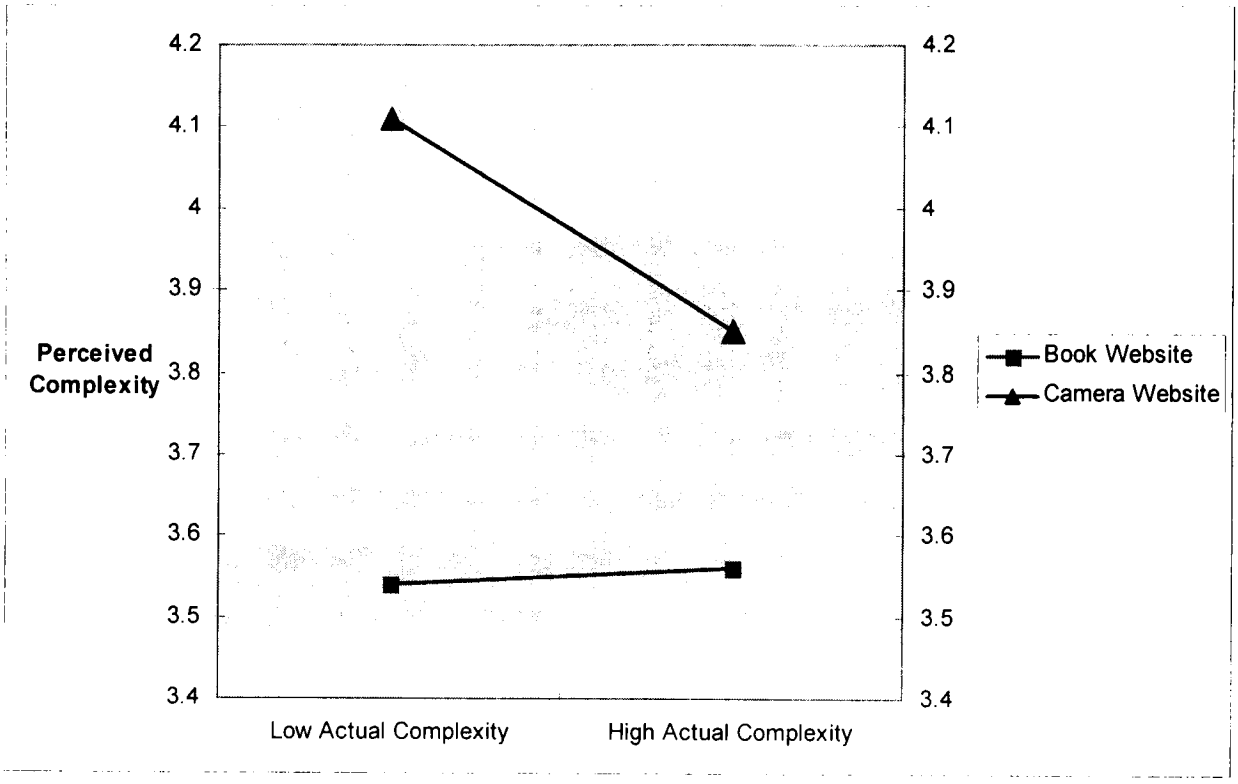
FIGURE 2

Effects of Actual Complexity and Website Type Conditions on Perceived Complexity



Perceived Complexity. The analysis yielded several interesting relationships regarding the actual complexity and website type factors. Consistent with H1a and as shown in Figure 2, there was no main effect for low versus high actual complexity, F (1, 83) = .97, p >.1, M = 3.83 vs. M = 3.71, nor as hypothesized in H1c, was there an interaction effect for the two factors, F (1, 83) = 1.40, p >.1. As predicted in H1b, there was a main effect for website type, such that book websites had significantly lower perceived variety than camera websites, F (1, 83) = 10.87, p <.01, M = 3.55 vs. M = 3.99. For camera websites, low actual complexity resulted in higher perceived complexity, M = 4.11 vs. M = 3.85.

Satisfaction. As shown in Figure 3, the manipulation of actual complexity and website type resulted in significant differences in satisfaction. There was a marginally significant main effect for low versus high actual complexity (F (1, 85) = 3.51, p =.06, M = 4.74 vs. M = 4.51), such that subjects were more satisfied with websites which had lower actual complexity than those that had higher actual complexity, as hypothesized in H2a. There was also a significant main effect for books versus camera websites (F (1, 85) = 15.35, p <.01, M = 4.41 vs. M = 4.84) such that camera websites produced significantly higher satisfaction than book ones, per H2b. As expected given in H2c, there was an interaction effect for actual complexity and website type, F (1, 85) = 19.53, p <.01.

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FIGURE 3
Effects of Actual Complexity and Website Type Conditions on Satisfaction

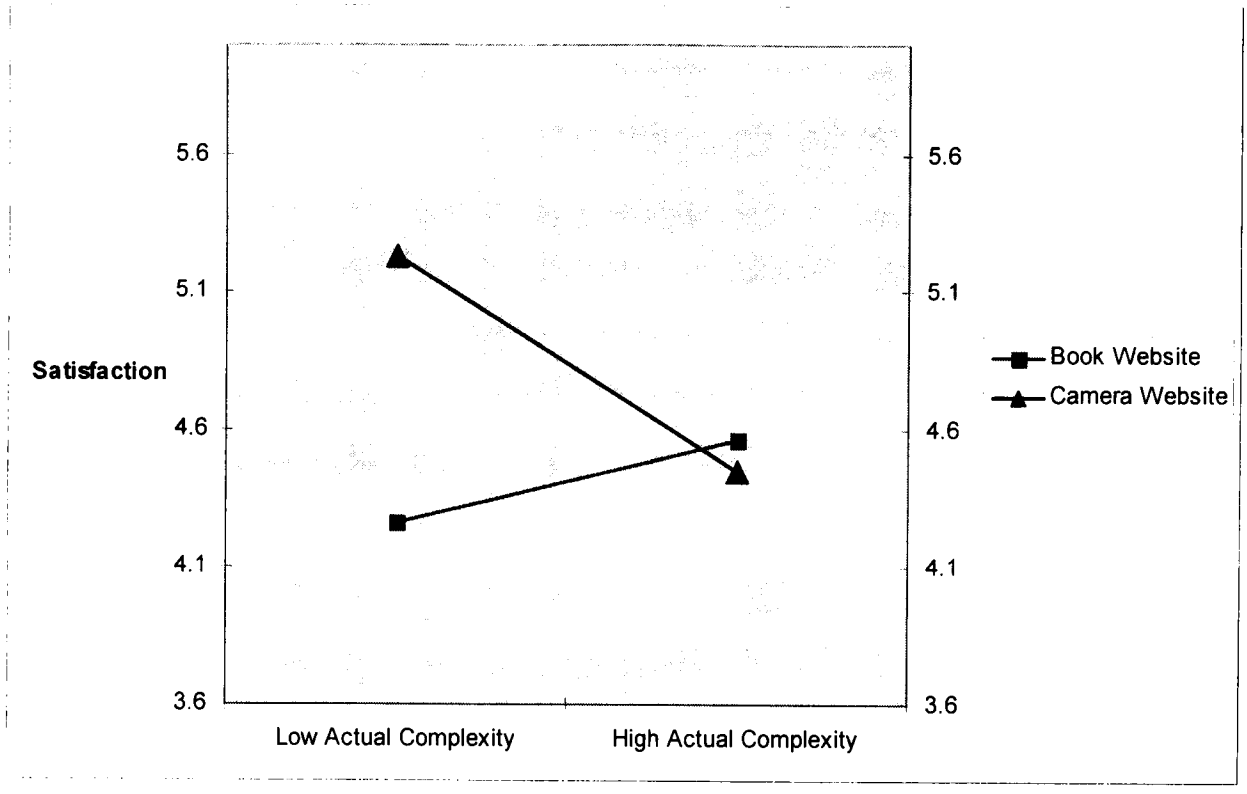
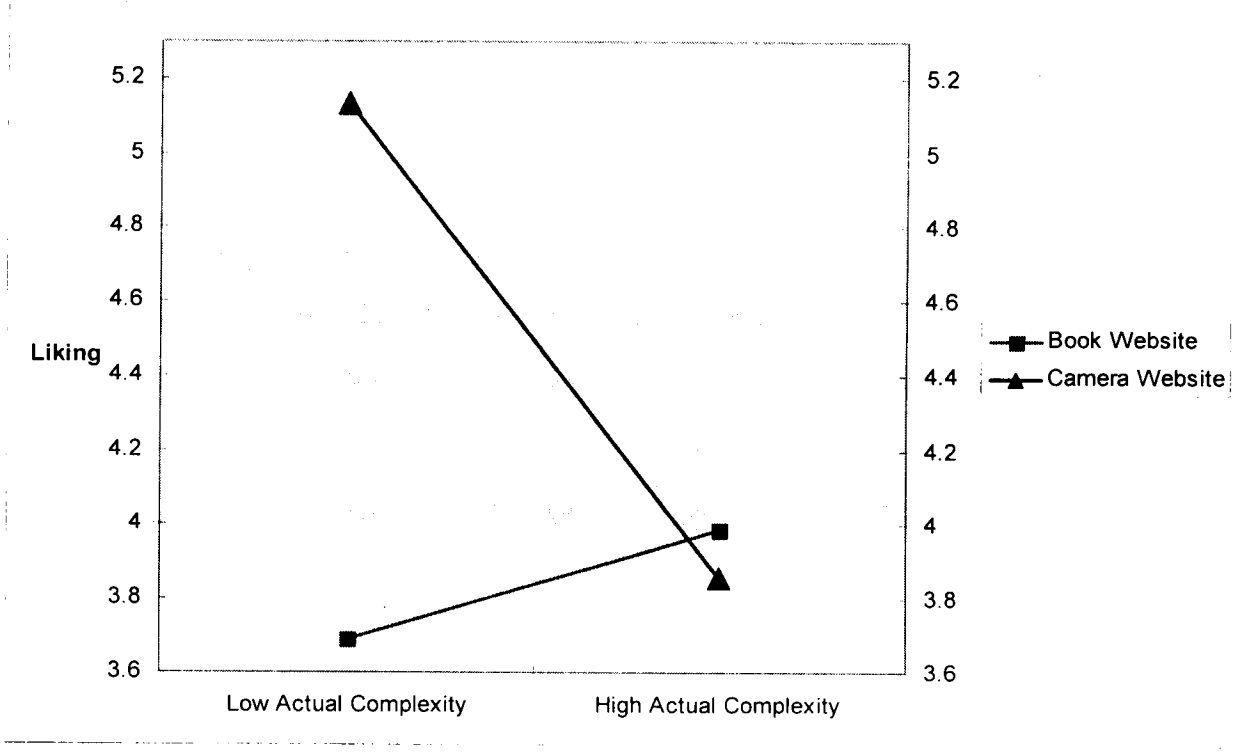


FIGURE 4
Effects of Actual Complexity and Website Type Conditions on Liking



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Liking. As expected in H3a and H3b, there were significant main effects for both low versus high actual complexity, (F (1, 77) = 9.93, p <.01, M = 4.41 vs. M = 3.92), and books versus camera websites (F (1, 77) = 21.23, p <.01, M = 3.84 vs. M = 4.49). As predicted in H3c, there was an interaction effect for actual complexity and website type, F (1, 77) = 29.92, p <.01 for the liking dependent variable. Figure 4 reveals the pattern of relationships.

Familiarity with type of website (control variable). As expected based on the pretesting, subjects were not found to be familiar with the four websites which were chosen for the study. Frequency pie charts show the familiarity measures for all four of the websites in the study and are given in Figure 5. The website types are shown to be extremely unfamiliar to the respondents of the study, as can be seen from the pie charts.

Additional Correlation Analysis

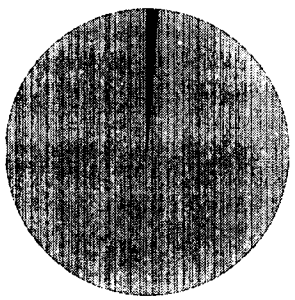
Correlation analysis was used to further understand the hypothesized relationships between perceived complexity, satisfaction and liking for the factors of actual complexity and website type. As mentioned above, this research finds that hedonic and high technology products tend to make consumers more expectant of higher complexity and thus engender satisfaction even when they are high in actual complexity. To further clarify this finding, Figure 6 shows the correlations between perceived complexity and satisfaction for the high versus low actual complexity and books versus camera websites factors. Notably for high actual complexity websites, there was a stronger correlation between perceived website complexity and satisfaction.

FIGURE 5

Control Variable: Familiarity (Yes versus No) for each Website as Frequency Pie Charts

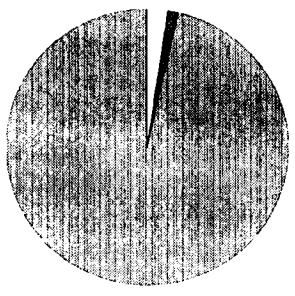
AKPETERS: http://www.akpeters.com/

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	1.2	1.2	1.2
	no	83	98.8	98.8	100.0
	Total	84	100.0	100.0	



FUJIFILM: http://www.fujifilm.com/

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	1.2	1.2	1.2
	no	81	96.4	98.8	100.0
	Total	82	97.6	100.0	
Missing	System	2	2.4		
Total		84	100.0		



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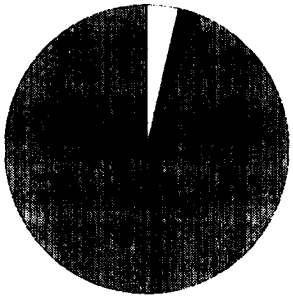
WESTVIEWPRESS: http://www.westviewpress.com/

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	2	2.4	2.5	2.5
	no	79	94.0	97.5	100.0
	Total	81	96.4	100.0	
Missing	System	3	3.6		
Total		84	100.0		



VIVITAR: http://www.vivitar.com/

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	1.2	1.2	1.2
	no	80	95.2	98.8	100.0
	Total	81	96.4	100.0	
Missing	System	3	3.6		
Total		84	100.0		

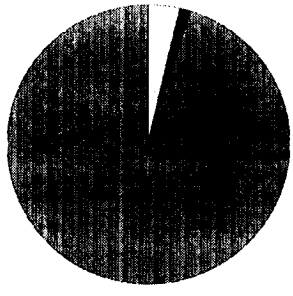
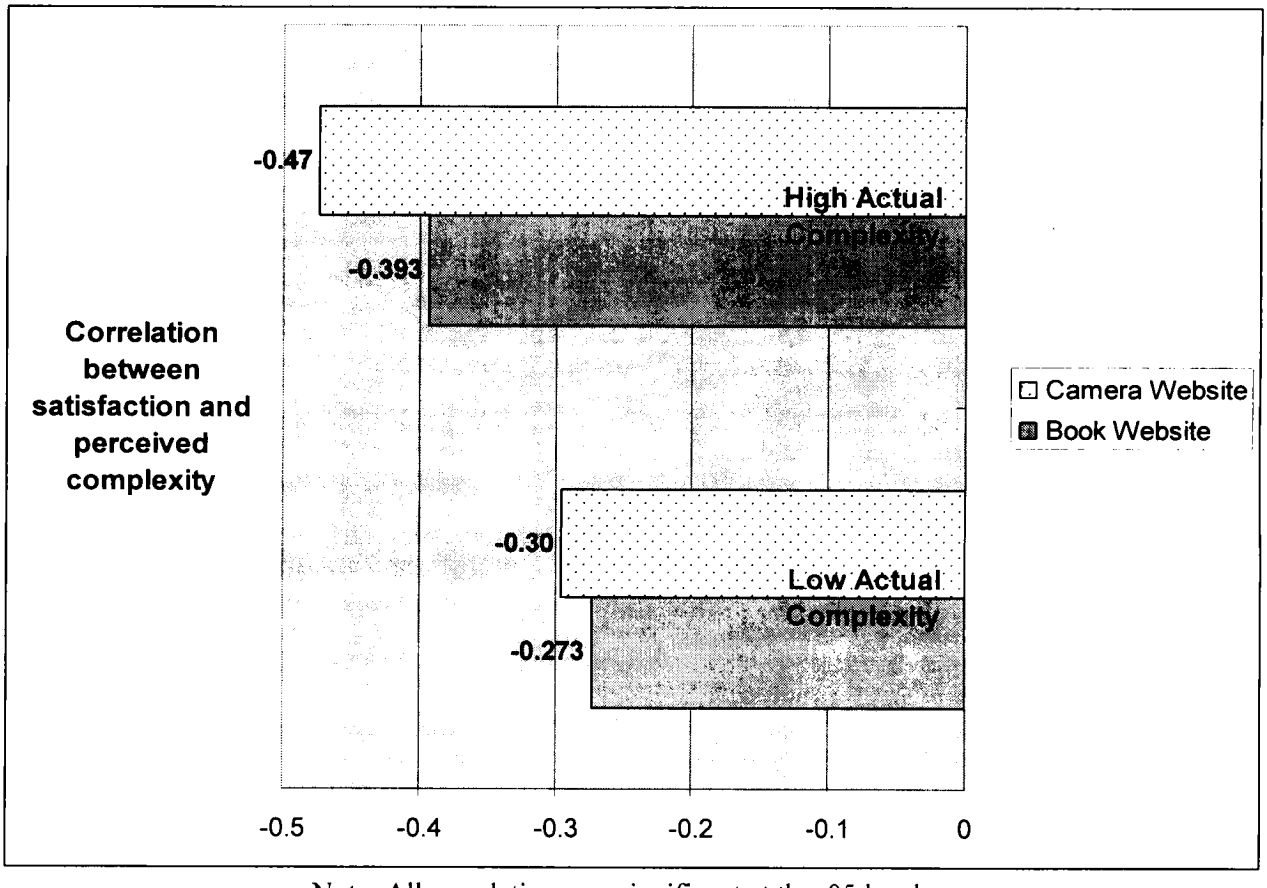


FIGURE 6
Additional Analysis: Correlations for Low versus High Actual Complexity and Website Type Conditions



Note: All correlations are significant at the .05 level.

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DISCUSSION

As predicted by visual complexity theory (and can be seen in Figure 2), perceived complexity is as much a product of the actual stimulus (the website in this case) as it is a product of the task or topic of that stimulus (the website product domain or type in this case). In the case of the present research, participants found all camera websites to be much higher in complexity than all book websites, as they had preconceived expectations in those directions. Even though this was the case, they still found the camera websites, being more hedonic in nature, to be more satisfying and likeable than the book websites. So, the complexity they perceived did not decrease their subjective experiences as one may have expected. They were, however, well calibrated with the actual complexity and with the expected outcome of information overload, in that when the complexity level was notably too high, their liking and satisfaction did decrease, even for camera websites (as revealed in Figures 3 and 4).

The correlations of perceived complexity and satisfaction for the manipulated factors (Figure 6) show that for the high actual complexity websites, regardless of the website type, there was a high significant negative correlation (0.4 or above absolute value) between perceived complexity and satisfaction. On the other hand, for the low actual complexity websites, the correlations were significant and negative, but with lower magnitude, indeed lower than the normal 0.4 magnitude required in marketing research.

In addition, the inter-correlations between the constructs of perceived complexity, satisfaction, and liking, presented in Table 6, show that participants were well-calibrated in their subjective conceptualizations of complexity, satisfaction and liking in all four of the experimental conditions they were presented with.

TABLE 6

Intercorrelations among Experiment Constructs

Condition	*Constructs*	*Intercorrelations (n=83)*		
Low Actual Complexity on a Utilitarian Website		**1**	**2**	**3**
	1. Perceived Complexity	--		
	2. Satisfaction	-.39**	--	
	3. Liking	-.32**	.75**	--
Low Actual Complexity on a Hedonic Website		**4**	**5**	**6**
	4. Perceived Complexity	--		
	5. Satisfaction	-.47**	--	
	6. Liking	-.37**	.81**	--
High Actual Complexity on a Utilitarian Website		**7**	**8**	**9**
	7. Perceived Complexity	--		
	8. Satisfaction	-.27*	--	
	9. Liking	-.15	.69**	--
High Actual Complexity on a Hedonic Website		**10**	**11**	**12**
	10. Perceived Complexity	--		
	11. Satisfaction	-.29**	--	
	12. Liking	-.25*	.85**	--

* $p < .05$ ** $p < .01$

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Thus, the findings of this study confirm all of the research hypotheses. The most important aspect of this research is in the view of complexity not as an objective measure of a website, but as an individual differences measure, which, depending on the user, can readily create either more or less satisfaction or liking.

CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

This article extends previous work done in this field by furthering the understanding of how website complexity impacts user satisfaction when taking into account the subject matter of the website. One contribution of this article lies in the use of the software Webtango to measure actual complexity and compare/contrast this measure with perceived website complexity. As can be seen from the experimental results, controlling actual complexity and website product type resulted in several interesting interactions in individual subjective experiences of satisfaction and liking. In addition to manipulating actual website complexity through use of software, the present research takes research from several fields, including cognitive psychology, information systems, human factors, and marketing, to obtain a synthesized view of the complexity literature. This interdisciplinary view of complexity shows that it has been a difficult construct to measure, manipulate and control not only in websites, but also in simple static visual stimuli as well. Thus, this article extends the concept of complexity itself as it relates to websites by contrasting actual with perceived complexity. Finally, this article empirically shows that whereas actual complexity is a valid measure and can be used as a general starting point for website designers, it does not provide the complete picture to guard against information overload. Instead, it is important for e-commerce companies to conduct consumer surveys when they make changes to their websites in order to take into account the previous expectations of the consumers with respect to the subject domain of the website.

These results are vital because they imply that website design has to continue to adapt to actual product characteristics and designs. A good example is how many technology websites today have video tutorials for their products so as to increase the satisfaction with the website and their products.

As a potential limitation of this article, a student convenience sample was used, and future research could gather actual e-commerce consumer data to make sure that the results would still apply. Although using a student sample can be considered problematic, it is a very common technique in causal internet research, since the target market tends to be young for internet-based consumption (e.g., Martin, Sherrard, and Wentzel 2005; Geissler, Zinkhan and Watson 2006; Gallagher, Foster and Parsons 2001). A future research attempt could look at connecting perceived website complexity and website satisfaction to brand loyalty or brand awareness. Additionally, several other product domains could be added into future research, for example, computers, clothing, perfumes, and so on, to see whether other interesting interactions take place regarding the subject matter of the website. Another interesting way to extend this research would be to measure not only subjective self-report constructs such as satisfaction and liking, but also actual behavioral measures (perhaps by using clickstream data) such as whether a consumer actually makes a purchase on the websites of interest. Also, newer websites could be used in future experimentation, since technology website design continues to become more and more complex and sophisticated. Finally, a longitudinal study could also be conducted using several existing websites to see if consumer learning impacts the results of the present research.

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APPENDIX A

Scale Items and Reliability

Complexity (endpoints given for semantic differential scale) *(α = .81)*

Select the response that best fits your assessment of the website you just viewed (8 questions follow):

1. not complex - complex
2. not dense – dense
3. not crowded – crowded
4. not interactive – interactive
5. no variety – lots of variety
6. inefficient – efficient
7. not overwhelming – overwhelming
8. simple – complicated

Satisfaction (endpoints given for semantic differential scale) *(α = .96)*

Select the response that best fits your feeling toward the website you just viewed (4 questions follow):

1. very dissatisfied – very satisfied
2. terrible – delighted
3. very dissatisfied – not at all dissatisfied
4. not at all satisfied – very satisfied

Liking (Likert scale anchored by strongly disagree and strongly agree) *(α = .91)*

Please select your response (6 questions follow):

1. If I knew I needed to interact with this website, I would look forward to doing so.
2. I liked interacting with this website.
3. I would never want to interact with this website again. (R)
4. I am glad I had a chance to interact with this website.
5. There is something about this website that appeals to me.
6. I disliked interacting with this website more than I do most other websites. (R)

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REFERENCES

Agarwal, R., & Venkatesh, V. (2002), "Assessing a firm's Web presence: a heuristic evaluation procedure for the measurement of usability," *Information Systems Research, 13*(2), 168-186.

Bansal, H. S., McDougall, G. H. G., Dikolli, S. S., & Sedatole, K. L. (2004), "Relating e-satisfaction to behavioral outcomes: an empirical study," *Journal of Services Marketing, 18*(4), 290-302.

Berlyne, D. E. (1960), *Conflict, Arousal, and Curiosity*. New York: McGraw-Hill.

Bruner, G. C., James, K. E., & Hensel, P. J. (2001), *Marketing Scales Handbook: A compilation of multi-item measures*. Chicago: American Marketing Association.

Chernev, A. (2003), "When more is less and less is more: The role of ideal point availability and assortment in consumer choice," *Journal of Consumer Research, 30*(2), 170-183.

Crowley, A. E., Spangenberg, E. R., & Hughes, K. R. (1992)," Measuring the hedonic and utilitarian dimensions of attitudes toward product categories. *Marketing Letters, 3*(3), 239-249.

Dhar, R., & Wertenbroch, K. (2000), "Consumer choice between hedonic and utilitarian goods," *JMR, Journal of Marketing Research, 37*(1), 60.

Donderi, D. C. (2006), "Visual Complexity: A Review," *Psychological Bulletin, 132*(1), 73.

Fischer, P., Schulz-Hardt, S., & Frey, D. (2008), „Selective Exposure and Information Quantity: How Different Information Quantities Moderate Decision Makers' Preference for Consistent and Inconsistent Information," *Journal of Personality and Social Psychology, 94*(2), 231.

Gallagher, K. K., Foster, K. D., & Parsons, J. (2001), "The Medium Is Not the Message: Advertising Effectiveness and Content Evaluation in Print and on the Web," *Journal of Advertising Research, 41*(4), 77-70.

Geissler, G. L., Zinkhan, G. M., & Watson, R. T. (2001), "Web homepage complexity and communication effectiveness," *Journal of the Association of Information Systems, 2*(2), 1-46.

Geissler, G. L., Zinkhan, G. M., & Watson, R. T. (2006), "The influence of home page complexity on consumer attention, attitudes, and purchase intent," *Journal of Advertising, 35*(2), 69.

Gourville, J. T., & Soman, D. (2005), 'Overchoice and Assortment Type: When and Why Variety Backfires," *Marketing Science, 24*(3), 382.

Ha, H.-Y., & Janda, S. (2008), 'An empirical test of a proposed customer satisfaction model in e-services," *The Journal of Services Marketing, 22*(5), 399.

Hochberg, J. (1957), 'Effects of the Gestalt Revolution: The Cornell symposium on perception," *Psychological Review, 64*, 73-84.

Ivory, M., Sinha, R., & Hearst, M. (2001), '*Empirically validated web page design metrics,*" Article presented at the SIGCHI '01, Seattle, WA.

Iyengar, S. S., & Lepper, M. R. (2000), 'When choice is demotivating: Can one desire too much of a good thing?," *Journal of Personality and Social Psychology, 79*(6), 995.

Jacoby, J., & Malhotra, N. K. (1984), 'Perspectives on Information Overload/Reflections on the Information Overload Paradigm in Consumer Decision Making," *Journal of Consumer Research, 10*(4), 432.

Johns, K. E., & Fair, R. C. (1999), *Principles of Economics* (5th ed.): Prentice-Hall.

Keller, K. L., & Staelin, R. (1987), "Effects of Quality and Quantity of Information on Decision Effectiveness," *Journal of Consumer Research, 14*(2), 200.

Khan, U., Dhar, R., & Wertenbroch, K. (2004), "*A Behavioral Decision Theoretic Perspective on Hedonic and Utilitarian Choice*," Unpublished manuscript.

Koffka, K. (1935), *Principles of Gestalt Psychology*. New York: Harcourt, Brace & World.

Kotha, S., Rajgopal, S., & Venkatachalam, M. (2004), 'The Role of Online Buying Experience as a Competitive Advantage: Evidence from Third-Party Ratings for E-Commerce Firms," *The Journal of Business, 77*(2), S109.

Kruglanski, A. W., & Webster, D. M. (1996), "Motivated closing of the mind: Its cognitive and social effects" *Psychological Review, 103*, 263-283.

Luce, M. F., Bettman, J. R., & Payne, J. W. (2001), "Consequences of trade-off difficulty," *Journal of Consumer Research* (1), 90.

Lurie, N. H. (2004). "Decision Making in Information-Rich Environments: The Role of Information Structure," *Journal of Consumer Research, 30*(4), 473.

Martin, B. A. S., Sherrard, M. J., & Wentzel, D. (2005), "The role of sensation seeking and need for cognition on Web-site evaluations: A resource-matching perspective," *Psychology & Marketing, 22*(2), 109.

McKinney, V., Yoon, K., & Zahedi, F. (2002), "The measurement of Web-customer satisfaction: An expectation and disconfirmation approach," *Information Systems Research, 13*(3), 296.

McMillan, S., Hwang, J.-s., & Lee, G. (2003), "Effects of Structural and Perceptual Factors on Attitudes toward the Website" *Journal of Advertising Research, December*, 400-409.

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Mick, D. G., Broniarczyk, S. M., & Haidt, J. (2004), "Choose, Choose, Choose, Choose, Choose, Choose, Choose: Emerging and Prospective Research on the Deleterious Effects of Living in Consumer Hyperchoice," *Journal of Business Ethics, 52*(2), 207.

Murray, E. (1908), "A qualitative analysis of tickling: Its relation to cutaneous and organic sensation," *American Journal of Psychology, 19*, 289-344.

Murry, J. P., & Dacin, P. A. (1996), "Cognitive "Moderators of Negative-Emotion Effects: Implications for Understanding Media Context," *Journal of Consumer Research, 22*(March), 439-447.

Nadkarni, S., & Gupta, R. (2007)., "A task-based model of perceived website complexity," *Management Information Systems Quarterly, 31*(3), 501-524.

Okada, E. M. (2005), "Justification Effects on Consumer Choice of Hedonic and Utilitarian Goods," *JMR, Journal of Marketing Research, 42*(1), 43.

Oliver, R. (1980), "A cognitive model of the antecedents and consequences of satisfaction decisions," *Journal of Marketing Research, 17*(November), 460-469.

Oppewal, H., & Koelemeijer, K. (2005), "More choice is better: Effects of assortment size and composition on assortment evaluation," *International Journal of Research in Marketing, 22*(1), 45-60.

Palmer, J. (2002), "Website Usability, Design and Performance Criteria," *Information Systems Research, 13*(2), 150-167.

Patrick, V., & Park, C. W. (2006), "Paying before consuming: Examining the robustness of consumers' preference for prepayment. *Journal of Retailing, 82*(3), 165-175.

Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993), *The Adaptive Decision Maker*, New York: Cambridge University Press.

Peterson, R. A., Balasubramanian, S., & Bronnenberg, B. J. (1997), "Exploring the implications of the internet for consumer marketing," *Journal of the Academy of Marketing Science, 25*(4), 329-346.

Schneiderman, B. (1998), *Designing the User Interface: Strategies for Effective Human-Computer Interaction*, Reading: Addison-Wesley.

Stevens, S. S. (1975), *Psychophysics: Introduction to its perceptual, neural, and social prospects*, New York: Wiley.

Stevenson, J. C., Bruner, G. C., & Kumar, A. (2000), "Webpage background and viewer attitudes," *Journal of Advertising Research, 404*(1/2), 29-34.

Voss, K. E., Spangenberg, E. R., & Grohmann, B. (2003), "Measuring the Hedonic and Utilitarian Dimensions of Consumer Attitude," *JMR, Journal of Marketing Research, 40*(3), 310.

Send correspondence regarding this article to:

Anjala Krishen
Department of Marketing
University of Nevada Las Vegas
Las Vegas, Nevada 89154
Tel.: +1-702-895-3591
fax: +1-702-895-4854
e-mail: anjala.krishen@unlv.edu

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