LINKING INFORMATION CONTENT, PRESENTATION ATTRIBUTES, AND SYSTEM DESIGN FEATURES WITH CONSUMER ATTITUDES IN HYPERMEDIA COMMERCIAL PRESENTATIONS

by

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A dissertation submitted to the Graduate Faculty in Business in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2002

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This manuscript has been read and accepted by the Graduate Faculty in Business in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

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Advisor: Professor George O. Schneller, IV

This dissertation draws upon theories and prior studies in the fields of marketing/advertising, information systems, online consumer behavior, human-computer interaction, and user interface and Web site design disciplines. It addresses the research question of whether information content, presentation attributes, and system design features contribute to visitors' perceptions of and attitude toward a commercial Web site. Literature has shown that perceived informativeness, entertainment, and irritation are consistent measurement criteria and perceptual antecedents that affect user attitude toward communications messages presented through the traditional media, Web advertising in general, and Web sites. Such attitudes in turn influence behavioral intentions such as intention to revisit and intention to purchase products from the sponsoring company. This dissertation explores these links in a coherent theoretical framework and tests these relationships in three experimental studies. In particular, the research question is broken down into three sets of factors that potentially influence visitor perceptions: information content, presentation attributes, and system design features. Hypotheses are generated to test the relationships between these factors and visitors' perceptual dimensions. Subsequently, these perceptions are tested against visitors' perceived value of the site, attitude toward the site, intention to revisit the site, and intention to purchase products presented through the site.

Findings from this research validate the proposition that consumers value informative messages in an entertaining form in any medium. It validates existing research in traditional

media and extends related theories to commercial Web sites. This research finds that product price and quality information have significant influence on perceived informativeness of a Web site. Available product demo pages make product presentation more entertaining, and the use of popup ads and continuous animation increases the level of irritation of the consumer or visitor. Additionally, this research extends the application of the technology acceptance model (TAM) to individual system design features, such as the sitemap or a search engine, and finds the usefulness of these features to be significant predictors of attitude toward a Web site. This dissertation suggests that future exploration in combining systems and user interface design with consumer attitude and behavior is promising in electronic commerce research.

Acknowledgements

This dissertation is dedicated to the memories of my grandfather, Yang De-Rong, and my grandmother, Shen Si-Mei, who always wanted the best for their children and grandchildren. They saw me start in the doctoral program with great pride. Today, as the first among their children and grandchildren to obtain a doctorate, I am sure they are even more proud of their grandson, and are sharing my joy, with blessings from above.

This dissertation is the product of many people. I would like to thank all members of my dissertation committee for their help and support. I want to thank Dr. George O. Schneller, IV, my advisor and committee chair, for his guidance, insightful comments, constantly positive outlook, reassurance, and gentle sense of humor that kept me going over the many years since I started in the doctoral program. I am grateful to Dr. Robert H. Ducoffe, who provided me not only a great deal of education in marketing research, but also immensely helpful comments on theoretical constructs, research questions, experimental design, data collection, and discussion of implications of the research. I would also like to express my heartfelt thanks to Dr. Marios Koufaris, whose unlimited enthusiasm, tireless assistance, invaluable insights, and constant encouragement were crucial to producing this dissertation. Finally, I would like to thank Dr. Georghios P. Sphicas for his tremendous help and unconditional support over the years for making sure that I produced the best research possible.

I am also grateful to the faculty and staff of the School of Administration and Business at Ramapo College of New Jersey, for their help and support in the execution of this study. It is a pleasure to work with such fine colleagues.

Finally, I want to thank my family for their understanding and support that kept me happy, sane, and motivated over the years. I wish to thank my mother, Fengdi Yang, my father, Dr. Shunfu Gao, a physicist, and my sister, Hong Gao, for their constant spiritual support of my journey at both smooth and rough times. I thank my lovely daughter, Crystal Sarah Gao, for her understanding that Daddy was writing a "book," and would spend more time playing with her, instead of working many late nights, after the "book" was completed.

Last but not least, I am indebted to my wife, Laura Hua Luo, for her patience, understanding, love, and support. I'd like, in the meantime, to thank her parents, Qimei Wu and Zhengxian Luo, for bringing up this beautiful, smart, classy, talented, and gentle-hearted girl who became my wife.

Laura and Crystal made the journey of my life all worthwhile.

-- YUAN GAO [高渊], APRIL 29, 2002, NEW YORK CITY

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1 INTRODUCTION

1.1 Overview of the Use of Hypermedia Document Systems and the World Wide Web

The World Wide Web has undoubtedly become an important playground of commercial activities. According to survey data produced by Network Wizard, available at http://www.nw.com, there were over 147 million (as of January 2002) hosts connected to the Internet, up from 109 million in January 2001. Companies engage the Web in a wide range of activities from pure marketing and promotion, customer service, to direct sales and generation of advertising revenue (Berthon et al., 1996; Singh & Dalal, 1999). They have embraced Internet and Web technologies in various ways to reap the potential benefits brought by the new medium (Liu et al., 1997; Berthon et al., 1996).

Through this special medium, firms can disseminate more information inexpensively, market, promote, and sell products and services, and enhance customer support at a lower cost (Palmer & Griffith, 1998). In the meantime, companies can also increase business by reaching out to a huge pool of potential customers, receive feedback from customers and potential customers, and respond more quickly to their requests. By doing so, they may benefit from enhanced relationships with customers, additional sales leads, more efficient communications, faster access to market information, and a better company image.

The question of how to make effective use of this new medium calls for research into many areas including information systems, communications, advertising, human-computer interaction, and psychology, among others. Recent research has revealed many factors that affect consumer behavior, attitude, and perception in the online environment (Ducoffe 1996; Jarvenpaa & Todd, 1997; Eighmey, 1997; Lohse & Spiller, 1998; Chen & Wells, 1999; Koufaris et al., 2001; Bhatnagar et al., 2000). For example, Eighmey (1997) finds that "Web site users are assisted by information placed in an enjoyable context" (p. 62), echoing

Ducoffe's (1996) finding of that the value of advertising comes from informative claims in an entertaining form.

However, most of the existing research did not address the specific features or content elements that could contribute to being informative, entertaining, and irritating. As a result, the following question remains largely unanswered: how information content and system features contribute to the delivery of a hypermedia system or Web site that affects visitors' perceptions of a site's being informative, entertaining, or irritating, and hence their attitude toward the site? To learn more about the issues that may help clarify this question, this study will test a model relating information content, form attributes, and system design features with user perceived informativeness, entertainment, and irritation, as well as their impact on site value, attitude toward the site (Ast), and related behavioral intentions.

1.2 Summary of Thesis

The next section (Section 2) covers a review of literature in the fields of information content of commercial messages, systems attributes that influence human computer interactions, and consumer attitudes toward traditional advertising, Web advertising, and an entire Web site. Section 2 also identifies studies that used content and attributes as independent variables, which support the viability of the current study.

Section 3 proposes a theoretical framework in which the linkage between information content/system attributes and viewer perceptions is established. Two sets of hypotheses are developed along with discussion of dependent and independent variables employed in each model. The first set attempts to examine how information content and system attributes impact the three perceptual and attitudinal dimensions of a visitor's experience at a site. The second set examines how such perceptual dimensions impact a visitor's overall attitude and subsequent behavioral intentions.

In Section 4, the study methodology is outlined such that it not only incorporates the independent variables being tested but also controls for other factors. Custom-developed and peripherally adapted commercial Web sites are used in three experiments that differ in either information content or presentation attributes. These experiments permit the impact of the independent variables on perceptual dimensions, site value, and attitude toward the site to be tested. Pretests for instrument and site design refinement were conducted prior to the final study and are described.

Sections 5 and 6 discuss implementation of the study, findings, conclusions, and implications for future research.

1.3 Potential Contributions of the Current Study

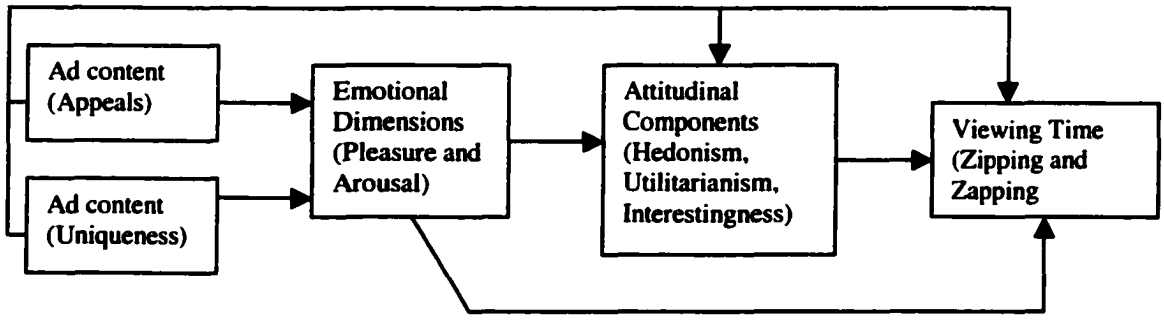
This study focuses on the information content, forms of presentation, and system design features of a Web site that contribute to visitor perceptions of product presentations in a hypermedia environment. In addition to commercial Web sites, this framework is also applicable to product presentations on intranets, extranets, and other hypertext-based document systems where hyper links and multimedia files are used. In comparison to other studies addressing e-store traffic and sales improvement, however, this study concentrates more on the message delivery side of the e-commerce spectrum. It provides an in-depth look at how information content, information presentation attributes, and system features affect a visitor's perceived informativeness, entertainment, and irritation, and subsequently the visitor's attitude toward the site, in the context of three experimental commercial presentations.

This thesis contributes to the field of e-business in a practical way. Existing studies have examined the link between physical e-store features and e-store traffic and sales (e.g., Lohse & Spiller, 1998). There have also been studies exploring the link between information content types and informativeness in magazine advertising (Aaker & Norris, 1982; Soley & Reid, 1983), and the impact of certain attributes (e.g., interruption, animation, and image

maps) on online consumer attitude (Coyle & Thorson, 2001; Xia & Sudharshan, 2000). The current study expands the scope of research in this stream of studies to connect some unexplored elements in information content, Web site presentation attributes, and system design features with visitor perceptions and attitude, in the hypermedia environment. It contributes to an understanding of how attributes of a Web site influence system effectiveness.

Previous consumer research has established a hierarchical model of advertising effects, spanning the spectrum from ad content to cognition, attitude, and behavior (Holbrook, 1986; Olney et al., 1991). In their model reproduced here (Olney et al., 1991, p.441), Olney et al. summarized existing research into a single framework and examined the variance in behavior explained by attitude, emotional dimensions, and ad content. Mediating roles played by intervening variables along this hierarchical chain are also considered to influence resultant variables like attitude and subsequent behavior. Their hierarchical model offers a glimpse of the relationships studied in consumer research on advertising effects.

Illustration 1.1 A Hierarchical Model of Consumer Research



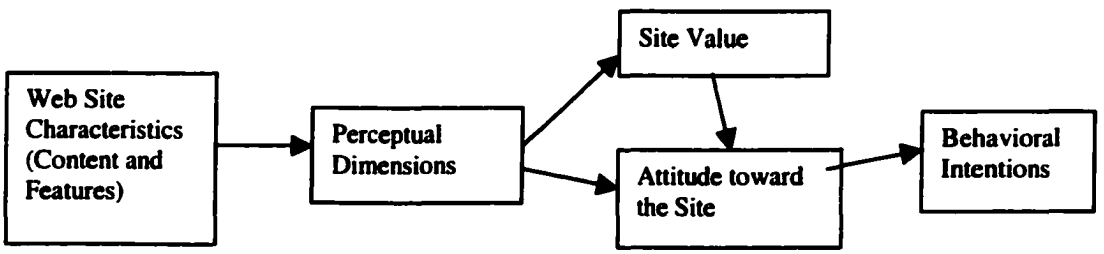
(Source: Olney et al., 1991, p.441)

In particular, a large body of research has been generated in studying the impact of executional factors, i.e., ad content and format, on advertising performance like consumer recall, where each study explains a varying degree (between 13% and 26%) of variance in recall (Stewart & Furse, 1985). For example, Stewart and Furse (1985) found content and form features like novelty, humor, vividness of information, puffery, demonstration, and

fantasy are positively related to recall, based on their meta-analysis. These links are well documented in advertising and marketing research where both content and form variables are examined as significant predictors of recall, readership, informativeness, and attractiveness (Naccaroto & Neuendorf, 1998). Variables describing the format of advertisements include characteristics like font size, copy length, color, major visual, or copy placement (e.g., bottom or right), and content variables include examples like competitive comparison, humor, status appeal, spokesperson approach, and problem/solution appeal (Naccaroto & Neuendorf, 1998). Rodgers and Thorson (2000) provide a good summary of form factors that have been identified in the advertising literature, and look at new additions to that list in the Internet-based interactive marketing research.

Nevertheless, the study of the effect of executional factors extended to the Web involves new factors to be considered and requires a higher level of comprehensiveness due to the volume and scope of a Web site in comparison to a print or TV ad. This study supplements existing research in completing a chain of theories and studies relating content and forms of commercial Web sites to visitor experience, site value, and attitude toward a site. Particularly related to this study, such a chain, which derives its theoretical origin and support from the Olney et al. (1991) model cited above, is represented in the following diagram:

Illustration 1.2 Theoretical Relationships Examined in the Current Study



Specifically, this study considers Web site characteristics in three dimensions: information content, format or presentation attributes, and system design features. Each

category of characteristics will be reviewed in detail in the literature review (next section). A brief explanation of each type, for the purpose of this study, is given in the next paragraph.

Illustration 1.3 Categories of Web Site Characteristics

Web Site Characteristics:
Category 1: Information Content Category 2: Presentation Attributes Category 3: System Design Features

Information content refers to the types of information (e.g., price-value information, quality statements, product performance, product components, ingredients, features, and product availability, etc.) delivered. Format or presentation attributes refer to the techniques incorporated in the presentation of information and products, e.g., use of product animation, use of cartoons or humorous statements, use of animation for visitor attention, and use of popup windows. A system design feature refers to a subsystem that is created with the intention to enhance a visitor's browsing experience and to facilitate efficient information retrieval. Such features may include the product menu and classification structure, a frequently asked questions (FAQ) section, an internal search engine, a sitemap, and an online help screen.

This research will identify a number of potential effects of these Web site characteristics on visitor perceptions, the value of the site from the consumer's perspective, attitude toward the site, and subsequent behavioral intentions. Questions answered include

1) whether certain types of information content have an impact on perceived informativeness,

2) whether certain techniques and attributes used in message delivery have an impact on perceived informativeness, entertainment, and irritation,

3) whether the perceived usefulness of certain system design features is related to visitor attitude,

4) whether site informativeness, entertainment, and irritation have an impact on user-perceived site value, and attitude toward the site, and

5) whether attitude toward the site impacts behavioral intentions, e.g., intention to return to the site, and intention to purchase products presented.

From this study, practical guidelines can be developed to create hypermedia document systems that "communicate the most informative claims" a business is "capable of delivering" (p.31) from the value perspectives of consumers (Ducoffe, 1996). It contributes to bridging the gap between content/features and attitudinal perceptions. Research in both fields of system design and consumer behavior will benefit from its findings.

In addition to theory validation, this study also advocates a framework that uses consumer perception as the criterion and content attributes and system features as a tool in message creation and customer-oriented system design. This study looks for evidence in support of a claim that certain informational cues like price, value, quality, and performance detail are indicative of informativeness of a commercial message, a Web page, or a Web site. In the meantime, we are reminded of the very principle that "consumers' cognitive assessments" are crucial in assessing the value of a commercial message just like in advertising (Ducoffe, 1996). If certain attributes are shown to be relevant to informativeness of a commercial product presentation, much like advertising, then these attributes can be emphasized in the creation of similar messages. The results in either direction (supporting or non-supporting of the links discussed) will make a contribution to understanding the validity of the approach of interpreting informativeness, entertainment, and irritation based on observable contents and features.

2 LITERATURE REVIEW

2.1 Information Content, Presentation Attributes, and System Design Features

This section reviews literature addressing information content and presentation attributes intended to communicate informative messages in an entertaining way. Also included in this section is a review of studies that have looked at system design features as enhancements to information and product presentations in the Web context. Most of the studies referenced in this section examine the physical presence of a type of information, an attribute that is supposed to entertain, and/or a specific feature that is intended by design to help information delivery and to enhance visitor experience and hence reduce user frustration or irritation. However, scarce attempt has been made to link these features with user perceived delivery and usefulness and subsequent attitude toward the products presented or the presenter. Literature on informativeness, entertainment, and organization/irritation from user perceptions is reviewed in more detail in the next section.

2.1.1 Information Content

In search for specific types of informational content, this paper first turns its attention to research in information content from the advertising literature.

One stream of research in informativeness of a commercial message has surfaced in the literature since 1977. Resnik and Stern (1977) view concrete information like price and quality as cues consumers can use to make intelligent decisions among alternative choices. They operationalized the informativeness construct through a content analytic scheme in which message content is analyzed with respect to 14 evaluative criteria:

Table 2.1 Resnik and Stern's (1977) 14 Content Cues

1) Price or value	8) Nutrition
2) Quality	9) Packaging or shape
3) Performance	10) Guarantees or warranties
4) Components or contents	11) Safety
5) Availability	12) Independent research
6) Special offers	13) Company research
7) Taste	14) New ideas

Based on the presence or absence of each content cue in a message, this methodology attempts to judge the amount of information communicated through an ad. Resnik and Stern (1977) applied this methodology to TV advertising and found 49% of their sample contained one or more cues. Appendix A shows their interpretations (Stern et al., 1981). Resnik and Stern (1977) argue that informational cues about a product, like price and value-retention capabilities, components and features, comparative claims of quality and performance, and product guarantees and warranties, are particularly relevant in assisting consumers in making intelligent purchase decisions.

Over 60 journal articles were published using this procedure in analyzing ad messages in various media between 1977 and 1996 (Abernethy & Franke, 1996). There have been applications of this method to magazine advertising, TV advertising, and newspaper advertising. Review of the literature finds that print media are generally more informative than radio and TV advertising, and that informativeness differs across countries and product categories (Stern & Resnik, 1991; Abernethy & Franke, 1996). A classification of cue usage also reveals that out of the 14 cues, the following types of information appeared much more frequently in advertisements: price/value, quality, performance, components or contents, special offers, and new ideas (Stern & Resnik, 1991; Abernethy & Franke, 1996).

Research based on this methodology attempts to explain information content through *what is said* in a message, without considering whether and how effective information is communicated to the consumers. As noted in Stern et al. (1981), this type of research attempts

to gather "face-value information that can potentially assist the typical buyer in making an intelligent choice"(p. 39). They acknowledge that its informativeness or persuasiveness on consumers remains unanswered (Stern et al., 1981). The following table summarizes the major studies adopting the Resnik-Stern method.

Table 2.2 Literature Review on Content Analysis of Advertising Information

Author (year)	Media Type	Country	Product Orientation
Aaker & Norris (1982)	Television	US	All
Abernethy (1992)	Newspaper	US	All
Chou, Franke & Wilcox (1989)	Magazine	US	All
Dowling (1980)	Television	US & Australia	All
Harmon, Razzouk & Stern (1983)	Magazine	US	All
Healy & Kassarjian (1983)	Magazine	US	All
Hong, Muderrisoglu & Zinkhan (1987)	Magazines	US & Japanese	Women's
Hoy & Shaw (1982-1983)	Television	US	All
James & Vanden Berg (1990)	Magazine	US	All
Laczniak (1979)	Magazine	US	All
Madden, Caballero & Matsukubo (1986)	Magazine	US & Japanese	All
Marquez (1977)	Magazine	US	All
Pollay, Zaichkowsky & Fryer (1980)	Television	US & Canada	All
Reid & Rotfeld (1981)	Television	US	Children's
Renforth & Raveed (1983)	Television	Ecuador	All
Resnik & Stern (1977)	Television	US	All
Rice & Lu (1988)	Magazine	Chinese	All
Senstrup (1985)	Television	Europe	All
Stern, Krugman, & Resnik (1981)	Magazine	US	All
Stern, Resnik & Grubb (1977)	Television	US	All
Taylor (1983)	Magazine	UK	Women's
Weinberger & Spotts (1989)	Television	US & US	All

2.1.2. Presentation Attributes

More recently, the content analysis methodology has been adapted to various studies examining information content and feature presence in commercial Web sites. These include a modified version of the Resnik-Stern approach (Philport & Arbittier, 1997; Ghose & Dou,

1998 – See Appendices B and C), or categories of Web site content with regard to technology features (Palmer & Griffith, 1998; Huizingh, 2000). In these relatively recent studies, more aspects of a communications message have been examined through content analysis criteria. In addition to information content, format or presentation attributes that contribute to the delivery of entertaining appeals have also been analyzed.

Philport and Arbittier (1997) studied ad content from over 2000 commercial communications messages across three established media (TV, magazines, and newspapers) and the Internet. They find that the number of unique ads for each brand varies by category, and that leading brands command a larger share of each media type than smaller brands. They also find that product positioning, customer relations, and sales incentives are message content types that distinguish brand communications by media. Appendix B shows the informational and content type cues that constitute these three "discriminant functions." The product-positioning dimension includes cues such as endorsement, facts and details, and product display. The customer relations dimension includes cues like Web address, 1-800 number, customer service, and parent company reference, while sales incentives include mentions of price, sales, coupons, or lease terms. While they extended their coverage of media to Internet banner advertising, they find no distinguishing characteristics, i.e., banner ads were not particularly different in any of the three dimensions. Their study suggests that marketing researchers are paying attention to advertising on the Web, yet the impact of a message delivered through a banner is fairly limited. That observation further justifies our current study, which treats the integral collection of hypermedia-based documents, related image files, and systems functions as a whole in examining its effectiveness in Web communications.

Nonetheless, variables such as product demonstration or display, special effect techniques like fantasy, and the employment of humor reflect an attempt to assess message appeal enhanced by entertaining features (Philport & Arbittier, 1997).

Ghose and Dou (1998) perform an analysis linking the number of content attributes with site quality measured by being listed in Lycos top 5% Web sites. They find that greater degrees of interactivity, defined by the total count of interactive functions as listed in Appendix C, relate positively to Web site appeal, and the "customer support" component is most predictive of being included in the Lycos top 5% list. In this study, entertainment features specifically examined include electronic post cards, surfer postings, and online games. Though the entertainment features were not the feature group most predictive of inclusion in the Lycos top 5% list, the presence of each feature increases the likelihood of being included. However, their study adopted an appeal measure based on expert evaluations. They did not link the presence of these features with perceived entertainment.

In a study of 651 companies from Yahoo! and Dutch Yellow Pages, Huizingh (2000) considers entertainment one of the content features, along with information and transactions, and includes in this category pictures, jokes, cartoons, games, and video clips. He finds that entertainment features appear in about one-third of all sites. Based on feature counts, he finds that larger sites tend to contain more forms of entertainment features.

Web site designers for obvious reasons have examined presentation features in great length. A first-time visitor judges a site by its look: eye-catching graphics and animations, along with navigation buttons and company logos (Grotta, 2000). Software packages intended to enhance Web site appeal have been developed by many vendors, e.g., Adobe Photoshop®, Adobe LiveMotion®, CorelDraw Graphics Suite®, Macromedia Flash®, and Macromedia Fireworks® (Pike, 2000). Technologies like Flash® and LiveMotion® have been used by many Web sites as entrance pages. In a study on the effects of interactivity and vividness on consumer attitude, Coyle and Thorson (2001) find that a more vivid Web site is related to a more positive attitude toward the site, where audio and animation are adopted to operationalize the vividness construct. Nevertheless, the perceptual implication from the

consumer's perspective has not been widely explored, and the true effectiveness of any presentation attributes awaits further examination. This is particularly true with regard to the formats through which product information is presented. Formats also communicate much non-product information that can affect company image and visitor attitude toward products and the site. Two effects may result from the use of certain presentation attributes: the means of delivering product information in a form perceived entertaining may enhance the communication of information, and may also create an affective response in the viewer.

Together with information content, presentation attributes are important ingredients that impact the effective delivery of a commercial message because of their ability to enhance the interface between information content and consumers. Thus the form of presentation is especially relevant to the Web as a communications medium.

2.1.3 System Design Features

As a relatively new communications medium, the Internet provides message creators added flexibility and functionality in message delivery. Other than information content and format or presentation attributes, marketers can take advantage of the opportunities of incorporating certain system design features that further enhance a visitor's experience while visiting a Web site. The significance of such an experience has been demonstrated in several studies.

For example, alongside entertainment and information, Chen and Wells (1999) identify a factor "organization" that consists of adjectives describing feelings of confusing, distracting, irritating, cumbersome, and messy. In this particular medium, "organization" relates closely to the "irritation" measure in Ducoffe (1995, 1996). Eighmey (1997) finds that, in addition to information, structure and design of a Web site are important factors contributing to better perceptions of Web sites. System design features may enhance visitor experience and efficiency in information retrieval, and thus contribute to both perceived

informativeness and reduced irritation. The following are some recent studies examining the effects of system design features in Internet marketing sites.

Relating to site features, Lohse and Spiller (1998) performed a study measuring 32 user interface features at 28 online retail stores against store traffic and sales. They conclude that online store traffic and sales are influenced by customer interfaces. In particular, they found that an FAQ page, promotional activities, and better organization of the product menu have significant influences on traffic and sales. Their study is one of the few to examine the impact of individual content features on the overall effectiveness of an e-store implementation. Recognizing content as the most important element of a Web site, Nielsen (1999) provides several design principles based on his experience as a leading user interface design consultant in the field, e.g., speed, quality of a search mechanism, and structure and navigation.

Certain design features are considered interactive functions that contribute to site appeal (Ghose & Dou, 1998). Examples include customer comments and inquiries sections, online problem diagnostics, key-word search, personal-choice helper, dealer locator, user groups/chat room, and interactive job placement. They do not directly introduce product features or quality, but assist information retrieval and ease of browsing. For example, a personal-choice helper at www.ford.com is able to suggest an automobile based on user input and calculate monthly payments or present a comparison between buy and lease options.

Huizingh (2000) considers both the complexity of the navigation structure and search function design features. He finds that more complex structures are found in larger Web sites, which are also more likely to have a search mechanism.

Research addressing the impact of different digital retailing interfaces by Westland and Au (1999) represents yet another attempt to study system design attributes as factors influencing user behavior and potentially attitude. They find that virtual reality storefronts do

increase a consumer's time spent searching for products but do not significantly increase sales. Such findings necessitate further explorations of the field.

In the area of human-computer interaction, significant research has been done relating network quality of service with usability and user satisfaction. One such factor affecting quality of service is system speed, which is a result of access speeds, processing delays, queuing delays, and propagation delays. These were manipulated in various studies to serve as independent variables, according to Sears and Jacko (2000). Such studies are gradually migrating to the study of Web sites. Nielsen (1997) argued, based on a combination of human factors and computer networking, "speed must be the overriding design criterion." He asserts that research has shown that users need a response time of less than one second, moving from one page to another, based on traditional human factors research.

In a study linking the use of interruption implemented via popup windows, Xia and Sudharshan (2000) manipulated the frequency of interruptions and found that interruptions had a negative impact on consumer shopping experiences. Intrusive formats of advertising like interstitials are found to have "backlash risks" in this new medium (Jupiter Research, 1999).

To summarize, along with information content and form attributes, system design features are some of the applications of current information technology that may affect consumer perceptions and attitudes. As part of a Web site, the usefulness of such features could be an important predictor of visitor attitude toward the site. Yet studies making such a connection are scarce in the existing literature. Thus it forms the third category of Web site characteristics our current study explores, assessing the impact of the perceived usefulness of such features on visitor attitude toward the site.

Literature reviewed in this subsection attests to the fact that the three categories of Web site characteristics to be examined in the current research have long been considered

factors that closely relate to many effectiveness measures of advertisements and Web sites. Information content cues have been considered to influence informativeness of an advertisement, while interactive features have been considered to make the message delivery more entertaining and attention getting. Nonetheless, how these attributes truly impact the effectiveness perceptions from the perspectives of consumers have not been given priority in the literature. Nonetheless, consumers are the ultimate judges of the effectiveness of advertisements and Web sites. Hence we will turn our attention to a second body of research that centers around consumer perceptions and attitude in response to commercial content and presentations.

2.2 Consumer Attitude

Informativeness is a perception (Hunt, 1976; Ducoffe 1995; Ducoffe 1996; Eighmey, 1997; Chen & Wells, 1999). Research in marketing and advertising has also focused on consumer perceptions of a communications message, and how these perceptions influence advertising value and/or consumer attitude (Ducoffe, 1995; Ducoffe, 1996; Chen & Wells, 1999). Information contained in a commercial message is believed to be individual-specific and cannot be measured objectively (Hunt, 1976). Ducoffe (1995, 1996) finds that perceived informativeness, entertainment, and irritation are significant predictors of advertising value and attitude toward advertising, from a consumer's perspective.

Content analysis researchers seem to concur on these points. Resnik and Stern, being pioneers in applying content analysis to advertising message content, acknowledge that it would be unrealistic to create an "infallible" instrument to measure information because information is "in the eye of the beholder" (1977). However, they assert that without concrete information for intelligent comparisons, consumers may not be able to make efficient purchase decisions (Stern & Resnik, 1991).

Perceived informativeness, entertainment, and irritation have been shown to affect consumer attitude toward Web advertising, considered by 57% of respondents in one study to include firms' entire Web sites (Ducoffe, 1996). However the current literature in content analysis does not provide a link between content and perception. Thus no claim can be made about what types of information are considered informative or contribute to advertising value. The same reasoning applies to the presence and impact of entertainment features on perceived entertainment. Likewise, without an assessment based on visitor feedback and attitude, no claim can be made about the effectiveness of a search function or an online choice-helper. Literature on consumer perceptions and attitudes will be reviewed in the next subsection (Section 3).

2.3 Effects of Information Content and Site Attributes on Consumer Perceptions and Attitudes

The literature has touched upon the effect of certain media formats on consumer attitude, especially under the broader topic of interactive marketing (Bezjian-Avery et al., 1998; Rodger & Thorson, 2000; Coyle & Thorson, 2001). Bezjian-Avery et al. (1998) test the impact of visual and nonlinear information presentation on consumer attitude toward products. Coyle and Thorson (2001) associate interactivity and vividness with perceived telepresence and consumer attitude toward brand and site, and find that vividness, in the form of audio and animation, contributes to product attitude and subsequent behavioral intentions.

When the types of message content that are *thought* to be informative from the marketer's perspective are substantiated through consumer views, the information content studies will possess more prescriptive power in message creation. Content types relating positively to informativeness claims can complement existing research in attitudinal perceptions by answering questions like what types of information and what features of a site will make it more informative, entertaining, or irritating, etc. To pursue this question, this

study searches the current literature for studies connecting the two sets of variables: content/features and perception.

Surprisingly few journal articles have attempted to study such a link. An extensive literature search yielded the following studies addressing this question.

To address TV advertising informativeness, Aaker and Norris (1982) developed a list of 20 characteristic descriptors intended to explain a commercial's informativeness. They link these characteristics with a dependent variable measuring perceived informativeness of the commercial. They hypothesize that newness of product, product type, hard sell versus soft sell (hard sell refers to factual information while soft sell means appealing to emotions), product class versus brand orientation, and whether the ad poses a problem and a related solution influence informativeness. They find hard sell versus soft sell, product class orientation, and the number of distinct claims (e.g., about product quality or performance) are the most significant predictors of informativeness of the 524 TV commercials they studied (Aaker & Norris, 1982).

Soley and Reid (1983) studied how: 1) the number of informational cues, based on Resnik-Stern's content analytic scheme, and 2) the type of informational cues present in an advertising message, affect perceptions of informativeness. Multiple regression was used, in which independent variables were the total number of cues, and each separate cue, and the dependent variable was the perceived informativeness based on magazine reader responses. They used *Iron Age* Ad-Chart informativeness index scores of 126 ads for that purpose. Though the Resnik-Stern (1977) methodology was developed with consumer products in mind, their study applied that same methodology to industrial ads in the metal and machinery industry. Results of their study indicate that quality, components/content, price/value, and availability information affected perceived informativeness, while the total count of cues did

not. In other words, the types of information mattered while the quantity of information did not.

In a laboratory experiment, Ylikoski (1994) found moderate support for the connection between the amount of informative claims and perceived informativeness, through a between group comparison of different versions of automobile advertisements.

Recent literature has shown a limited number of studies linking e-store interface features with Web traffic and sales (Lohse & Spiller, 1998), or availability of interactive functions with site ranking (Ghose & Dou, 1998). Steuer (1992) provides a theoretical discussion on the mediating impact of communications technology on a person's perception of his/her environment, termed telepresence. The three dimensions of interactivity, including speed, range, and mapping, and the two dimensions of vividness -- breadth and depth determine telepresence (Steuer, 1992). Coyle and Thorson (2001) developed and tested hypotheses relating progressive levels of interactivity and vividness of Web sites with telepresence and consumer attitude. Their work represents an early attempt to use certain design elements to understand how these factors affect the experience of consumers.

The lack of theories in connecting content and features with perception may have been the main reason for the scarcity of research in this field. It is the position of this study that what matters most is what the consumer perceives rather than what the advertiser puts into a message. Ducoffe (1996) argues that "a theory of advertising persuasion will remain incomplete if restricted to studying how advertising accomplishes business goals to the exclusion of considering how it furthers the aims of consumers"(p.31). Nevertheless, no matter how different the perspectives of an advertiser and a consumer may be, to search for how they link to each other is to find the "focal point" where "the interests of buyers and sellers meet" (Ducoffe, 1995, p.12). An exploratory study to test this linkage between some of the better defined and frequently appearing content elements and system features, and

perceived values of a message is a worthy pursuit. Because it represents that "focal point" that would enable promoters of products to get feedback from consumers on what was effective and what was not and hence to better understand what consumers value.

In summary, our current study focuses on the information content and system design features of a Web site that contribute to enhanced visitor perceptions of product presentations in a hypermedia environment. In addition to Web sites, this framework is equally applicable to intranet, extranet, and other hypermedia based document systems and presentations where hyper links and multimedia files are feasible.

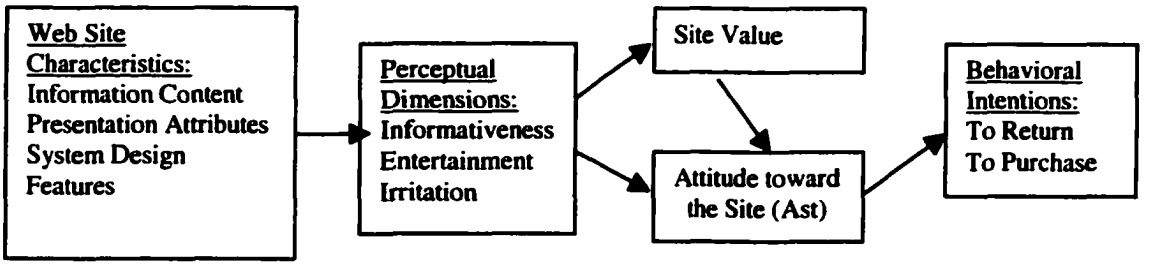
The literature review in the current section lays down the arguments for the need and viability of studying content types, format or presentation attributes, and design features of a Web system. This section calls for further studies linking Web site characteristics and consumer perceptions and attitude. While recapturing some factors reviewed in this section, the next section reviews literature that is relevant to the development of a theoretical framework that places all of the relationships to be examined in the current study in a coherent picture.

3 THEORETICAL FRAMEWORK -- HYPOTHESES DEVELOPMENT

3.1 Dependent Variables

The theoretical framework concerning system variables, perceptual antecedents, and attitude and behavioral intentions form the three sets of variables under the current study: independent, mediating, and dependent variables.

Illustration 3.1 Theoretical Framework of the Current Study



3.1.1 Value of A Web Site

A consumer's experience with a Web site is similar to exposure to advertising. The consumer's assessment of the value of advertising can be drawn from exchange theory (Ducoffe, 1996). An exchange is viewed as a relationship that involves continuous actions and reactions between two parties until one of the parties distances itself from such a relationship when it sees it as no longer appropriate (Houston & Gassenheimer, 1987). The value derived from such an exchange from the consumer's perspective is an important factor in further engagement of the consumer in this relationship. Advertising value is "a subjective evaluation of the relative worth or utility of advertising to consumers" (Ducoffe, 1995, p.1). Such a definition is consistent with a generic definition formulated by Zeithaml (1988), who defined value of an exchange to be "the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given" (p.14).

A visit to a Web site is a form of exchange in which the visitor spends time learning information from, and perhaps enjoying entertainment at the site. In order for such a relationship to sustain itself, the benefits must outweigh the costs. Considering information and entertainment two major benefits a consumer derives from visiting a commercial site, a Web site's value is enhanced by more informative and entertaining presentations of products and services.

However, the value of a Web site, like advertising, is individual specific. One consumer may find what she needs at a site and perceive the site high in value, while another person may find it low in value because of the lack of information he wants. Someone may find a site high in value because it fulfills his entertainment needs while another person may not.

Relating to measures of general likeability of an advertisement, attitude toward the ad (Aad) has been found to have both cognitive and affective antecedents, where deliberate, effortful, and centrally processed evaluations result in said cognitive dimensions (Brown & Stayman, 1992; Muehling & McCann, 1993; Ducoffe, 1995). MacKenzie and Lutz (1989) argue that such evaluations can be viewed as antecedents to consumer attitude toward an advertisement. In this study, we examine a similar role played by such cognitive evaluations of a Web site, and relate consumer cognitive perceptions with the value of a Web site, and subsequent attitude toward the site, a construct discussed in the next subsection.

3.1.2 Attitude toward the Site (Ast)

Attitude toward the site (Ast) is a measure parallel to attitude toward the Ad (Aad) and was developed in response to a need to evaluate site effectiveness, like using Aad to evaluate advertising in traditional media (Chen & Wells, 1999). Aad has been considered a mediator of advertising response (Shimp, 1981). Since Aad has been found to influence brand attitudes and purchase intentions (Brown & Stayman, 1992), it is considered an important factor for

marketing and advertising strategies. Attitude toward the site is considered an equally useful indicator of "Web users' predispositions to respond favorably or unfavorably to Web content in natural exposure situations" (Chen & Wells, 1999, p.20).

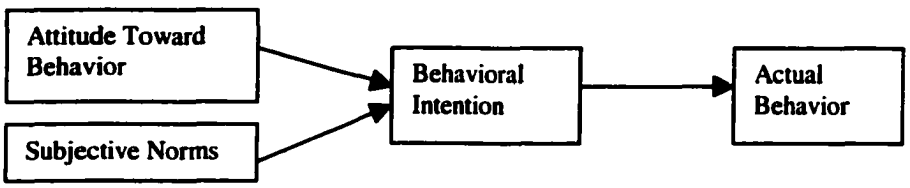
The similarity between Aad and Ast arises from the fact that a commercial Web site contains information similar to that contained in traditional advertising. While attitude toward the ad is a favorable or unfavorable response to a particular advertisement (MacKenzie et al., 1986), attitude toward the site may be seen as a response in a similarly favorable or unfavorable manner toward a Web site. Chen and Wells (1999) developed and tested a scale assessing a surfer's general favorability toward Web sites through a 6-item scale, incorporating various perspectives that reflect a visitor's positive or negative impressions of a site. A Web site that is high in perceived informativeness, entertainment, and organization (low on irritation) is likely to be appreciated by the site visitor and hence would likely receive a favorable attitude toward the site evaluation, a finding that has been validated by Ducoffe (1996) and Chen and Wells (1999).

3.1.3 Behavioral Intentions -- Intention to Return and Intention to Purchase

The theory of reasoned actions (TRA) has been a widely studied model in social psychology that demonstrates the causal relationship between attitude and behavioral intentions (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). According to TRA, a person's behavior is determined by his/her behavioral intentions, which in turn is determined by a person's attitude concerning such a behavior. Additionally, a person's intention to revisit a site can also be seen as a result of his/her attitude toward using a technology that a person intends to use again in the future, based on the Technology Acceptance Model (TAM) (Davis, 1989; Davis, et al., 1989). It has also been shown that such a relationship holds when applied to Web sites (Koufaris, 2002). These two behavioral intentions are discussed separately to account for their differences. A simplified diagram of TRA is presented here. Subjective

norms in this model relate to an individual's normative beliefs like expectations of specific referent individuals or groups, and motivation to comply with such expectations (Fishbein & Ajzen, 1975; Davis et al., 1989). This dimension as another determinant of behavioral intentions in the TRA will not be studied. We believe effects of this factor are at a minimum when people browse and search Web information freely for personal interests.

Illustration 3.2 Theory of Reasoned Actions



3.1.3.1 Intention to Return

Intention to revisit a site is another indicator of site effectiveness. Repeat visits increase the number of times a consumer is exposed to a commercial message, extended to a homepage or a whole Web site. Aaker (1995) suggests that the benefits of retaining loyal customers exceed those of gaining new prospects. For a store, loyal customers contribute to a store's profitability in the form of increased sales revenue and reduced customer acquisition costs (Reicheld & Sasser, 1990). For these reasons, it is in the sponsoring company's interest to develop a Web site that would retain customers, indicated by their intention to return (Koufaris et al., 2001).

Nonetheless, a Web site is different from other forms of advertising on TV, radio, or in magazines where product messages can be forced upon the viewers by means other than the ad itself. For example, advertisements can be embedded in programs like movies, sports programs, or radio talk shows that may be of interest to the viewer or listener. For a Web site, on the other hand, the value of the site itself and a consumer's attitude toward the site, formed after his/her initial visit, provide the incentive for his/her return to the site in the future. A

visitor's attitude toward the site while visiting the site immediately influences his/her processing of site information and is reflected through his/her subsequent surfing behavior, e.g., mouse clicks. This exploration behavior may have additional influences on her/his intention to return.

Such an intention may be affected by the perceived informativeness of the site, the enjoyment experienced by the visitor, the usefulness of the site, or the usefulness of a particular feature of the site. This study adopts this measure as another important indicator of the overall effectiveness of a site, treating it as another dependent variable resulting from a visitor's experience with the site.

3.1.3.2 Intention to Purchase

Existing consumer research has shown much evidence in the relationship between brand attitude and purchase intentions (Brown & Stayman, 1992; MacKenzie et al., 1986; Shimp, 1981). In the context of the Internet, a Web site is often the Web presence of a firm, or a company who does business solely on the Internet. In either case, the site and the brand have much in common. The influence of attitude toward the site on purchase intention is an extension from the relationship between brand attitude and purchase intention studied in the current literature. While intention to revisit a site is more narrowly focused on the Internet medium, intention to purchase is applicable to both traditional media and the Internet. Founded on the same social psychology theory of reasoned actions (TRA), it links a person's attitude with his/her behaviors and has been widely studied in both psychology and marketing research (Saltzer, 1981; Bagozzi, 1981, 1982; Warshaw, 1980; Warshaw & Davis, 1985). Based on such evidence of purchase intention as a significant predictor of purchase behavior, this research treats intention to purchase as another effectiveness measure of a Web site.

3.2. Variables Mediating Effects of Site Characteristics on Attitude and Value

Research in advertising value in both traditional media and the Web has identified information, entertainment, and irritation as three primary benefits and costs consumers derive from a commercial message or Web advertising, and were shown to be significant predictors of consumer perceptions of advertising value (Ducoffe 1995, 1996).

In a study of attitude toward Web sites, Chen and Wells (1999) corroborate Ducoffe's (1996) findings by reporting that 54% of variance in attitude toward a Web site is explained by entertainment, informativeness, and organization factors.

In Eighmey's (1997) profiling of user responses to commercial Web sites, it was found that entertainment value, amount of information and its accessibility, and approach used in site presentation account for over 50% of the variance in user perceptions of Web site effectiveness.

Our current study will adapt the three "perceptual antecedents" in testing hypotheses relating content features with perceptions of information, entertainment, and irritation from Ducoffe (1995, 1996). While Ducoffe's (1995, 1996) studies treat these factors as independent variables, the current study adopts them as mediating variables that link the delivery of information content types, presentation attributes, and system design features with visitor attitudes and behavioral intentions. In summary, this study attempts to uncover practical design and presentation factors contributing to perceived informativeness, entertainment, and irritation, which in turn explain visitor or consumer attitude toward a site, intention to revisit, and intention to purchase products presented.

3.2.1 Informativeness

A Web site is informative if it is able to "inform consumers of product alternatives so that purchases yielding the greatest possible satisfaction can be made" (Ducoffe, 1996, p.22).

Consumers consider information a major benefit of being exposed to advertising or any type of commercial messages (Bartos & Dunn, 1974; Bauer & Greyser, 1968). Information is considered one of the need-satisfying functions derived from media communications, according to the extended uses and gratifications theory (McQuail, 1983; Wright, 1960, 1974; Ducoffe, 1995). Consumers in the online environment value information just like in traditional advertising, with 48% of respondents in a Jupiter Research survey citing their major use of the Web for product research and gathering information on health/medical information, local events, and/or job postings (Jupiter Research, 1999). In the same survey, 40% of respondents said a banner that is informative would grab their attention, and an even larger number (49%) would pay attention to ads that contain some discount or coupon information.

Eighmey (1997) finds that Web site users benefit from information that adds value in and of itself. He reports in a pilot study that users of Web sites derive similar benefits to those reported in uses and gratifications studies using television commercials.

Ducoffe (1995, 1996) finds a significant positive .65 correlation between informativeness and advertising value in traditional media and .73 correlation in Web advertising. Chen and Wells (1999) find a positive correlation of .68 between informativeness and attitude toward a site.

Nevertheless, informativeness is individual specific. An individual considers a Web site informative only if s/he receives the information she needs or wants, or information s/he sees useful. Thus the impact of the attitudinal antecedent on his/her attitude is also individual specific.

3.2.2 Entertainment

A Web site's entertainment value is expected to be an important source of value for consumers through its ability to enhance the experience of visitors to the site (Ducoffe, 1996). Likable or pleasant advertising is considered to impact attitude positively (Mitchell & Olson, 1981; Shimp, 1981; Ducoffe, 1996). Uses and gratifications research indicated that the entertainment value of a commercial exchange lies in its ability to fulfill the audience's needs for escapism, diversion, aesthetic enjoyment, or emotional release (Ducoffe, 1996; McQuail, 1983).

Though trailing utilitarian functions in a user survey, Jupiter Research (1999) finds 36% of respondents said they engage in entertainment activities, like viewing videos, listening to audio, playing fantasy games, and visiting movie or sports sites. In the same survey, animated banner ads and ads that feature sweepstakes or contests would catch the attention of 24% and 21% visitors respectively. They closely follow ads that are informative and those that are content/channel related. The entertainment benefit can also be derived from simply a good execution of a Web site that visitors are attracted to.

According to Eighmey (1997), the successful delivery of a Web site is done through an effective intersection of information and entertainment. His study finds that entertainment value is a significant factor distinguishing highest-rated and lowest-rated Web sites. Scales used in that study include a site being "clever," "entertaining," and "imaginative."

Ducoffe (1995, 1996) finds a significant positive .48 correlation between entertainment and advertising value in traditional media and a .76 correlation in Web advertising. Chen and Wells (1999) find a positive .51 correlation between entertainment and attitude toward a site.

On a note similar to informativeness, entertainment value is also individual specific. Though one individual might find the initial entrance screen of the Coca-Cola Web site entertaining, another person could find it annoying. Thus a visitor's attitude and behavioral intentions will correlate with such perceived entertainment.

3.2.3 Irritation

From the marketer's point of view, irritation is an unintended outcome from visiting a Web site. It can be caused by tactics employed by advertisers that "annoy, offend, insult, or are overly manipulative" (Ducoffe, 1996, p.23), or visitor feelings of confusion, distraction, and messiness due to the way a Web site is presented and features incorporated (Chen & Wells, 1999). In the traditional media, an irritating commercial is one that provokes and causes displeasure and momentary impatience (Aaker & Bruzzone, 1985). In the Web context, irritation may arise from the negative feelings about the organization of a presentation, a feature of the site, or the visitor's frustration with a design feature.

People are often irritated by intrusive television commercials. Intrusive means of information delivery triggers viewer irritation. Twenty-three percent of survey respondents find interstitials so annoying that they will consider never returning to that site (Jupiter Research, 1999).

Ducoffe (1995, 1996) finds a significant and negative correlation of -.52 between irritation and advertising value in traditional media and .57 in Web advertising. Chen and Wells (1999) find a positive .44 correlation between "organization" and attitude toward a site, where "organization" is measured through the following adjectives: not messy, not cumbersome, not confusing, not irritating. Here "organization" could be seen as a close opposite of "irritation." Another frequent source of irritation when visiting a Web site is the time it takes to download pages, especially graphics, and the need to download plug-ins to

view certain pages. Some sites that require registration before viewing certain content parts may also trigger irritation.

As with informativeness and entertainment, irritation is individual specific. While some will definitely not visit a site that contains interstitials, some like them if the interstitial is informative, humorous, entertaining, or is content/channel related (Jupiter Research, 1999).

3.3 Hypotheses Relating Mediating Variables with Site Value

The above discussion relates information, entertainment, and irritation, the major benefits and costs a consumer or visitor derives from his/her experience with a Web site, to the value of a Web site. The more informative a Web site is perceived to be, the more benefits a visitor to the site derives from such an exchange experience (Bartos & Dunn, 1974; Bauer & Greyser, 1968). The visitor or consumer also derives more gratification from his/her experience, and finds more use of that particular information communicated from the site. We hypothesize the relationship between perceived informativeness and perceived site value similar to that of between perceived informativeness and value of advertising, as was found to be positive and strong in Ducoffe (1995, 1996).

H1: Perceived informativeness is positively related to site value.

The value of entertainment is its ability to fulfill the audience's needs for escapism, diversion, aesthetic, enjoyment, or emotional release (McQuail, 1983; Ducoffe, 1996). Ducoffe (1995) finds a strong positive relationship between perceived entertainment and advertising value. Eighmey (1997) finds entertainment a significant factor for a Web site to be highly rated. Along the line similar to Ducoffe (1995, 1996), we hypothesize a positive relationship between perceived entertainment and the value of a Web site.

H2. Perceived entertainment is positively related to site value.

On the other hand, irritation contributes negatively to the value of a Web site due to the fact that irritation is something undesirable. Annoyance and irritation are the main reasons people criticize advertising (Greyser, 1968). Irritation leads to reduction in advertising effectiveness (Aaker & Bruzzone, 1985). Irritation is also a cause for visitor to leave a site (Nielsen, 1999; Jupiter Research 1999). Thus we hypothesize that the more irritation, the less value a site is to a consumer.

H3. Perceived irritation is negatively related to site value.

3.4. Hypotheses Relating Mediating Variables with Attitude toward the Site (Ast)

In a similar vein, again based on the proceeding discussion, Ast is another resultant variable influenced by perceptual dimensions of informativeness, entertainment, and irritation. MacKenzie and Lutz (1989) propose that ad credibility is one of five determinants of attitude toward an ad. Though Ast is similarly an affective response to a Web site, it can also be seen as a result from the processing of message stimuli that influence a consumer's propensity to accept claims made at a Web site, i.e., credibility of a Web site. Thus the value of a Web site and its perceptual antecedents -- informativeness, entertainment, and irritation, affect the consumer's attitude toward a site. More favorable attitudes are formed in consumers and visitors who see a site valuable and who see a site offer more benefits.

H4. Perceived informativeness is positively related to attitude toward the site.

H5. Perceived entertainment is positively related to attitude toward the site.

H6. Perceived irritation is negatively related to attitude toward the site.

These hypotheses are based on the constructs developed by Ducoffe (1995, 1996), and Chen and Wells (1999), and closely replicate the study of Ducoffe (1996) in testing relationships between the three perceptual dimensions and advertising value. Including these

three links with the rest of the study completes the entire framework proposed under the current study.

3.5 Hypothesis Relating Site Value with Attitude Toward the Site

Closely following what is discussed in the proceeding paragraphs, the value of advertising is considered a narrower construct than Aad (Ducoffe, 1996). Advertising value assesses to what extent an ad provides a consumer what s/he wants. Relating the value of advertising on the Web and attitude toward advertising on the Web, Ducoffe (1996) finds that consumers' assessment of value has a significant impact on their overall attitude toward Web advertising. He finds a strong correlation (.70) between these two measures. In our current study, we similarly hypothesize that the value of a Web site is positively associated with Ast.

H7: Attitude toward the site is positively related to site value.

3.6 Hypotheses Relating Attitude Toward the Site with Behavioral Intentions

A sizable body of literature has documented a strong relationship between attitude and behavioral intentions. The theory of reasoned actions (TRA) argues that attitude toward an object is related to behavioral intentions (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Research has demonstrated such a relationship through numerous studies (Saltzer, 1981; Bagozzi, 1981, 1982; Warshaw, 1980; Warshaw & Davis, 1985). Shimp (1981), MacKenzie and Lutz (1989), and Brown and Stayman (1992) found attitude toward an ad positively influences consumer's purchase intentions.

Similar to traditional advertising, this study examines the relationship between intention to return and intention to purchase and attitude toward the site.

H8: Intention to return is positively related to attitude toward the site.

H9: Intention to purchase is positively related to attitude toward the site.

3.7 Independent Variables

This subsection addresses a preliminary list of categories of content cues, form attributes, and system design features based on current literature.

3.7.1 Information Content and Hypotheses on Informativeness

For a Web site to be informative, it must contain relevant information that users of the site find meaningful and useful. In particular, information must be relevant to the user's task at hand. For commercial messages, the advertising literature provides several such measures (Resnik & Stern, 1977; Aaker & Norris, 1982). First, we will adopt the definition of "informative commercial communication" from Aaker and Norris (1982): one that contains information that is truthful, complete, intelligible, relevant, unknown, and substantial enough to warrant processing. From this conceptual base, Aaker and Norris (1982) conducted a series of open-ended discussion with advertising research professionals to conceptualize the construct used to explain informativeness of a commercial through a set of measurable characteristics. Their final list (Appendix D) includes 20 characteristic descriptors of both information content and copy approaches used. With regard to content, the list includes the following types of information: price, product components, product test, government sponsored test, distinct claims or thoughts, product use, newness of product, and expert/average person testimonial (Aaker & Norris, 1982).

In a related empirical study of TV commercials, Aaker and Norris (1982) find that hard/soft sell (hard sell adopts a reason-why approach while soft sell uses a mood approach), product class versus brand orientation, and distinct claims tend to distinguish an informative commercial. Their finding is restricted to TV commercials where entertainment and characterization may be emphasized in message creation while many relevant aspects of a product like price and components and test results tend to be omitted because of the high cost

of TV advertising. However, the instrument they developed is applicable to all types of commercial messages.

Another stream of literature on studying informative commercials started with Resnik and Stern's 14 evaluative criteria (1977). Resnik and Stern (1977) argue that informational cues about a product, like price and value-retention capabilities, components and features, comparative claims of quality and performance, when and where a consumer can get them, and product guarantees and warranties, are particularly relevant in assisting consumers in making intelligent purchase decisions. The list of content types and related questions used in the content analytic scheme are presented in Appendix A.

The "Chicago-school" of economists consider informative commercials a facilitator of efficient and active comparison shopping by consumers (Bloom and Krips, 1982). Consumers incur search costs finding price and product information. Such a search cost can be reduced significantly in the electronic marketplace, through an informative Web site that includes relevant information about products and services (Bakos, 1997).

From the cognitive effects of information content on viewer perceptions of informativeness of advertising, Ylikoski (1994) proposes that cognitive effects of a commercial message produce changes in the consumer's mind. Awareness comes from the moment a potential buyer recognizes a product, through exposure to ad content. He considers advertising's information content a stimulus that enters the cognitive system of the receiver and in turn produces cognitive effects like spontaneous thoughts or ad perceptions. His laboratory study yields some support for the impact of quantity of information measured by number of content cues present in an ad and viewer perceived informativeness (Ylikoski, 1994).

From the above discussion, we believe that content information about products do contribute to value of the commercial message from a consumer's perspective. This

perspective also reflects some of the arguments in Ducoffe's (1995) conceptualization of the informativeness construct, which is from the consumer side. These arguments include advertising's "ability to present a true picture of products" to consumers, and supplying information as "one of the need-satisfying functions derived from media communications" (Ducoffe, 1995; McQuail, 1983). Here we interpret "true picture of products" as completeness of information about product from multiple dimensions, or the quantity of information -- the number of information cues -- as defined by Soley and Reid (1983).

Soley and Reid (1983) did not find the quantity of information a significant predictor of perceived informativeness, though content analytic studies have quantitatively treated informational cues. Relating to the definition of an "informative commercial" by Aaker and Norris (1982), product related information, including price, components, quality, and performance is "relevant" but "unknown" to the consumer before her exposure to a Web site. The more types of information available to the consumer, the more "complete" and "substantial" the amount of information a consumer can use to make an "intelligent" decision. Among them are certain types of information, like test results, customer testimonials, and warranties and guarantees, that enhance the credibility and believability of information. Nonetheless, because there is no rigid definition of quantity of information in the literature, this study will focus on specific types of information including price/value and quality/performance.

3.7.1.1 Selection of Individual Informational Cues Under the Current Study

Philport and Arbittier (1997) and Ghose and Dou (1998) use modified analytic schemes to apply to ads from multiple media or Web sites (See Appendices B and C). When a large number of commercial messages are sampled from magazines and newspapers, informational cues (from among the 14 Resnik-Stern list) including safety, packaging or shape, nutrition, taste, company-sponsored research, independent research, and new ideas

constitute a significantly smaller percentage of appearance (Stern et al., 1981; Abernethy, 1992). In Soley and Reid (1983), using a sample of industrial advertisements, quality, components/content, price/value, and availability were found to be significant predictors of informativeness, while other cues were not. Based on the above observation, this study will test a select number of informational cues that have been found to appear more frequently and have been found to be more likely predictors of informativeness in commercial messages across different media.

From an information processing perspective, valuable information must be relevant, accurate, complete, accessible, reliable, and timely. In particular, product, price, performance, and promotion are seen as key product dimensions of commercial communications in marketing textbooks. According to Porter (1980), firms engage in two basic types of product strategies: cost leadership and differentiation. Product selling points often come from product pricing or quality. Thus in addition to product detail, price/value claims and quality/performance statements are important dimensions a marketer attempts to get across. In a related vein, unique features and new ideas incorporated into a product are often seen a way to differentiate a product from competition, like specialty and exceptional quality. These types of information represent what firms try to communicate. However, in order for a message delivered to become a "focal point" (as in Ducoffe, 1996) between the marketer and the consumer, product information must be "relevant," "unknown," and "intelligible" from a consumer's perspective, and must be "substantial enough to warrant processing" (Aaker & Norris, 1982).

On the marketer's side, the frequency of appearance of a cue indicates the advertisers' beliefs of that cue's ability to "inform" consumers of promoted products. The cue of product components or contents is found in 43% of magazine advertising (Stern et al., 1981), 46.4% of newspaper advertising (Abernethy, 1992), and 17.5 to 21.8% of TV advertising (Resnik &

Stern, 1977; Stern & Resnik, 1991). TV ads have been empirically concluded to be less informative by content analyses (Stern et al., 1981; Abernethy, 1992). Along with price or value, quality, performance, availability, special offers, product features and content is one of the most frequently found cues in advertising. A similar measure named "facts and detail" used by Philport and Arbittier (1997) is found to be one of the "product positioning" factors distinguishing brand communications by media. Aaker and Norris (1982) include "product components" as one descriptive characteristic in explaining informative commercials. Soley and Reid (1983) found components and contents to be a significant predictor variable of perceived informativeness in Iron Age magazine ads. Components, features, and content of products represent factual knowledge a consumer looks for in a product. Over the Internet, Web site visitors also prefer to be given facts (Huizingh, 2000). Thus we also expect a positive relationship between the provision and receipt of product facts and detailed information and perceptions of informativeness in the hypermedia environment..

Additionally, some evaluative cues on Resnik-Stern's original list that have been found to appear infrequently are indeed part of product description related to content and components. These other factors include how a product tastes (e.g., snacks and drinks), what the nutritional content or ingredients are, and packaging or shape that describes the exterior look.

Delivered product description represents information "substantial enough to warrant processing" (Aaker & Norris, 1982) due to its "relevancy." Individual aspects of a product description make the "completeness" of information possible. When a consumer visits a Web site, her/his perceived delivery of description of product detail impacts her/his perceived informativeness in a positive way.

3.7.1.2 Price and Value

Among the descriptive information about a product, price of a product, the relative worth of a product, or the value inherent in a product, are important aspects that a consumer values in making a purchase decision. The cue of price or value is found in 37% of magazine advertising (Stern et al., 1981), 68% of newspaper advertising (Abernethy, 1992), and 8.7% to 9.1% of TV advertising (Resnik & Stern, 1977; Stern & Resnik, 1991). It is one of the most frequently found cues in advertising. It is also considered part of a sales incentive by Philport and Arbittier (1997) and is found to be one of the "product positioning" factors distinguishing brand communications by media. In particular, they find it most frequently appearing in newspaper ads.

Aaker and Norris (1982) treat "price mentioned" as one of the 20 descriptors explaining informative commercials. Soley and Reid (1983) find price to be a significant predictor of perceived informativeness. An emphasis on price, discount, or value claims reflects a marketer's intention to promote a product through the cost dimension, in cost leadership strategy (Porter, 1980). Additionally, price information is considered a major component of a buyer's search cost, along with product information (Bakos, 1997). The availability of price information represents "substantial" savings of time and money in obtaining "intelligible" and "unknown," yet highly relevant information that consumers can use to evaluate competing products in their purchase decisions.

A second price-related information cue on products is price-based promotions. The cue of special offer or promotion is found in 26% of magazine ads (Stern et al., 1981), 24.4% of newspaper ads (Abernethy, 1992), and 1.9% to 7.1% of TV ads (Resnik & Stern, 1977; Stern & Resnik, 1991). It is an incentive (Philport & Arbittier, 1997) found most frequently to appear in newspaper ads. Ghose and Dou (1998) find sales and promotions contribute to site appeal. Lohse and Spiller (1998) find that promotion on the electronic shopping mall entrance

screen generates additional visits and sales. Forty-nine percent of Web surfers say that ads that feature discounts or coupons are most likely to grab their attention, ahead of ads that are informative (40%), or content/channel related (31%) (Jupiter Research, 1999).

Due to increased engagement and exploration, a promotional message stimulates interest in a visitor. If a promotional message catches a viewer's attention, it succeeds at being "relevant" and "substantial" to the viewer because the information content of the message has been received and processed. It signals the connection between the marketer's intention to deliver and a viewer's actual receipt of the message about the products promoted. We expect any price-based promotion to further the delivery of price information. In summary, we expect the delivery of price and value related information to contribute to perceived informativeness of commercial presentations in the context of the hypermedia environment.

H10: Informativeness is positively related to presence of price information.

3.7.1.3 Quality and Performance

The cue of performance is found in 15% of magazine advertising (Stern et al., 1981), 11.2% of newspaper advertising (Abernethy, 1992), and 17.7% and 8.5% of TV advertising respectively in two separate studies (Resnik & Stern, 1977; Stern & Resnik, 1991). It is another frequently found cue in advertising. This dimension communicates the meaning of what a product does and why it is better than competitor offerings. The original wording in content analyses was the following:

- Performance: What does the product do, and how well does it do what it is designed to do in comparison to alternative purchases? (Stern et al., 1981, p.40)

From a consumer's perspective, performance reflects the competence and superiority of a product over alternative offerings. The performance dimension is task-oriented and is measured by more efficient and effective accomplishment of the jobs the product is intended to perform.

Aaker and Norris (1982) include product use, product test, government-sponsored test, comparative advertising, and problem posed (and thus how the product solves the problem) to explain informative commercials. These descriptors have focused on the performance of products. In the Web environment, site sponsors have more room to devote to claims of product performance through multiple dimensions, including technical attributes, test results, comparative advertising, and customer testimonials. Even though consumers are not expected to take these claims at their face value, the information presented provides them an opportunity to hear what the company has to say about its products and helps them make an independent judgment about product choices. We thus argue that the delivery of performance claims is preferably "relevant" and "substantial enough to warrant processing" (Aaker & Norris, 1982). It is another important type of information a customer values. We believe that its delivery positively impacts perceived informativeness.

Like performance, a related cue quality is found in 63.7% of newspaper ads (Abernethy, 1992), and 2.4% to 2.9% of TV advertising (Resnik & Stern, 1977; Stern & Resnik, 1991). The original wording is quoted as the following:

- Quality: What are the product's characteristics that distinguish it from competing products based on an objective evaluation of workmanship, engineering, durability, excellence of materials, structural superiority, superiority of personnel, attention to detail, or special services? (Stern et al., 1981, p.40)

This dimension addresses the superiority of the product itself, rather than how it is used. The fine line between quality and performance is difficult to identify but is exemplified

in the case of an automobile. A consumer typically views the quality of a car by its reliability, the number of times a car is brought back to the repair shop. On the other hand, the performance of a car is measured by number of seconds it takes the car to accelerate from 0 to 60 mph, the number of seconds it takes to stop the car from 60 mph, cornering ability, horsepower, and traction, among other things.

Quality information is often communicated through other means as well. For example, celebrity or other kinds of endorsements are considered part of product positioning by Philport and Arbittier (1997) and are found to be one of the factors distinguishing brand communications by medium. The product-positioning group in their study includes comparison, product quality, customer service, and guarantee. Neither independent nor company-sponsored research frequently appeared in ads studied (Abernethy, 1992; Stern, et al., 1981; Soley & Reid, 1983). Nonetheless, consumers often view product test results as convincing quality statements. They support related product quality claims to improve credibility.

Additionally, new ideas are found in less than 1% of magazine or newspaper ads (Stern et al., 1981; Abernethy, 1992), but over 15% of TV ads in a 1986 study by Stern and Resnik (1991). In our current study, we will consider new ideas to communicate the uniqueness in features and functionality of a newly developed product in comparison to existing products. It reflects special features that may not exist in other products, and thus is a claim similar to quality or performance. For example, synthetic oil is a type of nontraditional motor oil that is supposed to be new as well as superior in performance. Superior performance is often a result of high quality or unique engineering that competitors do no possess.

In Porter's (1980) three generic business strategies, product quality and unique features are some of the approaches to differentiate a firm's offerings in a competitive environment. The differentiation strategy is also one of the reasons a firm could command a

higher price than its competitors. Soley and Reid (1983) find quality statements to be the most significant predictor of perceived informativeness in their study, while performance has only a marginal impact. The audience of a site presentation will likely consider quality, performance, new ideas, research results, and endorsements to be a group of statements making a quality claim. For example, Aaker and Norris (1982) include number of distinct claims, product test, and government sponsored test as characteristic descriptors of an informative commercial. Considering quality an "intelligible" and "relevant" ingredient within Aaker and Norris' (1982) definition of an informative commercial, we expect such statements to have a positive impact on perceived informativeness. Consolidating the above discussion on product performance, quality, and other claims related to product superiority and distinctness, we hypothesize a positive relationship between the mentioning of product quality or performance and higher levels of perceived informativeness.

H11: Informativeness of a Web site is positively related to inclusion of information on product quality.

In summary, this subsection proposes that product information specifically related to price-value and quality-performance impacts the perceived informativeness of products. By "informative" we mean that a Web site is informative about the products presented. A Web site can be informative about many things in addition to its products, like investor relations, job openings, alliance partners, etc. This study adopts a perspective that is focused on products, in line with previous advertising research in informativeness (e.g., Ducoffe 1995, 1996). For example, in evaluating informativeness of Web advertising, Ducoffe's (1996) seven-item scale specifically emphasizes "product information" (p.28).

The hypotheses developed in this subsection relate to two broad categories of product information: price and quality. They represent a reasoned aggregation of the many informational cues in content analysis literature, and represent a fairly high percentage of

usage among advertisers (Abernethy, 1992; Stern, et al., 1981; Soley & Reid, 1983). More importantly, these are the two major categories of information consumers seek in their purchase decisions. The study of the effects of these two types of product information is theoretically more founded at this stage. The success of this study, where information is categorized at a coarse grain, encourages finer classification of information in future studies, where the effects of each informational cue in the existing content analytic literature could be examined in more detail.

3.7.2 Format and Presentation Attributes and Hypotheses on Informativeness and Entertainment

An important attribute of the use of a Web site to disseminate product information and conduct e-commerce is the ability of the customer to interact with the site, through certain features in support of such functions (Palmer & Griffith, 1998). These functions include both text-based email inquiries and feedback forms and entertaining features that attempt to retain customers at the site for longer visits (Ghose & Dou, 1998). Entertaining features in this particular hypertext medium include pictures, virtual reality display of products, multimedia shows, online games, and the use of cartoons and humor (Philport & Arbittier, 1997; Ghose & Dou, 1998; Huizingh, 2000).

A Web site is a mix of direct selling and advertising with characteristics of both general product display and interactive involvement with customers (Berthon et al., 1996). In addition to providing product information, through hypermedia, a Web site can engage visitors in dialogues such as inquiries, suggestions, order status tracking, new product proposal, and online problem diagnostics (Ghose & Dou, 1998). This medium affords a rich collection of formats that are available to the marketer in the presentation of products.

From a broader perspective, interactivity is an important dimension of features that distinguish the Internet from other media. Steuer (1992) gives a concise definition of this

concept related to the Internet. He considers interactivity to be "the extent to which users can participate in modifying the form and content of a mediated environment in real time" (p. 84). Interactive functions allow the user to participate actively in the exchange and persuasion process through direct manipulation of the structural elements of a site (Rodgers & Thorson, 2000).

Like television, the interactivity of this medium provides the potential to deliver information in an entertaining form. In the meantime, it also contributes to the potential irritation visitors might experience like that of viewers of TV advertising. This subsection will address the factors that might enhance the entertainment value of a Web site, and those factors that may cause irritation.

3.7.2.1 Entertainment Features

Hypermedia is multimedia. Animation, video, and audio complement traditional text and graphics when used judiciously. The behavior of Web site visitors can be either goal-directed, i.e., searchers, or can be experiential, i.e., surfers (Hoffman & Novak, 1996; Singh & Dalal, 1999). Entertainment supports experiential flow of surfers because they are more likely to engage in "shallow, sensory-level, peripheral processing of the executional aspects of the message" (Singh & Dalal, 1999, p.95). Hence, entertainment features are more likely to have an impact on exploration behavior and attitude of surfers.

Structural ad features like animation, color, and graphics that are studied in traditional media have also been found in the online environment (Rodgers & Thorson, 2000). In traditional advertising literature, the following ad features have been studied and linked to subjective measures derived from user profile studies (Rodgers & Thorson, 2000): color, size, typeface, product class, appeal type, animation, audio, sound level, sound clarity, and movement. They argue that additional features like vividness, realism, and interactivity can

be studied because the Internet encompasses and expands the complexities of print and broadcast media.

Ultimately, the purpose of identifying objective and subjective measures of a commercial message is to enable predictions of consumer perceptions and responses to messages that contain those features. In an experimental study, Li and Bukovac (1999) find that the objective structure of size and animation on a banner ad makes a difference in viewer responses. They find that large animated banners are more attention getting than smaller and static banners and thus assist recall of the ad. Coyle and Thorson (2001) argue that interactivity and vividness are the two main factors affecting perceived telepresence, and consequently attitude toward the site. They find the presence of image maps, audio, and animation to influence perceived telepresence and attitude toward the site (Coyle & Thorson, 2001).

According to Steuer (1992), telepresence is the perception of direct experience through virtual reality, which in turn is a simulated environment in which the user feels present. Such a telepresence fulfills the needs of escapism, diversion, or aesthetic enjoyment (Ducoffe, 1995), where the value of entertainment lies (McQuail, 1983).

Unlike the continuous animation in a banner ad or on a Web page whose only purpose is to gain attention, some animations are intended to display a product from a multi-dimensional perspective and are only active upon request or when the mouse pointer is moved upon. Many shopping sites present a larger image, some full screen, to let the user view the details of a product, if the user so desires, by clicking on a miniature version of the product picture. The same benefit derives from the use of animation upon request. For example, Nissan's Web site allows the user to look at its newly introduced model through animation of a car turning around slowly after the visitor requests it. This interactive capability allows the user to choose what she wants to see (Rodgers & Thorson, 2000).

A picture is worth a thousand words. A literal interpretation of this old saying is appropriate in our current context. A "true picture" of a product is information a consumer values (McQuail, 1983; Ducoffe, 1996). Animated product displays not only provide the consumers an opportunity to see the product from multiple angles, but also enhances the directness of their product experience, which has been found to produce more confidently held and more enduring attitudes (Coyle & Thorson, 2001; Smith & Swinyard, 1982, 1983). Such direct product experience is informative due to its truthfulness, relevancy, and completeness.

Nielsen (1995) believes that product demos through animation or video clips are good for showing things that move. In particular, he believes that demos of physical products are well suited for the Internet medium. Judicious use of text, graphics, animation, video, and audio enhances the presentation of products and alerts visitors to promotions and special offers. Product detail can be presented from more angles than still pictures.

Ultimately the user is the judge of the attractiveness of a site presentation. In a low-engagement information-processing mode, typically when a user stumbles across a site of marginal interest, pure text and plain background will not arouse much interest in the surfer. Graphics, animations, and video clips might be some of the elements that prevent a visitor from simply clicking away from a site.

The presentation of such product animation at a customer's request also signals the customer's willingness to process the information. The benefits derived from such exchanges conform to the substantiality of an "informative commercial" that warrants processing, as defined by Aaker and Norris (1982).

Seeing control as a major benefit of shopping online, customers favor sites that provide them with more perceived control (Koufaris et al., 2001). Additionally, a clickable image also leads to perceived interactiveness of a Web site that Coyle and Thorson (2001) argue would further lead to consumer's favorable attitude. The adoption of animation in this setting

provides the consumer more product information in an entertaining form, without causing irritation. Thus as a further exploration of the effect of animation on viewer perceptions, we hypothesize the following,

H12a: Entertainment is positively related to the use of animated product demonstrations upon request.

H12b: Informativeness is positively related to the use of animated product demonstrations upon request.

The use of humor in traditional advertising has been a complex topic due to mixed findings from over a quarter century's research on humorous ads (Weinberger & Gulas, 1992). However, research has shown that humor does attract attention and seems to be most effective in ads promoting low-risk routine purchases (Weinberger et al., 1995). In a series of field studies, Scott et al. (1990) find that humorous flyers increase attendance at social events like neighborhood picnics and clambakes but have little effect on attendance of business gatherings.

Wells et al. (1971) find that, along with vigor, personal relevance, and irritation, humor is a major perceptual dimension in their profiling of user responses to TV commercials. The adjectives that accounted for this factor include jolly, merry, playful, humorous and amusing. They believe that humor contributes to perceived entertainment, even though it does not necessarily score high on personal relevance.

Additionally, when a Web surfer is engaged in low-risk message processing, peripheral cues like humor may be used and can succeed in gaining visitor attention as they do in traditional media (Weinberger et al., 1995). A more likable interface will also encourage visitors to visit more pages and stay longer, and hence nurture a more positive attitude.

Ducoffe's (1996) entertainment factor is based on audience needs for escapism, diversion, aesthetic enjoyment, or emotional release. Humor fulfills most if not all of these needs: a diversion because of its incongruous nature, emotional releases like laughing, temporary escapism, and enjoyment. The conceptualization of this dimension is closely in line with some earlier user profiling studies in advertising. From a pool of 600 adjectives, Aaker and Bruzzone (1985) identify four factors that explain the majority of variance in predicting informative, enjoyable, annoying, or offensive ads. In particular, amusing/humorous did not break out as a separate factor but contribute to 37.6% of the variance explained by the factor "entertainment." Examination of the 25 most entertaining commercials, each of which scored 2 standard deviations above the average, reveals that "amusing/humorous" is the predominant part of the factor. In particular, none of the most amusing commercials scored low on the "entertainment" factor. These amusing commercials involve a comedian interacting with children, animated characters, and conversations that had a "touch of warmth and quiet humor" (p.21).

Humor's intention is to amuse and entertain people, to make them laugh, and to convey light-hearted enjoyment (Morkes et al., 1999). Morkes et al. (1999) define humor to be "an incongruous comment that is recognized by the receiver as an attempt to amuse and that succeeds at amusing" (p.403). Humor is found to enhance the likeability of the computer interface and has a positive effect on user cooperation (Morkes et al., 1999). The above discussion leads us to hypothesize the following,

H13a: Entertainment is positively related to the use of humor.

In addition to entertainment, humor also helps gain attention and comprehension, especially when humor is related to the products presented (Speck, 1991). Many studies have been devoted to the effect of thematic and structural relatedness of humor to a message (Weinberger et al., 1995). Here "thematic" refers to humor's relationship with product themes

and "structural" refers to the integration of humor with product claims (Speck, 1991). When ad effectiveness was measured through reader or viewer recall and comprehension, both related and unrelated humor have been found to have a positive effect (Chapman & Crompton, 1978; Scott, et al., 1990; Ziv, 1988; Vance, 1987; Zillmann et al., 1980). However, related humor was found to be superior to unrelated humor when direct comparison studies were conducted (Kaplan & Pascoe, 1977). Measures of recall and comprehension reflect the ad's effectiveness at getting product-related messages across to the viewer, which implies a more informative message to the visitor. Weinberger et al. (1995) found a positive relationship between related humor and attention and comprehension in low risk products. Attention and comprehension contribute to the delivery of information contained in a message and lead to more informative perceptions of advertised products. No use of humor in Web advertising or Web pages have been studied in the past. This study will extend advertising from the traditional media to the Web and study the impact of humor on attention and comprehension (perceived informativeness) of products. Thus we hypothesize the following,

H13b: Informativeness is positively related to the use of humor.

3.7.2.2 Irritation Factors

Certain web-based features may have negative effects on visitor attitudes. These negative elements include scrolling text across the screen or status bar, continuous-running animation, nonstandard link colors, outdated information (Nielsen, 1999), broken links, error messages, and popup interstitials (Jupiter, 1999). Nielsen (1999) sees that animation may be effective at drawing a visitor's attention but should leave him/her in peace to read the message.

In an early study of irritation in advertising, Greyser (1973) found that "interruptiveness" is a predominant reason why the British public considered TV advertisements more irritating than the print media. In data collected from the U.S. public, he

finds that more people feel irritated by TV commercials than by other media, while the predominant factor is TV commercials' intrusiveness. The Internet is a hybrid of the print and broadcast media. The use of interstitials and popup windows closely mirrors a TV commercial's intrusiveness and interruptiveness. Yet users may experience even greater irritation because of the additional effort required to get rid of these web-based interruptions.

Jupiter Research's (1999) survey found that 23% of the users were so annoyed by interstitials that they will never come back to the site again, while 46% of visitors found popup ads mildly annoying. However, 14% would like them if they are informative, content/channel related, and/or entertaining. Even though there is evidence from research showing mixed results on the effect of interruption, e.g., popup windows, on consumer decision performance and decision satisfaction (Xia & Sudharshan, 2000), when a visitor is annoyed by such distractions and interruption, we expect his/her irritation level to be high. We expect the use of unexpected popup windows to be associated with irritation,

H14: Irritation is positively related to the use of popup windows.

Web site design consultant Jakob Nielsen (1995) cautioned a balanced treatment of the use of multimedia in Web site design as early as 1995. He still stands by his recommendations five years later (Nielsen, 2000). He suggests such features like animation be used in a limited number of cases where it enriches a graphical display, shows a multi-stage transition, illustrates change over time, or when it is used in connection with a client-side image map. He acknowledges that the use of images may catch visitor attention and help visualize 3-dimensional structures, but advises that animation should never be used permanently on a screen. He argues that "moving images have an overpowering effect on the human peripheral vision" and that the presence of a continuous animation on a page makes it very hard to read text in the middle of a page (Nielsen, 1995).

While animated product presentation is activated upon a user's request, i.e., a click on the link that leads to such a product demo, continuous animation is animation purely designed to catch a user's attention or an attempt to entertain the visitor while s/he is at the site. Nonetheless, the continuousness poses a problem that is similar to popup windows in terms of intrusiveness. It is much like scrolling text at the bottom of a television screen that cries for attention. It is another form of intrusive presentation of information. Such intrusiveness demands attention like TV commercials, and will similarly cause irritation like any other intrusive means of advertising. We hypothesize that continuously running animation is positively associated with irritation.

H15: Irritation is positively related to the use of continuous animation.

3.7.2.3 Summary on Format and Presentation Attributes

In summary, this subsection hypothesizes that certain presentation attributes may impact visitor perceptions of entertainment and irritation. A visual product demonstration enhances communication of product information, and thus contributes to informativeness. Humor contributes to entertainment of a site and informativeness of an ad or site. And intrusive means of presentation causes irritation. These intrusive means include continuously running animation that commands a visitor's attention on a page, as well as unexpected popup windows that might be used to promote a product.

3.7.3 System Design Features and Hypotheses between the Usefulness of System Design Features and Attitude toward the Site

The user interface of hypermedia makes an important contribution to the effective presentation of a business and its products. Lohse and Spiller (1998) identify a set of attributes based on their review of online stores, e.g., navigation features, search mechanisms, help functions, store layout, and hyperlinks among related products, and relate them to store

traffic and sales. Nielsen (1999) makes a similar observation about the importance of user interface design in the hypertext environment and emphasizes a few principles he believes to be constant throughout future development of Internet technology, i.e., speeds, search mechanisms, a sense of structure and navigation support, sitemap, page scrolling, and content.

Eighmey (1997) finds that a "clear and metaphorical structure" contributes to the attractiveness of a Web site while an "efficiently executed design" contributes to the "ease of use" factor (p.65). In summary, consensus has formed that organization of hypertext files influences the effective delivery of a message and presentation of products. The current literature falls short on relating such features with visitor perceptions and attitudes toward sites. Such a consideration motivates the inclusion of such features in our current study as system design features on organization and navigation.

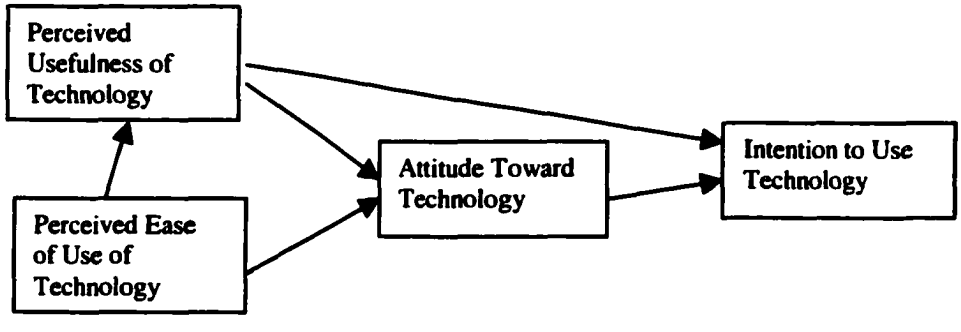
According to Nielsen, Hypertext research showed that structure helps users navigate (Nielsen, 2000). However, he believes that structure has been under-valued on the Web due to bad information architecture that has prevented users from accessing all available options. The starting point of such a structure is the home page. Like any communications message, the home pages perform two functions: informing and persuading (Singh & Dalal, 1999). Singh and Dalal (1999) argue that an effective home page must provide the right information as well as the right look and feel that could persuade the visitor to further explore the site. The menu structure tells the visitor what information is available at the site and graphics like logos and images on the home page communicate the theme of a business or institution.

In a research framework identifying relevant aspects of Web site designs, quality of navigational structure, image and presentation style are considered design features that can influence visitor attitude toward a site (Huizingh, 2000). The study content analyzed over 600 Web sites based on a set of content attributes and used two-person groups to evaluate some of the perception items that tend to be subjective. Structure is believed to help visitors find

information, and the use of multimedia helps to build an image of a site. Of particular interest is a design aspect called "presentation style" (p.126), which is measured by similarity in presentation style including layout, colors, font style and size, and mix of text and graphics, etc (Huizingh, 2000). He argues that uniform presentation style stimulates reading and facilitates interpretation of information.

In information systems research, the usefulness of a technology and the user's attitude toward technology are addressed in the Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989). It is based on the theory of reasoned actions (TRA) (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). TAM has been widely adopted in user acceptance of technology research due to its parsimonious nature and highly reliable constructs (Koufaris, 2002). It has been adopted in numerous studies testing user acceptance of word processors (Davis et al., 1989), spreadsheet applications (Mathieson, 1991), email (Szajna, 1996), telemedicine technology (Hu et al., 1999), and Web sites (Koufaris, 2002). Like a word processor that helps create work-related documents, and an email system that facilitates communications at work, site design features incorporate various types of current information technology and facilitate information retrieval and navigation at a site. The original TAM model is presented here:

Illustration 3.3 The Technology Acceptance Model (TAM)



Some major design features of a commercial Web site include the product menu and classification structure, an FAQ section, an internal search engine, a sitemap, and an online

help function to customize or personalize the experience of a visitor. This last one may include customized homepages, recommendations of products based on customer preferences, a calculation to find out how much mortgage the user can afford, and the like. The ultimate purpose of these system design features is to facilitate information retrieval about the products and services offered, and to provide the user a positive experience at the site, be it shopping or browsing. Each design feature is based on one or a combination of a few related technologies and hence by itself constitutes a subsystem of the entire site. This study will apply the usefulness construct of the TAM model to each individual design feature and look at the contribution of each technology feature to user experience, reflected in her perception of the Web site and attitude toward the site.

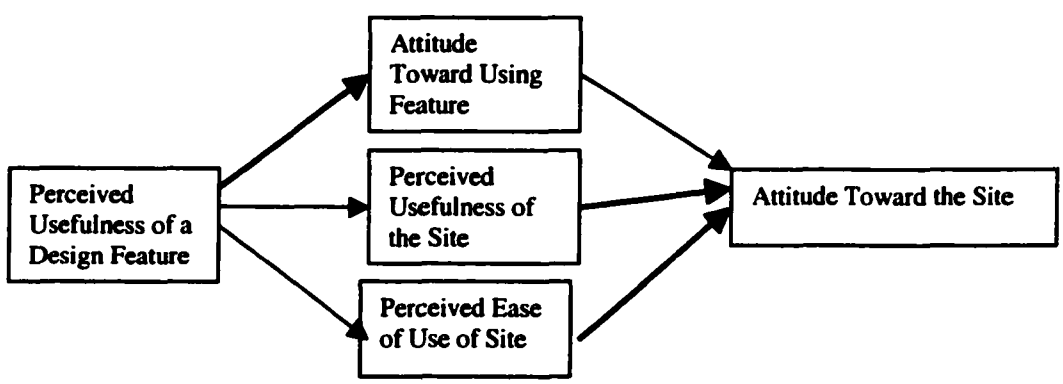
TAM treats perceived usefulness of the system and perceived ease of use as two distinct antecedents of attitude toward the use of a technology (Davis 1989; Davis et al., 1989). However, findings from both studies (Davis, 1989; Davis et al., 1989) showed that usefulness was a significantly stronger factor than ease of use. Especially, when users learned to effectively use the system, the direct effect of ease of use on attitude and behavioral intentions disappeared (Davis et al., 1989). In Davis' (1989) own opinion after his two studies, "no amount of ease of use can compensate for a system that does not perform a useful function" (p.333). Such a finding underscores an alternate conceptual explanation, i.e., ease of use → usefulness → attitude and usage causality proposed by Davis himself (1989), in his post-study analysis. Based on this causality chain, regression results showed that ease of use might be an antecedent to usefulness, rather than a construct parallel to usefulness, and such that usefulness mediates ease of use (Davis, 1989).

Adapting TAM to Web sites, Koufaris (2002) found a similar significance of usefulness over ease of use on customer' s intention to return (usefulness: $p<.01$ vs. ease of use: not significant). His finding echoes Davis (1989) that Web surfers are more likely to be

skilled users of the system due to their past experience of using the Web. Additionally, unlike office productivity software such as a word processor or spreadsheet application, the simple and user-friendly interface of a Web browser significantly diminishes the direct impact of ease of use on user attitude and usage. Davis (1989) found that after 14 weeks of use of a word processor system, the impact of ease of use on actual usage was no longer significant. Based on the above observation, this study will simply consider the effect of usefulness of a system function and view perceived ease of use an antecedent to and mediated (and thus has been captured) by the usefulness construct.

TAM states that the perceived usefulness of technology has an impact on user attitude toward technology. In our adapted version, we similarly argue that perceived usefulness of a design feature influences 1) user attitude toward using that feature, a subsystem of the entire site, 2) perceived usefulness of the whole site, and 2) perceived ease of use of the site. In turn, these three factors will have an impact on user attitude toward the site. Thus the arguments are laid out in the following diagram:

Illustration 3.4 Extension of TAM



In the preceding chart, dark lines represent what the TAM model would predict while other lines are discussed in the following paragraphs.

First, the site is an integral whole of all of its subsystems. We believe that a user's favorable attitude toward a certain feature reflects a positive experience during her visit to the

site. This experience contributes to her attitude toward the whole site. Additionally, certain design features constitute a significant portion of a user's experience. For example, a search engine at an online bookstore, where merely browsing is very unlikely to locate a book for a goal-directed user, is a significant part of that store, and the usefulness-induced attitude toward that internal search mechanism should be reflected in the user's attitude toward the site.

Second, when a feature is perceived to be useful, part of the site is perceived useful, and at times that part could be fairly significant. For example, the product menu and classification structure at a department store shopping site is the main subsystem that a user experiences in finding product and price information, while other parts of the site may give shipping, warranty, and general corporate information. We argue that the perceived usefulness of a part of a system like this constitutes a significant portion of the perceived usefulness of the entire site. Thus a design feature or subsystem would contribute proportionately to the usefulness of the site. Empirical evidence shows that the perceived usefulness of a shopping site impacts visitor intention to return to a site (Koufaris, 2002). Adapting the TAM model to our study, a similar relationship is expected to hold, i.e., the perceived usefulness of a site influences user attitude toward the site.

Third, we argue that each individual design feature at the site fulfills the role of a facilitator of information retrieval. That facilitating role may be manifested in the form of a collection of frequently asked questions to make retrieval of information less complex. Such a facilitator could be in the form of an internal search engine that enables a user to enter a few key words, or to specify some options. The usefulness of such a search engine is reflected in perceived relevancy and accuracy of the search results. A sitemap is yet another feature that facilitates navigation at the site and could contribute positively to the user's experience. A site would be perceived to be easy to use when design features like the above help the user retrieve

information and fulfill tasks the user wants to carry out, and thus will be perceived by the user to be valuable.

Adapting TAM to Web systems, Koufaris (2002) hypothesizes that perceived ease of use of a shopping site relates positively to a visitor's intention to return. We similarly argue that the perceived ease of use of the Web site, resulting from perceived usefulness of design features, has a positive impact on visitor attitude toward using and visiting the site.

Human-computer interactivity has been considered a unique benefit offered through the Web (Rodgers & Thorson, 2000). According to Rafaeli (1988), interactivity is not limited to interpersonal communications. Rather, channels and media can act as surrogate participants in the process. Traditional examples of interactivity include radio talk shows, on-demand cable programs, reader letters to editors, etc. (Rafaeli, 1988). On the Web, such forms of interactivity are further enhanced by a visitor's ability to communicate with the site sponsor through various channels. They include emails, product survey, electronic inquiry, feedback forms, personalization of Web sites, frequently asked questions (FAQs), on-request video clips and product demos, and search engines that enable the retrieval of information only of interest to the user. Interactivity in the form of "many places to click" and a "clickable image map" are also found to positively impact visitor attitude (Coyle & Thorson, 2001).

An immediate benefit of these interactive functions is enhanced control perceived by the user. User control has been described as the extent the system allows the user to manipulate the pace and sequence of exposure to the content of material presented (Milheim & Martin, 1991). Relating to a Web site, a user can limit her exposure to information she is interested in, through a search engine, the FAQs, or a clear index on the sitemap. Lohse and Spiller (1998) found e-stores that offer an FAQ section had more visits compared to those without, and those having a feedback form for customer support have higher sales. Often

times, when, where, and how to order types of information are communicated through FAQ sections.

A personal-choice helper like those found at an auto manufacture site, a car reservation site, or an insurance company site enables user input to the system and to a certain extent engages the visitor in a two-way communication. The hypermedia environment affords the user more opportunities to personalize her search and browsing pace and sequence, and her exposure to content of material available, compared to traditional broadcast or print media. A higher level of perceived control may be expected when the internal browsing and search tools are used by a visitor and perceived to be useful for her tasks. Clawson (1993) finds that customers want control, convenience, and customization like they want interactive television. Perceived control was shown to affect consumer intention to return to electronic shopping sites (Koufaris et al., 2001). Koufaris (2002) also notes the contributions to consumer control made by site design features like the internal search engine, the hierarchical classifications of products, and intelligent agents. We similarly propose that the perceived usefulness of a site feature will be related to perceived control and thus visitor attitude toward a site. Summarizing the above, we propose that the perceived usefulness of a system design feature is positively related to user attitude toward the site.

Examples of frequently found subsystems of a commercial Web site include an FAQ section, a sitemap, an internal search engine, the product menu and classification hierarchy, and a help function or personal-choice helper. This study will study the two more commonly available features across e-commerce sites: the product search mechanism and the sitemap, i.e., site directory or table of contents of the site.

In particular, the internal search engines are designed to retrieve information or service information of specific products or services about which the user has provided input. For example, when a visitor inputs "men's accessories" in a key-word search, the system is

expected to retrieve specific products related to the request, and the user is given opportunities to further explore these products and related information like price, content, features, quality, performance, etc. The efficient retrieval of product information or the help a users gets in finding a product further enhances a visitor's positive experience at the site and contributes to creating a more favorable attitude toward the site, due to the speed, relevancy, and reduced effort. Additionally, easier access to needed information also contributes to more perceived informativeness and less irritation and hence has another positive impact on a visitor's attitude toward the site. We thus test H16a with the product search mechanism and specifically examine the relationship between perceived usefulness of the search engine and attitude toward the site.

H16a: Perceived usefulness of the product search function is positively related to attitude toward the site.

The organization or navigation structure is the most important aspect of an entire site design, and has been noted by many scholars and practitioners alike (Eighmey, 1997; Chen & Wells, 1999; Nielsen, 1999; Lohse & Spiller, 1998). A sense of structure and navigation support is important for a user to know where she has been, where she is, and where she is headed (Nielsen, 1999). Nielsen (1999) argues that a sitemap is useful based on 20 years of hypertext research because a sitemap gives the user an overview of the entire navigational space at a site. However, not all users use sitemaps effectively. Some may see it useful and some may see it cumbersome. Generally, visitors to a site always have the menu structure to navigate around the site. Users are the ultimate judges of the features at the site. Perceived poor navigational support leads to user disorientation, confusion, perceived messiness of a site, and irritation.

A sitemap perceived as useful enables the visitor to go wherever she wants to and thus should affect informativeness of the overall structure and content of the Web site.

Nonetheless, it also has an impact on the effectiveness and efficiency of access to product information. A perceived useful sitemap helps retrieve information in a timely manner. Navigational support provided by a good sitemap makes retrieving "relevant," "unknown," and "complete" information easy and makes information more "intelligible" (quoted terms reflects criteria used in definition of an informative commercial message, in Aaker & Norris, 1982). We expect these benefits a visitor derives from a useful sitemap will be reflected in her/his attitude toward the site. Accordingly, we use the sitemap as another design feature of a hypermedia system in our test of H16b.

H16b: The usefulness of the sitemap is positively related to attitude toward the site.

3.8 Control Variables: Involvement, Web Experience, and Demographics

3.8.1 Involvement

User attitude toward advertising and Web sites has been shown to be influenced significantly by product involvement, i.e., the interest and relevance of a product to the user, and situational involvement, e.g., involvement with a purchase process or a task assignment (Rothschild, 1979; Mitchell, 1981; Lutz et al., 1983; Kassarjian, 1981; Zaichkowsky, 1986; Muehling & Laczniak, 1988; Koufaris et al., 2001; Koufaris, 2002; Coyle & Thorson, 2001). The felt relevance or importance of the product or product category is considered more enduring than involvement due to a task assignment that arises from a given situation (Antil, 1984). Muehling et al. (1993) provided a comprehensive review of the involvement construct in advertising research. There has been considerable amount of research and debate as well as variations in definition of the involvement concept (Zaichkowsky, 1985; Greenwald & Leavitt, 1984; Mitchell, 1980; Park & Mittal, 1985; Muehling et al., 1993; Koufaris et al., 2001). Two major types of involvement have been generally accepted in the literature, though often under different terms: product involvement (enduring involvement), and task

involvement (situational involvement). For example, Antil (1984) defines involvement as the level of perceived personal importance or interest evoked by a stimulus. This definition distinguishes between something that is intrinsically important and something that is important due to a situation like task assignment, current objective, interest provoked by an advertising message, etc.

A visitor's involvement state is an important factor that could contribute to message processing and exploration behavior (Coyle & Thorson, 2001; Koufaris et al., 2001; Koufaris, 2002). Participants' level of involvement may mask effects that are otherwise attributable to Web site characteristics under the experiments to be discussed in the next section. Thus both product involvement and task involvement need to be considered to account for their influences on user perceptions.

People's personal interest and felt importance of different products are more enduring and often represent a stable degree of interest over time (Rothschild, 1979, 1984). Such product involvement is independent of situations a person faces. A consumer will be more likely to actively search for information on products of interest and of importance to her. She may also derive enjoyment from visiting such sites, e.g., an apparel site for current fashion and clothing. Due to higher levels of product involvement, the visitor may also be willing and able to understand more information from the site.

Koufaris et al. (2001) and Koufaris (2002) treat product involvement as an individual factor that positively influences shopping experience and attitude. When examining the effect of progressive levels of interactivity and vividness, Coyle and Thorson (2001) measured product involvement as a control variable that may play a role as a covariate. Both studies found significant correlation between product involvement and their independent variables.

This study does not attempt to address the impact of involvement on perceptions and attitude. Nonetheless, the study will provide two mechanisms of treating involvement to

prevent the masking of effects otherwise attributable to site characteristics: assignment of a task to control task involvement and taking measures of both task involvement and product involvement of each participant.

3.8.2 Web Experience

Familiarity with the Web facilitates the navigation and search behavior of the user. Such a skill is considered one of the most important antecedents to flow (Trevino & Webster, 1992; Webster et al., 1993; Hoffman & Novak, 1996; Koufaris et al., 2001). Lack of Web skills may inhibit a visitor from exploring a Web site to its fullest extent. Such skills arise from the extent of Web related experience a user accumulates. However, average weekly Web use was not significant in Coyle and Thorson's (2001) experimental study. Koufaris et al. (2001) found mixed results on the impact of Web skills on customer concentration and shopping enjoyment. In our current study, Web skill is not studied and we will control for Web skills by taking a single self-reported measure of average weekly Web use to see if Web experience impacts our result variables in any way.

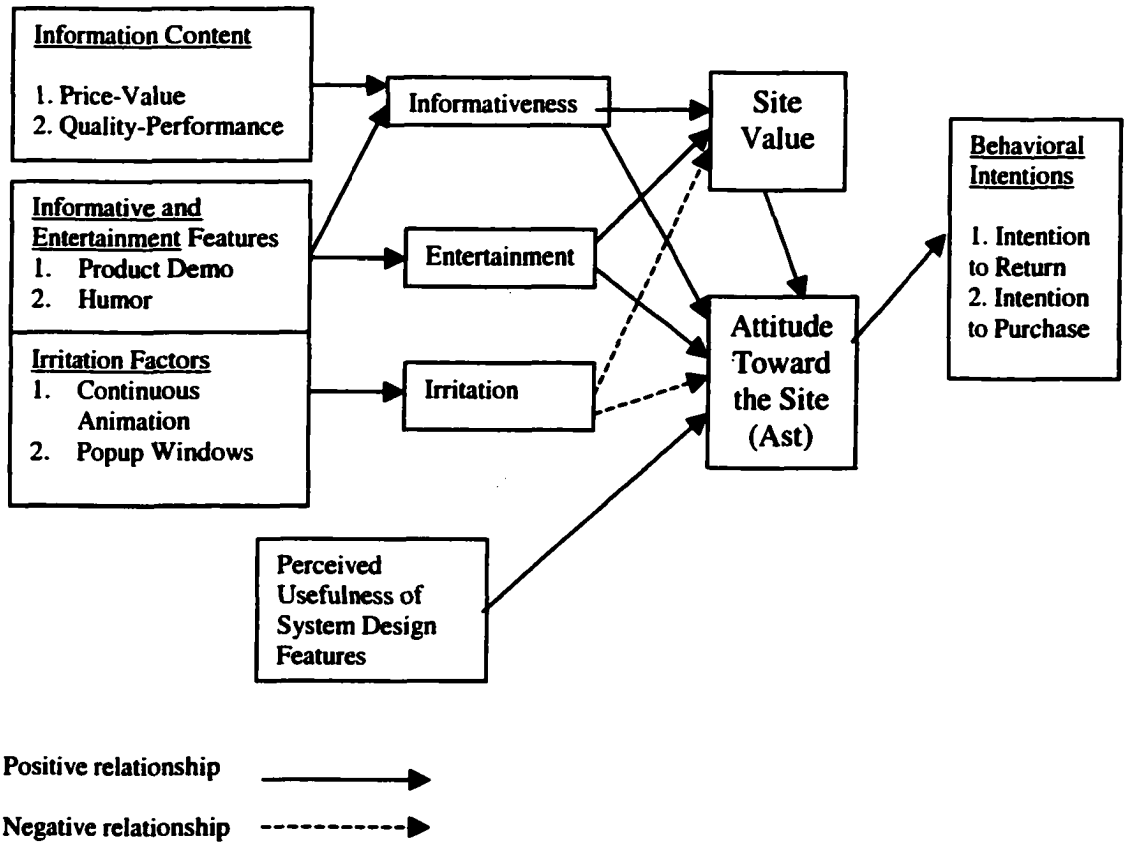
Whether or not to take extensive measures of Web experience and computer skills is also influenced by the homogeneity of subject pool. As will be discussed in the next section, the experimental nature of the study design calls for a homogeneous pool of participants where initial comparability is assumed and random assignments are made. College students form the subject pool we draw participants from. They generally have had similar levels of experience with computers in general and with the Internet in particular, thus variance in Web skills is expected to be small. This author argues that a single weekly usage measure would serve as a good indicator of Web experience.

3.8.3 Demographics

Age and gender are demographic variables that may determine consumer behavior on the Web (Engel et al., 1990; Assael, 1992). Any possible differences that might be explained by them will be examined in this study.

The following diagram summarizes the research framework in this study:

Illustration 3.5 Research Framework of Thesis



4 RESEARCH METHODOLOGY

4.1 Study Method

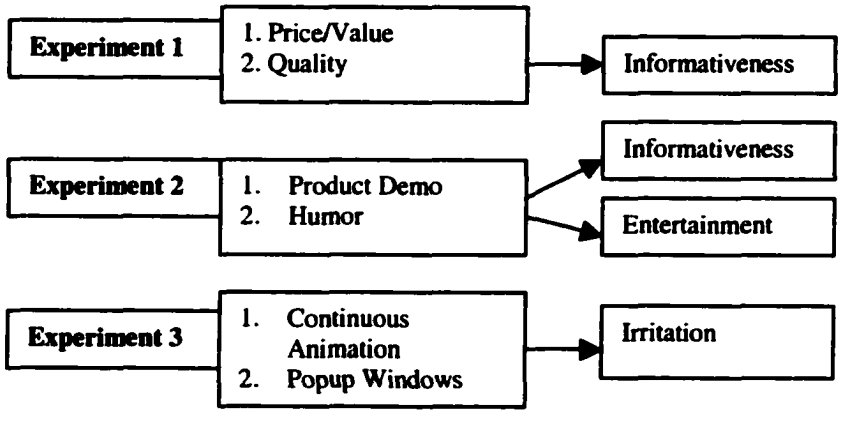
The research methodology addresses both internal validity and external validity through a balanced approach, with the use of carefully designed experiments that incorporate real time commercial Web sites.

First, existing literature in both advertising and IS research emphasizes developing experiments with high levels of internal validity. Specifically related to information content and Web technology features, four previous studies (Soley & Reid, 1983; Lohse & Spiller, 1998; Xia & Sudharshan, 2000; Coyle & Thorson, 2001) engaged content cues and features and linked them with attitudinal variables. In particular, Xia and Sudharshan (2000) used a 3x2 (interruption frequency and involvement) design in studying the impact of interruption on decision processes. Coyle and Thorson (2001) developed multiple Web sites and aggregated cells of treatments into a 3x3 design (interactivity and vividness). In both cases real Web sites were adapted to the experiments and the external validity is stronger than plainly made-up treatments. Such a methodology is closely in line with experimental design involving traditional media, e.g., Ducoffe (1995) used a 2x2 design and a replication (8 groups) to study the roles of information and entertainment in advertising value.

In IS research, Westland and Au (1998) used a three-group design to study the impact of three different digital retailing interfaces on outcome variables of time spent shopping, money spent, and number of items purchased. Morkes et al. (1999) tested hypotheses in a simple two-treatment-group design to study the reactions of participants to humorous and non-humorous communications interfaces. Based on these observations in the current literature, we see it appropriate to carry out an experimental design to test the hypotheses involving the impact of content and features.

Secondly, research has also been done in getting consumer reactions to their shopping experience with real world commercial sites. Jarvenpaa and Todd (1997) gathered consumer comments and responses to questions about electronic commerce after their visits to a real world Web site. Their study was exploratory in an early stage of electronic commerce, and has motivated many further studies in the field. Koufaris et al. (2001) and Koufaris (2002) conducted field studies to understand online consumer attitudes and behavior. Chen and Wells (1999) developed an attitude toward the site (Ast) construct through gathering visitor evaluations of 28 real Web sites. An apparent advantage of studies using real Web sites is the higher level of external validity obtained. Due to the nature of the framework outlined in this current study, a mixed approach using tightly controlled experimental design elements while incorporating real life commercial Web sites will be adopted.

Illustration 4.1 Experimental Design and First-Stage Relationships



In this framework, the first stage hypotheses (shown in the preceding diagram) involve the impact of information types and format and presentation attributes. Three perceptual dimensions of informativeness, entertainment, and irritation are hypothesized to relate to the presence or absence of content types and presentation features. In particular, price-value reflects the communication of information about how much a customer is expected to pay and they constitute an important decision criterion in a customer's purchase process.

On the other hand, product quality claims and performance related statements reflect perceived superiority of the product over competitive offerings. Both quality and performance speak to the excellence of the product, and reflect another important criterion a consumer can use in their purchase decisions. These types of information are also found to be the most frequently appearing cues in content analytic results of traditional advertising (Soley & Reid, 1983; Stern & Resnik, 1991). The following 2x2 design of Web sites (4 versions) will be adopted in the study.

Result Variable: INFORMATIVENESS	**Price-Value Info Absent**	**Price-Value Present**
Quality Absent	No price, no quality information	Price mentioned, no quality statement
Quality Present	No price, quality information presented	Both price and quality information present

The perceptual dimension of entertainment is similarly tested in a separate experiment, with animated product demonstration and use of cartoon/humor being the two factors fully crossed. These two factors are also tested for their relationship with the informativeness perception (product demos show multiple angles of the product and thus more detail and more direct experience; humor related to products enhances the delivery of information, in addition to entertainment).

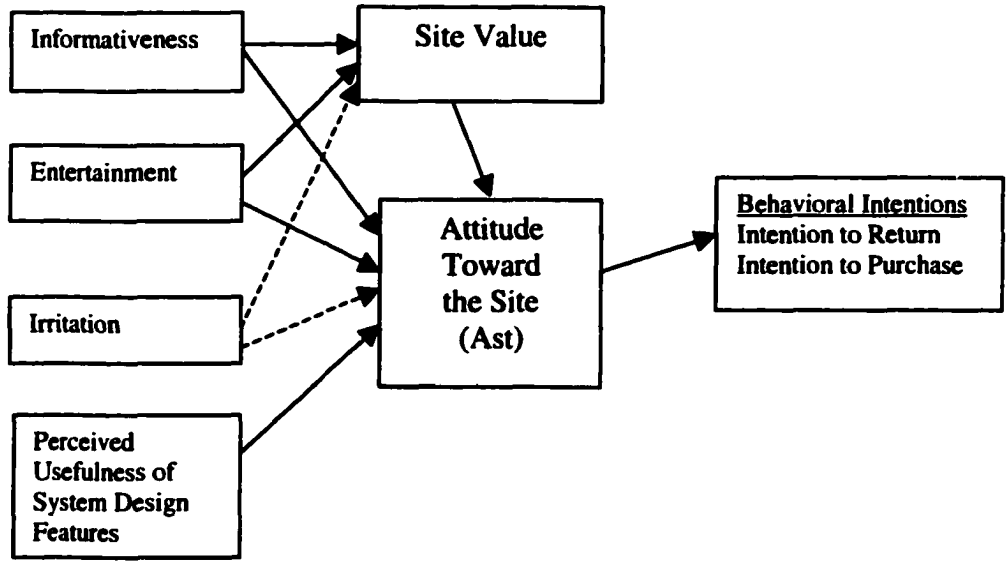
Result Variables: ENTERTAINMENT + INFORMATIVENESS	**No Animation of Product**	**Product Animated Demo upon Request**
No Cartoon/Humor	No product animation, no humor or cartoon	Link to animated product demo available, no humor
Cartoon/Humor Present	No product animation, cartoon and/or humor present	Both product animation and humor present

The perceptual dimension of irritation is also tested with a 2x2 design, in a third experiment. Two factors tested include continuous animation and unexpected popup windows.

Result Variable: IRRITATION	**No Continuous Animation**	**Continuous Animation Present on Each Page**
No Popup Windows	No continuous animation, no popup windows	No popup windows, continuous animation present
Popup Windows	Popup windows occur once or twice, no continuous animation	Continuous animation present, and popup windows

The above experiments represent the design used for testing the first-stage hypotheses, where content factors are linked to perceptual dimensions of the visitors. Attitudinal measures are taken from all subjects to test hypotheses of all second-stage hypotheses, where perceived informativeness, entertainment, and irritation are linked to site value, attitude toward the site, as well as further implications for behavioral intentions. These links represent the second half of the entire framework, and are shown in the following diagram.

Illustration 4.2 Second-Stage Relationships



The experiments provide three separate opportunities to test and validate hypotheses on these second-stage relationships. To adequately address the issue of external validity, the first experiment adapts products and images from several Web sites in the same industry (futon makers and retailers), and the second and third experiments are peripherally modified existing commercial sites that are fully functional for full-scale e-commerce purposes. Such a design strategy enables the collection of responses to realistic commercial Web sites, yet at the same time produces high internal validity in an experimental setting. Web sites and product types chosen for the experiments are nonperishable goods that are appropriate to both younger customers as well as the general population. In particular, furniture, electronics, and PDAs (personal digital assistants) are owned and shopped by the customers between the ages of 18 and 24 at a proportional percentage. They comprise between 8 to 15% of the furniture, electronics, and PDA customers (Simmons Marketing Data, Choices II, 2000).

This author believes that due to the nature of the model that involves the delivery of informational cues and content attributes to viewers of a site, a real world commercial site cannot be manipulated to make certain information types and presentation features absent or present. As a result, a field study using a real site will not yield useful data concerning the effects of information content and presentation attributes. For example, a real site cannot be "having" and "not having" a popup window at the same time. If it contains price information along with a product picture, every visitor will see it. A real Web site is a good candidate for testing attitudinal relationships. Since relationships between perceptions and values and attitudes are to a large extent a replication of previous studies, especially Ducoffe (1995, 1996), the value of a field study would be fairly limited and thus this study will not include a field study in its methodology.

A preliminary grouping of subjects looks like the following. A total of 180 participants will be recruited through a gift incentive of about $7 in value, a lottery of cash

prizes, and the convenience that sessions are scheduled right before or after regular classes. One hundred and eighty (180) people will be recruited and randomly assigned to the three experiments. Everybody participates in two experiments. A hypothetical assignment of participation looks like the following.

	1, 2, 3, 4, 5, 6, ... Participants Pool ....., 177, 178, 179, 180		
Participants	1st through 60th	61st through 120th	121st through 180th
Experiment 1	+	+	
Experiment 2	+		+
Experiment 3		+	+

Each experiment has 120 participants, randomly assigned to 4 treatment groups (30 per cell). From the point of each participant, s/he visits two sites and fills out a questionnaire after her/his visit to each site.

4.2 Design of Web Sites (Stimuli)

4.2.1 Approach to Site Design

Taking into consideration that participants will be from a college community, web sites used in the experiments will be youth-oriented sites where the interests of college students may lie. Product prices are approximately in the lower-three-digit range so the price information is relatively substantial but not out of reach for most visitors. Products will be chosen from consumer durables in the mentioned price range so that quality and performance information represents an important decision criterion. Aaker and Stayman (1992) find that the relationship between perceptual antecedents and attitude is stronger for products other than consumer nondurables (e.g., snacks and drinks). They also find that the strength of the relationship tends to be stronger on novel products than on familiar products.

The choice of using consumer durables as stimuli also enables a proper incorporation of animated product demos. A consumer would be more interested in looking at a three-

dimensional commodity from several different angles (front, top, bottom, side, etc.) than a bottle of coke or a bag of potato chips.

Based on the above considerations, a preliminary list of products included sneakers, electronics, hand-held computing devices, travel gear, and dorm room furniture like futons and rockers.

In summary, the research stimuli are developed to simulate as closely as possible an interaction between a Web site and its interested audience in a natural environment. The manipulation of content and features is listed in the following table.

Table 4.1 Treatment Conditions Based on Fixed Factors

Content/Feature Factor	Manipulation	
	ON condition	OFF condition
Price	Prices mentioned with product	Offers to provide price via phone or email
Quality	A link to description of overall quality in construction, in addition to product description	Only product description
Product Demo	Two prominently visible links to demos of two feature products, in addition to pictures	No apparent link to product demos
Cartoon-Humor	A humorous ad incorporating a cartoon related to product; viewer is given an option to see another product-related cartoon	No deliberate attempt to amuse; a non-humorous ad in place of the cartoon version
Popup Windows	Two promotional windows pop up at 30 seconds and 3 minutes into the session, respectively	No popup windows
Continuous Animation	Header of each page contains continuous animation	Still images in place of active animation

Three sets of experimental web sites are developed to test the hypotheses proposed in this study. They are based on existing sites and images through internal and external hyperlinks to the relevant web sites via URLs. The factors that vary from group to group

within an experiment are changed peripherally and all other content remains unchanged. The following three subsections detail the design of the three groups of websites.

4.2.2 Experiment 1: Price-Quality

Experiment 1 employs the site of a hypothetical futon maker and retailer. A content frame was developed and used to link to product pages. To test the impact of product price and construction quality information on perceived informativeness, as proposed in the theoretical framework, additional pages showing products' high-quality material and rigid construction processes are created and links added from product pages and the content frame as well. When price information is shown, it is presented in red. Links to quality construction are shown in a blue neon sign next to each product picture and description. All groups will be given the same initial entrance page. They are instructed to explore the site to find as much information as they can and click as many links as possible.

Experiment 1	No Price Info	Price Shown with Product
No Product Quality Link	Group 1	Group 2
A Link to "Quality"	Group 3	Group 4

4.2.3 Experiment 2: Product Demo-Humor

The use of animated product demos is achieved through two prominent icons positioned on the header frame of each page. A PDA (personal digital assistant) manufacturer's Web site --- www.handspring.com -- is positioned in the main frame of the screen. Two prominent icons (one slightly animated and one 3D in bright color) placed in the header frame (about 3-quarter inch in height) link to the only two product demos available from this site. Without the two links on top of the page, these product demos require more than five clicks and scrolling because they are not visible on the initial screen of their respective pages.

To test the validity of the design, two separate pretests were conducted. In the first test, 24 students in the lab were first shown an interactive 3D car demo at the Nissan Web site, to explain what interactive or 3D demo means. Then, they were asked to visit the www.handspring.com site for about 7 to 8 minutes. All of them visited the real site, i.e. without any prominent links to the related pages.

After exploring the site for about 7 to 8 minutes, they were asked if anybody saw any kind of interactive or 3D product demo at the site. Only one student said that he saw one demo (one of the links represented in the experiment -- interactive Visor phone demo). In a separate experiment, 15 students were asked to visit the same site, and the same question of whether they saw a 3-D or interactive demo was asked. None said they did. They were told at that point that there were interactive demos at the site. Given the specific instruction to find a 3D or interactive demo, they were asked to explore the site for an additional five minutes. Only one of them found a demo page. Based on these results, it seems that even though these demo pages are available somehow at the site, without a prominent icon on top of the screen, most subjects will be unlikely to see them.

To operationalize the humor construct, a popup ad is opened at the beginning of the site visit, along with the site homepage. It contains a cartoon showing a man buying a PDA that accomplishes many functions. In the cartoon the PDA is enlarged to ensure that everybody would notice it. The viewer is given an option to either close the window or to see another cartoon. The non-humorous version simply contains a picture of a PDA with similar text. This non-humorous ad pops up in place of the cartoon popup.

Experiment 2	No Apparent Link to 3D or Interactive Product Demo	Two Prominent Links on Header Frame to One 3-D and One Interactive Product Demos
Non-humorous Ad	Group 1	Group 2
Humorous Ad with Cartoon	Group 3	Group 4

Though the PDA industry is new, Handspring™ has become one of the known brands in the wireless handheld industry. Like product involvement, prior familiarity with the brand could also mask effects otherwise attributable to site features. Extensive research has been done in brand familiarity (Fazio et al., 1983; Koriat et al., 1980). This study will adapt from existing literature a 3-item scale measuring prior brand familiarity to see if that has anything to do with perceptions of the site.

4.2.4 Experiment 3: Continuous Animation-Popup Windows

An existing camera store www.ritzcamera.com is placed in the main frame. In the header frame, an animated picture reminding visitors that the site is open 24 hours a day, animated pictures encouraging visitors to call or e-mail orders, and an animated slogan telling the visitor that shopping can be done by mouse-clicking is shown. A still picture version is used for the non-animated version.

In the operationalization of the popup windows, this experiment makes an attempt to operationalize the interruptive nature of popup windows. Instead of having a popup window at the beginning of the visit, this design interrupts the user 30 seconds into the session, and again at 3 minutes into the session. They are separate windows of a promotional nature with the first telling the visitor that a discount of 5% is given for orders of $150 or more, and the second asks the visitor to enter a prize drawing contest.

Experiment 3	Still Pictures Only	Animated Pictures and Icons
No Popup Windows	Group 1	Group 2
2 Popup Ads in New Windows	Group 3	Group 4

4.3 Subjects

Appendix F shows a sample flyer used to recruit participants in this study. Participants were drawn from undergraduate college students, a significant group of Internet

users. College students are wired and frequently use email and the Web for schoolwork, as well as for entertainment. Additionally, this research studies how different features influence perception and attitude. A relatively homogeneous sample would not negatively affect the internal validity of the study. Voluntary participation is sought from students on the campus of a northeast college. A gift incentive of about seven dollars' worth is offered for participating.

Each participant is expected to spend a total of approximately 30 minutes to complete the study. Each participant is assigned a task of finding a product (with separate instruction sheets for each site, see Appendix E) that s/he would recommend because a friend of his/hers wants his/her opinion and recommendation. The task assignment approach was used in involvement research to manipulate levels of involvement (Park & Young, 1983, 1986; Krugman, 1966; Mitchell, 1980; Buchholz & Smith, 1991; Gardner et al., 1985; Laczniak & Carlson, 1989). Our current study will borrow that approach. Though the cited studies have used task assignment and different instructions to engage subjects in different levels of involvement, the purpose of the task assignment in this study is to bring all participants to a similar level of task involvement while they view each site. They follow the same instructions as shown in Appendix E.

For the purpose of obtaining responses to the usefulness of design features, participants are asked to use the sitemap (site directory) and product search function during their visits. Each participant is asked to give a brief reason why s/he recommends what. The purpose of this task is to bring participants to a similar level of involvement in the process, thus minimizing the effects of differences in task involvement on perception and attitude.

Participants fill out the rest of the survey in response to questions reflecting their perceptions, value, and attitude toward the site. Measures of control variables are also taken.

4.4 Survey Instrument

The survey instruments, customer-tailored to each experiment, are shown in Appendix E, along with instructions for each site. Items from a multi-item scale are separated and mixed with items in other scales. The following is an explanation of items adapted from existing literature and items created for this study.

4.4.1 Attitude Toward the Site (Ast)

Coyle and Thorson (2001) adopted a three-item scale to measure attitude toward a site, with a reliability coefficient of .84. Though similar to scales used in Aad in traditional advertising, this scale ties closely into the Web environment and is deemed appropriate for the current study.

Bad	Good
Unfavorable	Favorable
Dislike	Like

4.4.2 Site Value

Ducoffe (1995, 1996) explored the construct of advertising value in both traditional media and the Web. The measures of the value of a Web site are adapted from his studies. It has a reliability coefficient of .828 in studying traditional advertising (Ducoffe, 1995). A three-item scale is used to measure site value.

This website is valuable.
This website is useful.
This website is worth the visit.

4.4.3 Intention to Purchase

Purchase intent is a widely used measure in studying behavioral intentions. Madrigal (2000) used three pairs of descriptive words, extremely likely-extremely unlikely, not

probable-probable, certain chance-no chance to describe purchase intent. In the context of instructions given in this study, we will adopt a four-item scale used by Coyle and Thorson (2001), which particularly relates to making a product recommendation to a friend. It has a reliability coefficient of .83 in their Web marketing study. This scale includes the following items:

It is very likely that I will buy a product from this company.
It is improbably that I will buy any of their products.
I will buy one of their products the next time I need one.
Would you recommend your friend to buy a [company/brand] product? "Absolutely Not" ..... "Absolutely Would"

4.4.4 Perceived Informativeness, Entertainment, Irritation

This study will adapt the original 3-item scales from Ducoffe (1995) in measuring informativeness and entertainment. With respect to the measure for irritation, this author feels that the irritation construct is similar but not identical between Web advertising and Web sites. Amongst Ducoffe's (1996) five items measuring perceived irritation of Web advertising, the item that states Web advertising "insults people's intelligence" is less applicable to a Web site than to advertising in general, for which this item was developed. The other two items "is annoying" and "is irritating" are more transferable to the perception of Web sites. Thus this study will adapt the "is annoying," "is irritating," and "is frustrating" items from Ducoffe's (1996) study.

4.4.4.1 Informativeness

This website is a good source of product information.
This website supplies relevant product information.
This website is very informative about the company's products.

4.4.4.2 Entertainment

This website is enjoyable.
This website is pleasing.
This website is entertaining.

4.4.4.3 Irritation

This website is annoying.
This website is frustrating.
This website is irritating.

4.4.5 Information and Feature Delivery (Manipulation Check)

To monitor information delivery and reception, manipulation check variables are used through perceived presence of certain features via a list of checkmarks indicating if the viewer has noticed it.

4.4.6 Usefulness of System Design Features

Perceived usefulness of each feature is operationalized through a group of four questions indicating a user's agreement or disagreement with the statements assessing the usefulness of the feature. This four-item scale is adapted from TAM (Davis, 1989; Davis et al., 1989) in a way similar to Koufaris (2002). On a seven-point scale, the participant indicates his/her agreement or disagreement with each of the following statements.

Using [feature] can improve my shopping performance.
Using [feature] can increase my shopping productivity.
Using [feature] can increase my shopping effectiveness.
I find this [feature] useful.

4.4.7 Product Involvement

The Revised Personal Involvement Inventory (Zaichkowsky, 1985) is adapted to measure product involvement of the participant. This is the standard instrument to measure

product involvement in many studies including product presented and sold on the Web (Coyle & Thorson, 2001; Koufaris et al., 2001; Koufaris, 2002). They include the following 10 pairs of descriptive words.

Important	Unimportant
Irrelevant	Relevant
Means a lot to me	Means nothing to me
Unexciting	Exciting
Dull	Neat
Matters to me	Doesn't matter to me
Boring	Interesting
Fun	Not fun
Appealing	Unappealing
Of no concern to me	Of concern to me

4.4.8 Task Involvement

Task involvement could arise from a task assignment. To control for task involvement, participants are asked to perform a task while visiting each Web site. The instruction asks participants to role-play as has been adopted in the literature (e.g., Gardner et al., 1978; Buchholz & Smith, 1991). Existing literature offers abundant evidence in the appropriateness of using a task assignment approach (Park & Young, 1983, 1986; Krugman, 1966; Mitchell, 1980; Laczniak & Carlson, 1989).

Accordingly, the measure for task involvement assesses whether participants follow the instructions given by the researcher (Muehling et al., 1993). In this study it measures whether participants care about finding a product for a close friend so that a recommendation can be made. This study uses a 3-item scale asking whether the participant followed instructions to the best of his/her ability, whether s/he cares about finding a suitable product for his/her friend, and whether s/he tried everything possible.

I followed the instructions to the best of my ability.
I really did not care if I would find a good [product] for my friend.
I tried everything I could to find the most suitable product.

4.4.9 Demographics

Additionally, demographic descriptors of gender, age, and average number of hours per week spent on the Internet were taken to gain an understanding of the sample population.

4.5 Pilot Study

To ensure validity of the manipulations used in the experiments, a pilot study was conducted by recruiting, through the same type of incentive, participants from five evening MBA classes. A total of 33 people participated in the pilot study. In the pilot study, each participant was randomly assigned to one of four treatment groups. Thirty-two data points from the pilot study were used in related analyses for the balanced factorial design (8 data points in each cell). From the treatment group where 9 data points had been collected, the survey last collected was excluded. The table below shows the results of the manipulations.

Table 4.2 Pilot Study Manipulation Checks

Manipulators →	Price	Quality	Demo	Humor	Pop Up	Animation
Factor Absent (total 16 subjects)	(3) 18.75%	(6) 37.5%	(7) 43.75%	(0) 0%	(5) 31.25%	(4) 25%
Factor Present (total 16 subjects)	(16) 100%	(14) 87.5%	(15) 93.75%	(16) 100%	(15) 93.75%	(12) 75%
One-way ANOVA (compare means)						
F	65.00	10.91	12.31	N/A	21.43	10.00
p (sig.)	.000	.002	.001	.000	.000	.004
F-critical = 4.17 @ .05; 7.56 @ .01						

**Shown in the table are numbers (and %s) of subjects indicated having seen or experienced factor and statistical significance with the respective F statistic for each factor.*

Manipulation checks were performed through a series of one-way ANOVAs between a manipulated factor and the subject's indicated recognition. This approach was adopted by Coyle and Thorson (2001) in their manipulation checks for vividness (animation and audio)

and interactivity (image maps and many places to click). F statistics are shown in the above table. The null hypotheses of means of the two groups (factor absent or present) being equal can be rejected in all cases, indicating a significant difference between groups due to the manipulated factor.

Among the manipulations, price, humor, and popup ads worked extremely well. Especially for humor, all subjects who were given a humorous cartoon recognized its presence, and those who did not, correctly indicated that no humor was present. Those who were given quality information were far more likely to agree that the site contained information on product quality than those were not. Since product descriptions and pictures may also lead participants to believe that the site contained quality information, it is not a surprise that more than a third (37.5%) of the participants who were not given quality information believed that the site contained quality information. Nevertheless, a vast majority (87.5%) of those who were given quality information agreed that the site provided quality information. Additionally, the effectiveness of the manipulation of product quality was a main concern during the design of the experiment. The author observed participants' visits to this site and found many did indeed visit that page and spent more than just a few seconds reading it. To refine our manipulation on quality information and provide a more accurate manipulation check in our final study, words and phrases such as "sturdy," "solid," and "heavy duty" were removed from brief descriptions next to each futon picture, since they would show up in every version of the experiment.

On manipulation of product demos, 93.7% of the participants who visited the versions of the site with two prominent links to 3D and interactive demos, agreed that the site had product demos. Among those who were not given such prominent links, 43.75% said they saw a product demo. We saw that even though quite a few participants visited the demo pages without a prominent link, those who were given such links were much more likely to visit

these pages.

Surprisingly, 25% said they saw animation when actually there was none on their versions of the site, while 25% of those who were given an animated version said they did not see any. This might be explained by the observation that participants were instructed to fill out the survey *after* visiting the site, and animation turned out to be the least memorable feature in comparison to other manipulators. In response to this observation, an animated logo was added to the two versions containing continuous animation in the third experiment.

After manipulation checks, scale reliability was checked and all turned out to be adequate. The Cronbach's alphas are given in the following table.

Table 4.3 Scale Reliability Report of Pilot Study

Variable	Futon Site	PDA Site	Camera Site
INFORMATIVENESS (3 items)	.882	.875	.870
ENTERTAINMENT (3 items)	.888	.862	.852
IRRITATION (3 items)	.902	.941	.945
VALUE (3 items)	.810	.734	.857
ATTITUDE (3 items)	.930	.953	.965
INTENTION TO RETURN (3 items)	.804	.747	.927
INTENTION TO PURCHASE (4 items)	.849	.740	.755
PRIOR BRAND KNOWLEDGE (3 items)	Not Measured	.883	Not Measured
SITE MAP USEFULNESS (4 items)	Not Measured	.956	.983
SEARCH USEFULNESS (4 items)	Not Measured	.990	.973
TASK INVOLVEMENT (3 items)	.761	.784	.726

Preliminary ANOVA analyses were performed with the pilot data. No interaction effect between price and quality, demo and humor, or continuous animation and popup ads emerged.

Participants of the pilot study were instructed on the cover page to comment on any instruction or questionnaire item that was unclear, ambiguous, or difficult to understand.

Input was sought from the pilot participants before, during, and after the sessions when they participated. They did not encounter any problems with the sites or the questionnaire.

Thus, no major change to the questionnaire was made. To the experimental sites, as mentioned above, a minor change was made to the futon site. Words and phrases such as "sturdy," "solid structure," or "heavy duty" were removed from next to the pictures to reduce the chances of participants seeing them as a statement of quality. Additionally, description of quality information (next to the manipulation check item) on the survey tied closely into the aspects of the construction process, excellent material, and fine craftsmanship that were mentioned in the "Quality Construction" page, to which the presence and absence of a link was manipulated.

For the camera site, as mentioned in the above discussion of manipulation checks, the strength of animation was slightly increased (in the two versions with animation) by adding an animated logo so that participants would be less likely to miss it even after they have closed the browser window. This change was due, as mentioned above, to the relatively low percentage (75%) of those who reported seeing animation among those who were given animated versions. Such a change made sure that the manipulation was likely to be recognized by a higher percentage of participants exposed to animation. We would like to note here that in cases when a participant did not recall having seen animation when s/he filled out the survey, his/her perception of and attitude toward the site could have already been influenced by the presence of continuous animation.

5 RESULTS

5.1 Data Collection

Once the changes to the test sites were made, the data collection for the main study followed via solicitation of participation from undergraduate students in all business majors, including accounting, marketing, finance, management, and information systems, on the campus of a northeastern college. Appendix F shows the solicitation flyer. The incentives to participate included a Fuji brand single-use camera (about $7 to $9 retail-value), and the opportunity to enter into a lottery drawing four cash prizes (one $100 and three $50 prizes). Research sessions were held in a lab, before and after regularly scheduled classes. Every participant visited two sites and filled out a questionnaire after visiting each site. The entrance screen had two links to the two sites they needed to visit. Approximately a third visited the futon and the PDA sites, a third visited the PDA and the camera sites, and a third visited the camera and the futon sites.

Before each session started, each machine in the lab was randomly assigned an entrance screen that would lead to one of the four treatment conditions of the first site, and then one of the treatment conditions of the second site. Each session was as balanced as possible with regard to the treatment groups for each site. To that end, occasionally a participant was instructed to take a certain seat (to achieve a balance), but for most relatively large sessions, they were generally instructed to take a seat in the room, or to take any seat in the first three rows. All entrance screens looked the same and they were not aware that there were different versions. By this mechanism, all participants were randomly assigned to one of the four treatment groups in each experiment. Balancing within each session reduced the potential bias from session to session, because almost the same number of data points for each treatment condition was drawn from each session. It took 25 to 30 minutes for each participant to complete both surveys.

The entire data collection lasted about four weeks during the second half of a fall semester. A total of 192 participants took part in the study. Among the participants, a total of 384 surveys were distributed. Some did not visit and fill out the second survey due to a schedule conflict with other classes. A few could not complete the process due to network problems. Eliminating blank and significantly incomplete surveys, 368 were included in the final data analysis. To achieve a balance across the four treatment groups for each experiment, some surveys that were not 100% complete were also included in the 368 final data points. Missing data generally include items about the usefulness of the sitemap or search engine, task involvement (some were reluctant to tell if s/he followed instructions closely, even though it was anonymous), and attitude toward the site. However, all items needed for the ANOVA and MANOVA analyses, where the effects of treatment factors on perceptions of informativeness, entertainment, or irritation were examined, were complete.

Completed surveys for each of the sites numbered as follows: the futon site – 120; the PDA site – 120; and the camera site – 128. These were included in the analyses of variance. When testing hypotheses with multiple regressions, data points with missing values were ignored. Since regression and correlation analyses do not require equal number of data points per treatment group, the reduced number in data points does not affect the validity of the results. In all analyses, no missing data were replaced through mean substitution unless specifically mentioned. As noted later, the only instance when a mean substitution was used was in the case of the PDA MANOVA analysis, where product involvement and task involvement were considered covariates, and when there were missing values in the two covariates. In that particular situation, mean substitution was used as one of three alternative approaches in analyzing and validating our findings.

The remainder of this section is organized into the following subsections. First, overall descriptive statistics are presented with regard to all three sites. Second, scale

reliability coefficients are reported for each individual site in this study. Third, construct validity of the study is discussed by reporting of results from related factor analyses. Fourth, manipulation checks are reported on each individual experiment. Then hypothesis testing is performed on each individual site, followed by testing of hypotheses on pooled data across all three sites. A discussion on effect size is presented at the end of the section, before a summary of results on hypothesis testing. More discussion of results is presented in the following section (Section 6).

5.2 Descriptive Statistics

Along with each survey, demographic statistics were collected about each subject's age, gender, and average number of hours per week spent on the Internet. About 90% of the respondents completed that part. The following table summarizes these statistics of the sample.

Table 5.1 Descriptive Statistics of Sample Population

Descriptive Statistics (%)		Futon Site	PDA Site	Camera Site
Age	16-24	61.2%	72.7%	60.8%
	25-30	19.0%	11.6%	14.6%
	30-40	12.4%	4.1%	10.0%
	> 40	2.5%	0.8%	2.3%
Gender	Female	45.5%	35.5%	38.5%
	Male	47.9%	52.9%	47.7%
Weekly Web Usage	0 hours	1.7%	0.8%	2.3%
	1-3 hours	21.5%	14.0%	20.8%
	4-6 hours	19.8%	21.5%	23.1%
	7-10 hours	19.0%	20.7%	15.4%
	>10 hours	35.5%	32.2%	26.2%

As we can see from the above table, a majority of the subjects were under the age of 25 and spent a lot of time on the Web. Both male and female populations were well represented. Even though this is a student sample, they represent a large percentage (33%

between the ages of 15 to 30) of the entire population of Internet users (GVU's 10th Survey, 1998). Thus they represent a good portion of current and potential online consumers in electronic commerce.

5.3 Scale Reliability

Cronbach's alphas on multi-item scales adopted in this study are reported in the following table. Detailed item-by-item descriptive statistics are provided in Appendix I.

Table 5.2 Scale Reliability

Scale	Futon Site	Handspring Site	Ritz Camera Site
Informativeness	.8903	.8319	.7727
Entertainment	.8642	.8668	.7885
Irritation	.8132	.8762	.9473
Site Value	.8753	.8085	.8189
Attitude Toward Site	.9598	.9137	.9525
Intention to Revisit	.8702	.8388	.8242
Intention to Purchase	.8606	.7942	.8369
Product Involvement	.9270	.9278	.9352
Task Involvement	.7245	.8013	.7374
Prior Brand Knowledge	Not Used	.8981	Not Used
Sitemap Usefulness	Not Used	.9740	.9455
Search Engine Usefulness	Not Used	.9568	.9573

In all three sites, one reverse-coded item ("It is improbable that I will buy any product") was removed from "intention to purchase" scale, resulting in improved scale reliability. The alpha values with this item included were .6872, .6042, and .7446 respectively for the futon, PDA, and the camera sites. Maybe some subjects did not notice the reverse coding, or had difficulty interpreting the meaning of the word "improbable." No problem was detected from other reverse-coded items. In summary, the table above provides evidence of internal consistency of the scales adopted in this study.

5.4 Construct Validity

Construct validity addresses whether a measure measures the construct or variable that is supposed to be measured. To support the construct validity of measures adopted in this study, evidence of dimensionality of each scale, and their discriminant validity were obtained through factor analyses. Each scale was combined with one or more other scales that are theoretically or logically unrelated to form a group. A principle component analysis with direct oblimin rotation was performed on each group of scales. Results show that items within each scale load on the same factor, and thus are all unidimensional. Items belonging to different scales load on their own separate factors, showing evidence of discriminant validity. Annotated output of factor analyses is shown in Appendix J. We conclude that evidence supports construct validity for all scales adopted.

Pearson's bivariate correlation coefficients among scales used in this study also suggest that theoretically related constructs had a relatively high correlation, and theoretically or logically unrelated constructs had low correlation. Appendix K presents the correlation matrices in three separate tables corresponding to the three sites studied.

5.5 Manipulation Checks

Three sets of manipulations were adopted in this study. The futon site was manipulated through price and quality information; the PDA site was manipulated through prominent links to product demo and use of humorous cartoons; the camera site was manipulated through the use of continuous animation and popup ads. Manipulation checks were performed via one-way ANOVAs with respect to subjects' indicated reception of such information content or features. In particular, the following table reports the mean value of perceived delivery of information or feature and F statistics for each manipulation.

Table 5.3 Manipulation Checks

Manipulated Item		Percentage of Recognition in Intended Direction	F Statistic from Mean Comparison (F critical =3.9 at .05, 11.35 at .001)	p
Price	Absent	86.67%	212.400	< .001
	Present	93.33%		
Quality	Absent	65.00%	62.344	<.001
	Present	91.76%		
Demo	Absent	48.33%	19.786	<.001
	Present	81.67%		
Humor	Absent	86.67%	137.288	<.001
	Present	86.67%		
Animation	Absent	85.94%	113.143	<.001
	Present	82.81%		
Popup Ads	Absent	75.00%	69.550	<.001
	Present	84.38%		

From the above table, we conclude that all manipulations were successful.

5.6 Underlying Assumptions of ANOVA, ANCOVA, and Regression Analyses

Assumptions of each type of model adopted in this study were tested before data analyses were performed. This subsection states the overall model assumptions with respect to ANOVA, ANCOVA, and regression analyses. Some discussion is provided here so that potential violations in a model can be viewed in the proper light.

5.6.1 Assumptions of ANOVA analysis

Before each ANOVA was performed, five assumptions underlying an ANOVA analysis were checked. These assumptions are 1) groups are composed of randomly and independently sampled individuals, and 2) groups of scores being analyzed are independent. These two conditions were met in all of our experiments because individuals were randomly

assigned to treatment groups, and the individuals in one group were not the same individuals and were not matched with individuals who were in the other groups (McCall, 2001).

The third assumption is homogeneity of variance across populations from which the groups are drawn (McCall, 2001). This assumption was tested with regard to each ANOVA analysis performed with Levene's test of homogeneity of error variance. Statisticians have argued that "if sufficient number of cases are sampled and the number of cases in each group is the same, moderate violations of this assumption do not alter the result of the analysis of variance very much" (McCall, 2001, p.366). Balanced designs, such as experiments in this study, "protect against violation of the equal variance assumption" (Hildebrand, 1986, p.577). The F test in ANOVA analysis is robust in balanced designs even in the face of unequal group variances (Huck et al., 1974). This assumption is ultimately about the population variance, rather than the sample variance, and is stated such that "the population variance of Y_{ij} scores is constant for all levels of j of the factor" (Hildebrand, 1986, p.543). Nonetheless, we will check the homogeneity of variance for each ANOVA model with these observations in mind.

The fourth assumption of ANOVA analysis is that the samples are drawn from a population of scores that is normal in form (McCall, 2001). "Violations of the assumption of normality are not terribly damaging if a sufficient number of cases are sampled and if the departure from normality is not severe" (McCall, 2001). Hildebrand (1986) noted in his book on statistical thinking for behavioral scientists that, "with balanced design, normality is nearly irrelevant unless the discrepancy is huge" (p. 578):

> Nonnormality of populations is far less serious in making inferences about means as in ANOVA, than in making inferences about variances. The analysis of variance is in fact based on sample means; therefore the Central Limit Theorem effect is at work ..... barring gross skewness in the

> populations, an overall sample size of 30 or so will probably be enough to make F inferences reasonably close to correct. (Hildebrand, 1986, p.551)

We will test normality of our samples with regard to each experiment through normal P-P plots. "If the sample is from a normal distribution, points will cluster around a straight line" (SPSS for Windows, 1999 release, Help file). Due to adequately large sample sizes, we note that slight violation is viewed accordingly in light of the above evidence of the robustness of the F test.

The fifth assumption requires that the set of groups in the analysis be fixed rather than random (McCall, 2001). This was the case for all of the experiments involved in this study. They were designed based on two factors, which were fixed by the researcher. This condition was met in all experiments in this study.

5.6.2 Assumptions of ANCOVA Analysis

Two additional assumptions are necessary for an ANCOVA analysis. First, there must be a relatively strong linear relationship between the covariate and the dependent variable, with a medium to high correlation coefficient. According to Cohen (1988), r= .3 is considered modest, while r= .5 considered large and r= .1 considered small. In our ANCOVA analysis, we will use r= .3 as the threshold value for inclusion of a covariate in an ANCOVA analysis. Since a covariate is often used as part of a design to factor out pre-treatment effects on the dependent variable, e.g., a pretest SAT score relative to a posttest SAT score, it is often fairly accurate as measured (Afifi & Azen, 1979). In this study, since all potential covariates were measured through participant responses, there is generally a large portion of error variance involved in such measured scores and a r= .3 means that it would explain no more than 9% (including associated measurement error) of the variability in the dependent variable. Therefore if there isn't at least a moderate and linear correlation between the covariate and the dependent variable, we will drop them as covariates.

The second assumption of ANCOVA analysis is homogeneity of regression slopes across groups. To test this condition, all related ANCOVA analyses in this study underwent two steps: an examination of the regression slopes of the four groups in each experiment, and a detection of interaction effects between the categorical independent variables (fixed factors) and the covariate on the dependent variable (Field, 2000). If a significant fixed factor-covariate interaction effect on the dependent variable exists, we will exclude the covariate.

Additionally, in an ANCOVA analysis, all assumptions of the ANOVA must be met and were retested in each model for this study.

5.6.3 Assumptions of Regression Analysis

Regression models applied in this study were checked for potential violations of the five assumptions, 1) linearity, 2) normality, 3) homoscedasticity, 4) independence, and 5) multicollinearity (Hildebrand, 1986). Linearity was tested via plots of every IV vs. the DV. Normality and homoscedasticity were examined via plots of the residuals with the IVs and the DVs in each model. A fanning out effect, i.e., lack of constant variance, would indicate a violation of these assumptions (Afifi & Azen, 1979; Hildebrand, 1986). Assumption of independence can be examined via the Durbin-Watson test for auto correlation. A Durbin-Watson statistic of 1.5 or less would indicate autocorrelation (Hildebrand, 1986). Since data were collected in no particular order from different participants, we did not expect autocorrelation to be a problem but will include the Durbin-Watson statistic in every regression output. Multicollinearity is checked with the variance inflation factor (VIF), which suggests multicollinearity with a value of 5 or above.

Histograms and scatter plots related to assumptions of multiple regression models are provided in Appendix G for each of the models run in this study. Linear relationships between each independent variable and the dependent variables were checked through scatter plots and

no nonlinear patterns were spotted. They indicate that multiple regression models are appropriate. These scatter plots are shown in Appendix H.

Additionally, linear relationships between attitude toward the site (Ast) and behavioral intentions – intention to revisit and purchase intention – were also verified through scatter plots included in Appendix H.

5.7 The Futon Site Analyses

The futon site was designed to test the effects of price and quality information on perceived informativeness. The participants were generally neutral in their attitude toward the site (Ast) with a mean Ast score of 4.57, and 4.25 on site value, on a 7-point scale. This might be explained by the fact that the site did not contain much information, especially the versions that offered no price or no quality information. A futon is a relatively large purchase and many college students did not have prior experience of shopping for one. However, compared to the more favored PDA site employed in the second experiment, which had a mean Ast score of 5.66, this site offered an experience much in line with a real commercial site. Additionally, it added variance to overall Ast in this study and strengthened our pooled analyses.

We first attacked the two hypotheses that relate to the two fixed factors in this experiment, via ANOVA analysis. They are hypotheses H10 and H11. After the initial ANOVA analysis, potential covariates were considered for inclusion in further analysis. Subsequently, regression models between site value, attitude and their perceptual antecedents were run to test hypotheses H1 through H6. Finally, to test hypotheses H7 through H9, correlation analysis was performed among site value, attitude toward the site, intention to return, and intention to purchase.

5.7.1 Two-way ANOVA: Price and Quality on Informativeness

ANOVA was performed treating perceived informativeness as the dependent variable and manipulation of the presence of price and quality information as fixed factors in a 2x2 design. A Boxplot showed no outliers in the distribution of the dependent variable. Both price and quality had significant influence on the dependent variable. No interaction effect emerged.

Normal P-P plots indicated normal distributions of the dependent variable. Levene's test of equality of error variance produced a marginally significant F statistic at 2.789 and p= .044 (for rejecting the null hypothesis that error variances are equal). Given the balanced design of this experiment -- 30 data points were collected in each of the four groups -- the F statistic is protected and robust against slight violations (Hildebrand, 1986, p.577; Huck et al., 1974). Thus we conclude that the assumptions of ANOVA analyses were met in this model.

Results are shown in the following table:

Tests of Between-Subjects Effects

Dependent Variable: INFORMAT

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	47.436[a]	3	15.812	7.584	.000	.164
Intercept	2437.506	1	2437.506	1169.049	.000	.910
MPRCE	21.534	1	21.534	10.328	.002	.082
MQLTY	24.150	1	24.150	11.583	.001	.091
MPRCE * MQLTY	1.752	1	1.752	.840	.361	.007
Error	241.864	116	2.085			
Total	2726.806	120				
Corrected Total	289.300	119				

a. R Squared = .164 (Adjusted R Squared = .142)

Descriptive statistics show that those who were given price information perceived the site significantly more informative (p< .01, M=4.9306) than did those who were not (M=4.0833). Those who were given quality information perceived the site significantly more informative (M=4.9556) than did those who were not (M=4.0583). Thus both hypotheses H10

and H11 received support from the results above. Before drawing any conclusions, we consider potential covariates.

5.7.2 Consideration of Product Involvement As a Covariate

To account for potential effects of subject's product involvement, task involvement, hours spent on the Web, age, and gender on our dependent variable, perceived informativeness, a correlation analysis was performed on their correlation with informativeness. Only product involvement was found to be significantly ($p < .001$) correlated with perceived informativeness, with a Pearson correlation coefficient above .3, at $r = .361$. Since the stronger the correlation between the covariate and the dependent variable, the more reduction in error variance, we adopt the minimum $r = .3$ (i.e., if more than about 9% of the variance in DV can be explained by the covariate) threshold for the three experiments in our study. Before adding product involvement to the model as a potential covariate, we tested the homogeneity of regression slopes, an assumption required for ANCOVA.

A regression analysis was run within each treatment group, using involvement as the predictor variable and perceived informativeness as the dependent variable. The following standardized coefficients were obtained for each group.

Group Number	**0**	**1**	**2**	**3**
Treatment	No Price No Quality	Price but No Quality	Quality but No Price	Both Price and Quality
Regression Slope*	.217	.183	.448	.531

*Independent variable: product involvement; dependent variable: informativeness

These regression coefficients suggest that the assumption of homogeneity of regression slopes might have been violated. To confirm the result, another ANOVA analysis was conducted, in which only the interaction effects were considered. When significant interaction effects are present between the categorical independent variables, i.e., fixed

factors, and the covariate, the assumption of homogeneity of regression slopes is violated. The following table shows the result of a customized model showing the interaction effects between the covariate, product involvement, and the manipulated factors, on the dependent variable, perceived informativeness.

Tests of Between-Subjects Effects

Dependent Variable: INFORMAT

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	78.849[a]	3	26.283	14.487	.000	.273
Intercept	116.732	1	116.732	64.342	.000	.357
MPRCE * INVOLVEM	12.689	1	12.689	6.994	.009	.057
MQLTY * INVOLVEM	28.150	1	28.150	15.516	.000	.118
Error	210.450	116	1.814			
Total	2726.806	120				
Corrected Total	289.300	119				

a. R Squared = .273 (Adjusted R Squared = .254)

We note that the interaction effect between the covariate and the fixed factors were significant at $p < .01$ for price*involvement and at $p < .001$ for quality* involvement. Since the assumption of homogeneity of regression slopes was not tenable, we dropped product involvement as a covariate.

Consideration of potential covariates in an ANOVA analysis is for the purpose of detecting whether a covariate can explain any portion of the residual variance and their effect on the dependent variable. The portion of residual variance that might be potentially explained by one or more covariates remains with the residual (or error) variance.

We conclude that hypotheses H10 and H11 are supported in this study.

5.7.3 Regression on Site Value

A regression model within the futon site was run with perceived informativeness, entertainment, and irritation as independent variables, and site value as the dependent variable. No outlier was detected from Boxplot. No extreme cases with 3 standard deviations or larger in the standardized residuals were found. Results are shown in the following tables.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.829[a]	.687	.679	.80243	2.030

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: SITEVALU

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	163.975	3	54.658	84.888	.000[a]
	Residual	74.691	116	.644		
	Total	238.666	119			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: SITEVALU

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.859	.367		2.340	.021		
	INFORMAT	.302	.068	.332	4.432	.000	.481	2.080
	ENTERTAI	.571	.069	.559	8.258	.000	.590	1.696
	IRRITATI	4.73E-02	.062	-.045	-.760	.449	.760	1.315

a. Dependent Variable: SITEVALU

Results indicate that informativeness and entertainment are significant predictors of site value, at $p < .001$. Irritation turned out in the expected direction (negative correlation coefficient), but not a significant predictor of site value in this model. R-squared and F value indicate a good fit of the model. Assumptions of regression analysis were tested: VIFs were

low, indicating no multicollinearity; standardized residuals were normal; and scatter plots of standardized residual vs. predicted value showed no particular pattern, indicating no heteroscedasticity (See Appendix G for related plots). Therefore, we conclude that hypotheses H1 and H2 are supported in this study, and H3 is not supported. Some thoughts with respect to how irritation influences site value and attitude differently will follow in the next subsection and the next section.

5.7.4 Regression on Attitude toward the Site

A second regression model treated attitude toward the site as the dependent variable and the same set of perceptual antecedents as independent variables. Results from this model are shown below.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.853[a]	.727	.720	.81920	1.956

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	202.402	3	67.467	100.534	.000[a]
	Residual	75.833	113	.671		
	Total	278.236	116			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.323	.391		3.386	.001		
	INFORMAT	.497	.071	.492	7.022	.000	.492	2.033
	ENTERTAI	.401	.071	.354	5.655	.000	.614	1.628
	IRRITATI	-.200	.065	-.174	-3.058	.003	.747	1.339

a. Dependent Variable: ATTITUDE

F statistic and R-squared values indicate that Model has a good fit. All three perceptual antecedents are significant predictors, in the expected direction, of attitude toward the site, at $p<.01$. In the above model, VIFs were low, indicating no multicollinearity. Standardized residuals were normal, and scatter plots of standardized residual vs. predicted value showed no particular pattern, indicating no heteroscedasticity (see Appendix G for related charts). Thus we conclude that H4, H5, and H6 are supported in this study.

5.7.5 Correlation Analysis of Site value, Attitude toward the Site, and Behavioral Intentions

To test the relationship between site value and attitude toward the site, and the relationships between attitude toward the site and behavioral intentions -- intention to revisit the site and intention to purchase products presented, Pearson correlation analysis was performed on the four variables. Scatter plots (Appendix H) showed linear correlations between Ast and behavioral intentions. Significant correlations were found in all the three relationships tested, indicating support for hypotheses H7, H8, and H9 in this study.

Correlations

		SITEVALU	ATTITUDE	RVINTENT	PURINTEN
SITEVALU	Pearson Correlation	1.000	.707**	.860**	.809**
	Sig. (2-tailed)	.	.000	.000	.000
	N	120	117	120	120
ATTITUDE	Pearson Correlation	.707**	1.000	.812**	.714**
	Sig. (2-tailed)	.000	.	.000	.000
	N	117	117	117	117
RVINTENT	Pearson Correlation	.860**	.812**	1.000	.890**
	Sig. (2-tailed)	.000	.000	.	.000
	N	120	117	120	120
PURINTEN	Pearson Correlation	.809**	.714**	.890**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	120	117	120	120

**. Correlation is significant at the 0.01 level (2-tailed).

The procedure of verifying each significant correlation to ensure such significance was not an artifact of a large sample was followed. The confidence interval of [r-t*standard error, r+t*standard error] was created for each correlation and checked to see if the value 0 falls within that interval (Afifi & Azen, 1979; McCall, 2001). With 99% confidence interval based on the formula (p.141, formula 3.1.37) and table value of the t distribution with 60 degrees of freedom (Hildebrand, 1986, p.757, Table 4), the t statistic is 2.66. With about 120 degrees of freedom as in our samples, the t value is about 2.617. The confidence interval is slightly larger using 2.66, and thus our conclusions would be more conservative (such that we have a larger confidence interval than if 2.617 were used, into which 0 could fall, to make us accept the null hypothesis).

After the confidence interval was created, we checked whether 0 falls within the confidence interval of a correlation. If it does, we cannot reject the null hypothesis. In all three cases, 0 does not fall within the respective confidence interval, and thus we conclude that hypotheses H7, H8, and H9 received support in this study. The following table summarizes related calculation.

Relationship	Correlation Coefficient	Std. Error	Confidence Interval Lower Bound	Confidence Interval Upper Bound	Does 0 fall within Interval?
SiteValue * Attitude	.707	.074	.510	.904	No
Attitude * RevisitIntent	.812	.055	.666	.958	No
Attitude * PurchaseIntent	.714	.057	.562	.866	No

5.8 The PDA Site Analyses

This site manipulated the presence or absence of humor through a humorous ad that is related to the products of the site, and two prominent links to product demos available at the site. The manipulation was the placement of prominent links to product Flash demos in an attempt to differentiate the groups' visitation to such demo pages. Nonetheless, everybody could have accessed these demo pages without such prominent links. This explains the relatively low, though significant (.001), F statistic in our manipulation check of this manipulation. Participants' overall attitude toward the site was generally high, with a mean score of Ast at 5.66 on a 7-point scale, the highest of the three sites employed in the experiments. The mean score of site value was 5.33, on a 7-point scale. The high scores were explained by the fact that a PDA is something most of the college students have an interest in, even though they generally had no prior knowledge of the brand (M=2.47 on prior brand knowledge, on a 7-point scale). This site was also the favored site between the two sites each participant visited, based on their verbal feedback after each session.

First, we tested hypotheses H12a, H12b, H13a, and H13b, all of which relate to the fixed factors manipulated in this experiment. Multivariate analysis of variance was performed with two dependent variables, perceived informativeness and entertainment, and two fixed factors of demo and humor as independent variables. Then covariates were added to the model to account for differences in product involvement and task involvement. To test

hypotheses H1 through H6, regression models were run between perceptual antecedents and attitudinal measures of site value and attitude toward the site. Lastly, correlation analysis was performed to test hypotheses H7 through H9, relating attitudinal variables and behavioral intentions.

5.8.1 Two-way MANOVA: Demo and Humor on Informativeness and Entertainment

Two dependent variables are involved in this 2x2 experiment, perceived informativeness and perceived entertainment. One outlier was found with respect to perceived informativeness, and one for perceived entertainment. Even though they were outside the boundary of the Boxplots and have more than 3 standard deviations in standardized residual, a visual inspection reveals that they were just extreme low scores given to the site (2.67 in informativeness and 1.00 in entertainment). Since a data point is considered an outlier if it is unlikely to be obtained again in a replication of the study (McCall, 2001), we don't necessarily believe that such low scores were unlikely to obtain in a replication of this study. Thus we treat them only as extreme scores and consider them both in and removed from our analyses that ensue. Additionally, due to the factorial design of the experiment, they will not be removed outright at the beginning, but will be analyzed and reported in separate analyses.

Assumptions of ANOVA were checked. Normal P-P plots of dependent variables clustered around a straight line, indicating normal distributions. Levene's test of equality of error variances showed no reason to reject the null hypotheses of error variance being equal.

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
INFORMAT	2.164	3	116	.096
ENTERTAI	.839	3	116	.475

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+MDEMO+MHUMOR+MDEMO * MHUMOR

Box's Test of Equality of Covariance Matrices [a]

Box's M	13.707
F	1.475
df1	9
df2	154203
Sig.	.150

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept+MDEMO+MHUMOR+MDEMO * MHUMOR

Because two dependent variables are involved, the additional assumption of equality of covariance was checked. Using Box's test to check the homogeneity of covariance between dependent variables, the Box's test of equality of covariance matrices was performed, indicating no significant difference across groups in dependent variable covariances. The following table gives the initial results of the MANOVA analysis.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	INFORMAT	5.962[a]	3	1.987	1.879	.137	.046
	ENTERTAI	14.523[b]	3	4.841	4.462	.005	.103
Intercept	INFORMAT	4089.169	1	4089.169	3866.669	.000	.971
	ENTERTAI	3090.675	1	3090.675	2848.607	.000	.961
MDEMO	INFORMAT	5.561	1	5.561	5.259	.024	.043
	ENTERTAI	10.208	1	10.208	9.409	.003	.075
MHUMOR	INFORMAT	8.356E-02	1	8.356E-02	.079	.779	.001
	ENTERTAI	3.115	1	3.115	2.871	.093	.024
MDEMO * MHUMOF	INFORMAT	.317	1	.317	.300	.585	.003
	ENTERTAI	1.200	1	1.200	1.106	.295	.009
Error	INFORMAT	122.675	116	1.058			
	ENTERTAI	125.857	116	1.085			
Total	INFORMAT	4217.806	120				
	ENTERTAI	3231.056	120				
Corrected Total	INFORMAT	128.637	119				
	ENTERTAI	140.381	119				

a. R Squared = .046 (Adjusted R Squared = .022)

b. R Squared = .103 (Adjusted R Squared = .080)

The above analysis indicates a statistically significant effect of product demo on perceived entertainment at $p < .01$ and on perceived informativeness at $p < .05$. On the other hand, humor had no effect on perceived informativeness, and very little ($p = .093$) effect on

perceived entertainment. Overall, this model explains very little variance as indicated by the R-squared value.

As a point of reference, the following was the result of MANOVA with the two outliers removed. Their removal resulted in unequal number of data points in each cell. Results were consistent with the above table.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	INFORMAT	5.934[a]	3	1.978	2.162	.096	.054
	ENTERTAI	11.480[b]	3	3.827	3.933	.010	.094
Intercept	INFORMAT	4090.283	1	4090.283	4471.071	.000	.975
	ENTERTAI	3089.600	1	3089.600	3175.542	.000	.965
MDEMO	INFORMAT	5.831	1	5.831	6.373	.013	.053
	ENTERTAI	8.831	1	8.831	9.077	.003	.074
MHUMOR	INFORMAT	.132	1	.132	.144	.705	.001
	ENTERTAI	2.414	1	2.414	2.481	.118	.021
MDEMO * MHUMOR	INFORMAT	2.706E-05	1	2.706E-05	.000	.996	.000
	ENTERTAI	.388	1	.388	.398	.529	.003
Error	INFORMAT	104.291	114	.915			
	ENTERTAI	110.915	114	.973			
Total	INFORMAT	4201.694	118				
	ENTERTAI	3214.056	118				
Corrected Total	INFORMAT	110.225	117				
	ENTERTAI	122.395	117				

a. R Squared = .054 (Adjusted R Squared = .029)

b. R Squared = .094 (Adjusted R Squared = .070)

5.8.2 MANOVA with Product Involvement and Task Involvement As Covariates

To more closely examine the effects of demo and humor on these two dependent variables, we ran a correlation analysis between informativeness and entertainment and potential covariates. Among them, both product involvement and task involvement were significantly correlated with both perceived informativeness and entertainment, with a Pearson correlation coefficient greater than .3. Correlation coefficients are .406 and .437 respectively for the correlation between product involvement and informativeness and entertainment. Pearson correlation coefficients between task involvement and informativeness and entertainment were respectively .336 and .364. Therefore, we considered both product involvement and task involvement as covariates.

To test the assumption of homogeneity of regression slopes, we ran a regression within each group and produced the following coefficients with respect to dependent variables.

Group Number	0	1	2	3
Treatment	No Demo No Humor	Demo but No Humor	Humor but No Demo	Both Demo and Humor
Regression Slope of Product Involvement on Informativeness	.540	.377	.264	.391
Regression Slope of Product Involvement on Entertainment	.502	.374	.413	.464
Regression Slope of Task Involvement on Informativeness	.063	.367	.500	.473
Regression Slope of Task Involvement on Entertainment	.133	.384	.583	.329

The regression coefficients suggest that there might be slight violations of the assumption of homogeneity of regression slopes. We ran two separate univariate models customized to detect the interaction effects between fixed factors and covariates on dependent variables. Results are presented in the following tables.

Tests of Between-Subjects Effects

Dependent Variable: INFORMAT

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	37.140[a]	6	6.190	7.645	.000
Intercept	43.927	1	43.927	54.250	.000
MDEMO * TASKINVO	2.586	1	2.586	3.193	.077
MHUMOR * TASKINVO	4.833	1	4.833	5.969	.016
MDEMO * INVOLVEM	1.479	1	1.479	1.826	.179
MHUMOR * INVOLVEM	5.009	1	5.009	6.187	.014
Error	91.497	113	.810		
Total	4217.806	120			
Corrected Total	128.637	119			

a. R Squared = .289 (Adjusted R Squared = .251)

Tests of Between-Subjects Effects

Dependent Variable: ENTERTAI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	44.769[a]	6	7.462	8.819	.000
Intercept	22.912	1	22.912	27.079	.000
MDEMO * TASKINVO	1.247	1	1.247	1.473	.227
MHUMOR * TASKINVO	1.839	1	1.839	2.173	.143
MDEMO * INVOLVEM	.246	1	.246	.291	.591
MHUMOR * INVOLVEM	1.015	1	1.015	1.200	.276
Error	95.611	113	.846		
Total	3231.056	120			
Corrected Total	140.381	119			

a. R Squared = .319 (Adjusted R Squared = .283)

The interactions between fixed factors and covariates were not significant on perceived entertainment, but had some marginal significance on perceived informativeness, especially interactions between humor and the two covariates (p= .014 and p= .016). Levene's test for the potential model (with two covariates) showed that the equality of variance condition was met.

Levene's Test of Equality of Error Variances [a]

	F	df1	df2	Sig.
INFORMAT	1.904	3	113	.133
ENTERTAI	.915	3	113	.436

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design:
Intercept+INVOLVEM+TASKINVO+MDEMO+MHUMOR
+MDEMO * MHUMOR

Since the homogeneity of regression slopes condition was only marginally violated, we tested our model with the two covariates included. The inclusion of covariates that slightly violated the homogeneity of regression slopes assumption leads to a more conservative conclusion, i.e., more conservative in rejecting the null hypothesis (Huck et al., 1974).

Discussion will follow the next series of tables.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	INFORMAT	30.649[a]	5	6.130	6.981	.000	.239
	ENTERTAI	44.145[b]	5	8.829	10.385	.000	.318
Intercept	INFORMAT	49.311	1	49.311	56.160	.000	.336
	ENTERTAI	26.011	1	26.011	30.534	.000	.216
INVOLVEM	INFORMAT	12.475	1	12.475	14.208	.000	.113
	ENTERTAI	15.130	1	15.130	17.762	.000	.138
TASKINVO	INFORMAT	5.053	1	5.053	5.755	.018	.049
	ENTERTAI	5.556	1	5.556	6.523	.012	.056
MDEMO	INFORMAT	2.723	1	2.723	3.101	.081	.027
	ENTERTAI	6.470	1	6.470	7.595	.007	.064
MHUMOR	INFORMAT	5.584E-04	1	5.584E-04	.001	.980	.000
	ENTERTAI	1.826	1	1.826	2.143	.146	.019
MDEMO * MHUMOR	INFORMAT	.255	1	.255	.290	.591	.003
	ENTERTAI	1.231	1	1.231	1.445	.232	.013
Error	INFORMAT	97.462	111	.878			
	ENTERTAI	94.556	111	.852			
Total	INFORMAT	4113.250	117				
	ENTERTAI	3161.167	117				
Corrected Total	INFORMAT	128.110	116				
	ENTERTAI	138.701	116				

a. R Squared = .239 (Adjusted R Squared = .205)

b. R Squared = .318 (Adjusted R Squared = .288)

With the two covariates included, the above table shows that the factor product demo was significant on entertainment at $p < .01$, and not significant on informativeness ($p = .081$). Humor again had no effect on either dependent variable. No interaction effect emerged.

Due to missing data on product involvement and task involvement on three surveys, the above tables have included just 117 instead of the original 120 data points when covariates were not included. Thus the above table was based on slightly unbalanced numbers of data points in each cell (29, 29, 29, 30).

To examine the potential effects of this unbalanced structure of the preceding two models, the two outliers (with a standardized residual over 3 times the standard deviation of standardized residuals) were removed from the data set, resulting in 115 data points – one unit short of a balanced design. Then we put back a data point that was complete in all aspects (belonging to the treatment group that is short by one data point, not an outlier) except for a missing value in task involvement. We substituted the group mean (cell mean) of task involvement for that missing value. This model would be a close approximation of our

original design but with 29 units in each cell. MANOVA results of this balanced design are shown in the following table.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	INFORMAT	30.083[a]	5	6.017	8.291	.000	.274
	ENTERTAI	42.140[b]	5	8.428	11.768	.000	.348
Intercept	INFORMAT	50.668	1	50.668	69.825	.000	.388
	ENTERTAI	25.244	1	25.244	35.249	.000	.243
INVOLVEM	INFORMAT	9.051	1	9.051	12.474	.001	.102
	ENTERTAI	12.024	1	12.024	16.789	.000	.132
TASKINVO	INFORMAT	7.451	1	7.451	10.268	.002	.085
	ENTERTAI	8.531	1	8.531	11.912	.001	.098
MDEMO	INFORMAT	2.710	1	2.710	3.735	.056	.033
	ENTERTAI	5.009	1	5.009	6.995	.009	.060
MHUMOR	INFORMAT	4.562E-04	1	4.562E-04	.001	.980	.000
	ENTERTAI	1.112	1	1.112	1.553	.215	.014
MDEMO * MHUMOR	INFORMAT	2.322E-04	1	2.322E-04	.000	.986	.000
	ENTERTAI	.509	1	.509	.711	.401	.006
Error	INFORMAT	79.820	110	.726			
	ENTERTAI	78.778	110	.716			
Total	INFORMAT	4137.250	116				
	ENTERTAI	3176.278	116				
Corrected Total	INFORMAT	109.903	115				
	ENTERTAI	120.918	115				

a. R Squared = .274 (Adjusted R Squared = .241)

b. R Squared = .348 (Adjusted R Squared = .319)

As a point of reference, if all missing values in product involvement and task involvement were group-mean substituted, the following result would have been obtained. This design would be the 30-30-30-30 balanced factorial as planned.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	INFORMAT	30.838[a]	5	6.168	7.189	.000	.240
	ENTERTAI	44.362[b]	5	8.872	10.534	.000	.316
Intercept	INFORMAT	49.800	1	49.800	58.051	.000	.337
	ENTERTAI	25.642	1	25.642	30.444	.000	.211
INVOLVEM	INFORMAT	12.507	1	12.507	14.579	.000	.113
	ENTERTAI	15.793	1	15.793	18.750	.000	.141
TASKINVO	INFORMAT	4.989	1	4.989	5.815	.017	.049
	ENTERTAI	5.363	1	5.363	6.368	.013	.053
MDEMO	INFORMAT	3.099	1	3.099	3.612	.060	.031
	ENTERTAI	6.498	1	6.498	7.715	.006	.063
MHUMOR	INFORMAT	2.284E-04	1	2.284E-04	.000	.987	.000
	ENTERTAI	2.160	1	2.160	2.565	.112	.022
MDEMO * MHUMOR	INFORMAT	.202	1	.202	.236	.628	.002
	ENTERTAI	.894	1	.894	1.061	.305	.009
Error	INFORMAT	97.798	114	.858			
	ENTERTAI	96.019	114	.842			
Total	INFORMAT	4217.806	120				
	ENTERTAI	3231.056	120				
Corrected Total	INFORMAT	128.637	119				
	ENTERTAI	140.381	119				

a. R Squared = .240 (Adjusted R Squared = .206)

b. R Squared = .316 (Adjusted R Squared = .286)

By including both product involvement and task involvement as covariates, additional variance was explained in the new model, the R-squared values for informativeness and entertainment had significantly increased. Both results (with or without removing outliers, and with or without mean substitution for missing values in the covariates) show that product demo had significant impact on perceived entertainment ($p < .01$), but no significance ($p < .10$ at .056, .06, .081) on perceived informativeness. On the other hand, humor had no effect on either perceived informativeness or entertainment throughout. No interaction effect emerged.

To verify the only significant result of product demo on entertainment, an ANCOVA was performed with perceived entertainment as the only dependent variable while both product involvement and task involvement still included as covariates. Results conform to our findings above. Levene's test showed no difference in variance across groups for the dependent variable with $F[3, 113] = .915$, and $p = .436$.

Tests of Between-Subjects Effects

Dependent Variable: ENTERTAI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	44.145[a]	5	8.829	10.365	.000	.318
Intercept	26.011	1	26.011	30.534	.000	.216
INVOLVEM	15.130	1	15.130	17.762	.000	.138
TASKINVO	5.556	1	5.556	6.523	.012	.056
MDEMO	6.470	1	6.470	7.595	.007	.064
MHUMOR	1.826	1	1.826	2.143	.146	.019
MDEMO * MHUMOR	1.231	1	1.231	1.445	.232	.013
Error	94.556	111	.852			
Total	3161.167	117				
Corrected Total	138.701	116				

a. R Squared = .318 (Adjusted R Squared = .288)

In light of the fairly consistent results across the tables above in terms of significance levels of the effects of the fixed factors on the two independent variables, we draw the following conclusion about our hypotheses involved in this experiment. In this experiment, those who were provided prominent links to 3D and interactive demo pages perceived the site significantly ($p < .01$) more entertaining ($M=5.3667$) than did those who were not ($M=4.7833$). We conclude that hypotheses H12a (product demo on entertainment) is supported at $p < .01$ in

this study. Hypothesis H12b (product demo on informativeness) is not supported (p range from .06 to .09), but can be considered encouraging at p< .10 (M=6.0528 vs. M=5.6222), in the hypothesized direction.

On the effects of humor, H13a and H13b are not supported. Nonetheless, the effect of humor on perceived entertainment (H13b) approaches significance with p< .1 when no covariate was considered and p< .1 when product involvement was the only covariate. The significance level was p<.15 when both product involvement and task involvement were taken as covariates. Though the inclusion of more covariates improved model fit and explained more variance, the model became more conservative in rejecting the null hypothesis, i.e., type I error was more likely, due to potential buildup in slight violations of the requirement of homogeneity of regression slope by each variable. Note that during our test for the assumption of homogeneity of regression slopes, slight violations were detected with marginally significant interactions between humor and the covariates on perceived informativeness. For this study, we accept the null hypothesis of H13b. Nonetheless, the effect of humor on entertainment is encouraging in the right direction and worth further exploration. More discussion will be presented in the next section.

5.8.3 Regression on Site Value

A regression analysis within the PDA site was performed with perceived informativeness, entertainment, and irritation as independent variables, and site value as the dependent variable. Results are shown in the following tables.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.864[a]	.746	.739	.56582	2.264

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	108.972	3	36.324	113.458	.000[a]
	Residual	37.138	116	.320		
	Total	146.110	119			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.554	.439		1.262	.210		
	INFORMAT	.556	.066	.521	8.369	.000	.565	1.771
	ENTERTAI	.357	.059	.350	6.009	.000	.645	1.549
	IRRITATI	-.120	.048	-.141	-2.516	.013	.697	1.435

a. Dependent Variable: STVALUE

All three perceptual antecedents came out in the expected direction and significantly correlate with site value at $p < .01$ except for irritation, which is significant at $p < .05$.

Boxplot found no outlier in the distribution of site value. With respect to the regression model, one extreme case with a standardized residual over 3 (3.489) times the standard deviation of the standardized residuals was removed and the model was rerun. No new extreme cases were found. A slight improvement over the previous run was obtained with an adjusted r-squared value at .747. Results were consistent with the previous run and are shown in the following tables.

Model Summary[b,c]

Model	R				Durbin-Watson Statistic	
	NUMBER ~= 239.00 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate	NUMBER ~= 239.00 (Selected)	NUMBER = 239.00 (Unselected)
1	.868[a]	.754	.747	.5420	2.338	.000

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which NUMBER ~= 239.00.

c. Dependent Variable: STVALUE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	103.269	3	34.423	117.181	.000[a]
	Residual	33.782	115	.294		
	Total	137.051	118			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

c. Selecting only cases for which NUMBER ~= 239.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.479	.421		1.137	.258		
	INFORMAT	.581	.064	.562	9.068	.000	.558	1.791
	ENTERTAI	.334	.057	.334	5.820	.000	.650	1.538
	IRRITATI	-9.27E-02	.046	-.110	-1.997	.048	.701	1.427

a. Dependent Variable: STVALUE

b. Selecting only cases for which NUMBER ~= 239.00

Both models (before and after removing the outlier) had good fit with large F statistics and R-squared values. VIFs were low, indicating no multicollinearity. Standardized residuals were normal, and scatter plots of standardized residual vs. predicted value showed no particular pattern, indicating no heteroscedasticity (see Appendix G). Thus, all conditions of a

regression analysis were met in this model. We conclude that hypotheses H1, H2, and H3 are supported in the study of this site.

5.8.4 Regression on Attitude toward the Site

A second regression model treated attitude toward the site as the dependent variable and the same set of perceptual antecedents as independent variables. Results from this model are shown below.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.811[a]	.658	.649	.67410	1.763

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98.896	3	32.965	72.546	.000[a]
	Residual	51.348	113	.454		
	Total	150.244	116			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.987	.555		3.579	.001		
	INFORMAT	.515	.081	.461	6.372	.000	.578	1.731
	ENTERTAI	.241	.072	.227	3.372	.001	.668	1.497
	IRRITATI	-.245	.058	-.282	-4.209	.000	.673	1.486

a. Dependent Variable: ATTITUDE

In this regression model, once again informativeness, entertainment, and irritation are strong predictors of attitude toward the site. One extreme case with a standardized residual over 3 times the standard deviation of the standardized residuals was removed and the model

was rerun. Results were consistent with the previous run. Tables below show results of the second run.

Model Summary[b,c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	NUMBER ~= 250.00 (Selected)				NUMBER ~= 250.00 (Selected)	NUMBER = 250.00 (Unselected)
1	.833[a]	.694	.686	.6398	1.804	.000

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which NUMBER ~= 250.00.

c. Dependent Variable: ATTITUDE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	103.938	3	34.646	84.635	.000[a]
	Residual	45.848	112	.409		
	Total	149.786	115			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

c. Selecting only cases for which NUMBER ~= 250.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.792	.530		3.382	.001		
	INFORMAT	.548	.077	.484	7.097	.000	.587	1.704
	ENTERTAI	.240	.068	.225	3.538	.001	.674	1.484
	IRRITATI	-.251	.055	-.288	-4.542	.000	.682	1.467

a. Dependent Variable: ATTITUDE

b. Selecting only cases for which NUMBER ~= 250.00

In this model, VIFs were low, indicating no multicollinearity. Standardized residuals are normal, and scatter plots of standardized residual vs. predicted value showed no particular pattern, indicating no heteroscedasticity (Appendix G). Thus, all conditions of a regression analysis were met in this model. Hypotheses H4, H5, and H6 are once again supported in this study.

5.8.5 Regression on Attitude through Usefulness of System Design Features

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.685[a]	.469	.451	.76058	1.837

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.665	2	14.833	25.641	.000[a]
	Residual	33.552	58	.578		
	Total	63.217	60			

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.471	.488		5.065	.000		
	SITEMAP	.374	.083	.479	4.486	.000	.801	1.248
	SEARCH	.271	.090	.320	2.998	.004	.801	1.248

a. Dependent Variable: ATTITUDE

The above model was based on 60 data points within the site that was complete with respect to the usefulness of both the site directory and the search function. No outliers or extreme cases were found. Results showed significant correlation between usefulness of each system feature and attitude toward the site. Once again, they had low VIFs, indicating no

multicollinearity, normal standardized residuals, and no pattern in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (Appendix G for related charts). Therefore we conclude that both hypotheses H16a and H16b are supported at this site.

5.8.6 Correlation Analysis of Site Value, Attitude toward the Site, and Behavioral Intentions

This subsection tested the Pearson correlation coefficients between Ast and the two behavioral intentions proposed in our hypotheses. Linear relationships were confirmed through scatter plots (Appendix H). Significant correlations are flagged in the following table.

Correlations

		STVALUE	ATTITUDE	RTINTENT	PURINTEN
STVALUE	Pearson Correlation	1.000	.793**	.807**	.659**
	Sig. (2-tailed)	.	.000	.000	.000
	N	120	117	120	120
ATTITUDE	Pearson Correlation	.793**	1.000	.766**	.530**
	Sig. (2-tailed)	.000	.	.000	.000
	N	117	117	117	117
RTINTENT	Pearson Correlation	.807**	.766**	1.000	.724**
	Sig. (2-tailed)	.000	.000	.	.000
	N	120	117	120	120
PURINTEN	Pearson Correlation	.659**	.530**	.724**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	120	117	120	120

**. Correlation is significant at the 0.01 level (2-tailed).

All proposed relationships were strong in the expected direction, with all correlation coefficients above .5. The procedure of verifying each significant correlation to ensure such significance was not an artifact of a large sample was followed. The confidence interval of [r-t*standard error, r+t*standard error] was created, where t=2.66, the percentage of the t distribution with 60 degrees of freedom (Hildebrand, 1986, p. 757, Table 4), for each correlation and checked to see if the value 0 falls within that interval. We are conservative in providing a larger confidence interval than if 120 degrees of freedom were used (where the t statistic is 2.617). If 0 falls within the confidence interval of a correlation, we cannot reject

the null hypothesis. In all three cases, 0 does not fall within the respective confidence interval, and thus we conclude that hypotheses H7, H8, and H9 received support in this study. The following table summarizes the calculations.

Relationship	Correlation Coefficient	Std. Error	Confidence Interval Lower Bound	Confidence Interval Upper Bound	Does 0 fall within Interval?
SiteValue * Attitude	.793	.060	.633	.953	No
Attitude * RevisitIntent	.766	.065	.593	.939	No
Attitude * PurchaseIntent	.530	.083	.309	.751	No

5.9 The Camera Site Analyses

The camera site was designed to test the effects of continuous animation and unexpected popup ads on irritation perceived by the subjects. We note that participants generally had a favorable attitude toward this site, even after we added some ingredients (i.e., popup ads and continuous animation) that turned out to negatively affect visitor attitude, with a mean Ast score at 5.47 on a 7-point scale, slightly lower than that of the PDA site but much higher than the futon site.

Hypotheses associating the two fixed factors, continuously running animation and popup ads, and perceived irritation were tested first. They represent hypotheses H14 and H15. This was done through an ANOVA analysis. Hypotheses on the relationships between perceptual antecedents and site value and attitude toward the site were tested through two regression analyses. They represent hypotheses H1 through H6. Finally hypotheses H7 through H9, on the relationships between site value and Ast, between Ast and behavioral intentions, were tested via Pearson bivariate correlation analyses.

5.9.1 ANOVA: Animation and Popup Ads on Irritation

ANOVA was performed treating perceived irritation as the dependent variable and manipulation of the presence of continuous animation and unexpected popup ads as fixed factors in a 2x2 design. No outliers were found in the distribution of the dependent variable.

As in previous experiments, to account for influences of potential covariates on perceived irritation, we examined correlation between irritation and product involvement, task involvement, hours spent on the Internet, age, and gender. Among them only the correlation between product involvement and irritation was significant ($p = .008$) with a correlation coefficient of -.232. Since the strength of this correlation is under .3, i.e., less than 9% in dependent variability might be explained by the covariate, it was not considered a covariate in this experiment. With a Pearson correlation coefficient at -.232, we expect at most 5% error variance reduced through this covariate. Thus we drop it as a covariate without further testing any assumptions for an ANCOVA analysis.

Results of the ANOVA are shown in the table below, which indicates that both factors had significant impact on the dependent variable, irritation. No interaction effect emerged. P-P plots showed that the distributions of the dependent variable were normal. However, Levene's test showed a significant difference in error variance, with $F[3, 124] = 11.45$, and $p < .001$.

Hildebrand (1986) argued that balanced designs protect against violation of the equal-variance assumption, and that violations of equality of variance "has next to no effect on the correctness of the F inferences" (p.551). Further evidence of the robustness of the F statistic came from Keppel (1973), who noted that analysis of variance is very robust against violations of this assumption, especially if group sizes are equal. Even for unequal group sizes, it should not be a concern if the F value is large enough to produce a small p value such as 0.01 or less. Results of this ANOVA model are shown below.

Tests of Between-Subjects Effects

Dependent Variable: IRRITATI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	37.682[a]	3	12.561	5.892	.001	.125
Intercept	833.681	1	833.681	391.045	.000	.759
MANIM	20.855	1	20.855	9.782	.002	.073
MPOP	16.772	1	16.772	7.867	.006	.060
MANIM * MPOP	5.556E-02	1	5.556E-02	.026	.872	.000
Error	264.359	124	2.132			
Total	1135.722	128				
Corrected Total	302.042	127				

a. R Squared = .125 (Adjusted R Squared = .104)

We note that p values are below .01 for both factors. Virtually no interaction effect with F= .026 and p= .872. Since the equal variance condition was not met in this model, we explored further evidence with respect to the consequences of the violation of this rule.

In a theoretical proof of a rule applying to effects of inequality of variance, Scheffé (1959) extended formulas obtained under the assumption of equal error variance to cases where the assumption is violated. He concluded that with equal cell numbers and large n, the actual probability of a significant result at the .05 level for various values of the ratio of variances (one-tenth to ten times) in a two-tailed t-test is the same (Scheffé, 1959, p. 340, Table 340). Glass and Hopkins (1984) noted that "the principle reason Gosset ("Student") assumed homogeneity of variance was, no doubt, to simplify the mathematics" (p.238), and suggested that "for practical purposes one need *not* even test the assumption of heterogeneity of variance when n's are equal" (p.238). Hildebrand (1986) also noted that the reason for such an assumption is purely mathematical. The F test used in ANOVA is an extension of the t test and the effect of violation of the equal variance assumption is equally slight (Hildebrand, 1986). The consequences of violation of the equality of variance assumption in fixed-effects ANOVA are similar to that of two-sample t tests (Glass et al., 1972).

Glass and Hopkins (1984) discussed the "robustness" of ANOVA with respect to consequences of failure to meet the ANOVA assumptions: "fortunately, 'robustness' studies have confirmed that the t-test findings associated with the normality and homogeneity of variance assumptions generalize to ANOVA" (p.351). They noted that when n's are equal, violation of the homogeneity of variance assumption, when variance heterogeneity is within the range one could encounter in practice, e.g., the largest cell variance is no more than 10 times that of the smallest cell, has negligible consequences on the probability statements (type I error) or power (Glass & Hopkins, 1984). That is, the actual α used to reject the null hypothesis is negligibly close to the nominal α, e.g., .05 or .01, set by the investigator. To check whether the difference of variances is within that range in this study, descriptive statistics of measured perceived irritation from the four cells involved in this study is presented below.

Descriptive Statistics

Dependent Variable: IRRITATI

MANIM	MPOP	Mean	Std. Deviation	N
.00	.00	1.7656	.7607	32
	1.00	2.5313	1.3543	32
	Total	2.1484	1.1559	64
1.00	.00	2.6146	1.5266	32
	1.00	3.2969	1.9454	32
	Total	2.9557	1.7684	64
Total	.00	2.1901	1.2706	64
	1.00	2.9141	1.7069	64
	Total	2.5521	1.5422	128

From the above table, we note that the treatment group that was exposed to neither animation nor popup ads had the least standard deviation and the group that was exposed to both had the largest standard deviation. The mean values of perceived irritation of the treatment groups suggest that the (0,0) group (neither factor present) has its mean clustering around 1.76 (M=1.7656) within a narrow range while the (1,1) group (both factors present)

has a markedly higher perceived irritation (M=3.2969) with a standard deviation of almost 2, suggesting a much wider range of responses on this scale. Squaring standard deviations, we obtained the following variance statistics for each group.

Cell Variances by Treatment Group (Camera Site)

Factor Level	No Popup	With Popup
No Animation	0.5787	1.8341
With Animation	2.3305	3.7846

We note that the ratio between the largest cell variance and the smallest cell variance is 6.5398, smaller than 10. Therefore, based on past research that spanned almost half a century (Glass et al., 1972) on the issue of violation of the equal variance assumption when n's are equal, we can confidently conclude that, given our small p values (.002 and .006) from the ANOVA analysis, we found support for the two hypotheses on the effects of continuous animation and unexpected popup ads on perceived irritation, at $p < .01$.

Nonetheless, to confirm our analysis above, we further analyzed the data through the following avenue: we performed t tests of mean differences for each treatment factor, and t' tests assuming unequal variances. The t test assuming unequal variances approximates the degrees of freedom and is often referred to as the t' test (Hildebrand, 1986).

From the ANOVA table above, we note there is no interaction effect and the F value for the interaction term is almost zero, with a very large p value at .872. The major benefit of a two-way ANOVA is to be able to detect interactions between the factors (Hildebrand, 1986; McCall, 2001). When the test on interaction is not significant, the two-way ANOVA may be treated as two separate one-way ANOVAs with respect to each treatment factor, pooling across all treatment levels of the other factor (Keppel, 1973). This enables us to use the t-test on two samples (still equal in size 64 vs. 64) with reduced difference in variances. It also enables use to use the t' test assuming unequal variances, i.e., the equal variance assumption is not required for a t' test, between the two samples. "The t-test for means is mathematically

equivalent to the analysis of variance when the number of groups equals 2" (Glass & Hopkins, 1984, p.230).

We proceeded with the t test and the t' test (assuming unequal variance, where df is approximated) comparing the means of perceived irritation between those who were exposed to continuous animation and those who were not. Results are shown below.

Group Statistics

	MANIM	N	Mean	Std. Deviation	Std. Error Mean
IRRITATI	1.00	64	2.9557	1.7684	.2210
	.00	64	2.1484	1.1559	.1445

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IRRITATI	Equal variances assumed	14.630	.000	3.057	126	.003	.8073	.2641	.2847	1.3299
	Equal variances not assumed			3.057	108.523	.003	.8073	.2641	.2839	1.3307

We note that in both the t test (first row with row heading "equal variances assumed") and the t' test (second row with row heading "equal variances not assumed"), the mean differences between the two groups were significant at p= .003, confirming our ANOVA results above. We have used two-tailed tests throughout the course of our data analysis because a two-tailed test is more conservative than a one-tailed test. Because of the directionality of the hypotheses being tested in our study, a one-tailed test is also appropriate and would provide a significance level of .0015 as opposed to .003, in this case, resulting in stronger support for the hypotheses proposed.

The identical t statistics also confirmed the robustness of the t test when the assumption of equal variances was violated. Then, t and t' tests were performed with respect to the unexpected popup ads factor and results are shown below.

Group Statistics

	MPOP	N	Mean	Std. Deviation	Std. Error Mean
IRRITATI	1.00	64	2.9141	1.7069	.2134
	.00	64	2.1901	1.2706	.1588

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IRRITATI	Equal variances assumed	9.578	.002	2.722	126	.007	.7240	.2660	.1976	1.2503
	Equal variances not assumed			2.722	116.418	.007	.7240	.2660	.1971	1.2508

The mean difference between the two groups (with and w/o popup ads) was again significant at p= .007, under both tests. This confirmed our earlier ANOVA results.

Therefore, we conclude that, based on evidence cited in the literature with respect to the robustness of ANOVA analysis, and the confirmation of the results we obtained from the t and t ' tests, hypotheses H14 and H15 are supported in this study, at p< .01. Those who were exposed to versions with continuous animation perceived the site significantly more irritating (M=2.9557) than did those who were not (M=2.1484). Those who were exposed to popup ads perceived the site significantly more irritating (M=2.9141) than did those who were not (M=2.1901).

The following is an additional note to the above arguments made in the process of confirming the significance of the results. If we treated the (0,0) group as the control group, and compared its sample mean to that of the (1,0) group (with continuous animation only), we would obtain the t statistic on the significance of mean difference between the two groups with

a t test (and t' test) on the two groups of size 32 each. The resulting p values would indicate the effect of continuous animation on the difference of group means. The effect of popup ads could be tested likewise. The following summarizes the two comparisons via t and t' tests at a reduced scale, i.e., 32 vs. 32.

Factor	Continuous Animation		Unexpected Popup Ads	
Test	t statistic	p	t statistic	p
t (assuming equal variance)	2.816	.007	2.788	.007
t' (assuming unequal variance)	2.816	.007	2.788	.008

Results would be significant at $p < .01$. These tests were not to serve as confirmation of the conclusions we made above because they were based on reduced amount of data. We used only three cells of the whole experiment, leaving the (1,1) condition – exposure to both factors – aside in order to perform separate t tests comparing two sample means, and the t' test that relaxes the requirement of equal variance. However, if there weren't sufficient evidence pointing to the robustness of ANOVA in the face of violation of the equal variance assumption, this would be the option left for us to test the two hypotheses in this experiment.

5.9.2 Regression on Site Value

A regression model within the camera site was performed with perceived informativeness, entertainment, and irritation as independent variables, and site value as the dependent variable. Results are shown in the following tables.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.774[a]	.598	.589	.70109	1.884

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	90.852	3	30.284	61.611	.000[a]
	Residual	60.950	124	.492		
	Total	151.802	127			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.332	.520		.638	.525		
	INFORMAT	.630	.083	.545	7.603	.000	.630	1.586
	ENTERTAI	.303	.070	.298	4.358	.000	.691	1.447
	IRRITATI	-3.46E-02	.046	-.049	-.744	.458	.754	1.326

a. Dependent Variable: STVALUE

Results indicate that informativeness and entertainment are significant predictors of site value, at $p < .001$. Irritation turned out to be in the expected direction (negative coefficient), but not a significant predictor of site value in this experiment. One outlier was detected from the sample with over 4 in standard residual. It was removed, and the model was rerun and produced results that were consistent with the previous run, with improved r-squared values. Results are shown in the following tables.

Model Summary[b,c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	NUMBER ~= 362.00 (Selected)				NUMBER ~= 362.00 (Selected)	NUMBER = 362.00 (Unselected)
1	.800[a]	.640	.631	.6512	1.951	.000

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which NUMBER ~= 362.00.

c. Dependent Variable: STVALUE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92.639	3	30.880	72.824	.000[a]
	Residual	52.156	123	.424		
	Total	144.795	126			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

c. Selecting only cases for which NUMBER ~= 362.00

Coefficients[b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.373	.483		.772	.442		
	INFORMAT	.657	.077	.581	8.513	.000	.629	1.589
	ENTERTAI	.272	.065	.274	4.183	.000	.685	1.460
	IRRITATI	-4.72E-02	.043	-.068	-1.093	.277	.755	1.325

a. Dependent Variable: STVALUE

b. Selecting only cases for which NUMBER ~= 362.00

As the case before the removal of the outlier, R-squared value and F statistic indicate a good fit of the model. Additionally, VIFs were low, indicating no multicollinearity. The model had normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (see Appendix G for related charts and plots). Therefore, we conclude that hypotheses H1 and H2 are again supported in this study, and H3 is not supported.

5.9.3 Regression on Attitude toward the Site

A second regression model treated attitude toward the site as the dependent variable and the same set of perceptual antecedents as independent variables. Results from this model are shown below.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.757[a]	.573	.562	.82688	1.966

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	108.395	3	36.132	52.845	.000[a]
	Residual	80.680	118	.684		
	Total	189.076	121			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.539	.666		3.811	.000		
	INFORMAT	.285	.105	.215	2.721	.008	.577	1.734
	ENTERTAI	.436	.087	.373	5.024	.000	.657	1.523
	IRRITATI	-.281	.061	-.333	-4.572	.000	.682	1.467

a. Dependent Variable: ATTITUDE

Three outliers were found with a standardized residual over 3 times the standard deviation of standardized residuals. The model was rerun after their removal. A better model fit was obtained and results were consistent with the previous run. No new outliers were found. Results are shown in the following tables.

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	EXCLUDE ~= 1.00 (Selected)	EXCLUDE = 1.00 (Unselected)				EXCLUDE ~= 1.00 (Selected)	EXCLUDE = 1.00 (Unselected)
1	.801[a]	.994	.642	.633	.7059	2.217	.003

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which EXCLUDE ~= 1.00.

c. Dependent Variable: ATTITUDE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	102.887	3	34.296	68.824	.000[a]
	Residual	57.306	115	.498		
	Total	160.192	118			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

c. Selecting only cases for which EXCLUDE ~= 1.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.902	.582		3.270	.001		
	INFORMAT	.393	.094	.321	4.166	.000	.524	1.909
	ENTERTAI	.420	.077	.377	5.438	.000	.649	1.541
	IRRITATI	-.218	.055	-.271	-3.972	.000	.667	1.499

a. Dependent Variable: ATTITUDE

b. Selecting only cases for which EXCLUDE ~= 1.00

Based on low VIFs, normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value (see Appendix G for related charts), we conclude that all assumptions of a regression analysis were met. Therefore, hypotheses H4, H5, and H6 are supported in this study.

5.9.4 Regression on Attitude through Usefulness of System Design Features

In this subsection, we test hypotheses H16a and H16b, where perceived usefulness of system design features was examined in connection with attitude toward the site. In particular, we look at two most commonly used functions at a Web site, the search engine and the site directory or sitemap of a site. A regression analysis model was used where attitude toward the site was once again the dependent variable. No outliers were found and the results are shown below.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.573[a]	.328	.306	.96755	2.175

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.307	2	14.153	15.118	.000[a]
	Residual	58.042	62	.936		
	Total	86.349	64			

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.340	.627		3.731	.000		
	SITEMAP	.333	.111	.348	3.008	.004	.810	1.234
	SEARCH	.307	.108	.328	2.832	.006	.810	1.234

a. Dependent Variable: ATTITUDE

Only 64 data points within the site were complete with perceived usefulness of both the sitemap and the search engine, and attitude. Results from the regression analysis showed a good fit with the model explaining almost a third of the variance in attitude. Usefulness of

both the site directory and the search engine was significantly correlated with attitude toward the site ($p < .01$).

The above model had low VIFs, indicating no multicollinearity, normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (See Appendix G for related charts). The linear relationships between dependent variables and the independent variable (Ast) were also confirmed through scatter plots (Appendix H). We conclude that hypotheses H16a and H16b are supported in this study.

5.9.5 Correlation Analysis of Site Value, Attitude toward the Site, and Behavioral Intentions

After confirming linear relationships between Ast and behavioral intentions (see Appendix H for scatter plots), we report in the following table results of a Pearson correlation analysis between site value and attitude toward the site, attitude toward the site and intentions to return and purchase product presented.

Correlations

		ATTITUDE	STVALUE	RVINTENT	PURINTEN
ATTITUDE	Pearson Correlation	1.000	.640**	.716**	.626**
	Sig. (2-tailed)	.	.000	.000	.000
	N	122	122	122	122
STVALUE	Pearson Correlation	.640**	1.000	.736**	.684**
	Sig. (2-tailed)	.000	.	.000	.000
	N	122	128	128	128
RVINTENT	Pearson Correlation	.716**	.736**	1.000	.809**
	Sig. (2-tailed)	.000	.000	.	.000
	N	122	128	128	128
PURINTEN	Pearson Correlation	.626**	.684**	.809**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	122	128	128	128

**. Correlation is significant at the 0.01 level (2-tailed).

To validate the strong correlation among site value, attitude toward the site, intention to revisit, and intention to purchase, we examined the standard error of the correlation coefficient between each pair of variables in a relationship. The confidence interval [r-2.66*standard error, r+2.66*standard error] was once again used. Since 0 does not fall within the interval, we may reject the null hypothesis and conclude that hypothesis H7 is supported in this study. The same procedure was followed and we conclude that hypotheses H8 and H9 also received support in this study. Related calculations are shown in the following table.

Relationship	Correlation Coefficient	Std. Error	Confidence Interval Lower Bound	Confidence Interval Upper Bound	Does 0 fall within Interval?
SiteValue * Attitude	.640	.080	.427	.853	No
Attitude * RevisitIntent	.736	.068	.555	.917	No
Attitude * PurchaseIntent	.684	.070	.498	.802	No

5.10 Pooled Analyses

This subsection looks at pooled data across three sites in terms of their perceptual dimensions and their attitudinal consequences and subsequent behavioral intentions. A regression analysis on site value was performed first, followed by a regression analysis on attitude toward the site. A correlation analysis was once again performed among site value, attitude toward the site, intention to revisit, and intention to purchase.

5.10.1 Regression on Site Value

A regression model within pooled data was performed with perceived informativeness, entertainment, and irritation as independent variables, and site value as the dependent variable. Results are shown in the following tables.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.840[a]	.706	.704	.71211	2.067

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	443.855	3	147.952	291.761	.000[a]
	Residual	184.584	364	.507		
	Total	628.439	367			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.745	.221		3.366	.001		
	INFORMAT	.465	.038	.481	12.136	.000	.513	1.950
	ENTERTAI	.414	.038	.411	10.912	.000	.570	1.755
	IRRITATI	5.59E-02	.030	-.060	-1.880	.061	.786	1.272

a. Dependent Variable: STVALUE

The regression model above shows that informativeness and entertainment are significant predictors of site value ($p < .01$), while irritation had a significance level of $p=0.061$. Four outliers, whose standardized residuals were more than three times the standard deviation of standardized residuals, were detected and removed, and the model was rerun, resulting in the detection of another extreme case, according to the same criterion. Thus a total of five cases were excluded in the third run and no new extreme cases were found. The removal of these cases yielded consistent results with respect to the significance levels of informativeness and entertainment on site value. However, the p value of irritation was

reduced to p= .025, which is significant at p< .05 level. Results are shown in the following tables.

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)				EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)
1	.861[a]	.	.742	.739	.6579	2.119	1.713

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which EXCLUDE = .00.

c. Dependent Variable: STVALUE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	445.978	3	148.659	343.489	.000[a]
	Residual	155.373	359	.433		
	Total	601.351	362			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: STVALUE

c. Selecting only cases for which EXCLUDE ~= 1.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.715	.207		3.463	.001		
	INFORMAT	.521	.036	.544	14.434	.000	.507	1.973
	ENTERTAI	.361	.036	.361	10.028	.000	.556	1.798
	IRRITATI	-6.24E-02	.028	-.068	-2.254	.025	.790	1.266

a. Dependent Variable: STVALUE

b. Selecting only cases for which EXCLUDE = .00

The model had low VIFs, indicating no multicollinearity, normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (see Appendix G for related charts). Therefore we conclude

that hypotheses H1 and H2 are once again supported at p<.01, and H3 received support at p< .05.

5.10.2 Regression on Attitude toward the Site

A second regression model treated attitude toward the site as the dependent variable and the same set of perceptual antecedents as independent variables. Results from this model are shown below.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.834[a]	.695	.693	.77387	1.891

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	484.852	3	161.617	267.790	.000[a]
	Residual	212.440	352	.604		
	Total	697.292	355			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.723	.256		6.731	.000		
	INFORMAT	.460	.043	.437	10.591	.000	.508	1.968
	ENTERTAI	.361	.042	.331	8.544	.000	.578	1.731
	IRRITATI	-.233	.034	-.231	-6.817	.000	.756	1.322

a. Dependent Variable: ATTITUDE

Four outliers were removed and the model was rerun, resulting in two more extreme cases, which were removed from the third run. The result was consistent with the model prior to the removal of these cases. Results are shown in the following tables.

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	EXCLUDE = 00 (Selected)	EXCLUDE ~= .00 (Unselected)				EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)
1	.860[a]	.	.739	.737	.70426	1.930	.609

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which EXCLUDE = .00.

c. Dependent Variable: ATTITUDE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	486.223	3	162.074	326.777	.000[a]
	Residual	171.608	346	.496		
	Total	657.831	349			

a. Predictors: (Constant), IRRITATI, ENTERTAI, INFORMAT

b. Dependent Variable: ATTITUDE

c. Selecting only cases for which EXCLUDE = .00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.659	.235		7.053	.000		
	INFORMAT	.503	.040	.491	12.536	.000	.492	2.034
	ENTERTAI	.323	.039	.301	8.262	.000	.568	1.760
	IRRITATI	-.228	.032	-.228	-7.160	.000	.747	1.339

a. Dependent Variable: ATTITUDE

b. Selecting only cases for which EXCLUDE = .00

The model had low VIFs, indicating no multicollinearity, normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (see Appendix G for related charts). Therefore, all conditions of a regression analysis were met. F statistic and R-squared value indicate a good fit of this model. Results from this model provide very strong support for hypotheses H4, H5, and H6 based on data pooled across all three sites, at $p < .001$.

5.10.3 Regression on Attitude through Usefulness of System Design Features

Pooled data on usefulness of the sitemap and the search engine were used to test their predictive value on attitude toward the site. A total of 126 data points had information on all three items: usefulness of the sitemap, usefulness of the search engine, and attitude toward the site. Results are shown below.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.619[a]	.383	.373	.86671	2.054

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.313	2	28.657	38.148	.000[a]
	Residual	92.396	123	.751		
	Total	149.709	125			

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.415	.394		6.130	.000		
	SITEMAP	.349	.068	.403	5.108	.000	.806	1.241
	SEARCH	.290	.071	.324	4.111	.000	.806	1.241

a. Dependent Variable: ATTITUDE

Once again, both the usefulness of the sitemap and the usefulness and the search engine turned out significant at $p < .01$. One outlier was found and removed and the model was rerun. Results, shown in the tables below, are consistent with the first run.

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)				EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)
1	.640[a]	1.000	.410	.400	.8280	2.044	1.454

a. Predictors: (Constant), SEARCH, SITEMAP

b. Unless noted otherwise, statistics are based only on cases for which EXCLUDE = .00.

c. Dependent Variable: ATTITUDE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.595	2	28.798	42.005	.000[a]
	Residual	82.954	121	.686		
	Total	140.550	123			

a. Predictors: (Constant), SEARCH, SITEMAP

b. Dependent Variable: ATTITUDE

c. Selecting only cases for which EXCLUDE = .00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.419	.376		6.434	.000		
	SITEMAP	.370	.066	.437	5.648	.000	.803	1.245
	SEARCH	.274	.068	.315	4.064	.000	.803	1.245

a. Dependent Variable: ATTITUDE

b. Selecting only cases for which EXCLUDE = .00

This model had low VIFs, indicating no multicollinearity, normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (see Appendix G for related charts). We conclude that hypotheses H16a and H16b are supported with pooled data across the PDA and the Camera sites.

5.10.4 Regression on Attitude through Both Perceptions And Usefulness of System Design Features

In our individual site analyses, we did not test a full model that combines the three perceptual dimensions with the usefulness of system design features as predictors of attitude toward the site. That was due to insufficient data to test a regression model that contains five independent variables. Even though the majority visited at least one of the two system design features – the sitemap and the search function, only about half of them used both of them. The missing data on these two scales resulted in about 60 data points in each site that could be used in a full model, in which there were five independent variables.

With this limitation in mind, we first ran a regression analysis within the PDA site. Results show that, with the reduced set of data, it explained about 66% (adjusted R-squared) of the variance in attitude. Two of the five variables (perceived informativeness and perceived usefulness of the search function) turned out significant at $p < .01$. While the other three

(perceived entertainment, perceived irritation, and perceived usefulness of the sitemap) were in the expected direction, their coefficients were not large enough to be considered significant in predicting attitude in this model. The following tables provide the results from this run.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.831[a]	.690	.662	.59706	1.663

a. Predictors: (Constant), SEARCH, INFORMAT, SITEMAP, ENTERTAI, IRRITATI

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	43.611	5	8.722	24.468	.000[a]
	Residual	19.606	55	.356		
	Total	63.217	60			

a. Predictors: (Constant), SEARCH, INFORMAT, SITEMAP, ENTERTAI, IRRITATI

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.357	.784		1.731	.089		
	INFORMAT	.364	.103	.372	3.518	.001	.505	1.980
	ENTERTAI	.126	.096	.126	1.303	.198	.599	1.671
	IRRITATI	-.133	.080	-.169	-1.671	.100	.551	1.815
	SITEMAP	.137	.077	.175	1.767	.083	.575	1.740
	SEARCH	.229	.073	.271	3.147	.003	.762	1.313

a. Dependent Variable: ATTITUDE

A second regression analysis was run with data from the camera site. Two data points with standardized residual greater than 3 times the standard deviation of standardized residuals were removed. Though all variables turned out in the expected direction, only perceived

entertainment and perceived irritation were significant, at p< .01 and p < .05 respectively. The other three variables were not significant. Output tables are shown below.

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	SELECT = 1.00 (Selected)	SELECT ~= 1.00 (Unselected)				SELECT = 1.00 (Selected)	SELECT ~= 1.00 (Unselected)
1	.776[a]	1.000	.602	.567	.72662	2.195	.002

a. Predictors: (Constant), SEARCH, INFORMAT, IRRITATI, SITEMAP, ENTERTAI

b. Unless noted otherwise, statistics are based only on cases for which SELECT = 1.00.

c. Dependent Variable: ATTITUDE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.556	5	9.111	17.257	.000[a]
	Residual	30.095	57	.528		
	Total	75.651	62			

a. Predictors: (Constant), SEARCH, INFORMAT, IRRITATI, SITEMAP, ENTERTAI

b. Dependent Variable: ATTITUDE

c. Selecting only cases for which SELECT = 1.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.595	.922		1.730	.089		
	INFORMAT	.218	.139	.159	1.572	.121	.683	1.465
	ENTERTAI	.351	.113	.337	3.102	.003	.591	1.693
	IRRITATI	-.174	.073	-.235	-2.406	.019	.731	1.368
	SITEMAP	.182	.093	.202	1.953	.056	.650	1.538
	SEARCH	.129	.088	.147	1.475	.146	.700	1.429

a. Dependent Variable: ATTITUDE

b. Selecting only cases for which SELECT = 1.00

In each fun of the model above, there were five independent variables, and approximately 60 data points. Given the insufficient support we received from the above two runs of the full mode, and our suspicion that the number of data points were fairly low with respective to the number of independent variables involved, we proceeded with testing the full model with pooled data across the two sites. With a total of 126 data points pooled across the PDA and the camera sites, we performed another regression analyses. The results are shown in the following tables.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.747[a]	.558	.539	.74297	1.863

a. Predictors: (Constant), SEARCH, INFORMAT, IRRITATI, ENTERTAI, SITEMAP

b. Dependent Variable: ATTITUDE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.468	5	16.694	30.242	.000[a]
	Residual	66.240	120	.552		
	Total	149.709	125			

a. Predictors: (Constant), SEARCH, INFORMAT, IRRITATI, ENTERTAI, SITEMAP

b. Dependent Variable: ATTITUDE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.512	.649		2.330	.021		
	INFORMAT	.299	.090	.253	3.317	.001	.634	1.578
	ENTERTAI	.203	.075	.202	2.693	.008	.657	1.523
	IRRITATI	-.156	.058	-.197	-2.677	.008	.678	1.474
	SITEMAP	.142	.066	.163	2.140	.034	.631	1.584
	SEARCH	.198	.063	.221	3.139	.002	.742	1.348

a. Dependent Variable: ATTITUDE

From the tables above, we note that the model had a good fit, with more variance explained than just using the two system design features. However, this model cannot be compared with the regression model of informativeness, entertainment, and irritation on attitude because this model is based on data from just two sites where sitemaps and search engines were present. Since only about half of the participants used both features, the number of data points in this model is approximately a third of the total pool. The futon site did not contain and was not tested for system feature usefulness.

This model considered all perceptual dimensions of the user, including perceived informativeness, perceived entertainment, perceived irritation, perceived usefulness of the sitemap, and perceived usefulness of the search engine. All five factors turned out significant at $p < .01$ except for the perceived usefulness of the sitemap, which is significant at $p < .05$. These findings are encouraging because they confirm the findings in the separate models run in the previous subsections.

Three outliers with a standardized residual more than three times the standard deviation of standardized residuals were removed and the model was rerun, resulting in fairly consistent results below.

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)				EXCLUDE = .00 (Selected)	EXCLUDE ~= .00 (Unselected)
1	.781[a]	.997	.611	.594	.62068	2.005	.003

a. Predictors: (Constant), SEARCH, IRRITATI, ENTERTAI, SITEMAP, INFORMAT

b. Unless noted otherwise, statistics are based only on cases for which EXCLUDE = .00.

c. Dependent Variable: ATTITUDE

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	70.653	5	14.131	36.679	.000[a]
	Residual	45.074	117	.385		
	Total	115.726	122			

a. Predictors: (Constant), SEARCH, IRRITATI, ENTERTAI, SITEMAP, INFORMAT

b. Dependent Variable: ATTITUDE

c. Selecting only cases for which EXCLUDE = .00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.314	.544		2.417	.017		
	INFORMAT	.395	.079	.379	4.978	.000	.575	1.740
	ENTERTAI	.183	.064	.200	2.843	.005	.673	1.486
	IRRITATI	-.105	.050	-.145	-2.092	.039	.691	1.447
	SITEMAP	.135	.056	.169	2.406	.018	.673	1.486
	SEARCH	.144	.054	.173	2.690	.008	.801	1.248

a. Dependent Variable: ATTITUDE

b. Selecting only cases for which EXCLUDE = .00

The above tables indicate that irritation is no longer significant at $p < .01$ level but still significant at $p < .05$. All other variables are at the same level of significance.

This model had low VIFs, indicating no multicollinearity, normal standardized residuals, and no patterns in scatter plots of standardized residual vs. predicted value, indicating no heteroscedasticity (see Appendix G for related charts).

We conclude that hypotheses H4 and H5 are once again supported at $p < .01$, and H6 is supported at $p < .01$and $p < .05$, in the two models respectively. Hypothesis H16a is supported in both models (the sitemap + search engine → attitude, and the full) at $p < .01$, and hypothesis H16b was supported in the (sitemap + search engine→ attitude) model at $p < .01$, and also received support in the full model at $p < .05$.

5.10.5 Correlation Analysis of Site Value, Attitude Toward the Site, and Behavioral Intentions

Pearson correlation coefficients were obtained among site value, attitude toward the site, intention to return, and intention to purchase. The following table summarizes the results.

Correlations

		STVALUE	ATTITUDE	RVINTENT	PURINTEN
STVALUE	Pearson Correlation	1.000	.744**	.831**	.749**
	Sig. (2-tailed)	.	.000	.000	.000
	N	368	356	368	368
ATTITUDE	Pearson Correlation	.744**	1.000	.795**	.666**
	Sig. (2-tailed)	.000	.	.000	.000
	N	356	356	356	356
RVINTENT	Pearson Correlation	.831**	.795**	1.000	.831**
	Sig. (2-tailed)	.000	.000	.	.000
	N	368	356	368	368
PURINTEN	Pearson Correlation	.749**	.666**	.831**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	368	356	368	368

**. Correlation is significant at the 0.01 level (2-tailed).

As evidenced in the above table, pooled data show higher correlation coefficients among the four variables relating site value and attitude with behavioral intentions. Linear relationships between Ast and behavioral intentions were confirmed through scatter plots (Appendix H). All proposed relationships were strong in the expected direction, with all correlation coefficients above .6. The procedure of verifying each significant correlation to ensure such significance was not an artifact of a large sample was followed. The confidence interval of [r-2.6*standard error, r+2.6*standard error] was created for each correlation and checked to see if the value 0 falls within that interval. The value of 2.6 is the t statistic with 99% confidence interval and 240 degrees of freedom (Hildebrand, 1986, p. 757, Table 4). It is conservative (larger confidence interval and more likely to acceptance the null hypothesis -- no correlation) for samples with larger degrees of freedom such as in this study (table above). In all cases, 0 does not fall within the respective confidence interval, and thus we conclude

that hypotheses H7, H8, and H9 received support with data pooled across all three sites. The table below shows related calculations.

Relationship	Correlation Coefficient	Std. Error	Confidence Interval Lower Bound	Confidence Interval Upper Bound	Does 0 fall within Interval?
SiteValue * Attitude	.744	.039	.643	.845	No
Attitude * RevisitIntent	.795	.034	.705	.885	No
Attitude * PurchaseIntent	.666	.037	.568	.764	No

5.11 Effect Size and Summary of Hypothesis Testing

This subsection provides an analysis of the effect sizes of various treatment factors in the three experiments conducted in this study. Then the results of hypothesis testing are summarized.

5.11.1 Effect Size

Before summarizing results of our hypothesis testing, a discussion of effect size is in order so that our findings from this study can be viewed in a proper context. In short, the effect size is "an index of degree of departure from the null hypothesis" (Cohen, 1969, p.10). In a fixed factor experiment like those conducted in this thesis, it can be measured through the "variance accounted for" indicator eta-squared (η^2), which was produced in the ANOVA and MANOVA tables when the "estimates of effect size" was checked in the options dialogue box. They have been included in the results of each ANOVA, ANCOVA, or MANOVA analysis above.

APA's (1994) publication manual has included a new "encouragement" for reporting effect sizes. Nonetheless, this "encouragement" had largely been neglected in empirical studies of various journals (Keselman et al., 1998). Cohen (1969, p.77) observed that the

"difficulty arising from the use of PV (percentage of variance) measures lies in the fact that in many, perhaps all, of the areas of behavioral science, they turn out to be so small!" His observation was echoed by McCall (2001) in that "most statistically significant results in the social and behavioral sciences do not represent large portions of the total variability in the behavior being studied" (p.276). Based on his "subjective averaging of PVs from his reading of the research literature in behavioral science," Cohen (1969) offered a convention of various effect size measures as a general guideline in behavioral science research. These conventions were used by many researches that reported effect sizes in their studies, and were restated in the second edition of his book (Cohen, 1988). With these considerations in mind, the following table presents a summary report of the effect sizes of each information content factor or attribute studied in this research, and their relative strength in Cohen's convention.

Table 5.4 Effect Size of Experimental Factors (Eta-Squared Values)

Treatment Factor-DV in this Thesis	Sig.	Eta-sqrd (η^2)	Qualitative Description	*Cohen's Standard* *(1969, p.276, Table 8.2.2 & p.277-281)*	
Price-Informativeness	.002	.082	Medium+	***Large***	η^2***=.1379***
Quality-Informativeness	.001	.091	Medium/Large	***Medium***	η^2***=.0588***
Demo-Informativeness	.056	.033	Small/Medium	***Small***	η^2***=.0099***
Demo-Entertainment	.009	.060	Medium	*Note: Cohen offered just points of reference in terms of small, medium, and large effect sizes. He did not provide a range reference and the above values were not considered criteria or thresholds of achieving a certain level of effect size. Thus an η^2 value of, e.g., .033 may be interpreted as small to medium effect and a .091 as medium to large effect.	
Humor-Entertainment	.980	.000	No Effect		
Humor-Entertainment	.215	.014	Small		
Animation-Irritation	.002	.073	Medium		
Popup Ads-Irritation	.006	.060	Medium		

Eta-squared (η^2) values in the above table were taken from their respective ANOVA, ANCOVA, and MANOVA results in the preceding subsections. As we can see from the middle columns of the table, most of the factors in this study had medium effect on their

respective dependent variables. In particular, in the first experiment, information on product quality had a medium to large effect (η^2= .091), and product price information had a strong medium effect (η^2= .082) on perceived informativeness. In the second experiment, product demo had a medium effect (η^2= .060) on perceived entertainment. Humor had no effect (η^2= .000) on perceived informativeness, and a small effect (η^2= .014) on perceived entertainment (not statistically significant, p> .1), and product demo had a small to medium effect (η^2= .033) on perceived informativeness (not statistically significant, p= .081). In the third experiment, both continuous animation and unexpected popup ads had medium effect (η^2= .073 and η^2= .060) on perceived irritation.

Given Cohen's standard, these effect sizes were in line with other behavioral science research results. APA (1994) encourages reporting of effect sizes in addition to statistical significance. Though the decision whether to accept or reject a null hypothesis is not influenced by the effect size of the experimental factor, and is solely based on statistical significance, reporting effect sizes enables readers to evaluate study and sample replicability and facilitates meta-analyses as needed in future research (Wilkinson, 1999).

5.11.2 Summary of Hypothesis Testing

The following table summarizes the results of hypothesis testing in this study.

Table 5.5 Summary Result of Hypothesis Testing

Hypothesis	Futon Site	PDA Site	Camera Site	Pooled	Full Model on Ast
H1. Perceived informativeness is positively related to site value.	**	**	**	**	
H2. Perceived entertainment is positively related to site value.	**	**	**	**	
H3. Perceived irritation is negatively related to site value.	x	*	x	*	
H4. Perceived informativeness is positively related to attitude toward the site.	**	**	**	**	**
H5. Perceived entertainment is positively related to attitude toward the site.	**	**	**	**	**
H6. Perceived irritation is negatively related to attitude toward the site.	**	**	**	**	*
H7: Attitude toward the site is positively related to site value.	**	**	**	**	
H8: Intention to return is positively related to attitude toward the site.	**	**	**	**	
H9: Intention to purchase is positively related to attitude toward the site.	**	**	**	**	
H10: Informativeness is positively related to presence of price information.	**				
H11: Informativeness of a Web site on products is positively related to inclusion of information on product quality.	**				
H12a: Entertainment is positively related to the use of animated product demonstrations upon request.		**			
H12b: Informativeness of a Web site on products is positively related to the use of animated product demonstrations upon request.		x			
H13a: Entertainment is positively related to the use of humor.		x			
H13b: Informativeness is positively related to the use of humor.		x			
H14: Irritation is positively related to the use of popup windows.			**		
H15: Irritation is positively related to the use of continuous animation.			**		
H16a: Perceived usefulness of the product search function is positively related to attitude toward the site.		**	**	**	**
H16b: Perceived usefulness of the sitemap is positively related to attitude toward the site.		**	**	**	*

Note: Cells spanning two or more rows indicate that corresponding hypotheses were not tested in that column.

** support @ $p < .01$
* support @ $p < .05$
x no support @ $p > .05$

6 DISCUSSION, IMPLICATIONS, AND FUTURE RESEARCH

This dissertation examined the effects of information content, presentation attributes, and the usefulness of systems design features on consumer perceptions, site value, and attitude toward the site. The results summarized at the end of the previous section showed varying levels of support for the hypotheses proposed. This section discusses findings and limitations of this study, theoretical and practical implications, and suggests future research directions that can contribute to our further understanding of systems design and online consumer behavior.

6.1 Discussion of Findings

First, informativeness and entertainment were found to be significant perceptual antecedents to value of the site from a consumer's perspective. Statistical analyses of data from each of the three experimental sites all indicate significant correlations at $p < .01$. Multiple regression on pooled data also indicated support for the two hypotheses, at an even stronger level of $p < .001$. Irritation had a significant negative correlation with site value, but did not explain significant additional variance in site value on top of informativeness and entertainment. The interpretation of these results is that even though irritation is an unwanted outcome of visiting the site, the perceived value and worth of the site lie in its ability to provide information and enjoyment. When a site is deemed informative and/or entertaining, irritation becomes a lesser factor in affecting the perceived value of the site. This interpretation is better understood when combined with our results from multiple regression models of informativeness, entertainment, and irritation on attitude toward the site (Ast).

Second, all three perceptual measures of informativeness, entertainment, and irritation turned out to be significant antecedents to attitude toward the site (Ast), at $p < .01$. Irritation had a significant negative impact on attitude toward the site. That indicates that even though

perceived irritation may not be significantly detrimental to site value, it definitely hurts a visitor's attitude toward the site. In that regard, we note that the value of a site is a more focused dimension than the overall attitude toward a site. Their significance was also manifested in the full model that combined the three perceptual antecedents with the usefulness of two system design features as predictors of attitude.

Third, an extension of the technology acceptance model (TAM) to associate the usefulness of system design features with user attitude was tested through two of the three experimental sites, the PDA site and the camera site. In both sites, the usefulness of the two most frequently appearing system design features, the internal product search engine and the sitemap, were significant predictors of attitude toward the site. The perceived usefulness of these two design features explained 37.7% of the variance in attitude toward the site, in the pooled analyses.

However, when combining the three perceptual dimensions with the usefulness measures of the two system functions in the full model, regression analysis within each site showed only some of the independent variables significant in predicting attitude. On the other hand, when data were pooled from the two sites, all five variables turned out to be significant in predicting attitude. We suspect this was partly due to the relatively fewer number of data points in each of the individual runs (about 60) with a relatively larger number of independent variables. Our hypotheses were supported with pooled data in the full model. Due to that only a reduced data set was available to test our full model, we were not able to make a direct comparison between the full model and the two separate models in this study. Future research should further investigate whether combining perceptual antecedents with perceived usefulness of system functions would yield more powerful predictions of consumer attitude.

Fourth, the behavioral intentions measured through intention to return and purchase intent were significantly correlated with attitude toward the site. This finding validated the

proposition that theories and findings in the traditional media may be applicable to the Internet as well. Site value was strongly correlated with attitude toward the site, in all sites, showing that consumers favor sites that they perceive valuable and useful. Even though site value was not hypothesized to predict intention to return and purchase intent, it was strongly correlated with both behavioral intentions in all three sites, as well as in the pooled data (as shown in Pearson correlation tables in the preceding section).

In this study, three experiments examined the potential effects of Web site executional factors on visitor perceptions: informativeness, entertainment, and irritation. The design of the experiments enabled the detection of a causal relationship between fixed factors and perceptual outcomes (Huck et al., 1974).

The two most frequently included informational content cues by marketers, price and quality, turned out to have significant impact on perceived informativeness, at $p < .01$. This finding is not a surprise when we consider that these two information cues appeared frequently in print ads (Abernethy, 1992). To a large degree, a Web site resembles more the print media than the TV or radio, where time and space are at a premium. Both are important dimensions from which companies seek a competitive advantage, cost leadership and product differentiation (Porter, 1980). Nonetheless, we need to put our findings in perspective. We included only two content cues in a relatively small Web site where product information was at a minimum. Any additional information could make the site more informative about the products it presents. Information overload, a negative effect resulting from too much information, was not a factor in this site. A medium to large effect size, using Cohen's (1969, 1988) standard, on informativeness was detected from this study. This finding encourages further studies in examining the effects of other informational cues in Web sites through a similar approach or an expanded experiment in which more factors are manipulated.

Two product and site presentation features, the use of 3D and interactive product demos and the use of cartoon humor related to products presented, were tested against perceived informativeness and entertainment. Overall, they had only small or small to medium effects on the two dependent variables in this particular experiment. Neither was found significant on perceived informativeness. Combined with the results from the first experiment, we note that the amount of product information was very high across all treatment groups. Little additional variance was explained by the addition of either or both of these features. If this experiment were done with a site with lesser amount of information, their effect on perceived informativeness might turn out significant. Additional information may have little or no effect when the visitor was saturated with enough information. Future studies could further examine the differential effects of a site feature across different levels of information "load," e.g., low, medium, and high level of information saturation.

On entertainment, participants who were given more convenient access to demo pages showed higher levels of perceived entertainment. Because this feature was something different from still images they otherwise saw. Many participants who were not given such prominent links also indicated they saw the 3D product demo. Thus the difference could be more significant if participants who did not belong to the treatment groups had no access to these pages. This would require a complete design and implementation of a Web site, which could hamper the external validity of the research. Future research could further address the experimental design with these features.

Humor had very little effect on perceived entertainment. We note that this could be due to the nature of humor employed in this study. Once again, to seamlessly integrate humor into a Web site, with enough strength, requires a complete design of a Web site, within which several related cartoons and humorous stories are scattered around the site. Furthermore, the quantity of humor is not the only factor. The quality of humor also influences the receiver's

perception. Future research focusing on the effect of humor can be done in an expanded experiment with a technically and artistically sophisticated Web site.

The third experiment involving the use of continuous animation and popup ads was also successful, even though each factor explained only a modest amount of variance in the dependent variable, perceived irritation. Popup ads were delivered from the background, seamlessly integrated into an existing commercial site. On the other hand, the header frame of the site was an excellent place to put continuous animation because it stayed on top of the screen all the time. Animation had been argued in both directions -- good and bad -- with regard to its effect on consumer attitude. Coyle and Thorson (2001) found a more favorable attitude toward the site when animation was present, while industry surveys (Jupiter Research, 1999) showed consumers' general negative attitude toward animated banners. Leading user interface design consultant Jakob Nielson (2000) also advocates a cautious approach in the use of animation. This study found significant support in the hypothesized direction, with continuous animation a significant factor in perceived irritation, at $p < .01$. The use of popup ads was also significant at $p < .01$, on perceived irritation.

The animation-popup experiment focused on continuous animation and unexpected popup ads *within* a site. Whether the same effect is achieved for animated banner ads and popup ads for different products or sites, i.e., clicks that could lead to other sites being advertised in the animated banner or popup window, remains to be tested in future studies. Nonetheless, the results of this study validated observations in industry surveys (Jupiter Research, 1999) and practitioner's opinions (Nielson, 2000) and thus are encouraging that the findings may be generalizable to banner ads and interstitials in general.

6.2 Theoretical Implications

This dissertation takes a multidisciplinary approach on examining the linkage between hypermedia system design and online consumer attitudes. This study applied proven theories

and constructs in marketing, advertising, and information systems research to the new medium, and extended and validated the theoretical relationships between consumer attitude and its perceptual antecedents. Additionally, this study undertook some original exploration of the relationships between information content and system attributes, and consumer perceptions of a Web site's being informative, entertaining, and irritating. Results from this exploration are encouraging.

Perceived informativeness, entertainment, and irritation were found to influence perceived value of, and user attitude toward, advertising and advertising on the Web (Ducoffe, 1996). This study explored and answered the question of whether it is a worthwhile endeavor to explore this connection between specific informational content elements and system design attributes, and consumer perceptual dimensions in the Web environment. The answer is, in this author's opinion, a resounding "yes." This research further substantiates the argument that what makes a communications message valuable is no different in the new medium (Ducoffe, 1996).

This dissertation focused on the information content types, presentation format or attributes, and system design features of product presentations in a hypermedia context. It required a broad scope of theoretical constructs from fields of marketing/advertising, information systems, user interface design, and human-computer interactions. Review of literature in each discipline revealed that most of the existing research did not address the specific features or content elements that could potentially influence perceived informativeness, entertainment, and irritation. For example, extensive literature review in information systems research produced no viable construct that could be used to measure the attitudinal and behavioral outcomes of consumer-oriented system design. Even more surprising is that the stream of content analytic research, represented by the use of Resnik and Stern's (1977, 1981) 14 evaluative criteria, isolated itself from some major consumer behavior

theories in advertising research. This study bridged the gap between perspectives within advertising/communications research, as well as joined some recent research (Koufaris et al., 2001; Koufaris 2002) in creating a link between information systems and consumer behavior in marketing communications, advertising, and consumer psychology.

The theoretical framework developed and tested in this study is broad-based, yet firmly grounded. Its theoretical root lies in a large body of consumer research, summarized in the hierarchical model of advertising effects, spanning the spectrum from ad content to cognition, attitude, and behavior (Olney et al., 1991). The approach used in developing the framework of this dissertation applies to other hypermedia-based communications and messages, such as those on an intranet or an extranet, as well. This study provides a new perspective and adds new evidence to existing research in the chain of theories and studies relating content and design and attributes of commercial Web sites to a visitor or consumer's experience.

The following research questions that motivated this study have been answered.

1) Do certain types of information content impact perceived informativeness?

The answer is yes. This study experimented with two well-supported content elements -- price and quality information -- on perceived informativeness of product information. They were found to have a statistically significant, medium to large effect, on perceived informativeness. This encourages further exploration of other content elements on consumer perceptions.

2) Do certain techniques and attributes used in message delivery have an impact on perceived informativeness, entertainment, and irritation?

The answer to the second question is also affirmative. The majority of the attributes tested came out in the direction as hypothesized. Though not all tested attributes had a

significant effect on their hypothesized perceptual outcomes, results confirm our suspicion that further exploration under this proposed theoretical framework is worthwhile and can be very fruitful. In particular, we found that the use of product demo that was available upon clicking related links enhanced perceived entertainment, with a statistically significant medium effect. Both popup ads and continuously running animation had statistically significant medium effect on perceived irritation.

3) Are perceived usefulness of individual system design features related to visitor/user attitude?

The answer to this question is also affirmative. Following Koufaris' (2002) application of TAM model to Web-stores, this study extended the TAM construct for the first time to apply the "usefulness of technology" construct to individual system design features that were present at a Web site. They turned out to be factors that are distinct from other consumer perceptual dimensions. They were found to be significant predictors of consumer attitude toward a Web site.

4) Do perceived informativeness, entertainment, and irritation have an impact on site value, and attitude toward the site?

The answer to this question is once again affirmative. The part of our theoretical model that proposed and tested these relationships represents a close replication of previous research in the traditional media (Ducoffe, 1995), and Web advertising in general (Ducoffe, 1996). The new dimension of this study lies in its adaptation of the existing theoretical constructs to individual Web sites and validation of those relationships in three different commercial sites. In the meantime, site value was found to be highly correlated with, but logically different from, attitude toward the site. This distinction was also reflected in a finding in our experiments that the irritation factor played lesser a role in site value than in

attitude toward the site. This finding confirms proposed theory and observations in the traditional media and general Web advertising.

5) Do attitude toward the site impact behavioral intentions?

This question was answered affirmatively with strong support in this study. The tested relationships were based on the Theory of Reasoned Actions (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), evidence from existing research (Coyle & Thorson, 2001), and extension from consumer research on the relationship between brand attitude and behavioral intentions (Brown & Stayman, 1992; MacKenzie et al., 1986).

Lastly, this study sets an example of testing a framework that uses consumer perceptions as the criteria and the design of content attributes and system features as tools in creating communications message for a commercial purpose. Evidence supports our proposition that informational cues can be indicative of informativeness of a commercial message, a Web page, or a Web site. Findings support the validity of this approach.

Like communications messages in the traditional media, hypermedia systems should "communicate the most informative claims" a business is "capable of delivering" from the value perspectives of consumers (Ducoffe, 1996). This research contributes to bridging the gap between content/features and attitudinal perceptions in a practical way. Not only that scholarly research in both fields of system design and consumer behavior will benefit from its findings, practitioners will also learn something useful in the guidelines developed from findings of this study. Practical implications are discussed in the next subsection.

6.3 Implication to Practitioners

Internet technology and e-commerce continue to grow. How to achieve a competitive advantage through utilizing the advancement in information technology to support a firm's product offerings is a question faced by marketing managers in developing their Web

strategies for the new century (Palmer & Griffith, 1997). The underlying connectivity between system design and consumer behavior was demonstrated in the proposed and tested framework of this study. In accordance with our conclusions, we suggest that both marketing executives and system developers of e-commerce Web sites closely examine the issue of integrating technological characteristics and marketing communications in the Web context.

1) Consumers value information that is essential to their purchase decisions.

Consumers value information that helps them make better and more intelligent purchase decisions. To Web site developers and e-marketing professionals, this observation can be operationalized through concrete informational cues such as product price and quality information. Making information on price and quality, and potentially other types based on findings of future studies, available on a firm's Web site enhances the perceived informativeness of the site. Even though other types of informational cues were not tested in this study, we see as a starting point this study demonstrated the argument that consumers value commercial messages that deliver "the most informative claims an advertiser is capable of delivering" in a most entertaining form (Ducoffe, 1996).

2) Consumers appreciate entertainment.

An entertaining form through which product information is presented is also an important aspect of Web site design. An enjoyable experience increases customer loyalty (Koufaris et al., 2001; Koufaris, 2002). While there are customers who visit a Web site for product information, there are other visitors who stumble across a site due to chance. An entertaining Web site helps retain not only repeat visitors, but also chance surfers. It is imperative that Web site developers make customer experience their first priority in designing Web pages and incorporate features and attributes that have been shown to enhance consumer's entertainment.

3) Consumers' experience is enhanced by product experience that is more direct than simple text and images.

Serving as a validation of the merits of direct experience, virtual reality, and telepresence, findings from this study suggest that the use of animated product demo helps deliver a message in a more informative and entertaining way. Perceptions of both entertainment and informativeness were stronger when such features were incorporated into a site. Coyle and Thorson (2001) found that a more enduring and favorable attitude result from higher levels of telepresence created by animation and audio components. This study further demonstrates that such more direct product experience is essential in presenting a complete picture of products in an entertaining way. Findings suggest to practitioners that new entertaining attributes may be used to provide a more enjoyable experience to customers and visitors, and they should be tested objectively with consumer evaluations as the criterion in future Web site development.

4) Web sites should be cautious when using popup ads.

Consumers cannot possibly search for the entire Web site for information he or she likes. Thus the use of popup ads to "push" information through this interruptive means to the consumer is sometimes a viable technique. Jupiter Research (1999) found that a combined 69% found popup ads mildly to very annoying such that some 23% would consider not returning to the site. On the other hand, only a combined 15% of visitors like such interruptions when they were perceived informative, entertaining, or considered content/channel related. Our findings confirm that visitors to a Web site do not like interruptions. Our study showed that even promotional messages closely related to products sold at the site were not well received. Perceived irritation was significantly higher in treatment groups that experienced popup ads during their visit to the site. So a simple advice

to practitioners is – do not use popup ads. At a minimum, reserve it for mission-critical messages that otherwise cannot be effectively deployed.

5) Animation that runs continuously on the screen causes more irritation and negatively impacts consumer attitude toward the site.

Technology is fascinating, but not always beneficial to the firm. Though it is sometimes justified to deploy popup ads to deliver mission critical messages, there is hardly any circumstance that a site *must* used any continuous animation. Our study confirms Nielsen's (1999) suspicion that continuous animation had a negative effect on visitor attitude. Continuous animation is like "crying" for attention, and it is unlikely to work. A viable alternative to continuously running animation is to animate an image for a short duration when a visitor steps onto the site. For example, the Yahoo! Web site animates a banner ad for just a few seconds, so that it fulfills the attention-getting function but leaves the visitor to exploring his/her own interests afterwards.

6) Search engines and sitemaps are necessary components of any large Web site that is serious about doing e-commerce.

The appearance of the usefulness of an e-store highly correlates with return visits to the site (Koufaris, 2002). Similarly, the perceived usefulness of system design features such as the search engine and the sitemap could also significantly influence consumer attitude toward the site, as supported by evidence from this research. Our findings suggest that Web site designers should search for better and multiple ways in assisting consumers navigate the site and obtain needed information efficiently. If the technological features deployed at the site are perceived useful, consumers will develop more favorable attitude toward the site. Sitemaps give the site visitor a sense of direction and whereabouts. Web site developers should try to incorporate more system features that help inform the visitor where she is and guide her to where she wants to go.

6.4 Limitations

Two major limitations of this study include the use of student samples and the specificity of the Web sites adopted. College students (between 16 and 25, and some between 25 and 30) are deemed appropriate subjects in that they make a significant portion (17.5% for 16-25, and 16.6% for 26-30 year olds) of the Internet population (GVU's 10th Survey, 1998). However, whether the general public will respond in the same way as the student sample did in this study is unknown. The study needs to be replicated around a broader population. The generalizability of results is limited.

The specific Web sites used in this study were another source limitation. As discussed earlier, the relatively small amount of information in the first experimental site (futons) might have made the additional information cues, price and quality, weigh heavier on the perception of informativeness and thus may have produced a relatively larger effect than in sites with higher information content. A similar manipulation on price and quality in a site that has a relatively larger amount of information may not achieve as large an effect size, if significant at all, as in this study. The use of product demo was not significant on perceived informativeness in the PDA experiment. Whether the same result holds for a site with a relatively smaller amount of information needs to be tested in future research.

Given consideration to these limitations, we are encouraged by the findings of this study. Theories on perceptual antecedents of advertising value and consumer attitude that applied to traditional advertising media were validated across all three of our experimental Web sites. Considering the diverse nature of the sites employed -- with various types of content and features -- we may believe with much confidence that these results are very likely generalizable to other sites. The results are less likely to be site dependent. We are also encouraged by the support received to our modified TAM model, i.e., the usefulness of system design features on attitude toward the site (Ast). It was validated in both sites (PDA and

camera) tested in this study and was significant also when pooled, and when, in the full model, combined with three perceptual antecedents on Ast. Based on the fairly consistent results obtained across three sites and pooled, we believe that site specificity was not a big limiting factor in the theoretical relationships discussed in this paragraph.

6.5 Future Research Directions

Web marketing research in profiling user reactions to Web sites and home pages has been largely observational (Chen & Wells, 1999; Eighmey 1997; Singh & Dalal, 1999). To answer the question whether the causal relationship between executional factors and attitudinal outcomes exists in this new medium requires experiments that can be used in cross group comparisons. This line of research is gradually appearing in the recent literature (Li & Bukovac, 1999; Coyle & Thorson, 2001). This dissertation represents an addition to this line of research that explores the effects of different combinations of elements in this new medium. Such effects are in general considered hard to predict yet necessary for Web designers to test in order to achieve whatever goal they have in mind (Coyle & Thorson, 2001). Most of the elements manipulated in this study have been considered in the traditional advertising and marketing research to influence their respective dependent variables by implicit assumptions or research results. For example, the elements of price and quality have largely been assumed to contribute to informativeness in content analysis stream of research with just very few studies linking them with consumer attitude. Effects of humor have been studied in past research of marketing and advertising (Weinberger & Spotts, 1989). Findings from this research encourages the consideration of more attributes in further exploration in future research.

The advantage of experimental studies is their ability to validate causal relationships between the treatment effects and the dependent variables. Experimental research, though limited in scope, goes beyond the predictive powers of observational research. In completely

randomized design fixed-factor experiments, the differences in dependent variables can be reasonably attributed to the participants' membership in different treatment groups and thus a causal effect between the treatment factor and the dependent variable can be validated (Hildebrand, 1986; McCall, 2001).

Future research should replicate this study with other informational cues as fixed factors. To better represent each participant in more than a single level of treatment, a pair of Web sites can be employed in which a participant is exposed to the factor in one site but not the same factor in another. This could potentially reduce error variance. Future studies can also explore the effect of information content design features in varying degrees of information saturation at the site. Our study suggests to a certain degree that informational factors and entertaining ingredients may function differently in Web sites of differing amount of information and entertainment. For example, the use of humor may be more effective at a site that is less entertaining than the PDA site we used. We may further explore whether the theory of diminishing returns, in perceived informativeness vs. amount of information, applies here.

Research in advertising content analysis revealed that amount of ad information differs significantly from country to country (Abernethy, 1996). Likewise, the perception of informativeness may differ from culture to culture as well. Whether we can draw the same conclusions when these relationships are tested in Web sites in other cultures remain to be answered through comparative studies in future research.

To address the limitation of the sample population, similar studies can be done with the general population through incentives reaching the entire online population. Instead of using incentives to solicit participation, an alternative approach is to use non-intrusive means (i.e., not using surveys) to collect data on actual visitor surfing behavior. This requires the use of perhaps a real commercial site such that actual return visits and purchase behavior can be

recorded. Nonetheless, based on the strong correlation between perceptual antecedents and Ast, surrogate measures of attitude, such as time spent at the site and number of pages visited may be recorded through the Web site server software, and compared across treatment groups to determine the effects of manipulations incorporated.

This study was not able to compare the predictive power of the full model with that of the two separate models that originated from advertising research and information systems. Future research should explore a comparison between the three models when adequate data can be collected, and perhaps apply path analysis and structured equation modeling in studying the interconnections among various perceptual dimensions, attitude, site value, and behavioral intentions.

In a similar vein, future research may also explore site effectiveness beyond attitude and behavioral intentions to examine actual outcomes in terms of purchases or unplanned purchases, like those undertaken by Koufaris (2002).

Future research should also explore the connection between ingredients and composition of a search engine and its usefulness. The components of a search engine may include a category pick list and other features that facilitate search, in addition to keyword searches (Lohse & Spiller, 1998). An examination of various Web sites reveals that sitemaps differ significantly from each other in organization, hierarchical structure, vividness, and other aspects of its presentation. As with search engines, further exploration can be undertaken to examine the connection between the hyperlink structure and other ingredients of the sitemap and its perceived usefulness.

Personalization of Web sites has become an important strategy that some major Web sites, especially portal sites adopt, in attracting return visits to their sites. Examples include www.msnbc.com, www.weather.com, and www.yahoo.com. They store visitor preferences via cookies and provide customized homepages every time a visitor returns. How much

influence does this technique have on visitor perceptions, attitude, and retention remain to be determined in a separate model.

In summary, this dissertation extended and validated existing studies of advertising value and attitude toward the site (Ast). Additionally, it tested relationships between certain Web site content features and perceptual dimensions of Web site visitors. Doing business online is still in its early stage. It is necessary to take a rigorous and scientific look at the various components that go into this environment, in order to help electronic business to develop in a structured, efficient, and effective way (Koufaris, 2001). This thesis joins the pursuit that is beginning to explore the effects of information content, presentation formats, and design attributes on consumer perceptions and attitude, which in turn may impact the bottom line of firms who conduct electronic business. The line of research seeking to understand ways to maximize the effectiveness of the e-business environment is promising.

Appendix A

Criteria for Classification As Informative or Noninformative
[Stern, Krugman, & Resnik, 1981, p. 40]

(1) Price-value
- What does the product cost? What is its value-retention capability?
- What is the need-satisfaction capability/dollars?

(2) Quality
- What are the product's characteristics that distinguish it from competing products based on an objective evaluation of workmanship, engineering, durability, excellence of materials, structural superiority, superiority of personnel, attention to detail, or special services?

(3) Performance
- What does the product do, and how well does it do what it is designed to do in comparison to alternative purchases?

(4) Components or contents
- What is the product composed of? What ingredients does it contain?
- What ancillary items are included with the product?

(5) Availability
- Where can the product be purchased?
- When will the product be available for purchase?

(6) Special offers
- What limited-time nonprice deals are available with a particular purchase?

(7) Taste
- Is evidence presented that the taste of a particular product is perceived as superior in taste by a sample of potential customers? (The opinion of the advertiser is inadequate.)

(8) Nutrition
- Are specific data given concerning the nutritional content of a particular product, or is a direct specific comparison made with other products?

(9) Packaging or shape
- What package is the product available in which makes it more desirable than alternatives? What special shapes is the product available in?

(10) Guarantees and warranties
- What post purchase assurances accompany the product?

(11) Safety
- What safety features are available on a particular product compared to alternative choices?

(12) Independent research
- Are results of research gathered by an "independent" research firm presented?

(13) Company research
- Are data gathered by a company to compare its product with a competitor's presented?

(14) New ideas
- Is a totally new concept introduced during the commercial?
- Are its advantages presented?

Note:
1) The 14 criteria first appeared in Resnik & Stern (1977) without detailed explanation. Stern, Krugman, & Resnik (1981) provide the above interpretation for the first time.
2) This list has been adopted by over 60 studies since 1977, according to Abernethy and Franke (1996).

Appendix B

Variables in Content Analysis
[Philport & Arbittier, 1997, p. 72]

Orientation

Individual: Includes celebrity, company spokesperson, average person endorser

- Product display: Product demonstrated or displayed
- Facts/features: Includes mention of facts or features of product
- Technique: Ad uses special effects technique (e.g., fantasy)
- Humor: Ad employs humor

Product Positioning

- Comparison: Product compared to another product
- Product Quality: Ad mentions quality of product
- Customer Service: Customer Serviced mentioned
- Guarantee: A guarantee is mentioned

Sales Stimuli

- Price: Price is mentioned
- Sale: Product is mentioned to be on sale, not including a sales event
- Sales Event: Washing's day sale, Memorial day sale, etc.
- Lease/Financing: Terms to lease or finance the product
- Incentive: A gift or incentive is given for purchase
- Coupon: Coupon included in ad
- Contest: Contest is mentioned in the ad
- Continuity Program: Frequent flyer or other loyalty program

Marketing Programs

- Parent Company: Parent company of product mentioned
- Co-op/Co-branded ad: More than one brand is advertised
- Corporate Image: Ad enhances image of corporation with little product mention
- Social Responsibility: Ad mentions social issues such as environmentally friendly
- Event Sponsorship: Brand is sponsoring an event

Interactive Loop

- 1-800 Number
- Web Address

Discriminant Functions Found Significant

Discriminant Functions	Variables	Percent Variance
Product Positioning	Endorsements Facts and Details Product Display	60.36
Customer Relations	Web Address 1-800 Numbers Customer Service Parent Company Reference	20.12
Sales Incentives	Price Sales Coupon Lease	2.04

Appendix C

Forms of Interactive Functions
[Ghose & Dou, 1998, p. 32]

Customer Support
- Software downloading
- Online problem diagnostics
- Electronic form (e-form) inquiry
- Order status tracking
- Comment
- Feedback:

Marketing Research
- Site survey
- Product survey
- New Product proposal

Personal-Choice Helper
- Key word search
- Personal-choice helper
- Virtual reality display
- Dealer locator

Advertising/Promotion/Publicity
- Electronic coupon
- User groups
- Online order
- Sweepstakes/prize
- Multimedia shows
- Push media
- Interactive job placement

Entertainment
- Electronic post card
- Surfer postings
- Games

Appendix D

Description of Commercial Characteristics
[Aaker & Norris, 1982]

Variable Name	Explanation
Newness of object	Established vs. totally new concepts
Product type	Frequently purchased vs. consumer durable
Hard vs. soft sell	Reason-why vs. mood approach
Product class vs. brand orientation	Focus on product class vs. focus on brand
Problem posed	Problem posed and solved
Testimonial: Expert	
Comparative advertising	Comparison with competition
Price mentioned	
Product components	Description or view of product
Product test	Report of product test
Government sponsored test	
Number of distinct claims or thoughts	
Institutional	For sponsor image or position on a public policy issue
Product use	Whether a product's use is shown or not
New brand	Whether a new brand or not
Government association	Association with inspection or grading of product
Testimonial: man on the street	
Testimonial: prestigious	
Brand name mentions	Number of times brand name appears

Appendix E

Survey Instructions and Questions

Please Read Carefully Before Visiting the Site!

Instructions (Garden North Futons™ Site)

Suppose a close friend of yours (also your classmate) wants to buy a new wooden-frame futon for his apartment near campus. You are asked to give some suggestions.

Garden North Futons™ is the Web site of a futon maker and retailer. Please **click as many links as you can** to learn about all aspects of the futons they offer, and decide whether you can recommend to your friend one or two models from this site.

Use the space below to take some notes while visiting the site.

❑ I would recommend the _____or _____ model from this site.

Size of futon: _____.

Why do you like it (them)? (In simple words or phrases)

OR

❑ I would NOT recommend anything from this site.
Why? (In simple words or phrases)

This questionnaire is for the Futon site.

Part A. Circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
This website is a good source of product information.	1	2	3	4	5	6	7
This website is entertaining.	1	2	3	4	5	6	7
It is very likely that I will visit this site again in the future.	1	2	3	4	5	6	7
This website is frustrating.	1	2	3	4	5	6	7
This website is valuable.	1	2	3	4	5	6	7
It is improbable that I will buy any of their products.	1	2	3	4	5	6	7
This website is pleasing.	1	2	3	4	5	6	7
I will return to this site the next time I need a futon.	1	2	3	4	5	6	7
This website is useful.	1	2	3	4	5	6	7
This website is annoying.	1	2	3	4	5	6	7
It is very likely that I will purchase a futon from this company.	1	2	3	4	5	6	7
This website is worth the visit.	1	2	3	4	5	6	7
This website is enjoyable.	1	2	3	4	5	6	7
This website supplies relevant product information.	1	2	3	4	5	6	7
This website is irritating.	1	2	3	4	5	6	7
This website is very informative about the company's products.	1	2	3	4	5	6	7
I will buy one of their products the next time I need a futon.	1	2	3	4	5	6	7

Part B. Use the descriptive words listed below to indicate your overall impression of this site.

			Neutral				
Bad	1	2	3	4	5	6	7 Good
Unfavorable	1	2	3	4	5	6	7 Favorable
Dislike	1	2	3	4	5	6	7 Like

Part C. Would you recommend your friend to visit this site?

Absolutely Not	1	2	3	4	5	6	7	Absolutely Would

Part D. Would you recommend your friend to buy a Garden North futon?

Absolutely Not	1	2	3	4	5	6	7	Absolutely Would

Part E. Please check the types of information made available to you at this site. Check all that apply.

❑ Price of Product	Check this box if you saw the actual price of one or more products, e.g., the price of a futon frame, or the price of a futon mattress, or the price of a whole futon package, or promotional pricing on certain models, etc.

❑ Product Quality	Check this box if you saw any claims or statements that relate to the quality of the products, e.g., either a statement on the quality of wood used in futon frames, or quality material used for mattresses, or claims of superior craftsmanship, or statements about the superior structure of the futons, or product warranty, etc.

Part F. Please give us your assessment of the product menu and submenus at this site.

	Definitely Disagree <----> Definitely Agree						
Using this menu structure can improve my shopping performance.	1	2	3	4	5	6	7
Using this menu structure can increase my shopping productivity.	1	2	3	4	5	6	7
Using this menu structure can improve my shopping effectiveness.	1	2	3	4	5	6	7
I find the menu structure at this site useful.	1	2	3	4	5	6	7

Part G. We would like to know how interested you are in futons. Please use the series of descriptive words listed below to indicate your level of interest in futons:

Important	1	2	3	4	5	6	7	Unimportant
Irrelevant	1	2	3	4	5	6	7	Relevant
Mean a lot to me	1	2	3	4	5	6	7	Mean nothing to me
Unexciting	1	2	3	4	5	6	7	Exciting
Dull	1	2	3	4	5	6	7	Neat
Matter to me	1	2	3	4	5	6	7	Don't matter to me
Boring	1	2	3	4	5	6	7	Interesting
Fun	1	2	3	4	5	6	7	Not fun
Appealing	1	2	3	4	5	6	7	Unappealing
Of no concern to me	1	2	3	4	5	6	7	Of concern to me

Part I. Please tell us **honestly** how closely you followed our instructions (of looking for and recommending a futon to your friend) by your agreement or disagreement with the following statements.

	Definitely Disagree <----> Definitely Agree						
I followed the instructions to the best of my ability.	1	2	3	4	5	6	7
I really did not care if I would find a good futon for my friend.	1	2	3	4	5	6	7
I tried everything I could to find the most suitable futon.	1	2	3	4	5	6	7

Part J. Answers on this survey are anonymous. We appreciate your responses to the following questions.

1. How many hours a **week**, on average, do you spend on the Internet?
   ❑ 0 ❑ 1-3 ❑ 4-6 ❑ 6-10 ❑ More than 10 hours
2. Your age: ❑ 16-24 ❑ 25-30 ❑ 31-40 ❑ Over 40
3. Your gender: ❑ F ❑ M

-- Thank you! --

Please Read Carefully Before Visiting the Site!

Instructions (Handspring Site) – PDA, i.e., personal digital assistant

Suppose a close friend of yours wants to buy a new wireless handheld device and seeks advice from you. You heard that Handspring is one of the companies that make such products and decided to pay a visit to its website. Your friend has never visited the site before.

Though you may not know much about Handspring or the Visor brand yourself, you believe it is a good idea to see what they have to offer because you are considering buying a new handheld yourself.

Your Task:
Find which product might be most suitable for you or your friend. Please use all of the following three functions provided by the site:

2) **the product menu on the left-hand side,**
3) **the "sitemap" (i.e., site directory) linked from the top of the page or in the left column of each page, and**
4) **the "which visor is right for me" function linked from the top of the page.**

You'll be asked questions about your experience with each of the above functions on the survey.

Use the space below to take some notes.

❑ I would recommend _____.

❑ Some features of this item, in simple words or phrases:

❑ Reason I recommend it (can be very brief):

This questionnaire is for the Handspring (PDA-personal digital assistant) site.

Part A. Circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
This website is a good source of product information.	1	2	3	4	5	6	7
This website is entertaining.	1	2	3	4	5	6	7
It is very likely that I will visit this site again in the future.	1	2	3	4	5	6	7
This website is frustrating.	1	2	3	4	5	6	7
This website is valuable.	1	2	3	4	5	6	7
It is improbable that I will buy any of their products.	1	2	3	4	5	6	7
This website is pleasing.	1	2	3	4	5	6	7
I will return to this site the next time I need a handheld device.	1	2	3	4	5	6	7
This website is useful.	1	2	3	4	5	6	7
This website is annoying.	1	2	3	4	5	6	7
It is very likely that I will buy a product from this company.	1	2	3	4	5	6	7
This website is worth the visit.	1	2	3	4	5	6	7
This website is enjoyable.	1	2	3	4	5	6	7
This website supplies relevant product information.	1	2	3	4	5	6	7
This website is irritating.	1	2	3	4	5	6	7
This website is very informative about the company's products.	1	2	3	4	5	6	7
I will buy one of their products the next time I need one.	1	2	3	4	5	6	7

Part B. Please use the descriptive words listed below to indicate your overall impression of this site.

			Neutral				
Bad	1	2	3	4	5	6	7	Good
Unfavorable	1	2	3	4	5	6	7	Favorable
Dislike	1	2	3	4	5	6	7	Like

Part C. Would you recommend your friend to visit this site?

Absolutely Not	1	2	3	4	5	6	7	Absolutely Would

Part D. Would you recommend your friend to buy a Handspring product?

Absolutely Not	1	2	3	4	5	6	7	Absolutely Would

Part E. Please check what you saw at this site. Check all that apply.

❑ Three-dimensional (3D) Product Demonstration	Check this box if you visited any link that gives you a view of a product from multiple angles, e.g., a 360° view, or that allows you to flip a cover or to give it a spin, etc.
❑ Interactive Product Demonstration	Check this box if you visited any link that allows you to interact with the product on the screen, e.g., to see how to make a call with Visor Phone, how to receive a call, or how to compose and send text messages, etc.
❑ Cartoon	Check this box if the site shows you any funny cartoon during your visit, either in a normal product page or as a popup ad.
❑ One cartoon ❑ Two cartoons ❑ Three or more cartoons	If you checked the previous box, then in the box to the left, indicate how many cartoons you saw.

Part F. Please indicate how familiar **were** you with the Handspring brand before today's visit.

	Definitely Disagree						Definitely Agree
I knew a great deal about Handspring.	1	2	3	4	5	6	7
I was very familiar with the Handspring brand.	1	2	3	4	5	6	7
I have used this brand in the past.	1	2	3	4	5	6	7

Part G. Please give us your assessment of the product menu and submenus at this site.

	Definitely Disagree						Definitely Agree
Using this menu structure can improve my shopping performance.	1	2	3	4	5	6	7
Using this menu structure can increase my shopping productivity.	1	2	3	4	5	6	7
Using this menu structure can improve my shopping effectiveness.	1	2	3	4	5	6	7
I find the menu structure at this site useful.	1	2	3	4	5	6	7

Part H. 1. Did you use the sitemap (site directory)? ❑ Yes. ❑ No. If yes, please circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
Using this sitemap can improve my shopping performance.	1	2	3	4	5	6	7
Using this sitemap can increase my shopping productivity.	1	2	3	4	5	6	7
Using this sitemap can increase my shopping effectiveness.	1	2	3	4	5	6	7
I find this sitemap useful.	1	2	3	4	5	6	7

2. Did you use the "find a handheld for me" function offered at this site? ❑ Yes. ❑ No. If yes, please circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
Using this function can improve my shopping performance.	1	2	3	4	5	6	7
Using this function can increase my shopping productivity.	1	2	3	4	5	6	7
Using this function can increase my shopping effectiveness.	1	2	3	4	5	6	7
I find this "find a handheld for me" function useful.	1	2	3	4	5	6	7

Part I. We would like to know how interested you are in PDAs (handheld devices). Please use the series of descriptive words listed below to indicate your level of interest in such products:

Important	1	2	3	4	5	6	7	Unimportant
Irrelevant	1	2	3	4	5	6	7	Relevant
Mean a lot to me	1	2	3	4	5	6	7	Mean nothing to me
Unexciting	1	2	3	4	5	6	7	Exciting
Dull	1	2	3	4	5	6	7	Neat
Matter to me	1	2	3	4	5	6	7	Don't matter to me
Boring	1	2	3	4	5	6	7	Interesting
Fun	1	2	3	4	5	6	7	Not fun
Appealing	1	2	3	4	5	6	7	Unappealing
Of no concern to me	1	2	3	4	5	6	7	Of concern to me

Part J. Please tell us **honestly** how closely you followed our instructions (of looking for and recommending a PDA to your friend) by your agreement or disagreement with the following statements.

	Definitely Disagree						Definitely Agree
I followed the instructions to the best of my ability.	1	2	3	4	5	6	7
I really did not care if I would find a good PDA for my friend.	1	2	3	4	5	6	7
I tried everything I could to find the best product for my friend.	1	2	3	4	5	6	7

-- Thank you! --

Please Read Carefully Before Visiting the Site!

Instructions (Ritz Camera Site)

Suppose a close friend of yours wants to buy a digital camera. Your friend was fairly satisfied with an **Olympus** brand conventional camera. S/he wants you to recommend a digital camera, though not necessarily an Olympus brand.

Now you are visiting an online camera store, Ritz Camera. You have the following tasks to accomplish at this site:

1. **Find a digital camera you want to recommend to your friend, around or below $500.00.**

2. **To see whether you can find an Olympus brand digital camera with this budget, you will use the following features at the site:**
   1) **the product search engine, and**
   2) **the site map (site directory) linked from the top of the page.**

Among others, you will be asked about your experience with the product search function and the site map on the survey.

You may use this page to take some notes while you are visiting the site.

❑ I would recommend _____.

❑ Olympus brand? Yes No

❑ Some features of this item, in simple words or phrases:

❑ Why I recommend it (brief):

This questionnaire is for the Ritz Camera site.

Part A. Circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
This website is a good source of product information.	1	2	3	4	5	6	7
This website is entertaining.	1	2	3	4	5	6	7
It is very likely that I will visit this site again in the future.	1	2	3	4	5	6	7
This website is frustrating.	1	2	3	4	5	6	7
This website is valuable.	1	2	3	4	5	6	7
It is improbable that I will buy any of their products.	1	2	3	4	5	6	7
This website is pleasing.	1	2	3	4	5	6	7
I will return to this site the next time I need a camera.	1	2	3	4	5	6	7
This website is useful.	1	2	3	4	5	6	7
This website is annoying.	1	2	3	4	5	6	7
It is very likely that I will buy a product from this company.	1	2	3	4	5	6	7
This website is worth the visit.	1	2	3	4	5	6	7
This website is enjoyable.	1	2	3	4	5	6	7
This website supplies relevant product information.	1	2	3	4	5	6	7
This website is irritating.	1	2	3	4	5	6	7
This website is very informative about the company's products.	1	2	3	4	5	6	7
I will buy one of their products the next time I need a camera.	1	2	3	4	5	6	7

Part B. Please use the descriptive words listed below to indicate your overall impression of this site.

	Neutral						
Bad	1	2	3	4	5	6	7 Good
Unfavorable	1	2	3	4	5	6	7 Favorable
Dislike	1	2	3	4	5	6	7 Like

Part C. Would you recommend your friend to visit this web site?

Absolutely Not	1	2	3	4	5	6	7	Absolutely Would

Part D. Would you recommend your friend to buy a camera from this company?

Absolutely Not	1	2	3	4	5	6	7	Absolutely Would

Part E. Please check what you saw at this site. Check all that apply.

❑ Continuously Running Animation	Check this box if the site displays any animation that is continuously running on the screen. In case you need a definition, "animation" means an "active" or "moving" image.

❑ Popup Advertising (Popup Windows)	Check this box if the site uses unexpected popup windows for promotional messages or advertising.

❑ One popup ad ❑ Two popup ads ❑ Three or more popup ads	If you checked the previous box, then in the box to the left, indicate how many popup ads you saw.

Part G. Please give us your assessment of the product menu and submenus at this site.

	Definitely Disagree						Definitely Agree
Using this menu structure can improve my shopping performance.	1	2	3	4	5	6	7
Using this menu structure can increase my shopping productivity.	1	2	3	4	5	6	7
Using this menu structure can improve my shopping effectiveness.	1	2	3	4	5	6	7
I find the menu structure at this site useful.	1	2	3	4	5	6	7

Part H. 1. Did you use the product search function? ❑ Yes. ❑ No. If yes, please circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
Using this search engine can improve my shopping performance.	1	2	3	4	5	6	7
Using this search engine can increase my shopping effectiveness.	1	2	3	4	5	6	7
Using this search engine can increase my shopping productivity.	1	2	3	4	5	6	7
I find this search engine useful.	1	2	3	4	5	6	7

2. Did you use the sitemap (site directory)? ❑ Yes. ❑ No. If yes, please circle the number that best indicates your agreement or disagreement with each statement.

	Definitely Disagree						Definitely Agree
Using this sitemap can improve my shopping performance.	1	2	3	4	5	6	7
Using this sitemap can increase my shopping effectiveness.	1	2	3	4	5	6	7
Using this sitemap can increase my shopping productivity.	1	2	3	4	5	6	7
I find this sitemap useful.	1	2	3	4	5	6	7

Part I. We would like to know how interested you are in cameras, camcorders, or photography in general. Please use the series of descriptive words listed below to indicate your level of interest in such products:

Important	1	2	3	4	5	6	7	Unimportant
Irrelevant	1	2	3	4	5	6	7	Relevant
Mean a lot to me	1	2	3	4	5	6	7	Mean nothing to me
Unexciting	1	2	3	4	5	6	7	Exciting
Dull	1	2	3	4	5	6	7	Neat
Matter to me	1	2	3	4	5	6	7	Don't matter to me
Boring	1	2	3	4	5	6	7	Interesting
Fun	1	2	3	4	5	6	7	Not fun
Appealing	1	2	3	4	5	6	7	Unappealing
Of no concern to me	1	2	3	4	5	6	7	Of concern to me

Part J. Please tell us **honestly** how closely you followed our instructions (of looking for and recommending a camera to your friend) by your agreement or disagreement with the following statements.

	Definitely Disagree <----> Definitely Agree						
I followed the instructions to the best of my ability.	1	2	3	4	5	6	7
I really did not care if I would find a good camera for my friend.	1	2	3	4	5	6	7
I tried everything I could to find the product for my friend.	1	2	3	4	5	6	7

Part K. Answers on this survey are anonymous. We appreciate your responses to the following questions.

1. How many hours a **week**, on average, do you spend on the Internet?
   ❑ 0 ❑ 1-3 ❑ 4-6 ❑ 6-10 ❑ More than 10 hours
2. Your age: ❑ 16-24 ❑ 25-30 ❑ 31-40 ❑ Over 40
3. Your gender: ❑ F ❑ M

-- Thank you! --

Appendix F

Solicitation Flyer

Attention Web Surfers!

We are running a series of laboratory sessions to better understand consumer views of electronic commerce. You are invited to attend and have some fun, whether you are a computer novice or expert, whether you shopped online or not.

To express our appreciation of your participation, we will provide each participant a Fuji 27-exposure single-use camera when we debrief each session. Additionally, each participant will be entered into one $100 and three (3) $50 cash drawings. The odds of winning are approximately 4 in about 200 participants. The drawings will be held at the next business faculty meeting and names posted on the SAB bulletin board.

Each session lasts about 30 minutes and will be administered in a SAB lab. You will visit two (2) commercial Web sites and answer some questions on a survey. Your participation is voluntary, and you may discontinue your participation at any time. You will not be exposed to any, even remote, possibility of physical or psychological injury during the visit. The Web sites you will visit are ordinary corporate Internet presence or electronic shopping sites. These Web sites have been prescreened to NOT contain any offensive material in any way, shape, or form.

To guarantee anonymity, you will NOT be asked to reveal your name or any other identifying information on the survey, nor will any sensitive personal information be sought. All information you provide will be used for research purposes only, and will be kept confidential and remain anonymous. If you have any questions about the research please feel free to contact Mr. Yuan Gao, Assistant Professor, School of Administration and Business, at (201) 684-7819, or via email, ygao@ramapo.edu.

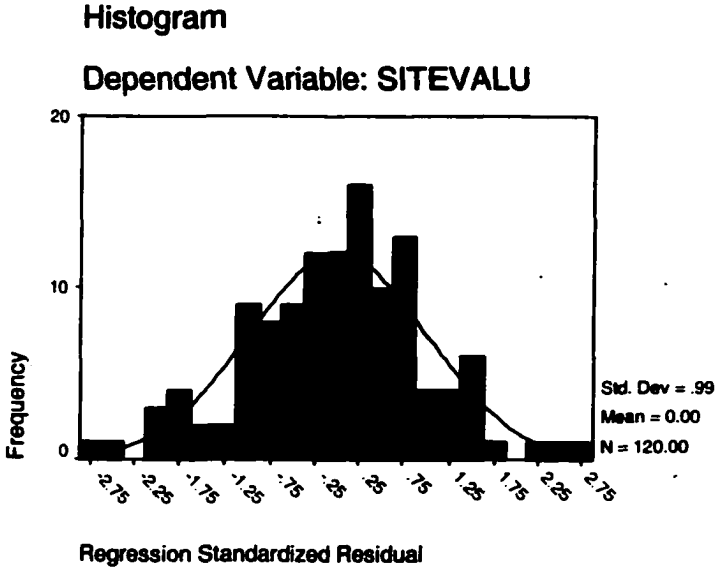
Appendix G

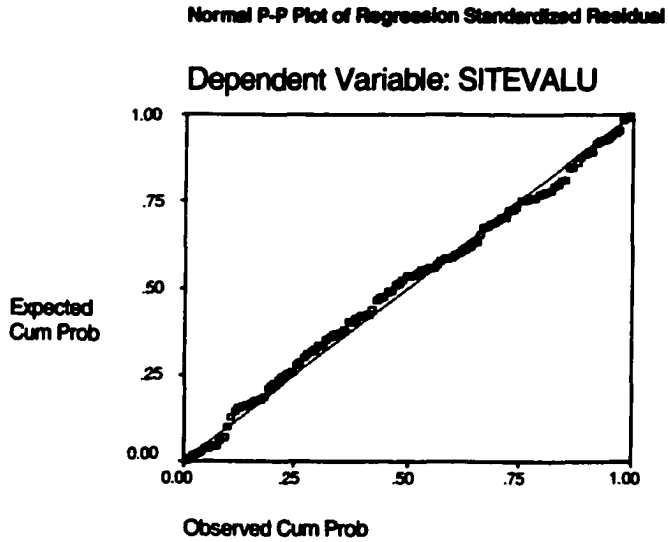
Assumption Checks for Regression Models

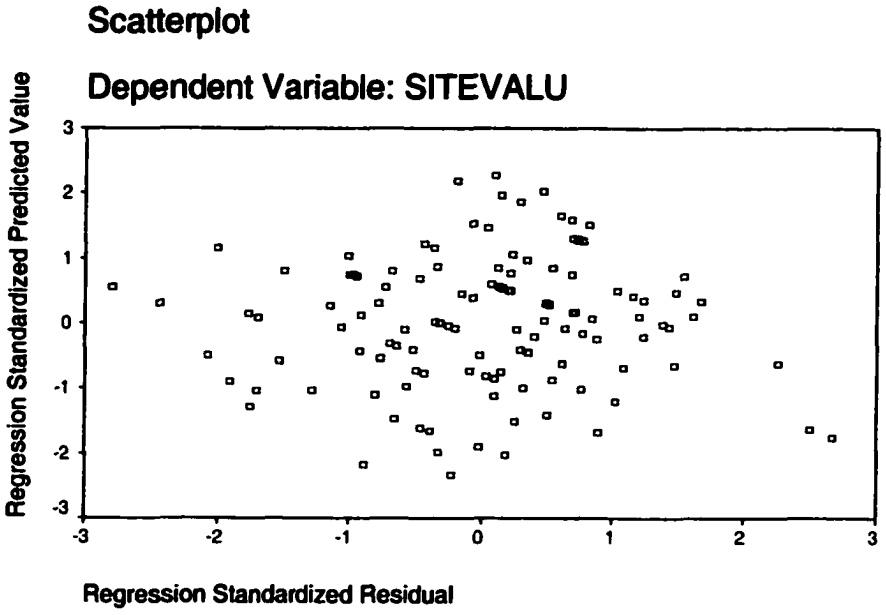
This appendix includes charts related to tests of regression assumptions. In each group, the histogram(s) of residuals appear first, then the normal probability plot (normal P-P plot), with points clustering around a straight line indicating normality, followed by scatter plot of standardized residual vs. standardized predicted value, for detection of heteroscedasticity.

1. Futon Site

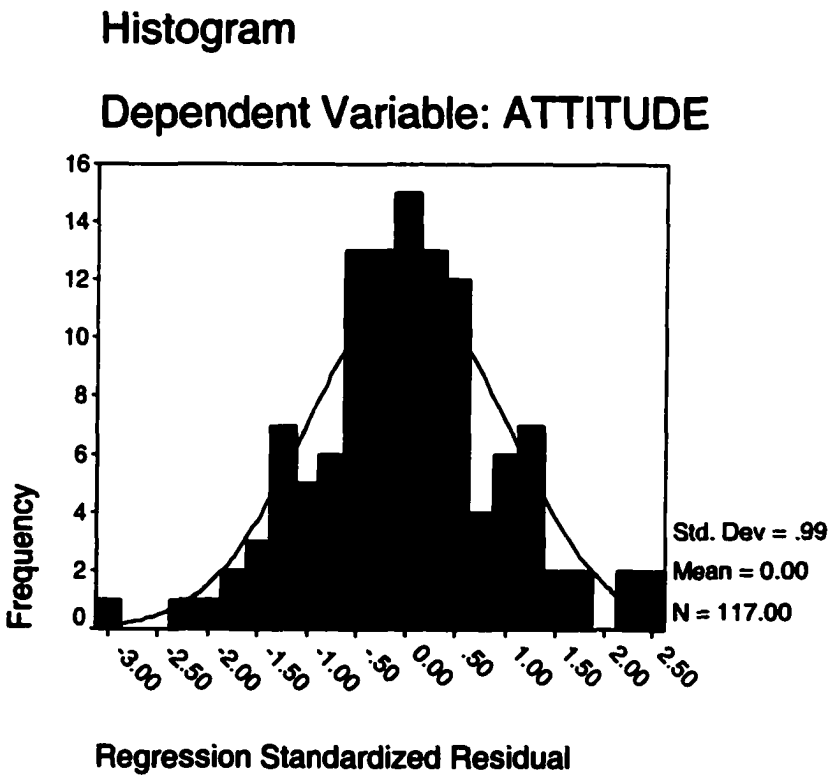
1) Regression on Site Value

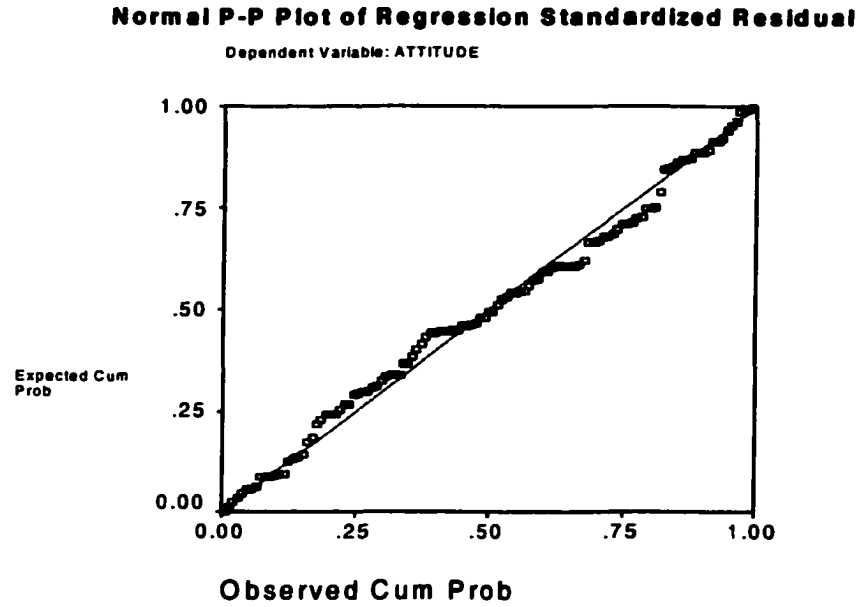


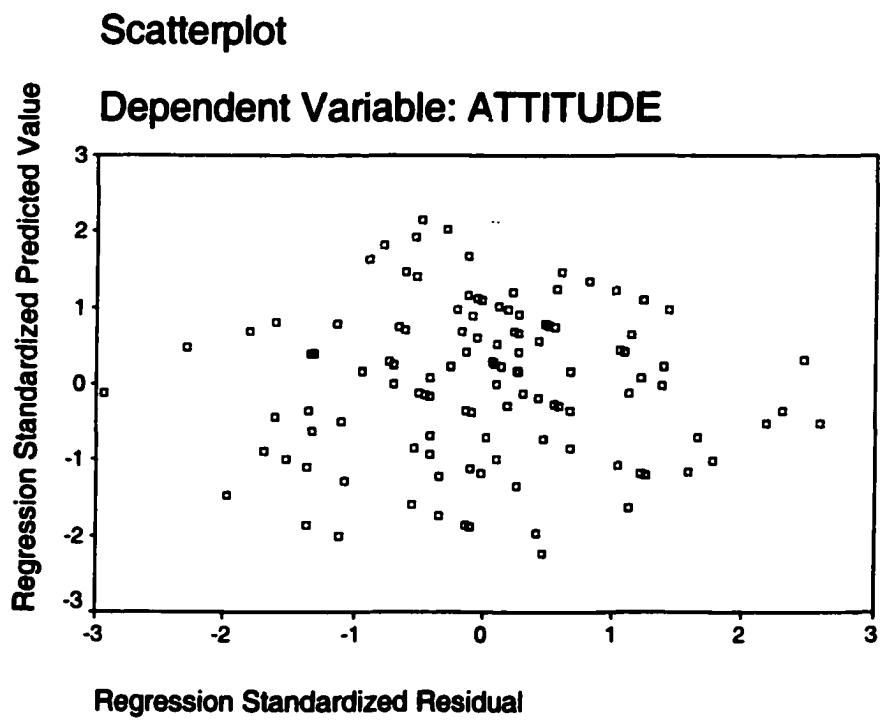




2) Regression on Attitude toward the Site (Ast)

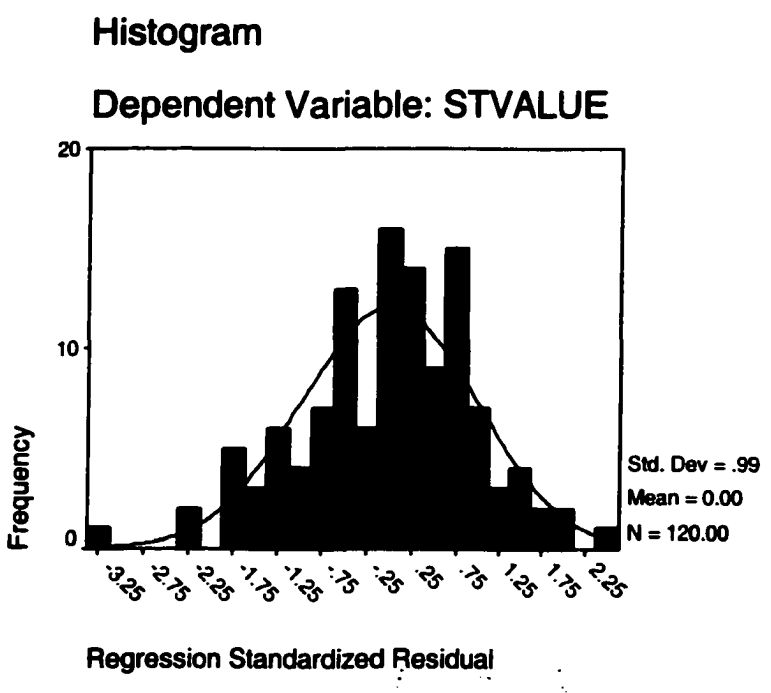




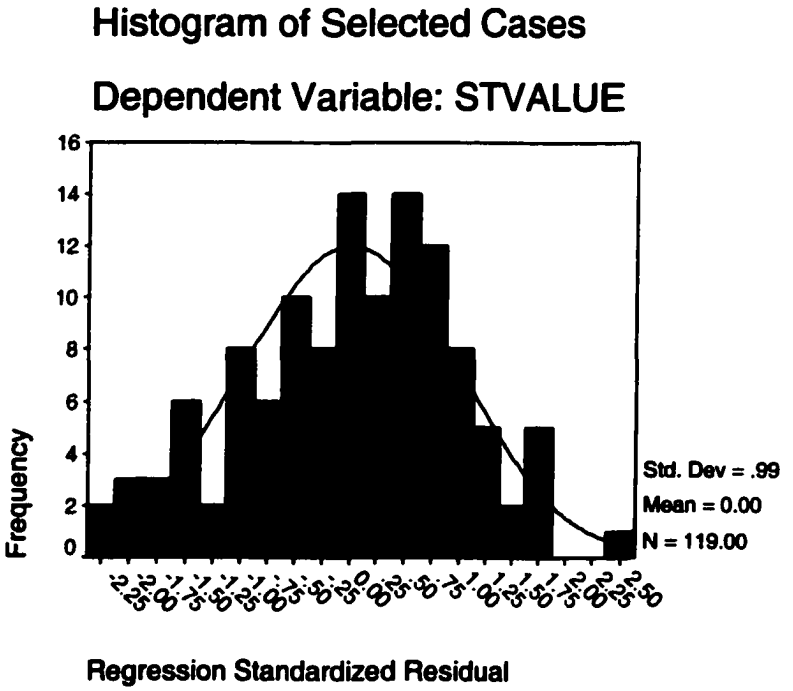


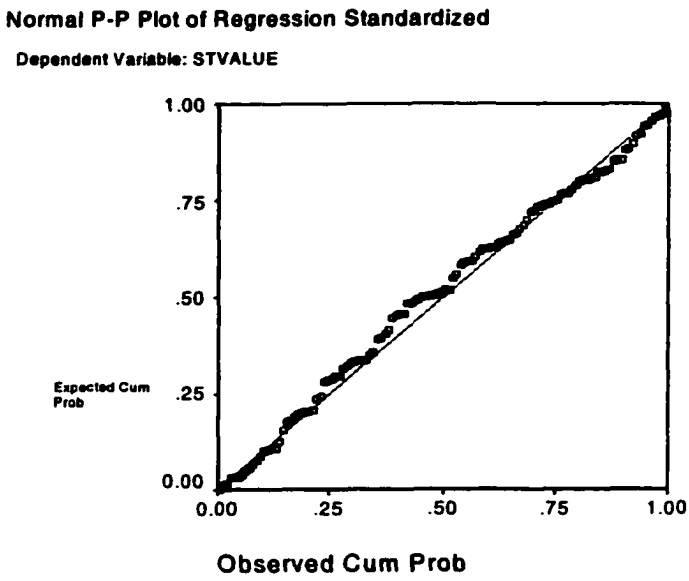
2. PDA Site

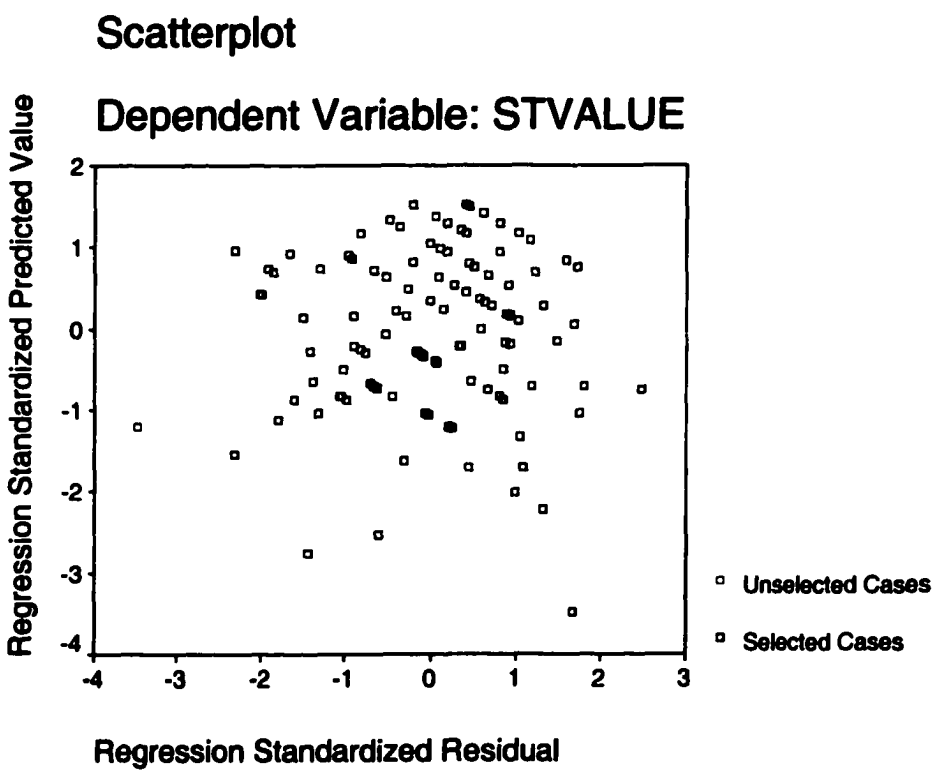
1) Regression on Site Value



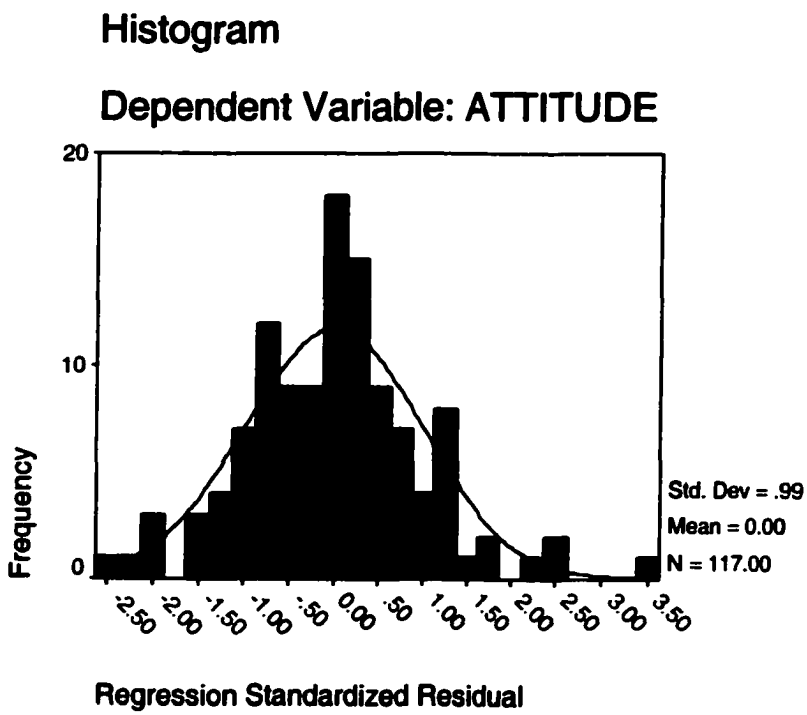
After Removal of one outliner ...



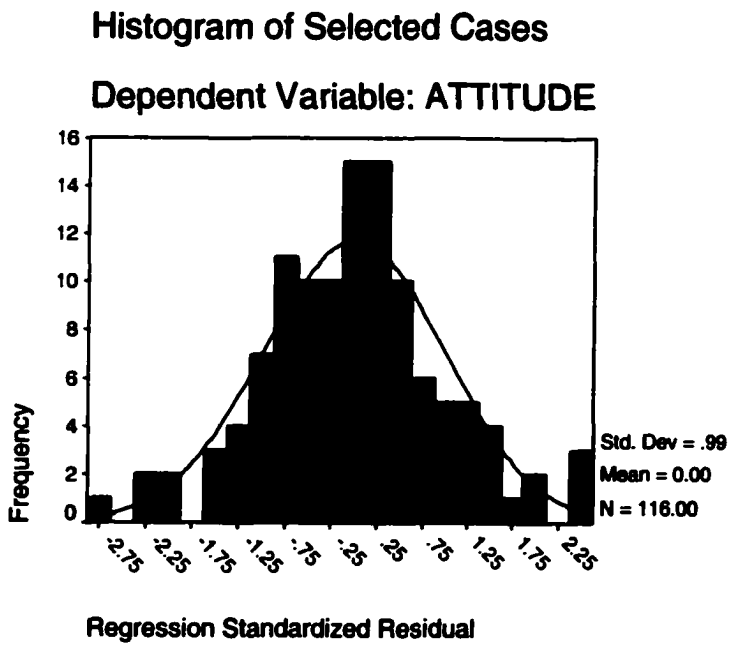


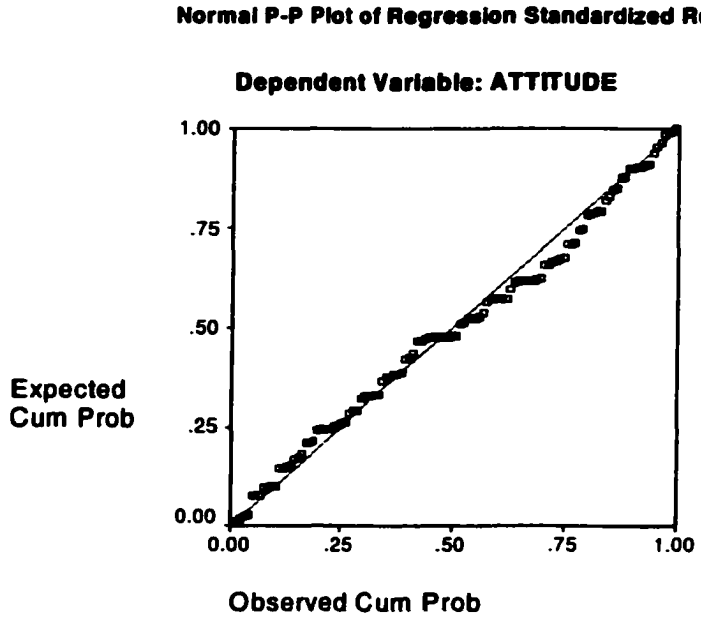


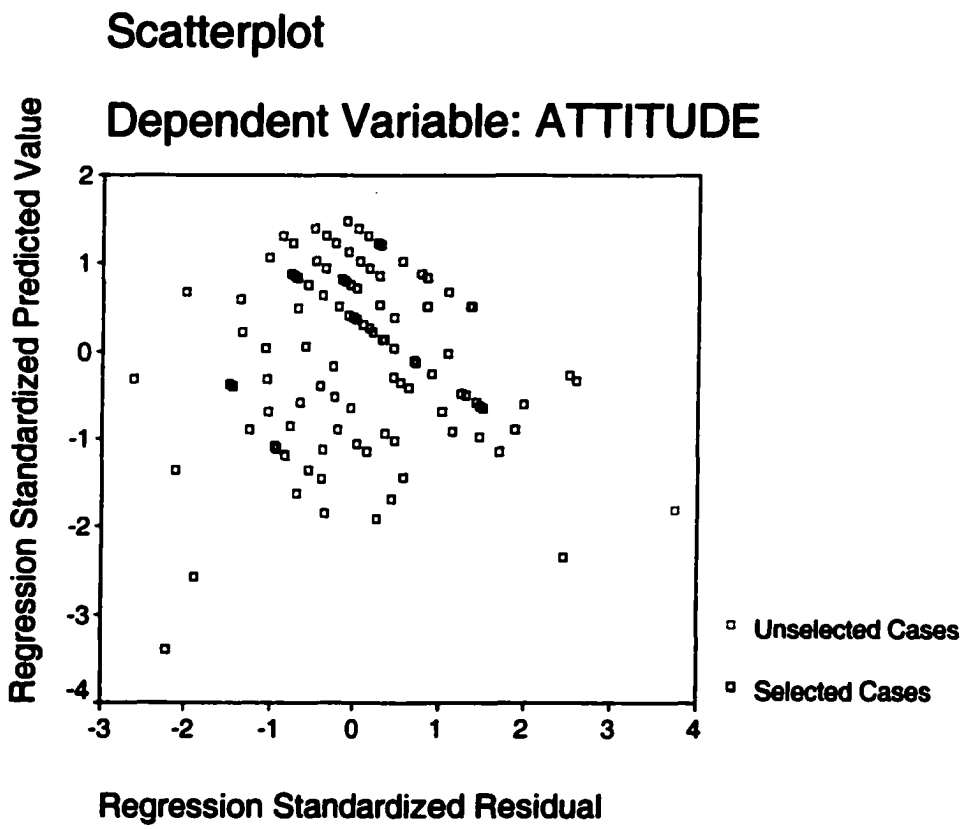
2) Regression on Ast



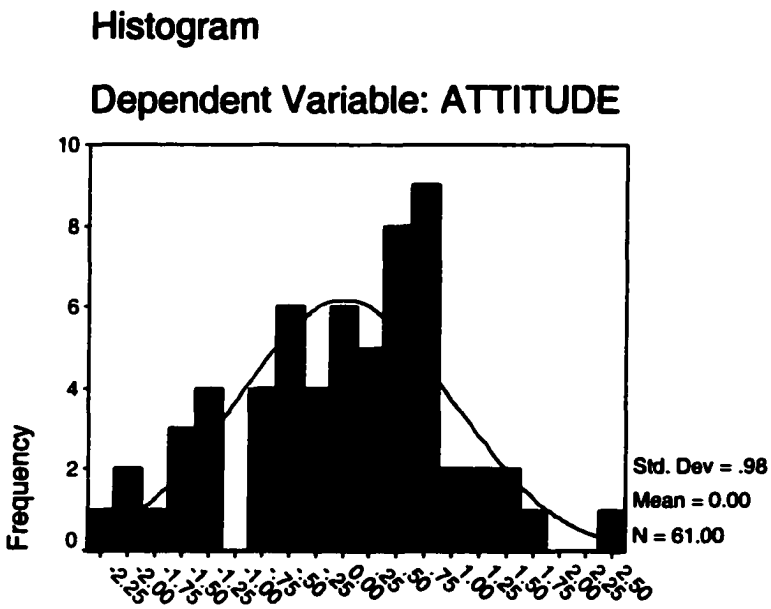
After removal of one outlier ...

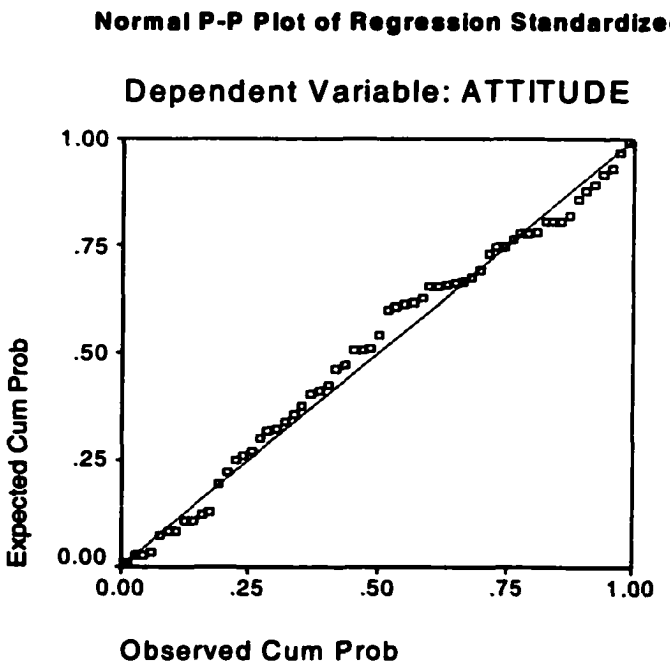




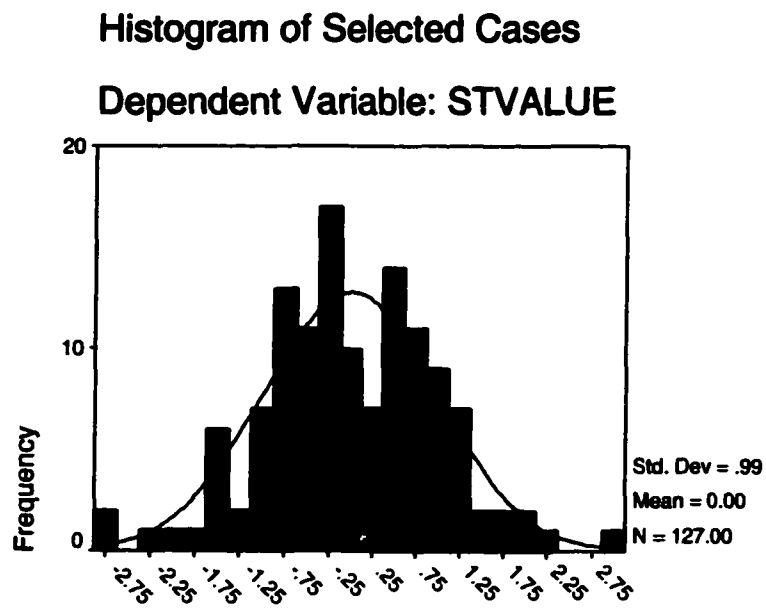


3) Regression on Site Value via System Design Features

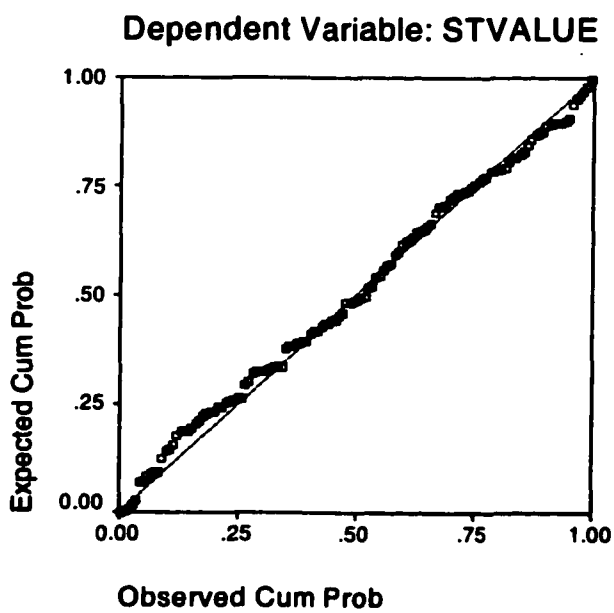


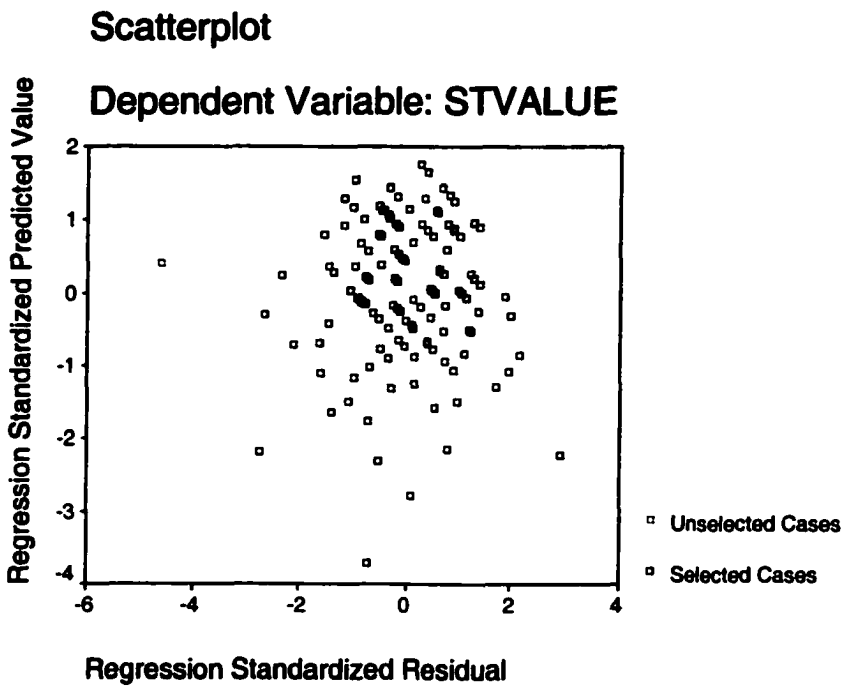


After removal of one outlier ...

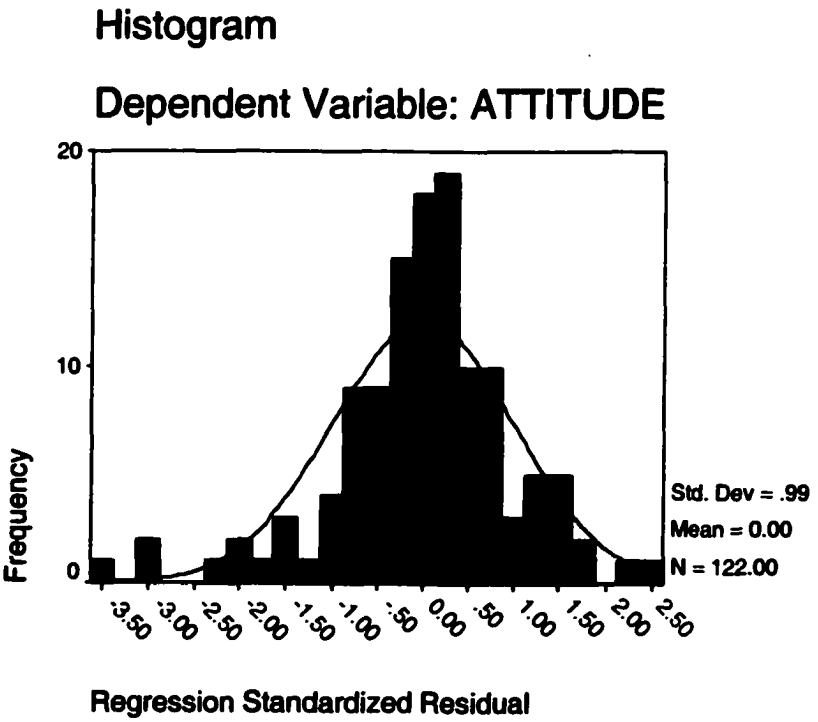


Normal P-P Plot of Regression Standardized Residual

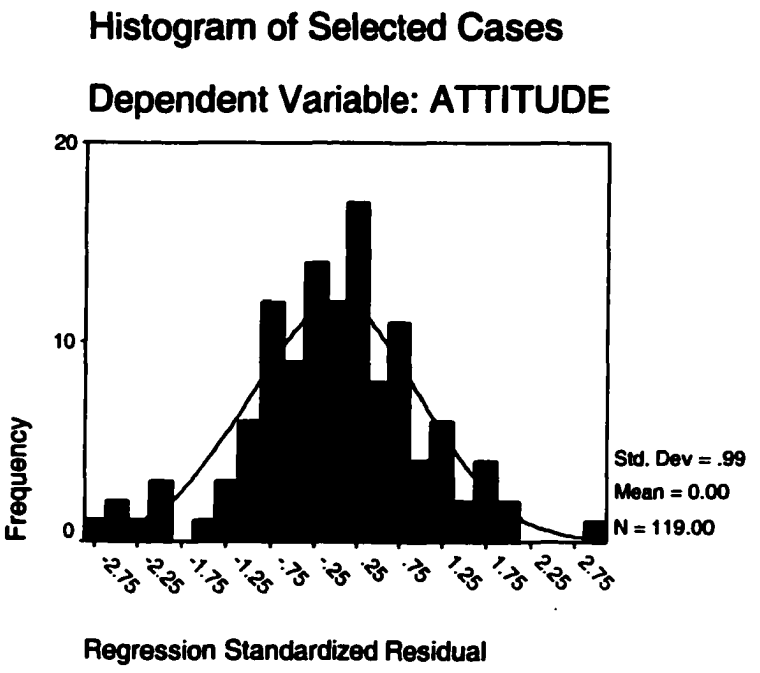




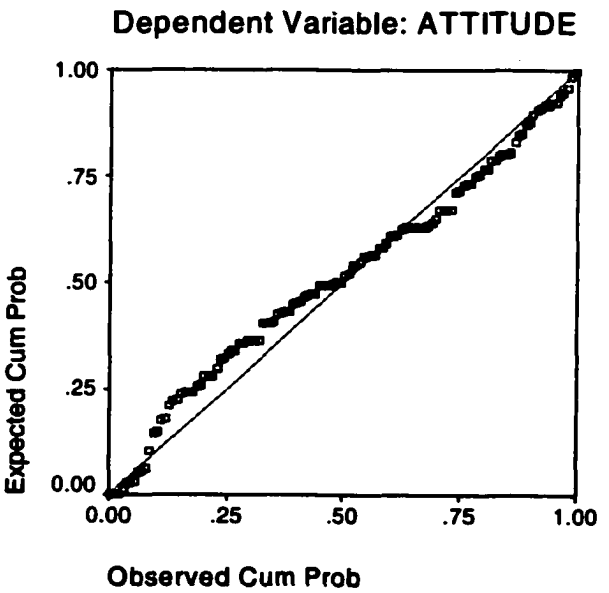
3) Regression on Ast

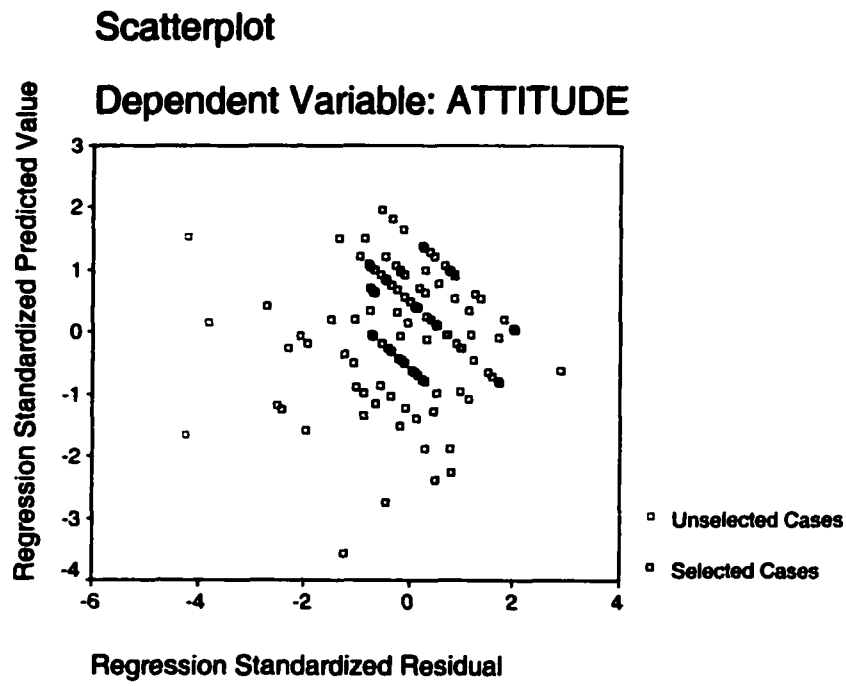


After removal of three outliers ...

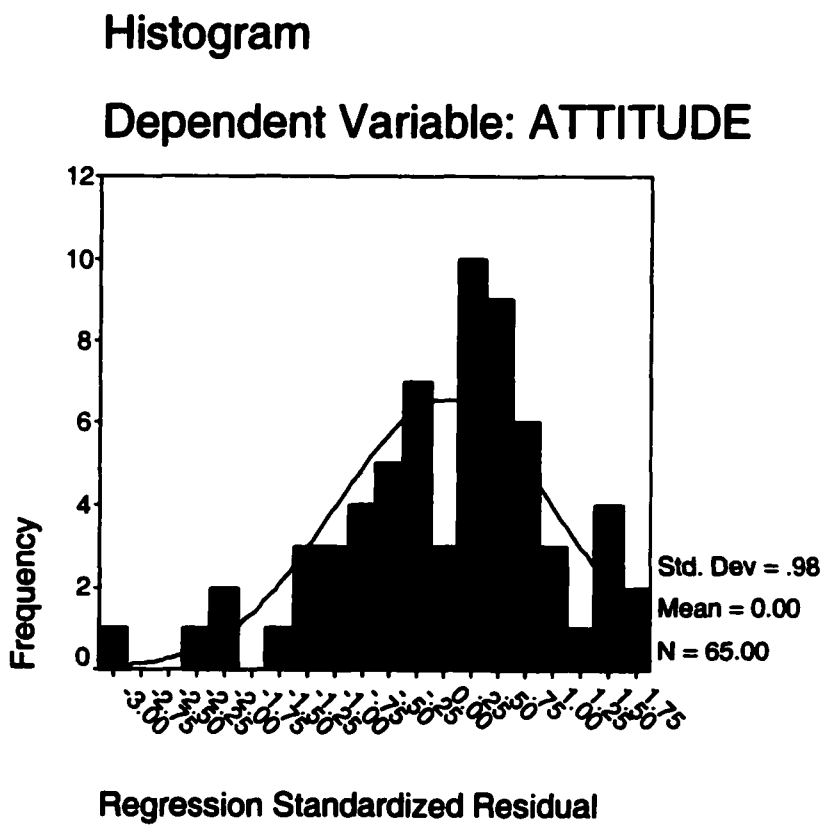


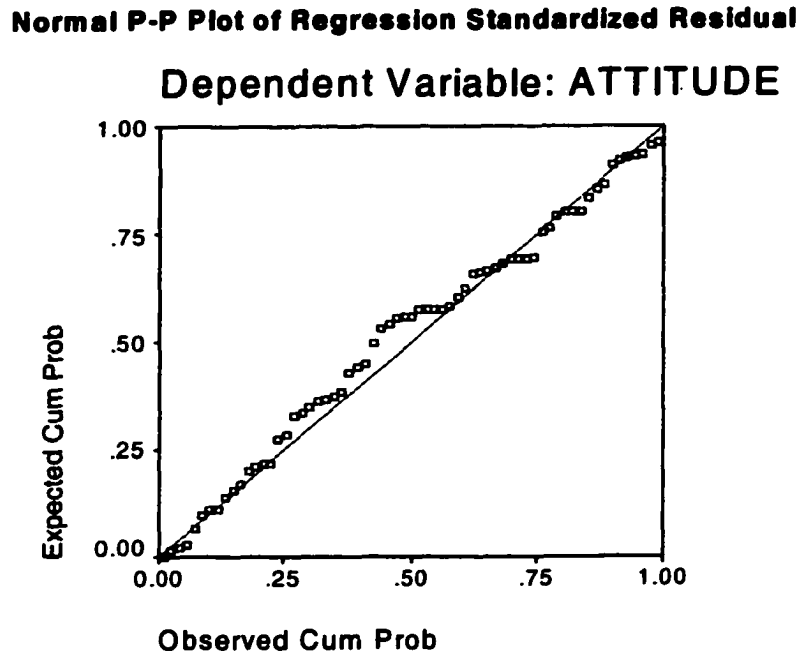
Normal P-P Plot of Regression Standardized Residual

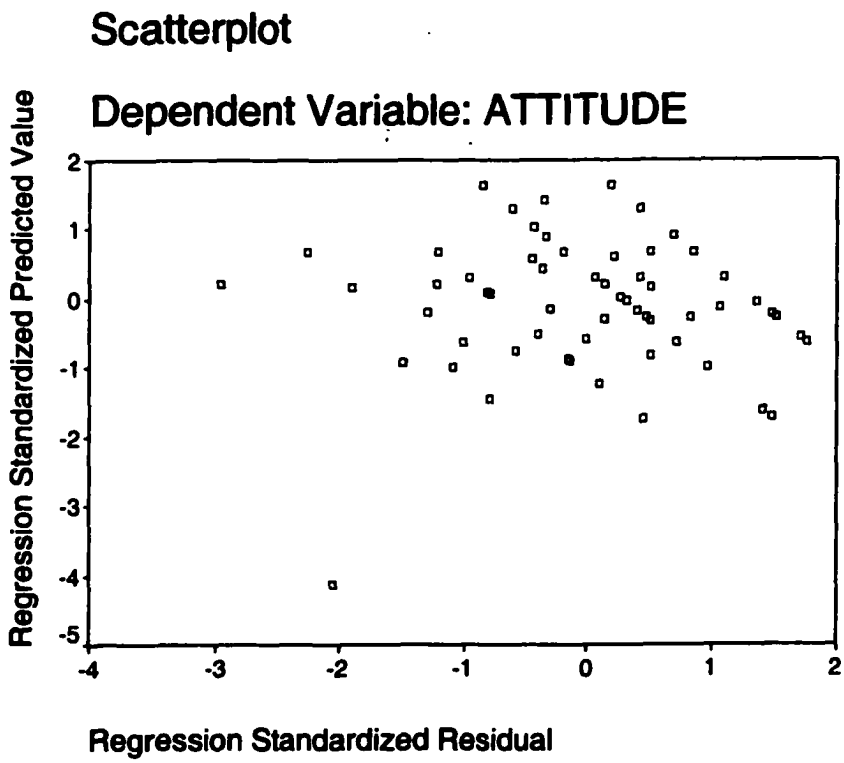




3) Regression on Ast via System Design Features

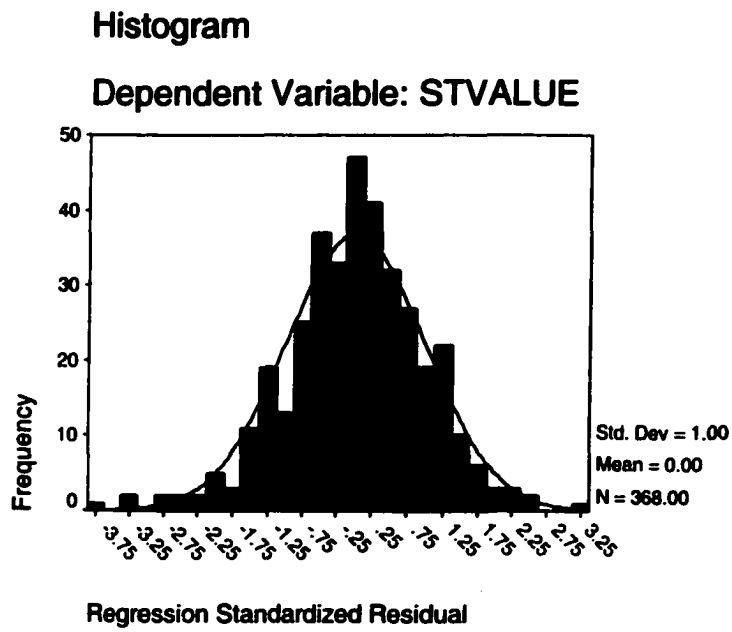




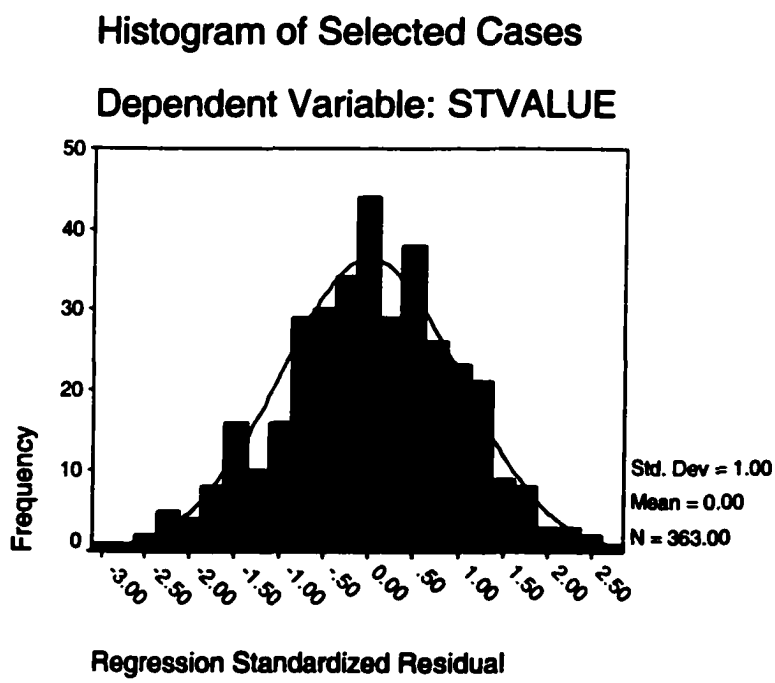


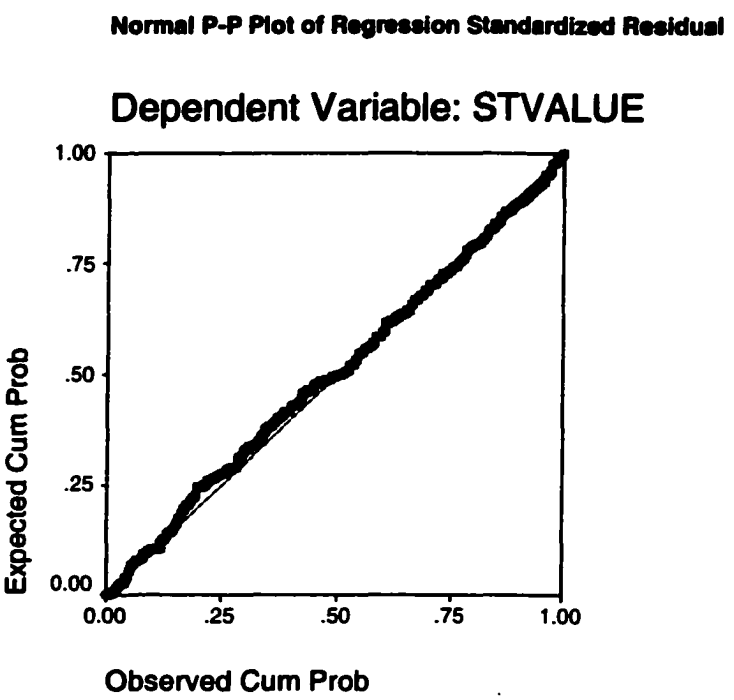
4. Pooled

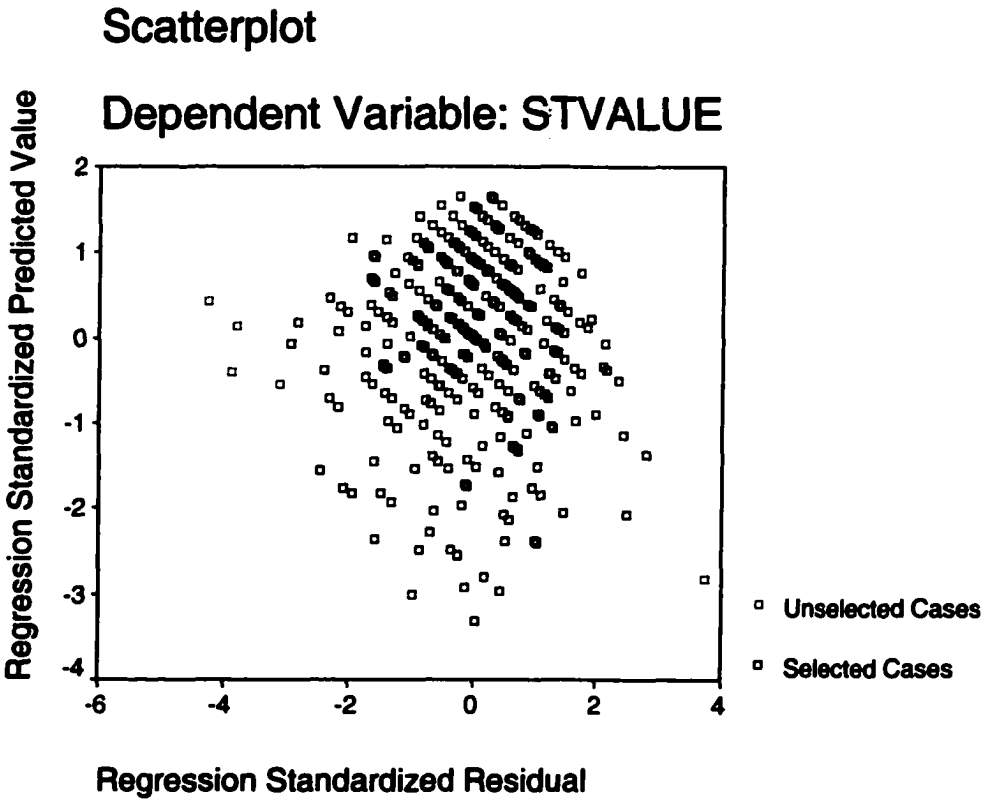
1) Regression on Site Value



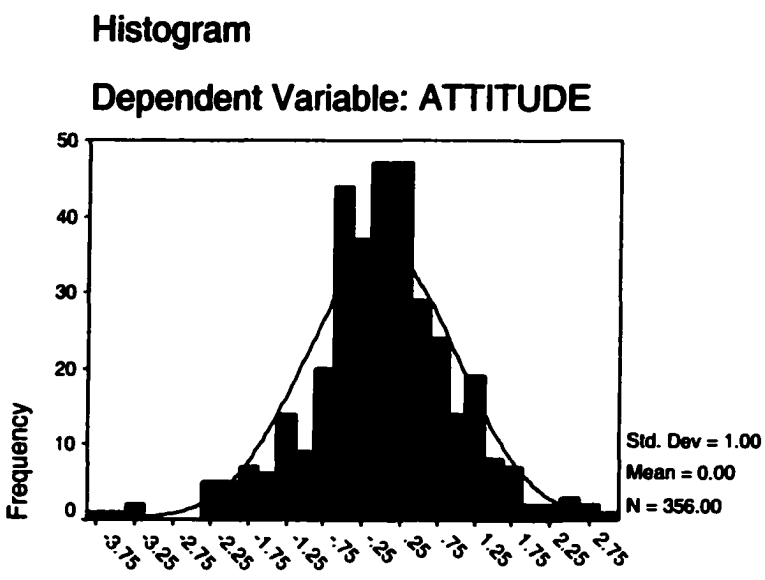
with 5 outliers (extreme cases) removed ...



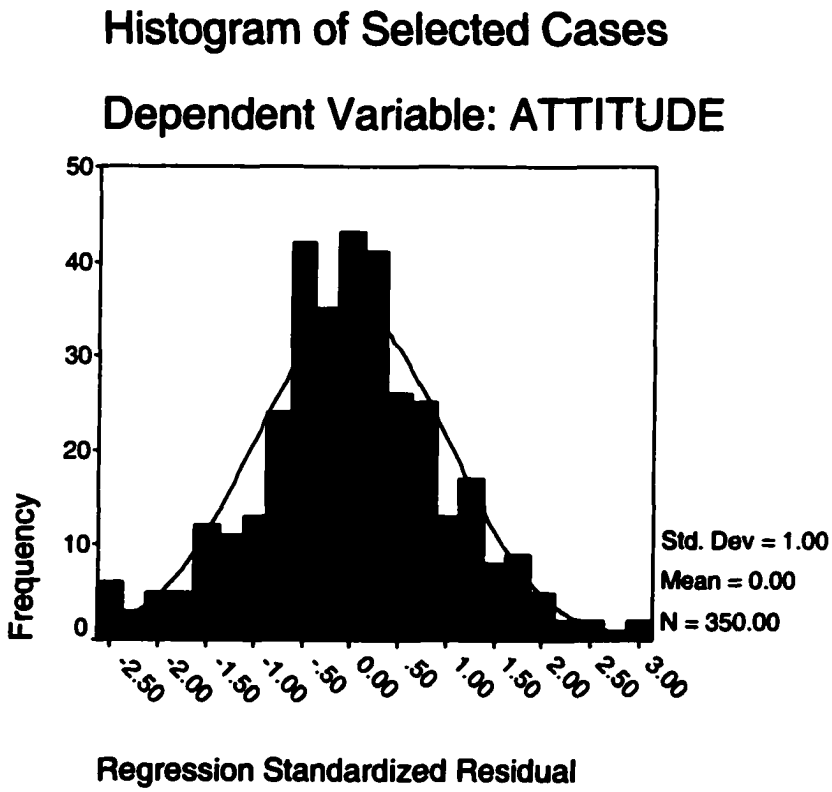




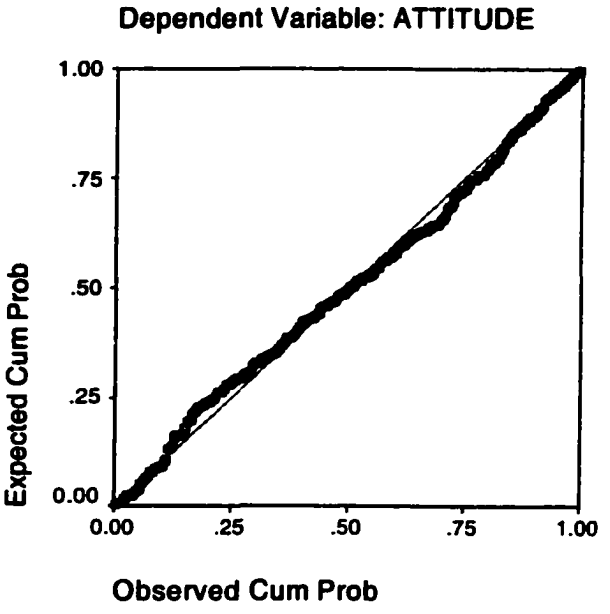
2) Regression on Ast

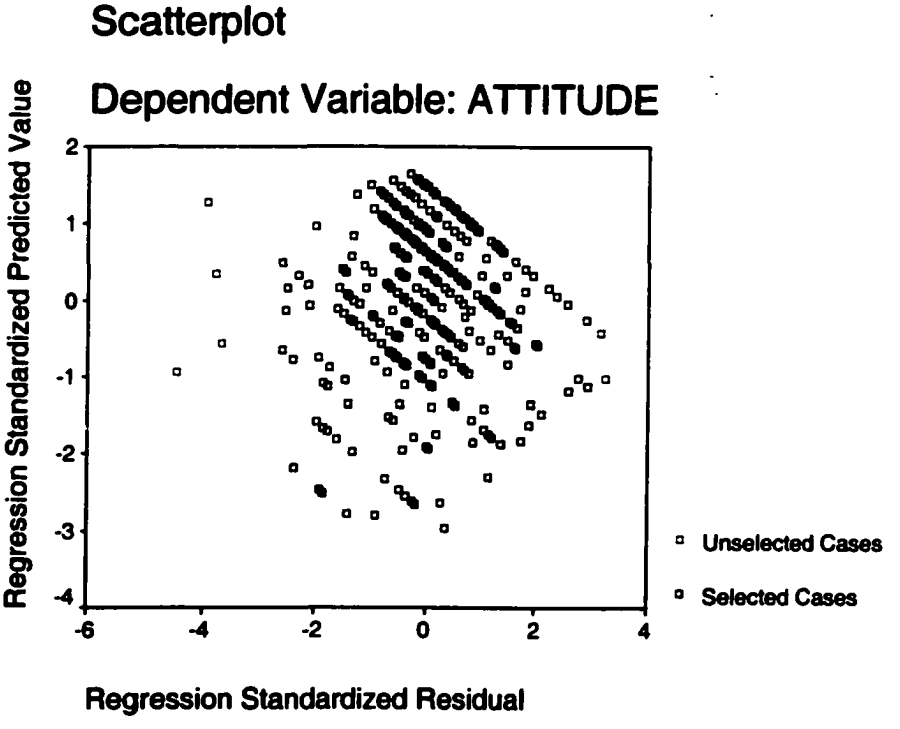


After Removal of 5 outliers (extreme cases) ...

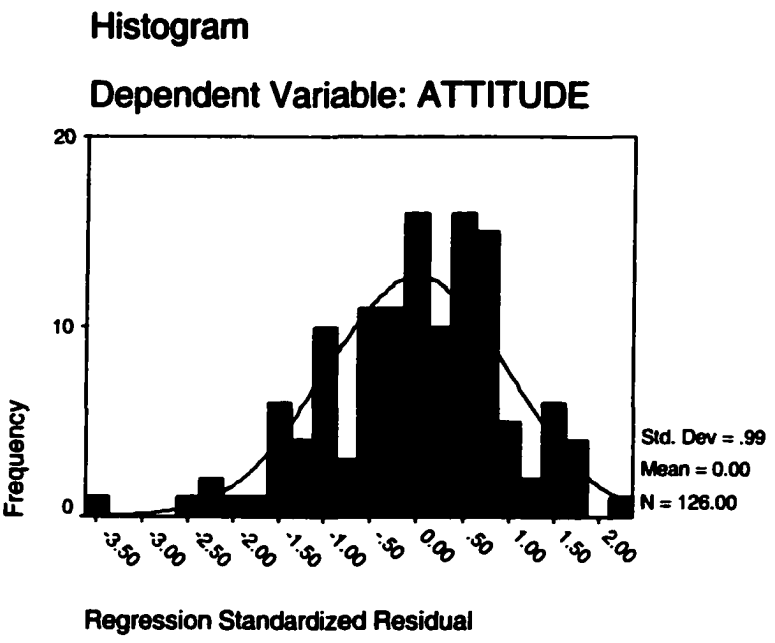


Normal P-P Plot of Standardized Residual for Selected Cases

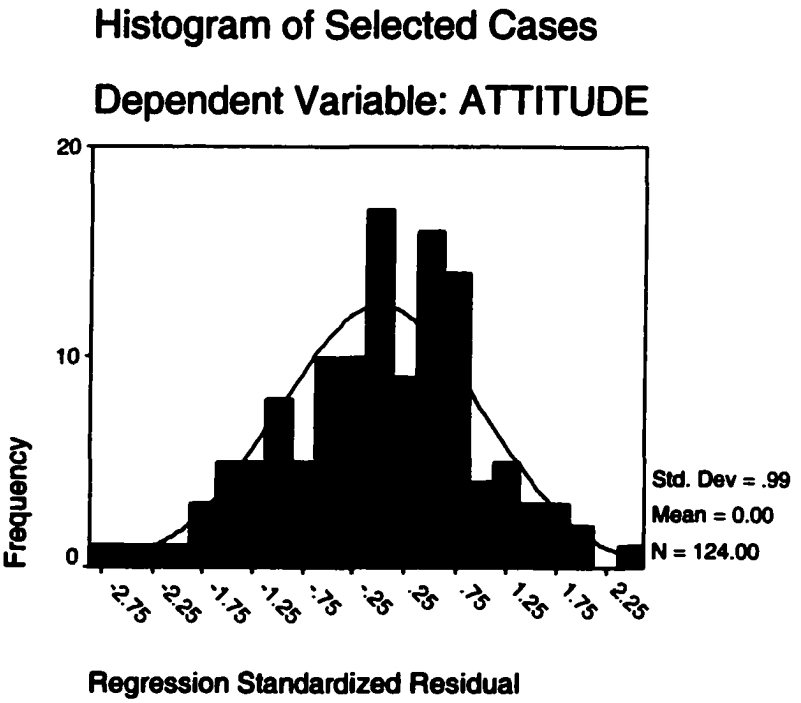


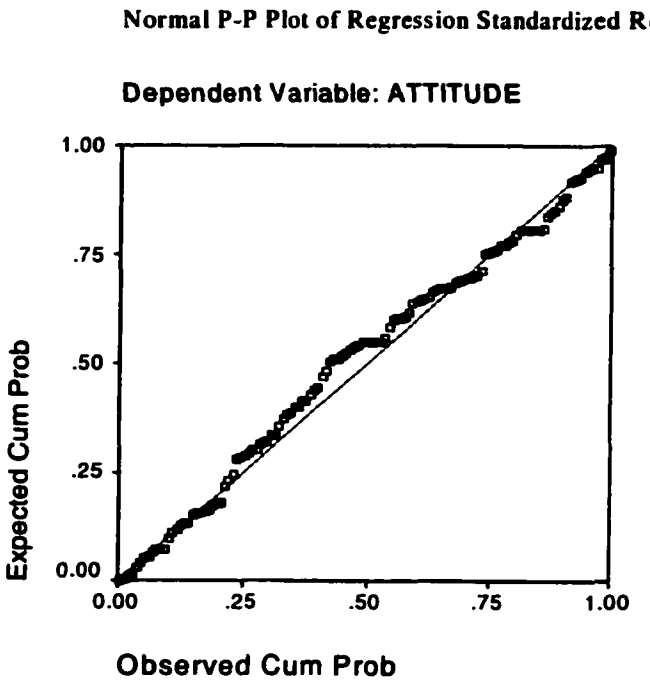


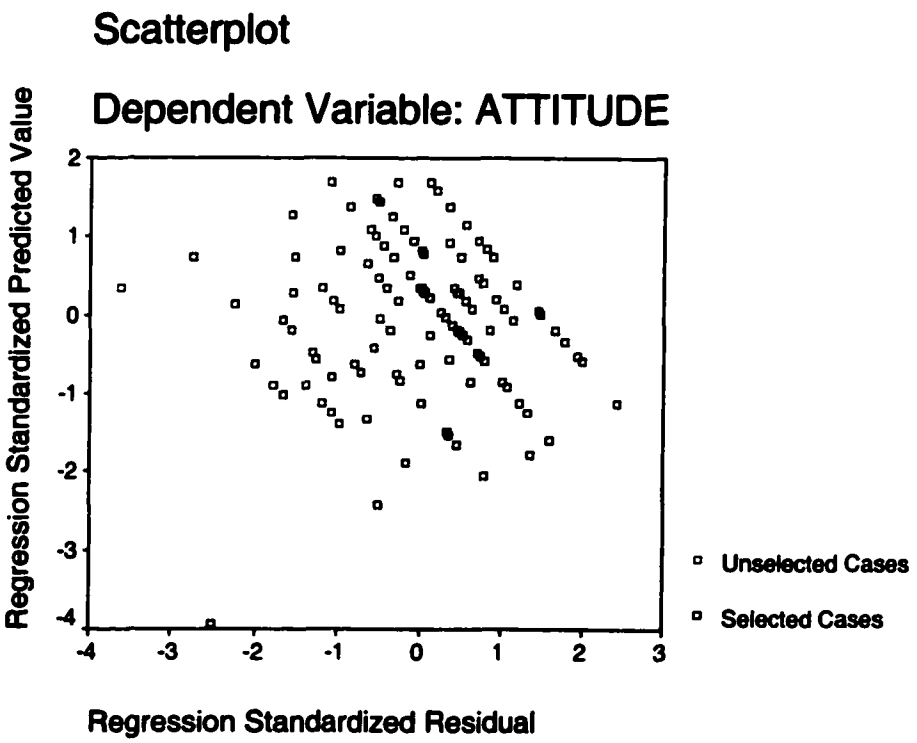
3) **Regression on Ast via system design features**



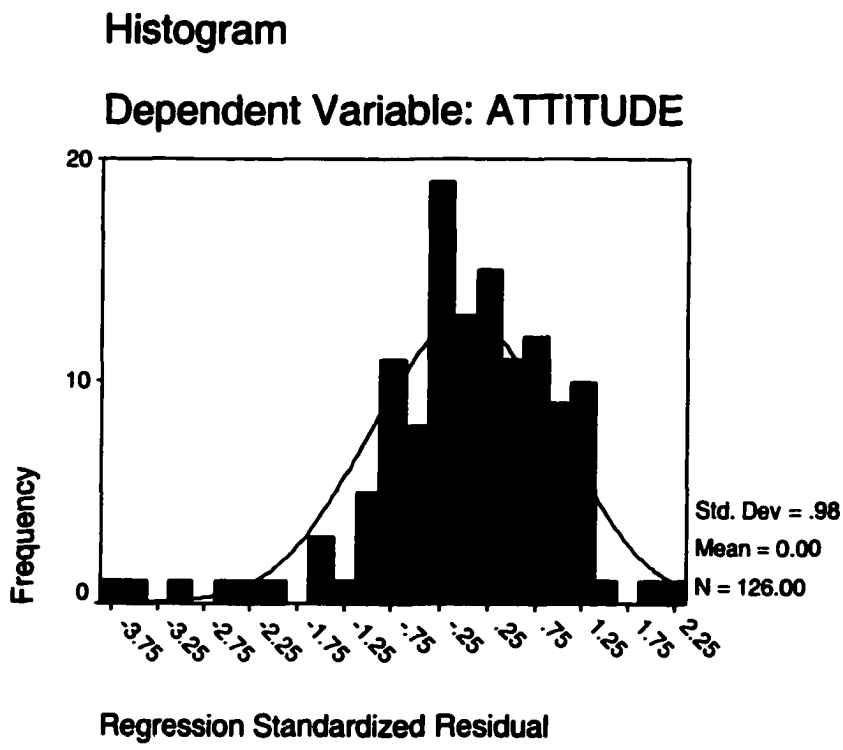
After removal of one outlier



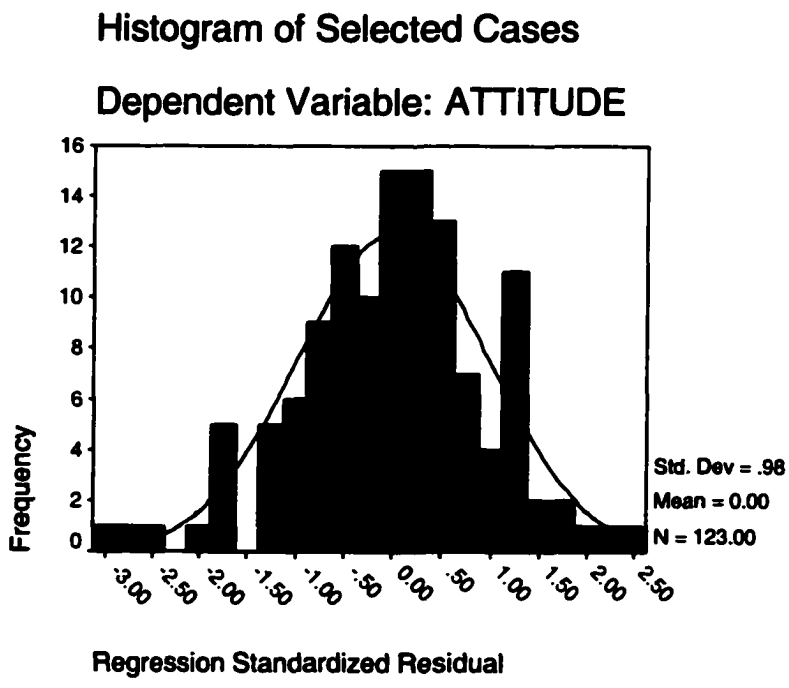




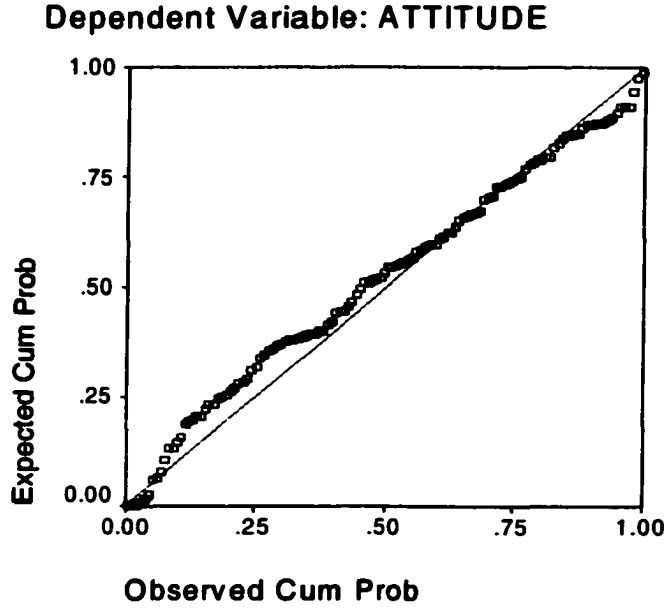
4) Full Model Regression on Ast (Perceptions + System Design Features → Ast)

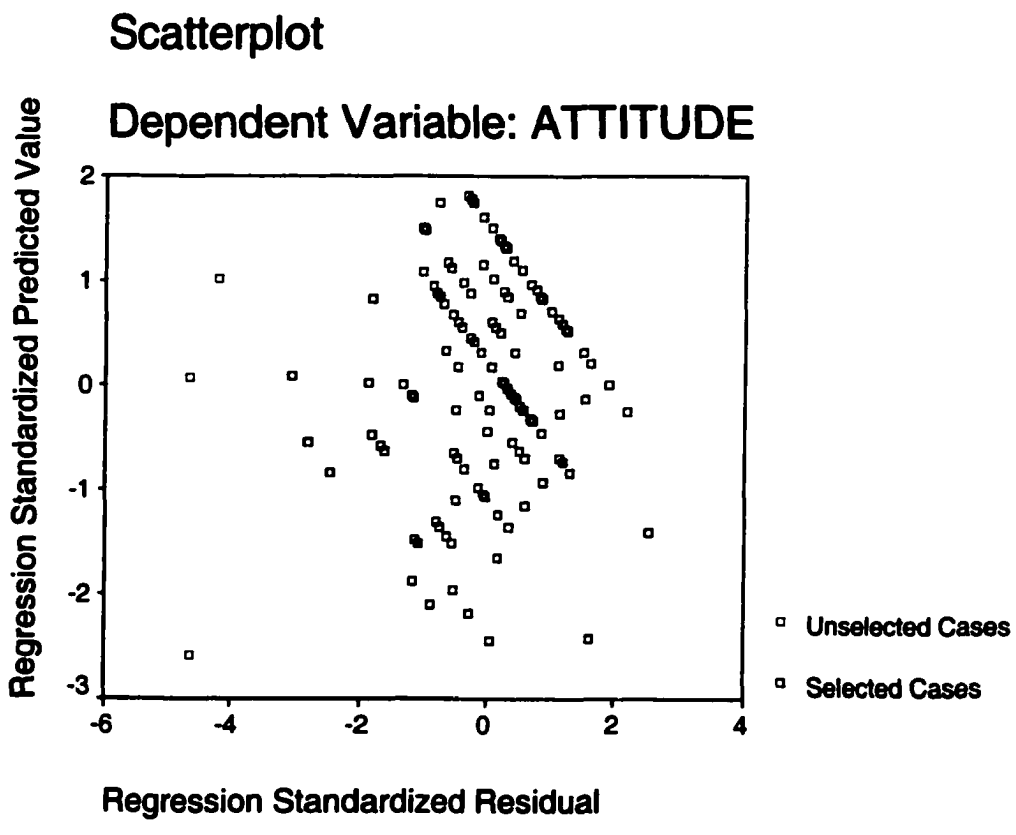


After removal of three outliers (extreme cases) ...



Normal P-P Plot of Regression Standardized Residual



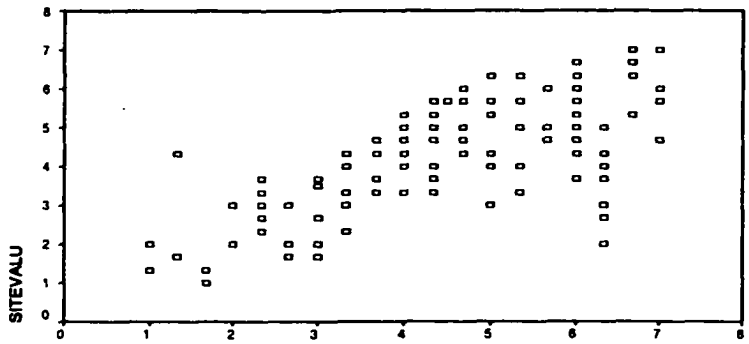


Appendix H

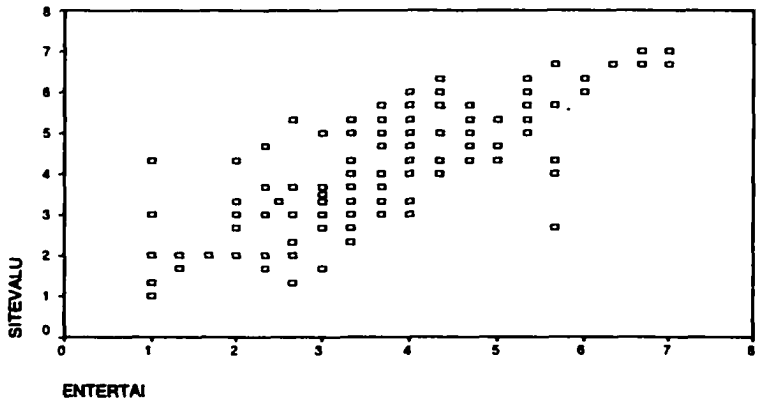
Scatter Plots of Linear Relationships Between Perceptual Variables and Value and Attitude, Between Attitude and Behavioral Intentions, and Between Systems Feature Usefulness and Attitude

1. Futon Site Scatter Plots

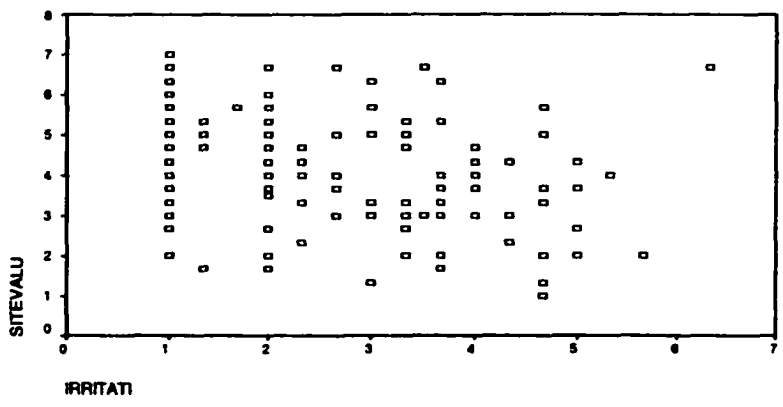
Scatter Plot of Informativeness vs. Site Value



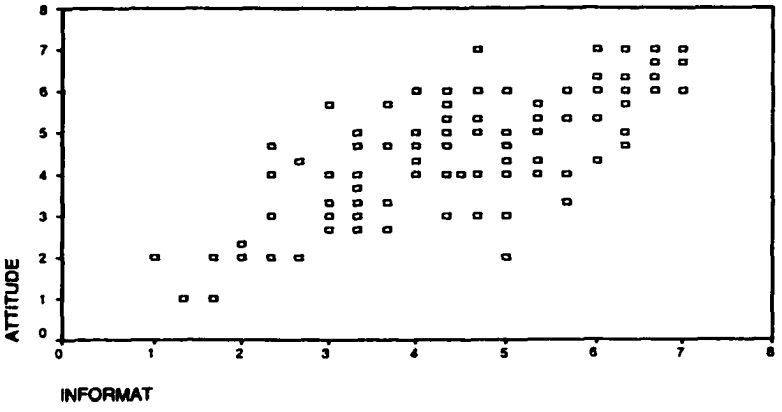
Scatter Plot of Entertainment vs. Site Value



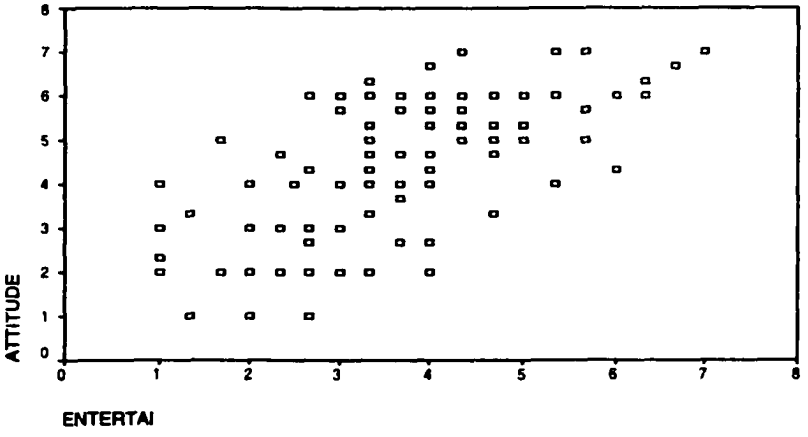
Scatter Plot of Irritation vs. Site Value



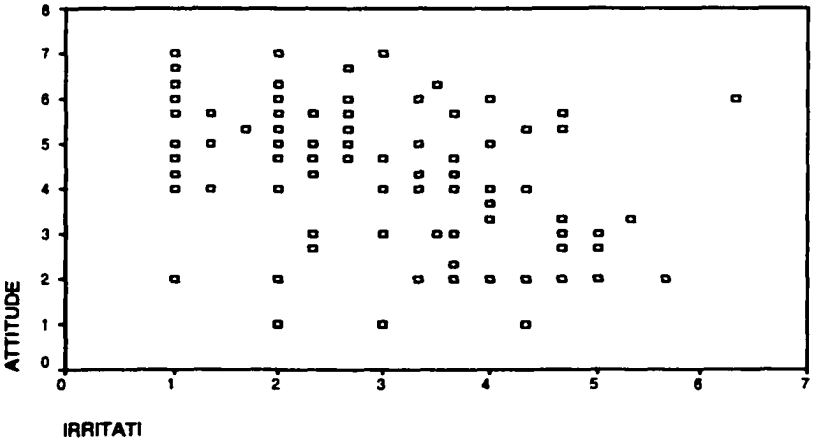
Scatter Plot of Informativeness vs. Attitude



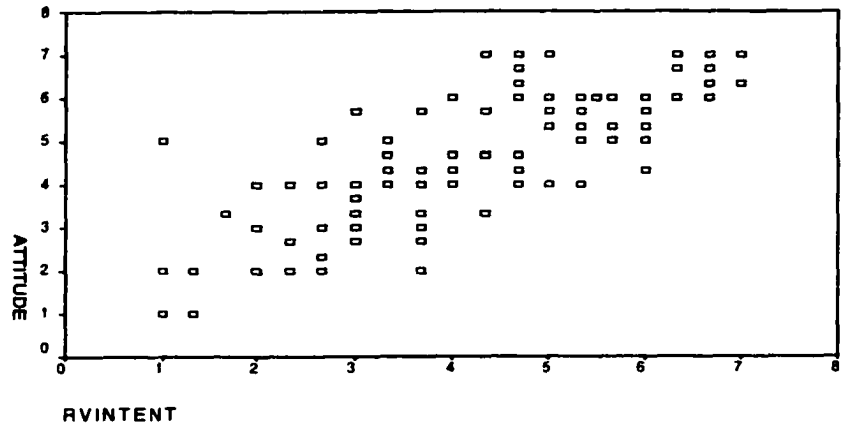
Scatter Plot of Entertainment vs. Attitude



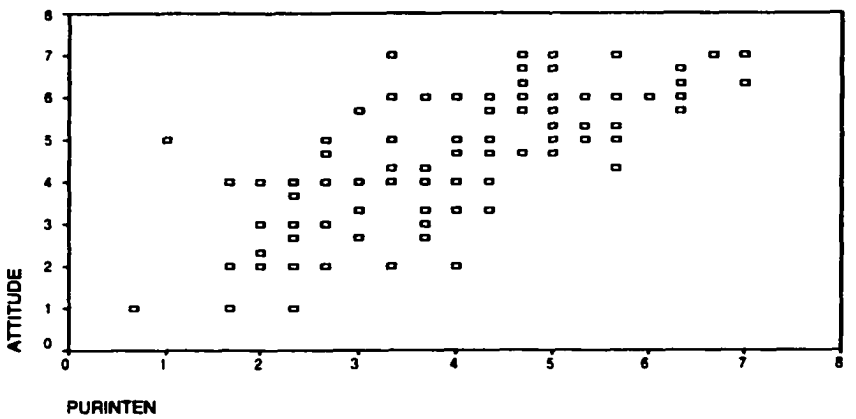
Scatter Plot of Irritation vs. Attitude



Scatter Plot of Attitude vs. Intention to Return

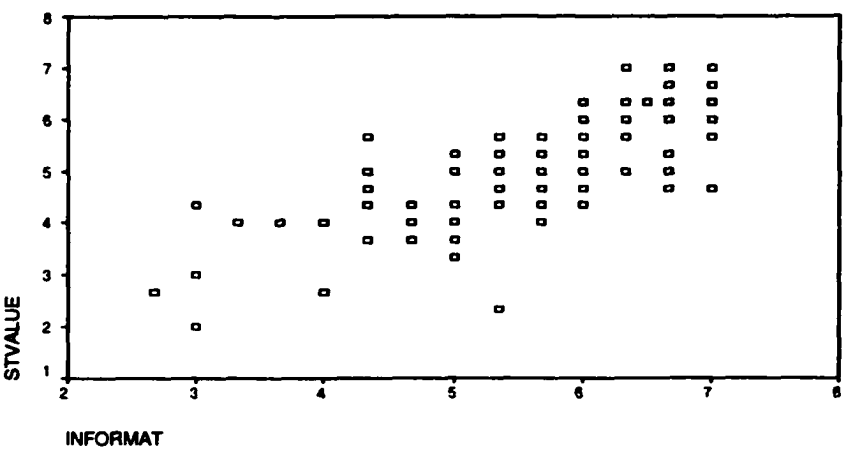


Scatter Plot of Attitude vs. Intention to Purchase

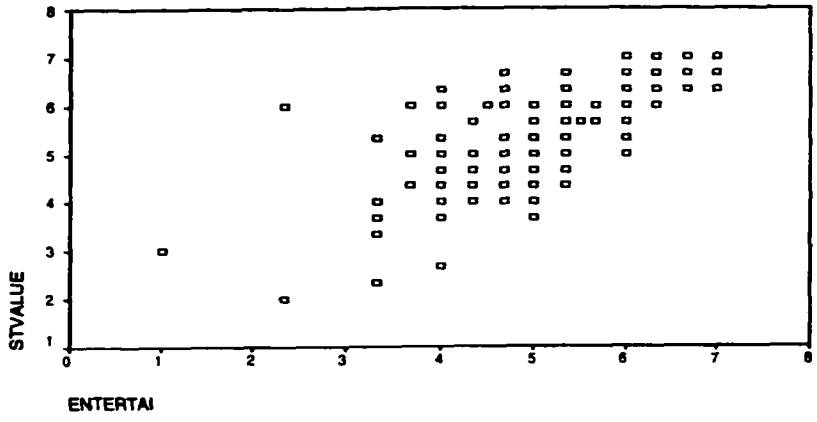


2. PDA Site Scatter Plots

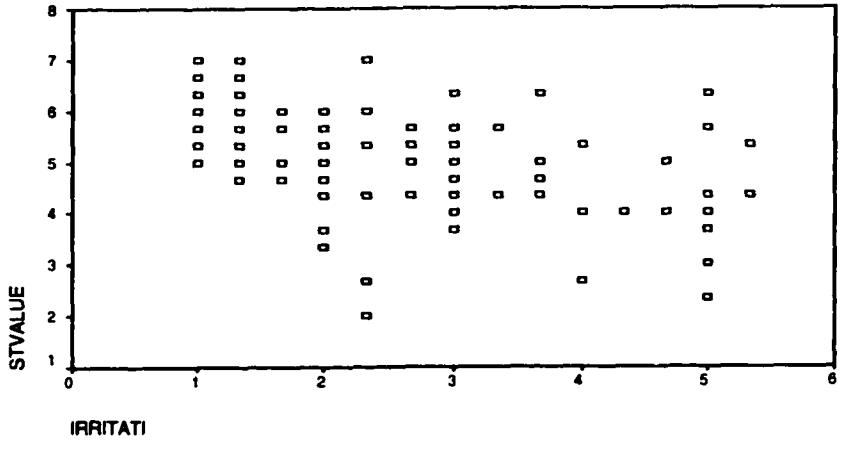
Scatter Plot of Informativeness vs. Site Value



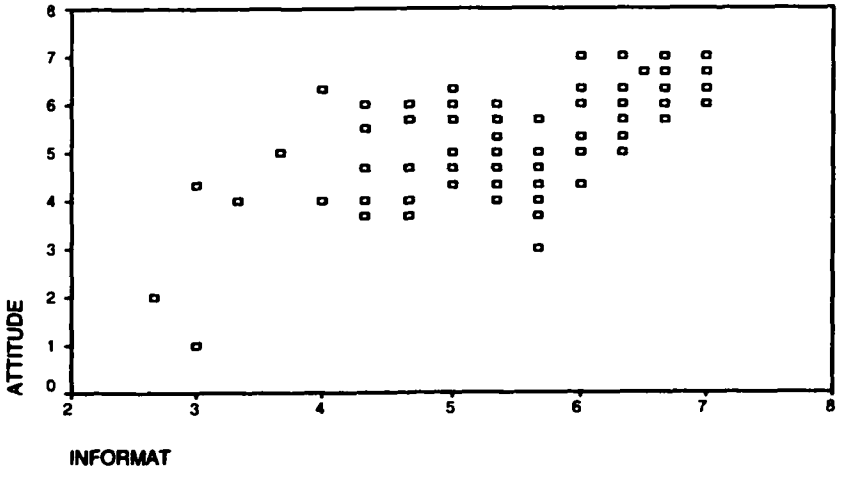
Scatter Plot of Entertainment vs. Site Value



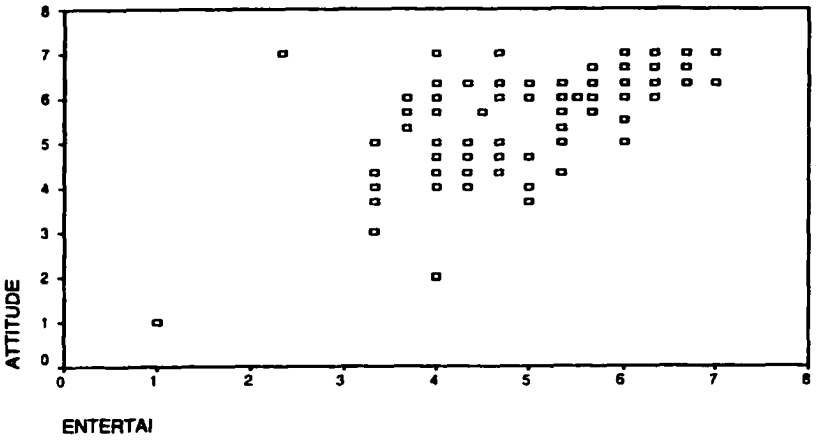
Scatter Plot of Irritation vs. Site Value



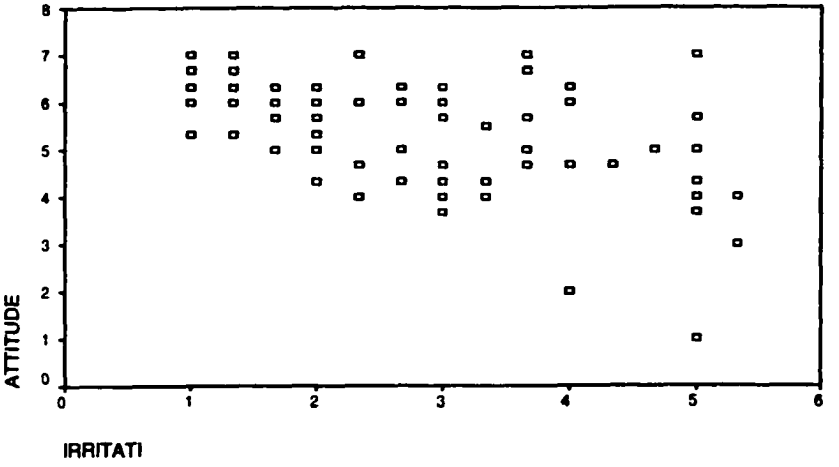
Scatter Plot of Informativeness vs. Attitude



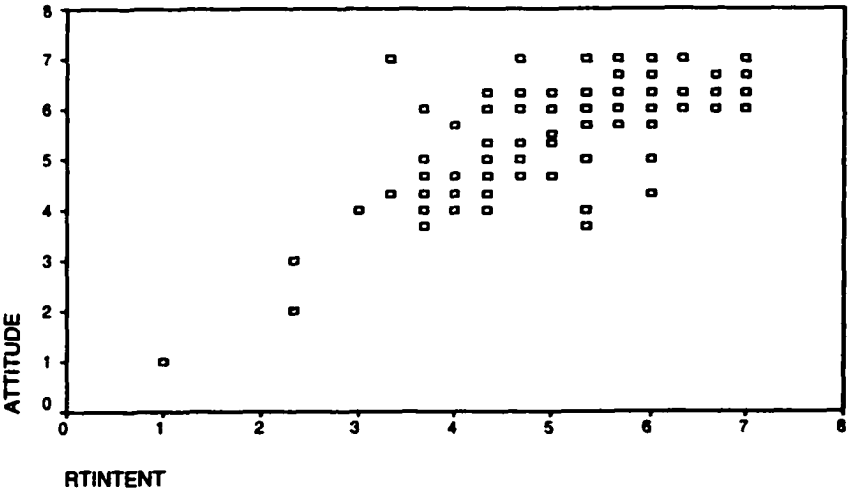
Scatter Plot of Entertainment vs. Attitude



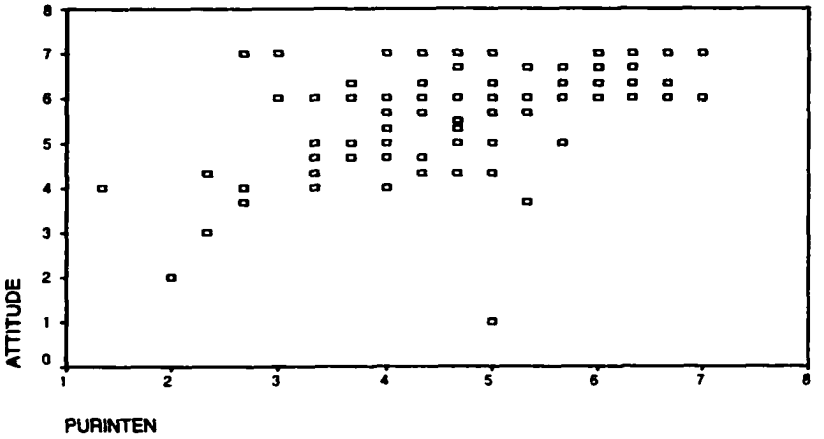
Scatter Plot of Irritation vs. Attitude



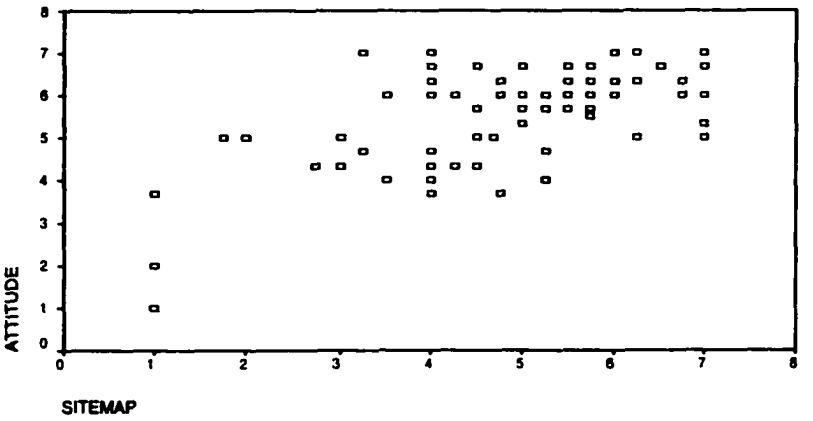
Scatter Plot of Attitude vs. Intention to Return



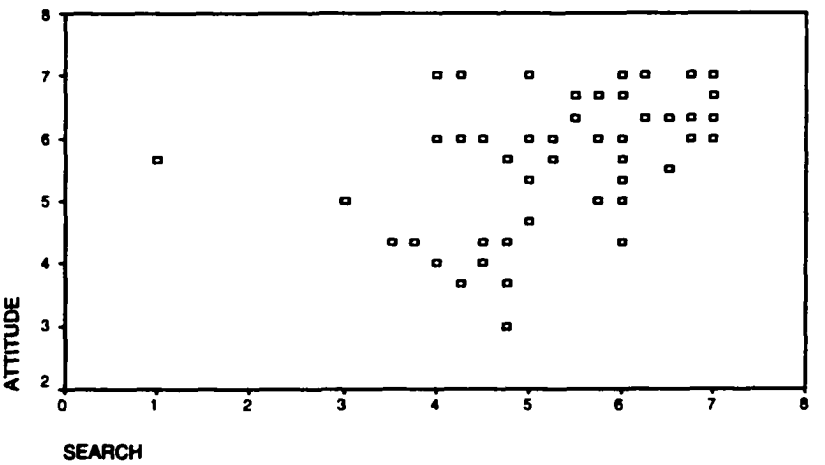
Scatter Plot of Attitude vs. Intention to Purchase



Scatter Plot of Usefulness of Sitemap vs. Attitude

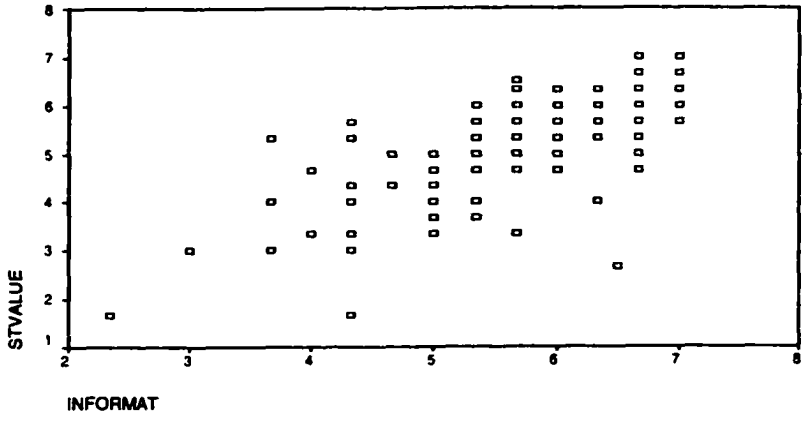


Scatter Plot of Usefulness of Search Mechanism vs. Attitude

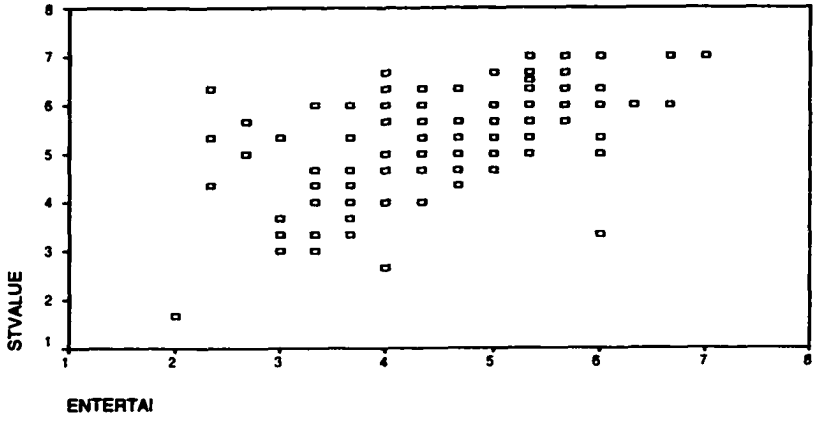


3. Camera Site Scatter Plots

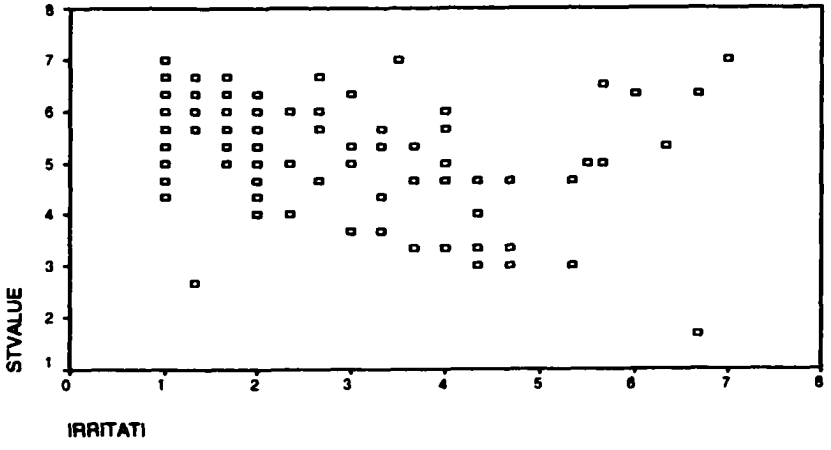
Scatter Plot of Informativeness vs. Site Value



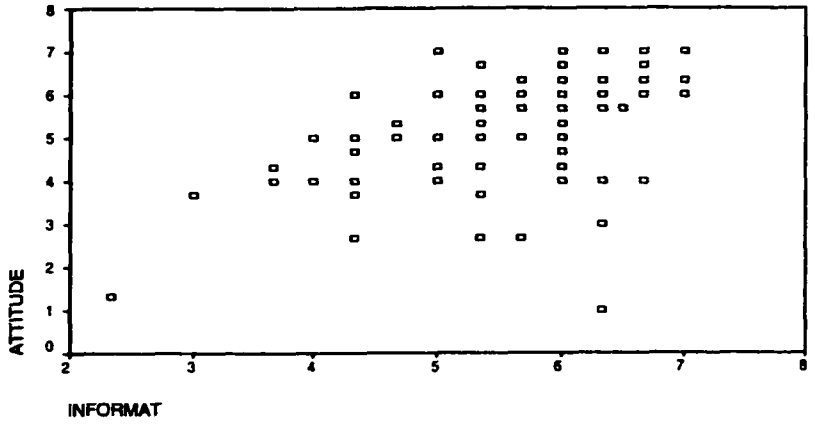
Scatter Plot of Entertainment vs. Site Value



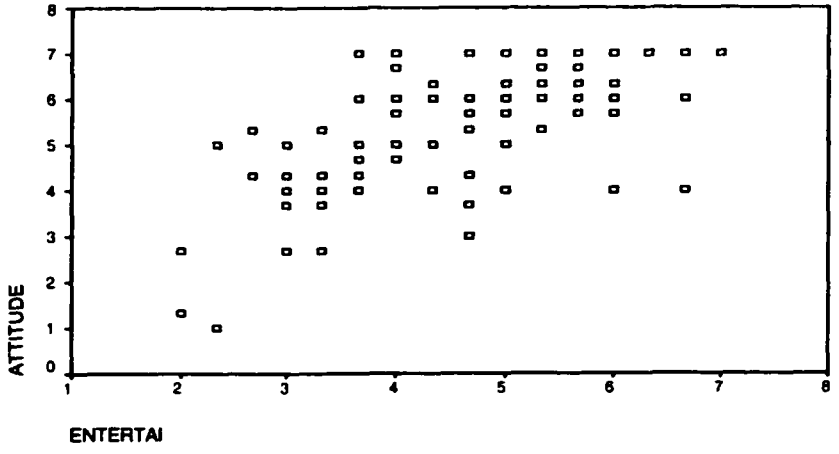
Scatter Plot of Irritation vs. Site Value



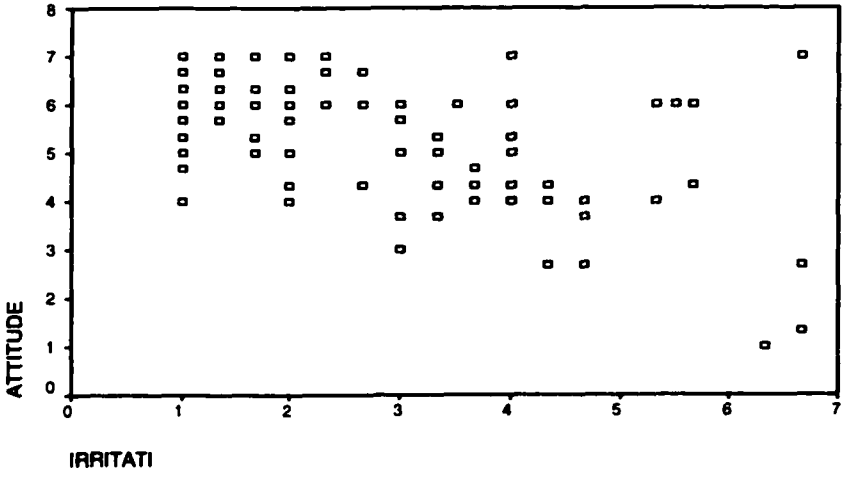
Scatter Plot of Informativeness vs. Attitude



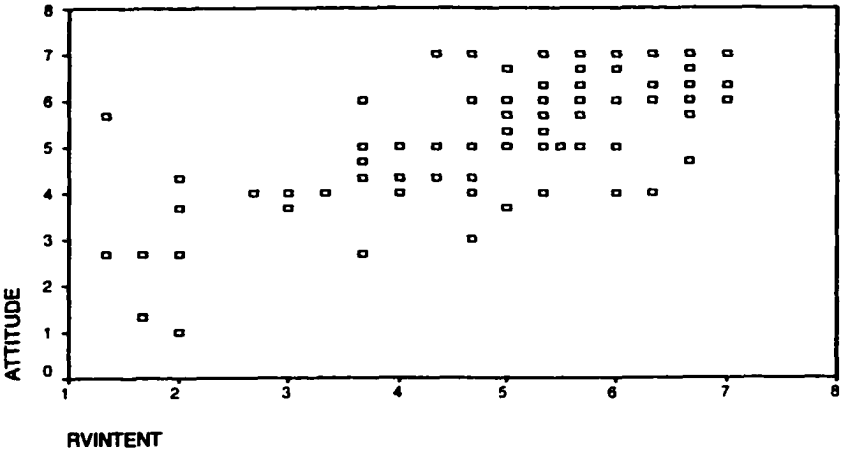
Scatter Plot of Entertainment vs. Attitude



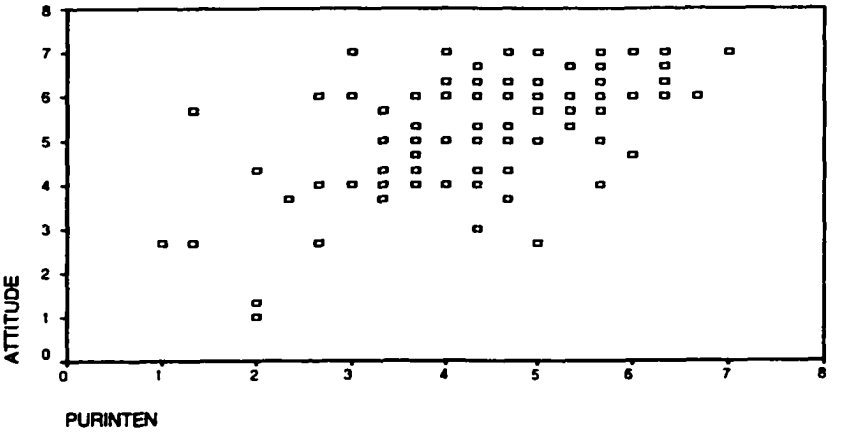
Scatter Plot of Irritation vs. Attitude



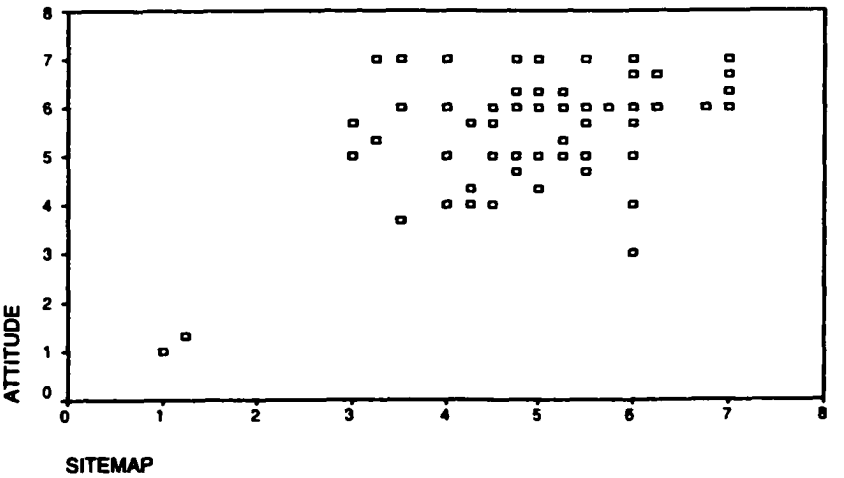
Scatter Plot of Attitude vs. Intention to Return



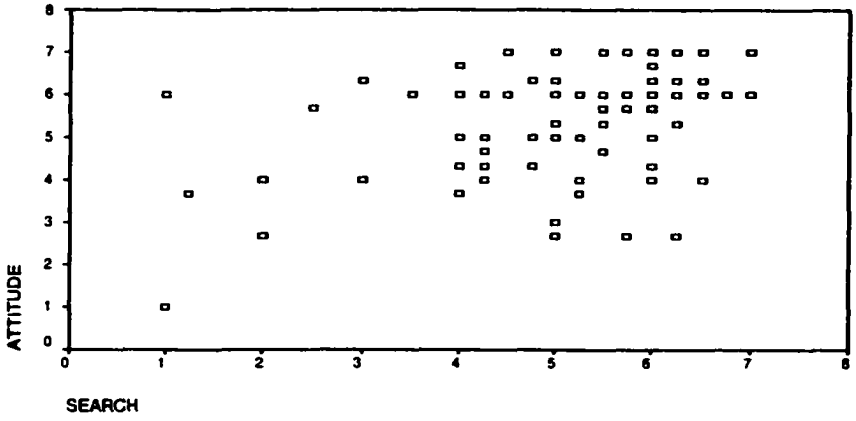
Scatter Plot of Attitude vs. Intention to Purchase



Scatter Plot of Usefulness of Sitemap vs. Attitude

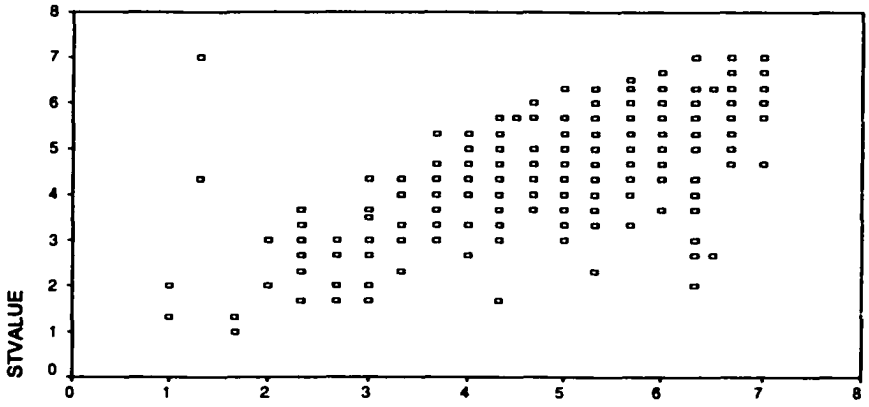


Scatter Plot of Usefulness of Search Mechanism vs. Attitude

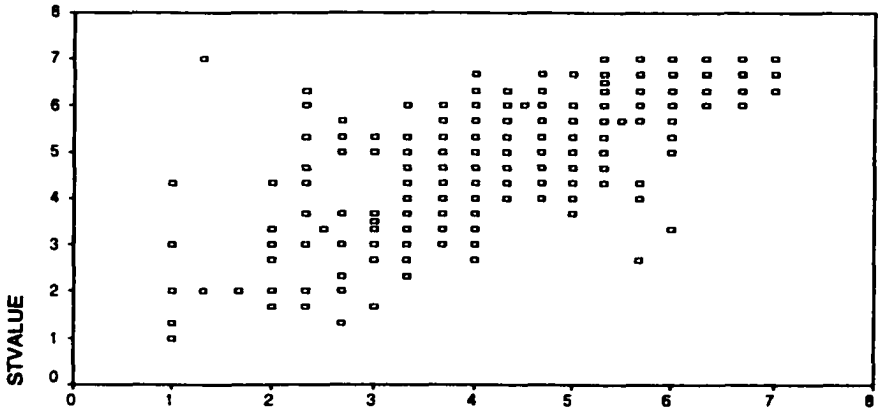


4. Pooled Data Scatter Plots

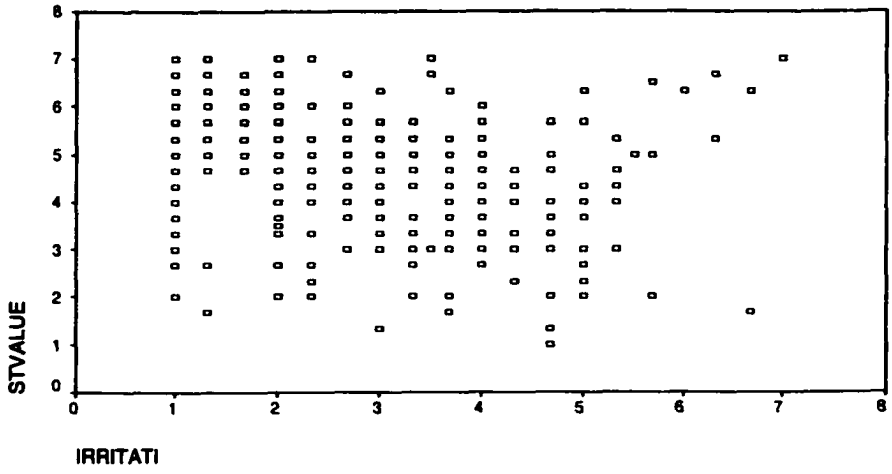
Scatter Plot of Informativeness vs. Site Value



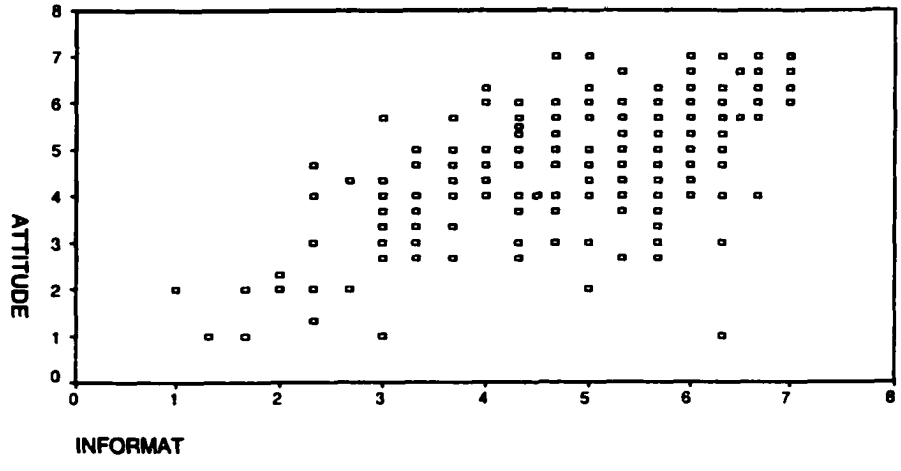
Scatter Plot of Entertainment vs. Site Value



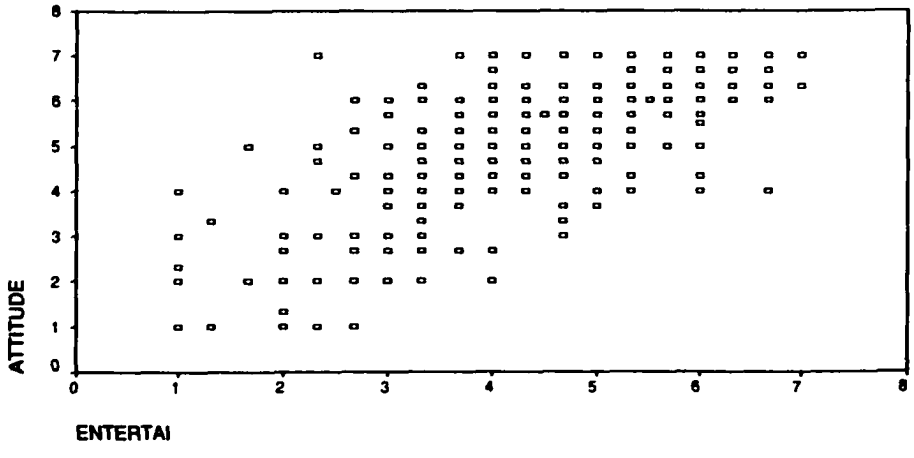
Scatter Plot of Irritation vs. Site Value



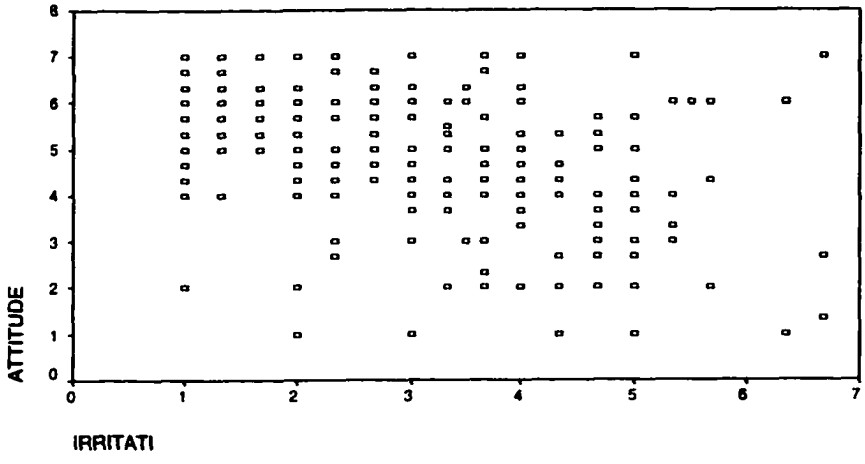
Scatter Plot of Informativeness vs. Attitude



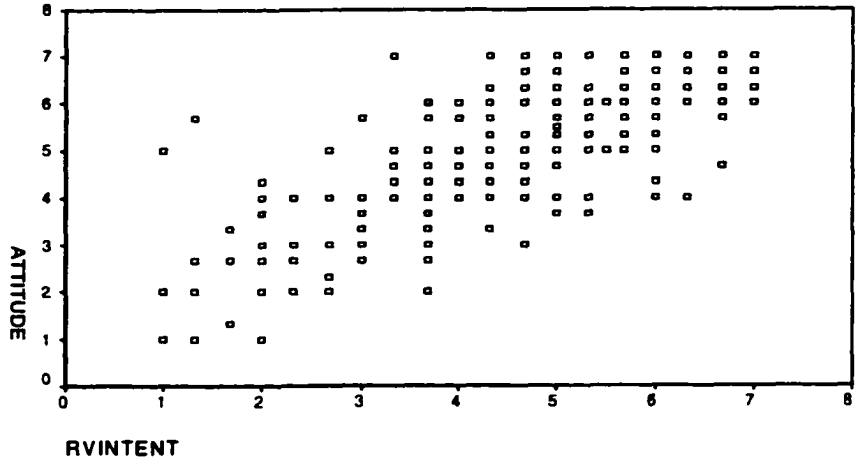
Scatter Plot of Entertainment vs. Attitude



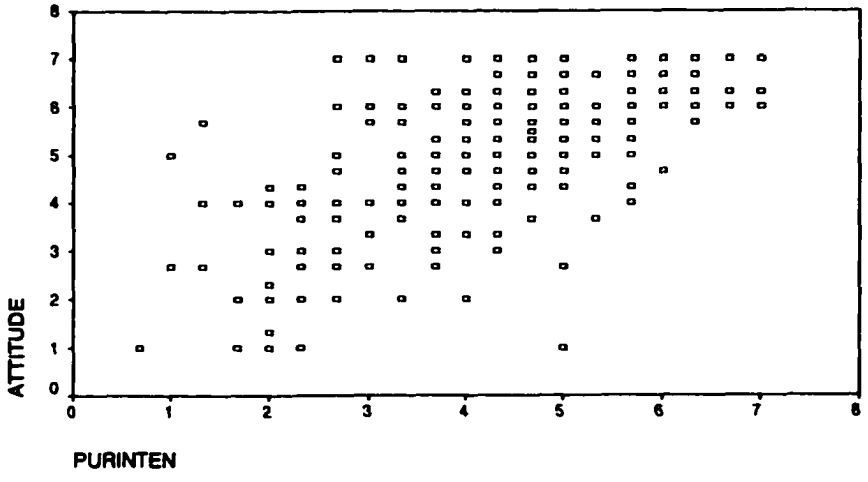
Scatter Plot of Irritation vs. Attitude

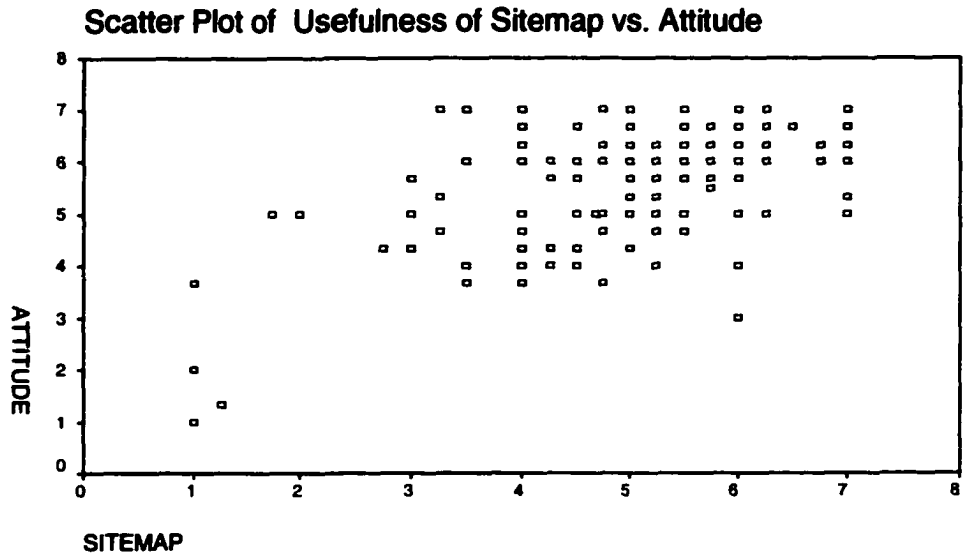


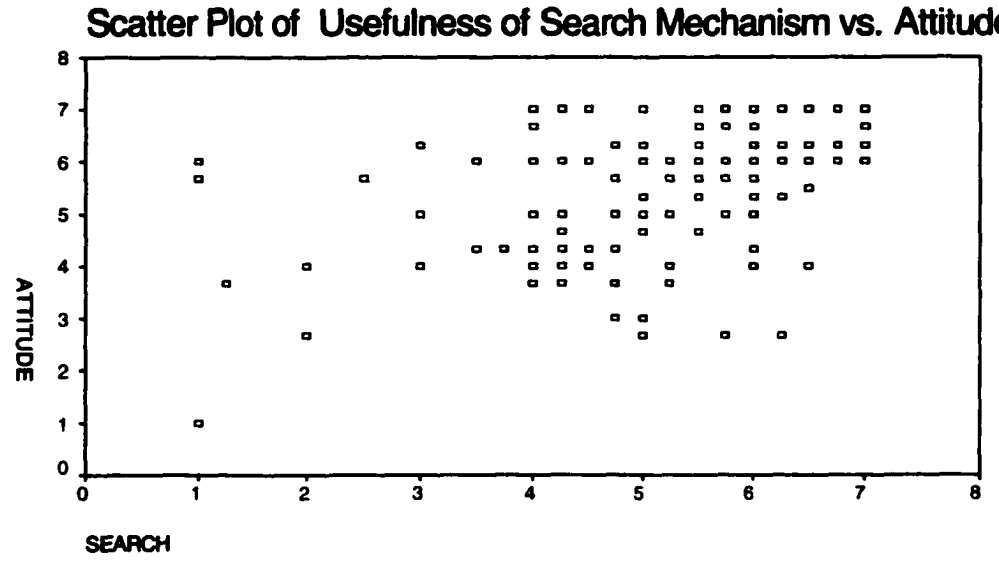
Scatter Plot of Attitude vs. Intention to Return



Scatter Plot of Attitude vs. Intention to Purchase







Appendix I

Analysis of Measurement: Descriptive Statistics and Cronbach's Alpha

Futon Site

Scale	Mean	S.D.	Cronbach's alpha
Informativeness			.8903
This website is a good source of product information.	4.59	1.56	
This website supplies relevant product information.	4.54	1.81	
This website is very informative about the company's products.	4.37	1.82	
Entertainment			.8642
This website is entertaining.	3.53	1.69	
This website is pleasing.	4.06	1.43	
This website is enjoyable.	3.79	1.57	
Irritation			.8132
This website is frustrating.	2.77	1.63	
This website is annoying.	2.54	1.56	
This website is irritating.	2.74	1.63	
Site Value			.8753
This website is valuable.	4.20	1.45	
This website is useful.	4.50	1.63	
This website is worth the visit.	4.13	1.71	
Attitude Toward Site			.9598
Bad...Good	4.68	1.59	
Unfavorable...Favorable	4.56	1.57	
Dislike...Like	4.48	1.67	

Intention to Revisit			.8702
It is very likely that I will visit this site again in the future.	3.53	1.76	
I will return to this site the next time I need a futon.	4.32	1.85	
Would you recommend your friend to visit this site? Absolutely Not...Absolutely Would	4.69	1.74	
Intention to Purchase			.8606
It is very likely that I will purchase a futon from this company.	3.43	1.53	
I will buy one of their products the next time I need a futon.	3.66	1.65	
Would you recommend your friend to buy a Garden North futon? Absolutely Not...Absolutely Would	4.53	1.48	
Product Involvement			.9270
Important...Unimportant	3.62	1.68	
Irrelevant...Relevant	3.61	1.63	
Mean a lot to me...Mean nothing to me	3.41	1.62	
Unexciting...Exciting	3.50	1.55	
Dull...Neat	3.73	1.70	
Matter to me...Don't matter to me	3.52	1.73	
Boring...Interesting	3.80	1.53	
Fun...Not fun	3.68	1.55	
Appealing...Unappealing	4.04	1.60	
Of no concern to me...Of concern to me	3.69	1.69	
Task Involvement			.7245
I followed the instructions to the best of my ability.	5.88	1.26	
I really did not care if I would find a good futon for my friend.	5.18	1.61	
I tried everything I could to find the most suitable futon.	5.42	1.31	

PDA Site

Scale	Mean	S.D.	Cronbach's alpha
Informativeness			.8319
This website is a good source of product information.	5.89	1.12	
This website supplies relevant product information.	5.85	1.22	
This website is very informative about the company's products.	5.78	1.29	
Entertainment			.8668
This website is entertaining.	5.16	1.25	
This website is pleasing.	5.00	1.16	
This website is enjoyable.	5.07	1.29	
Irritation			.8762
This website is frustrating.	2.37	1.38	
This website is annoying.	2.20	1.45	
This website is irritating.	2.37	1.51	
Site Value			.8085
This website is valuable.	5.22	1.26	
This website is useful.	5.53	1.29	
This website is worth the visit.	5.24	1.35	
Attitude Toward Site			.9137
Bad...Good	5.72	1.18	
Unfavorable...Favorable	5.63	1.19	
Dislike...Like	5.56	1.32	
Intention to Revisit			.8388
It is very likely that I will visit this site again in the future.	4.90	1.68	
I will return to this site the next time I need a handheld device.	5.29	1.43	
Would you recommend your friend to visit this site? Absolutely Not...Absolutely Would	5.73	1.33	

Intention to Purchase			.7942
It is very likely that I will buy a product from this company.	4.26	1.48	
I will buy one of their products the next time I need one.	4.56	1.53	
Would you recommend your friend to buy a Handspring product? Absolutely Not.....Absolutely Would	5.26	1.31	
Product Involvement			.9278
Important...Unimportant	5.06	1.52	
Irrelevant...Relevant	4.96	1.51	
Mean a lot to me...Mean nothing to me	4.60	1.49	
Unexciting...Exciting	5.01	1.46	
Dull...Neat	5.30	1.46	
Matter to me...Don't matter to me	4.65	1.62	
Boring...Interesting	5.35	1.30	
Fun...Not fun	4.95	1.46	
Appealing...Unappealing	5.07	1.57	
Of no concern to me...Of concern to me	4.99	1.51	
Task Involvement			.8013
I followed the instructions to the best of my ability.	5.68	1.26	
I really did not care if I would find a good PDA for my friend.	5.38	1.70	
I tried everything I could to find the best product for my friend.	5.33	1.60	
Prior Brand Knowledge			.8981
I knew a great deal about Handspring.	2.72	1.94	
I was very familiar with the Handspring brand.	2.69	1.95	
I have used this brand in the past.	1.99	1.69	
Sitemap Usefulness			.9740
Using this sitemap can improve my shopping performance.	4.93	1.47	
Using this sitemap can increase my shopping productivity.	4.98	1.48	
Using this sitemap can improve my shopping effectiveness.	4.91	1.47	
I find this sitemap useful.	5.08	1.54	
Search Engine Usefulness			.9568
Using this function can improve my shopping performance.	5.34	1.26	
Using this function can increase my shopping productivity.	5.30	1.25	
Using this function can improve my shopping effectiveness.	5.26	1.21	
I find this function useful.	5.51	1.25	

Camera Site

Scale	Mean	S.D.	Cronbach's alpha
Informativeness			.7727
This website is a good source of product information.	5.99	1.06	
This website supplies relevant product information.	5.78	1.23	
This website is very informative about the company's products.	5.70	1.13	
Entertainment			.7885
This website is entertaining.	4.40	1.32	
This website is pleasing.	4.76	1.22	
This website is enjoyable.	4.54	1.32	
Irritation			.9473
This website is frustrating.	2.52	1.49	
This website is annoying.	2.48	1.67	
This website is irritating.	2.57	1.69	
Site Value			.8189
This website is valuable.	5.19	1.19	
This website is useful.	5.16	1.40	
This website is worth the visit.	5.59	1.17	
Attitude Toward Site			.9525
Bad...Good	5.54	1.27	
Unfavorable...Favorable	5.40	1.31	
Dislike...Like	5.38	1.37	
Intention to Revisit			.8242
It is very likely that I will visit this site again in the future.	4.81	1.61	
I will return to this site the next time I need a camera.	5.15	1.51	
Would you recommend your friend to visit this site? Absolutely Not...Absolutely Would	5.54	1.50	

Intention to Purchase			.8369
It is very likely that I will buy a product from this company.	4.20	1.38	
I will buy one of their products the next time I need a camera.	4.39	1.36	
Would you recommend your friend to buy a camera from this company? Absolutely Not.....Absolutely Would	5.02	1.46	
Product Involvement			.9352
Important...Unimportant	4.89	1.68	
Irrelevant...Relevant	5.09	1.51	
Mean a lot to me...Mean nothing to me	4.89	1.68	
Unexciting...Exciting	4.91	1.51	
Dull...Neat	5.18	1.51	
Matter to me...Don't matter to me	4.66	1.54	
Boring...Interesting	5.17	1.47	
Fun...Not fun	4.84	1.73	
Appealing...Unappealing	4.89	1.59	
Of no concern to me...Of concern to me	4.91	1.35	
Task Involvement			.7374
I followed the instructions to the best of my ability.	5.81	1.23	
I really did not care if I would find a good camera for my friend.	4.96	1.55	
I tried everything I could to find the product for my friend.	5.11	1.46	
Sitemap Usefulness			.9455
Using this sitemap can improve my shopping performance.	5.10	1.33	
Using this sitemap can increase my shopping productivity.	5.23	1.25	
Using this sitemap can improve my shopping effectiveness.	5.20	1.30	
I find this sitemap useful.	5.10	1.36	
Search Engine Usefulness			.9573
Using this search engine can improve my shopping performance.	5.31	1.32	
Using this search engine can increase my shopping productivity.	5.13	1.41	
Using this search engine can improve my shopping effectiveness.	5.35	1.44	
I find this search engine useful.	5.30	1.35	

Appendix J

Output of Factor Analyses of Scales

Futon Site: Group--Informativeness, Entertainment, and Irritation

Structure Matrix

	Component		
	1	2	3
GDSRC	.497	-.379	.863
RELVT	.607	-.370	.917
INFOR	.543	-.373	.905
ENTTN	.848	-.186	.517
PLEAS	.856	-.276	.590
ENJOY	.929	-.094	.487
FRUST	-.088	.709	-.578
ANNOY	-.187	.912	-.389
IRRIT	-.167	.918	-.431

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Informativeness (first three items) loads on the third factor.
Entertainment (the next three items) loads on the first factor.
Irritation (the last three items) loads on the second factor.

Futon Site: Group -- Site Value, and Attitude toward the Site (Ast)

Structure Matrix

	Component	
	1	2
VALUA	.660	.859
USEFL	.742	.886
WORVT	.487	.912
GOOD	.958	.646
FVRBL	.964	.599
LIKE	.961	.600

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Site value (first three items) loads on the second factor.
Ast loads on the first factor.

Futon Site: Group -- Intention to Return, and Task Involvement

Structure Matrix

	Component	
	1	2
LKLVT	.879	-.060
RETRN	.900	.082
RECVT	.900	.194
FLIN	-.061	.855
TYEV	.030	.824
REVNTCR	.221	.727

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Intention to return (first three items) loads on the first factor.
Task involvement loads on the second factor.

Futon Site: Group -- Intention to Purchase, and Product Involvement

Structure Matrix

	Component		
	1	2	3
LKLPR	.408	.862	.262
BUYND	.301	.892	.333
RECBY	.360	.899	.294
REVE	.578	.318	.824
OFCN	.737	.199	.625
REVUNIM	.590	.368	.838
REVNTMT	.590	.305	.845
REVMNNO	.396	.260	.862
EXCI	.862	.386	.479
NEAT	.895	.339	.424
INTR	.927	.409	.533
REVNTFN	.759	.401	.602
REVUNAP	.829	.325	.571

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Intention to purchase (first three items) loads on the second factor.
Product involvement loads on the first and the third factors.

Note: Product Involvement loads on two factors, showing that the two dimensions of "interest" and "felt importance" are different with products at the futon site. Product involvement loads on only a single factor in the other two sites, the PDA site and the camera site. This difference may be attributable to the nature of products that differ across categories, reflecting that in the PDA and camera sites, the two aspects of "interest" and "felt importance" converge to a single dimension.

PDA Site: Group -- Informativeness, Entertainment, and Irritation, Usefulness of sitemap, and Usefulness of search function

Structure Matrix

	Component				
	1	2	3	4	5
GDSRC	.417	.279	.770	-.365	.664
RELVT	.504	.369	.523	-.369	.878
INFOR	.355	.268	.274	-.438	.940
ENTTN	.292	.284	.929	-.129	.220
PLEAS	.488	.385	.884	-.405	.362
ENJOY	.625	.450	.806	-.295	.422
FRUST	-.375	-.323	-.262	.927	-.305
ANNOY	-.574	-.220	-.366	.864	-.425
IRRIT	-.385	-.326	-.147	.829	-.660
SM1F	.954	.421	.405	-.378	.293
SM2D	.974	.498	.443	-.404	.370
SM3E	.949	.494	.347	-.456	.274
SM4U	.943	.448	.350	-.379	.456
SF1F	.543	.926	.272	-.294	.221
SF2D	.481	.937	.249	-.342	.211
SF3E	.410	.963	.310	-.235	.276
SF4U	.372	.895	.373	-.167	.241

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Informativeness (first three items) loads on the fifth factor.
Entertainment (the next three items) loads on the third factor.
Irritation (the following three items) loads on the fourth factor.
Perceived usefulness of sitemap (the next four items) loads on the first factor.
Perceived usefulness of the search function (the last four items) loads on the second factor.

PDA Site: Group -- Site Value, and Prior Brand Knowledge

Structure Matrix

	Component	
	1	2
VALUA	.151	.855
USEFL	.157	.896
WORVT	.150	.799
KNGD	.926	.242
VRYFM	.927	.251
SUDPT	.881	.018

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Site value (first three items) loads on the second factor.
Prior brand knowledge loads on the first factor.

PDA Site: Group -- Attitude toward the Site (Ast), and Prior Brand Knowledge

Structure Matrix

	Component	
	1	2
KNGD	.221	.929
VRYFM	.244	.926
SUDPT	.069	.869
GOOD	.932	.195
FVRBL	.911	.140
LIKE	.929	.194

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Ast (first three items) loads on the second factor.
Prior brand knowledge loads on the first factor.

PDA Site: Intention to Return, and Task Involvement

Structure Matrix

	Component	
	1	2
LKLVT	.832	.343
RETRN	.891	.289
RECVT	.853	.298
FLIN	.307	.846
TYEV	.423	.877
REVNTCR	.226	.845

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Intention to return (first three items) loads on the first factor.
Task involvement loads on the second factor.

PDA Site: Group -- Intention to Purchase, and Product Involvement

Structure Matrix

	Component	
	1	2
LALPR	.406	.893
BUYND	.355	.895
RECBY	.509	.761
REVE	.696	.382
OFCN	.801	.464
REVUNIM	.745	.374
REVMNNO	.739	.336
REVNTMT	.780	.352
EXCI	.827	.475
NEAT	.816	.370
INTR	.843	.396
REVNTFN	.752	.276
REVUNAP	.798	.280

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Intention to purchase (first three items) loads on the second factor.
Product involvement loads on the first factor.

Camera Site: Group -- Informativeness, Entertainment, and Irritation, Usefulness of sitemap, and Usefulness of search function

Structure Matrix

	Component				
	1	2	3	4	5
GDSRC	.254	.193	.836	-.296	-.482
RELVT	.212	-.023	.767	-.372	-.379
INFOR	.244	.363	.833	-.214	-.270
ENTTN	.198	.070	.494	-.083	-.784
PLEAS	.426	.518	.191	-.269	-.856
ENJOY	.510	.342	.366	-.358	-.848
FRUST	-.362	-.263	-.285	.943	.195
ANNOY	-.375	-.334	-.204	.946	.189
IRRIT	-.406	-.372	-.241	.966	.191
SR1F	.442	.936	.244	-.332	-.294
SR4U	.370	.948	.112	-.416	-.204
SR2D	.388	.955	.186	-.310	-.295
SR3E	.321	.908	.184	-.337	-.362
SM1F	.927	.361	.200	-.372	-.335
SM3F	.923	.319	.110	-.362	-.397
SM4U	.934	.323	.126	-.327	-.203
SM2D	.871	.300	.313	-.387	-.384

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Informativeness (first three items) loads on the third factor.
Entertainment (the next three items) loads on the fifth factor.
Irritation (the following three items) loads on the fourth factor.
Usefulness of the search function (the next four items) loads on the second factor.
Usefulness of sitemap (the last four items) loads on the first factor.

Camera Site: Group -- Site Value, and Attitude toward the Site

Structure Matrix

	Component	
	1	2
VALUA	.386	.915
USEFL	.607	.797
WORVT	.637	.839
GOOD	.956	.561
FVRBL	.961	.480
LIKE	.946	.570

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Site value (first three items) loads on the second factor.
Ast loads on the first factor.

Camera Site: Group -- Intention to Return, Task Involvement

Structure Matrix

	Component	
	1	2
LKLVT	.869	-.003
RETRN	.901	.271
RECVT	.857	.259
FLIN	.159	.837
TYEV	.129	.856
REVNTCR	.176	.745

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Intention to return (first three items) loads on the first factor.
Task involvement loads on the second factor.

Camera Site: Group -- Intention to Purchase, and Product Involvement

Structure Matrix

	Component	
	1	2
LKLPR	.358	.890
BUYND	.317	.869
RECBY	.296	.843
REVE	.799	.261
OFCN	.820	.261
REVUNIM	.816	.372
REVMNNO	.816	.372
REVNTMT	.717	.289
EXCI	.803	.275
NEAT	.825	.338
INTR	.808	.270
REVNTFN	.799	.255
REVUNAP	.761	.280

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Intention to purchase (first three items) loads on the second factor.
Product involvement loads on the first factor.

Appendix K

CORRELATION MATRICES

A. Correlation Matrix of Futon Site Variables

	Entertain-ment	Irritation	Site Value	Attitude	Return Intent	Purchase Intent	Product Involvement	Task Involvement
Informative-ness	.636 **	-.482**	.709**	.797**	.750**	.705**	.361**	.192*
Entertainment		-.243**	.781**	.700**	.780**	.696**	.498**	.094
Irritation			-.341**	-.505**	-.347**	-.255**	-.253**	-.311**
Site Value				.707**	.860**	.809**	.534**	.206*
Attitude					.812**	.714**	.460**	.128
Return Intent						.890**	.516**	.155
Purchase Intent							.487**	.211*
Product Involveme								.091

where ** $p<0.01$, * $p<0.05$

B. Correlation Matrix of PDA Site Variables

	Entertainment	Irritation	Site Value	Attitude	Return Intent	Purchase Intent	Usefulness of Sitemap	Usefulness of Search Function	Prior Brand Knowledge	Product Involvement	Task Involvement
Informa-tiveness	.579**	-.532**	.799**	.741**	.744**	.528**	.592**	.321**	.028	.406**	.366**
Entertain-ment		-.425**	.712**	.606**	.763**	.583**	.564**	.438**	.240**	.437**	.364**
Irritation			-.567**	-.635**	-.582**	-.342**	-.460**	-.285*	-.019	-.338**	-.433**
Site Value				.793**	.807**	.659**	.650**	.426**	.196*	.481**	.403**
Attitude					.766**	.530**	.664**	.533**	.181	.489**	.315**
Return Intent						.724**	.608**	.477**	.175	.513**	.346**
Purchase Intent							.467**	.445**	.237**	.477**	.389**
Usefulness of Sitemap								.471**	-.009	.455**	.240*
Usefulness of Search Function									.025	.407**	.251*
Prior Brand Knowledge										.358**	.097
Product Involvement											.305**

where ** $p<0.01$, * $p<0.05$

C. Correlation Matrix of Camera Site Variables

	Entertainment	Irritation	Site Value	Attitude	Return Intent	Purchase Intent	Usefulness of Sitemap	Usefulness of Search Function	Product Involvement	Task Involvement
Informa-tiveness	.536**	-.471**	.728**	.605**	.533**	.472**	.364**	.426**	.339**	.118
Entertain-ment		-.383**	.609**	.640**	.703**	.580**	.452**	.523**	.309**	.116
Irritation			-.420**	-.613**	-.469**	-.394**	-.529**	-.419*	-.232**	-.010**
Site Value				.640**	.736**	.684**	.392**	.507**	..342**	.135
Attitude					.766**	.530**	.664**	.533**	.489**	.128
Return Intent						.809**	.600**	.492**	.364**	.154
Purchase Intent							.577**	.462**	.377**	.200*
Usefulness of Sitemap								.431**	.391**	.111
Usefulness of Search Function									.280**	.223*
Product Involvement										.094

where ** $p<0.01$, * $p<0.05$

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