



Information load: its relationship to online exploratory and shopping behavior

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Abstract

This article documents an effort to experimentally examine the effects of information characteristics of Web shopping sites on consumers' desire to approach the sites. A field experiment was conducted in which respondents visited shopping sites characterized by varying levels of information load. Two dimensions of information load, complexity and novelty were identified and were found to have differential effects on the desire to approach shopping sites. The novelty dimension kept consumers exploring the shopping sites, whereas the complexity dimension has the potential to induce impulse purchases. Managers are advised to design their virtual shopping environments in line with their marketing objectives. Novelty is the key to successfully shaping attitudes, delivering content and soliciting responses, whereas complexity encourages on-line transactions. Future research directions for information academicians are suggested to formulate alternative models for on-line exploration behavior and to develop better measures for on-line informational environments. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

For marketing on the Web, which is a highly information-laden medium, the notion of information load is directly related to concerns about whether consumers can be given too much information in virtual shopping environments. Compared with conventional retail shopping, computer shopping enriches the information environment of virtual shopping by providing additional product information, such as comparative products and services, as well as various alternatives and attributes for each alternative, etc. However, the increasing volume and diversity of information presented to consumers may affect their information processing. Bettman, Luce and Payne (1998) point out that both consumer response to information load with selectivity and the

organization of information displays could have major impacts on consumer choices for making certain information easier to process.

Although the impact of information load on on-line shopping behavior is an important topic, there has been relatively little recent research. Studies have focused on the impact of information load on decision quality (e.g., Meyer & Gudykunst, 1997; Swink & Speier, 1999), comparing choices actually made to objective standards (e.g., Lynch & Srull, 1982; Mannecke & Valacic, 1998). The drawback of this approach is that it assumes that the experienced overall utility (or “happiness”) of on-line shopping results from rational choices. However, consumers not only shop to solve consumption problems, but also shop for entertainment and social contact (Holbrook & Hirschman, 1982). Exploring how information load influences consumers’ desire to stay, explore and shop in virtual environments would provide a balanced view of both the problem-solving and hedonic aspects of on-line shopping behavior.

Using information load to describe the general informational characteristics of virtual shopping environments, this study examines the effect of information load on on-line shopping behavior. This paper first defines the concepts of information load and on-line approach–avoidance behavior, and then delineates the relationships of these two concepts in order to derive hypotheses of on-line shopping.

2. Key concepts defined

2.1. The information load of virtual shopping environments

Borrowing from information theory, Mehrabian and Russell (1974) introduced the concept of information rate (load) as the complex spatial and temporal arrangements of stimuli within a setting. The purpose of information is to increase disproportionately the conditional probabilities of certain components at various parts in an arrangement, thereby reducing uncertainty (i.e., the amount of information) in the total arrangement.

Virtual shopping environments can vary in degrees and characteristics of information load. These general informational characteristics include concepts such as complex, random, intense, jarring, heterogeneous, dissonant, intermittent, rare, novel, surprising, meaningless, asymmetrical, close, crowded, or dense. Two major sub-dimensions have been identified for information load: complexity and novelty (Campbell, 1988; Donovan & Rossiter, 1982; Hwang & Lin, 1999; Iselin, 1988). Complexity refers to the number of different elements or features of a site, which can be the result of increased information diversity (Campbell, 1988). Novelty involves the unexpected, surprising, new, or unfamiliar aspects of the site. For example, Donovan and Rossiter (1982) identified two dimensions of information load in conventional retail environments, including novelty and variety, and found that novelty increased arousal, but that variety decreased arousal perceived in retail environments. Iselin (1988) subdivided the notion of information load into the concepts of quantity of repeated dimensions, and quantity of different dimensions, with the latter concept labeled as information diversity. Hwang and Lin (1999) distinguished the effects of information on bankruptcy prediction into two dimensions: information diversity and information repetitiveness.

2.2. Approach–avoidance behavior

The generic concept of approach–avoidance was defined by Mehrabian and Russell (1974) in a broad sense to include physical movement toward or away from a virtual store, the degree of attention, exploration and favorable attitudes such as verbally or non-verbally expressed preferences or liking.

All responses to virtual shopping environments can be considered as the following types of approach or avoidance behavior. The first is a desire to remain in (approach) or to leave (avoid) the site, as indicated by navigation duration. This is similar to the “hit” as defined by Berthon, Pitt and Watson (1996), where surfers land on a site but do not necessarily do anything with the information to be found there. They may simply glance at it and move on. Nevertheless, the longer they stay there, the higher is the possibility that they will move on to explore the site.

Second, there is the desire or willingness to explore the site (approach) versus a tendency to avoid moving through or interacting with the site (avoidance), as indexed by exploration intention. This is like the “visit” as defined by Berthon et al. (1996) where some interaction takes place between the surfer and the Web page. This may mean spending appreciable time reading the text or looking at the graphics. Or it could involve completing a form or querying a database.

Third, is a desire or willingness to shop in the site (approach) versus a tendency to avoid shopping in the site (avoidance), as indexed by shopping intention. As stated by Berthon et al. (1996), an efficient Web site should be able not only to attract buyers but also to turn those buyers into loyal customers who revisit the site and purchase products on an ongoing basis.

3. Information load and virtual stores approach–avoidance

The approach–avoidance behavior that occurs in virtual shopping environments is assumed to be the function of the information load of the environments. Information complexity is considered to turn away consumers, whereas information novelty attracts consumers. The following sections delineate the two hypotheses.

3.1. Information complexity and the desire to avoid

Humans are limited in their ability to process information (e.g., Miller, 1956); yet they are presented with increasingly complex information in information-laden retail outlets. Applying McMaster and Shea’s (1992) concept, in this information-intensive environment a challenging aspect of attracting consumers to approach is the management of the overall information complexity.

Prior research on information complexity indicates that information complexity directly influences decision quality (e.g., Hwang & Lin, 1999; Swink & Speier, 1999). For example, Swink and Speier (1999) found that when the experienced complexity of information is reduced, better decision-making followed. Hwang and Lin (1999) conducted a meta-analysis of 31 experiments reported in 18 empirical bankruptcy prediction studies to test the effect of information diversity. Their results indicate that information diversity has an adverse impact on decision quality.

However, the influences of information complexity on consumers' desire to approach virtual shopping environments are not well understood. Exploring shopping sites is different from making quality decisions. According to the contrasts between the experiential and information-processing views of consumer behavior presented in Holbrook and Hirschman (1982), exploring shopping sites is more likely to be hedonic in nature, with the exploratory behavior being the end in itself. Alternatively, making quality decisions is more likely to be problem solving in nature with the exploratory behavior being the means for the purpose of information acquisition. Umanath (1994) also demonstrated that the information load has different impacts on performance under different information acquisition modes, incidental learning and directed learning.

The complexity of virtual shopping environments might have both positive and negative effects on the intention to approach the environments. The positive evidence includes the following. Donovan and Rossiter (1982) found that the larger the "scale" of a conventional retail environment, the greater the number of respondents who report that they would stay longer in the environment. They thus reasoned that the perceived information load of an environment produced specific approach-avoidance responses to that environment, such as an expected greater variety of goods available and, hence, a greater probability of an impulse purchase.

As the amount of marketing information in an environment increases, consumers become more adept at avoiding exposure. Information personalization is thus particularly useful for the information-rich environment of virtual shopping, and it provides negative evidence. The rapid growth of the Web has made it possible for the increasingly large amount of information resources on the Internet to be accessed easily, but it has become more and more difficult to pick out from this sea of information the pieces that are really useful or important. Information personalization is the technique developed to help consumers extract relevant information (e.g., Guttman, Moukas & Maes, 1998; Sakagami, Kamba, Sugiura & Koseki, 1998) and reduce the amount of information that has to be processed. Owen (1997) reported findings on information load and executive stress, which revealed that having to deal with excessive information often led to stress. Iselin (1988) theorized that greater diversity of information would result in lower decision accuracy. Taking into account the information-intensive nature of virtual shopping environments, this study hypothesizes a negative effect of information complexity on the desire to approach shopping sites:

H₁: The information complexity of shopping sites will have a negative effect on the intention to approach the sites.

3.2. Information novelty and the desire to approach

Because of limitations inherent to our cognitive resources, it is impossible for us to process all of the information available at any given moment. Consequently, an individual's cognitive system is constantly selecting some certain pieces of this information for further processing. Using "salience effects" Lynch and Srull (1982) explained the phenomenon of selective attention. They stated that salient information, such as information that is novel or unexpected, in a given environment will appear to capture a disproportionately large amount of attention in comparison to information that is redundant or expected to appear so in this context. Bettman et al. (1998) proposed that consumers' attention may be captured involuntarily by aspects of the environment that are surprising, novel, unexpected, or extremely salient.

In addition to information that attracts attention, novel or salient information is also critical for decision-making. Stasser (1992) assessed the impact of using highly salient information on groups' discovery of hidden profiles, finding that it was critical to make information salient at the time members received the information and before discussion. Similarly, Hwang and Lin (1999) examined the effect of information repetitiveness on bankruptcy prediction. Their results indicated that lack of novelty, in their study treated as information repetitiveness, has an adverse impact on decision quality. Thus the provision of repeated information can be detrimental to prediction accuracy. Hypothesis 2 is thus derived from the previous discussion with a positive effect specified:

H₂: The information novelty of shopping sites will have a positive effect on the intention to approach the sites.

4. Method

4.1. Sample

For this study, the top 10 Web shopping sites recommended by Goldsborough (1998) were sampled to represent a variety of product categories with varying degree of information load. These shopping sites were rated as the best known and most reliable, including Amazon bookstore (amazon.com), CDnow music store (cdnow.com), Reel video store (reel.com), Virtual Vineyards winery (virtualvin.com), Virtual Flowers florist (virtualflowers.com), Auto-By-Tel price quotes for cars (autobytel.com), NetGrocer groceries online (netgrocer.com), Computer Discount Warehouse (cdw.com), OnSale auctions of computer equipment (onsale.com), and Chumbo commercial software (chumbo.com).

One hundred and fifteen males and females served as respondents, with the majority being male (63.8%). Age ranged from 17 to 40, with an average of 23.62. Of the total, 29.8% previously had the experience of on-line shopping and 84.9% at least had the experience of searching for products or service information on-line. Each individual was randomly assigned to visit two virtual stores described above. In total, the sample consisted of $n = 218$ observations due to some respondents visiting only one shopping site.

4.2. Procedure

Respondents either accessed the experimental shopping sites through their own computers in familiar environments, or using computers provided by us in a computer lab. After being randomly assigned to visit two pre-selected shopping sites, each respondent was instructed to explore the sites for as long as they liked, using their usual method of navigation. When they finished the exploration of each site, they were asked to rate the information load of the site they have just visited. Their intentions to act in the site were taken to measure the approach–avoidance intentions. The procedure was repeated for the second shopping site visit.

4.3. Measures

The information load of shopping sites was measured using Mehrabian & Russell's (1974, pp. 88–94) General Measure of *Information Rate*, which includes 14 semantic differential items for

assessing the information load of a situation. An algebraic sum is then obtained over all items to compute a total information load score for each shopping site for each respondent. Mehrabian and Russell considered that an advantage of using subjects' own judgments, instead of other measures of information load, is that the former automatically discounts the effects of familiarity and meaningfulness. In other words, subjects' own judgments provide estimates of information load that are based on conditional probabilities of the various component events.

The *approach–avoidance intentions* to shopping sites were measured by questions adapted from Mehrabian and Russell (1974, p. 221) to fit virtual shopping intentions. Three levels of approach–avoidance intentions were measured. The *desire to stay* in the site was measured by two questions: “How much time would you like to spend in this site?” and “How much would you try to leave or get out of this site?” The *desire to explore* the site was measured by two questions: “How much would you enjoy exploring around?” and “How much would you try to avoid any looking around or exploring this site?” The *desire to shop* in the site was measured by two questions: “To what extent is this site a good opportunity to shop?” and “How much would you dislike having to shop in this site?” Three further questions were taken from Donovan and Rossiter (1982) to gauge preference to the site and the re-visit intentions. They are, “Do you like this site?” “Would you enjoy shopping in this site?” “Would you avoid ever having to return to this site?”

5. Analysis and results

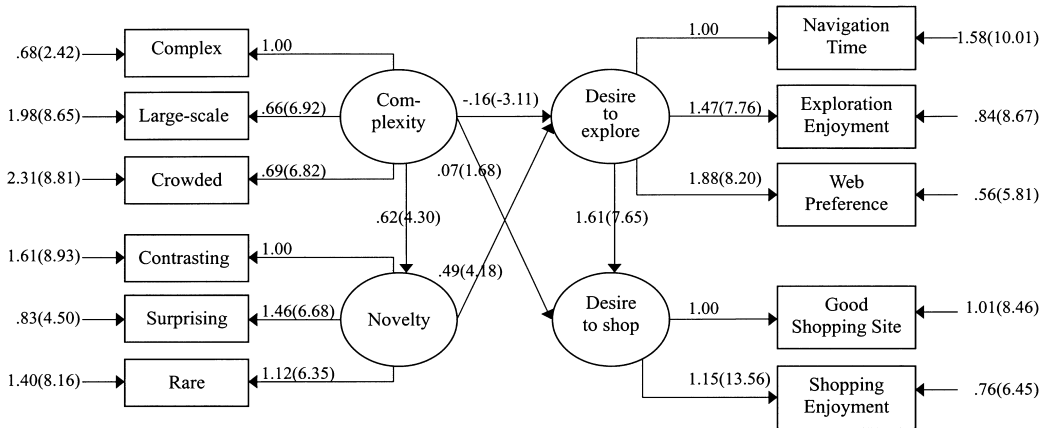
Structural equation modeling was used for a comprehensive test of the relationship between information load and the approach–avoidance behavior in these virtual shopping environments.

5.1. Scale item purification

An iteration procedure was first used both to examine the dimensionality of information load of virtual environments, and to examine the reliability of the intentions to stay, explore, and shop in these sites. Scale items with low squared multiple correlations (individual item reliabilities) were dropped from the analysis until all retained items demonstrated satisfactory reliabilities.

Two factors emerged which described the information load of virtual shopping environments: the information complexity (simple/complex, small-scale/large-scale, and uncrowded/crowded) and the information novelty (similar/contrasting, usual/surprising, and common/rare); both displayed acceptable reliability (0.732 and 0.706 for complexity and novelty, respectively). The variance extracted in each factor, 0.486 and 0.452, fell slightly short of the recommended 50% (Bagozzi & Yi, 1989), suggesting the need to explore additional measures.

For the approach–avoidance intentions to the sites, it was found that the intentions to stay and to explore collapsed as one dimension. Three items were identified to represent the intention to explore the sites: “How much time would you like to spend in this site?” “How much would you enjoy exploring around?” and “Do you like this site?” The two items for the intention to shop are: “To what extent is this site a good opportunity to shop?” and “Would you enjoy shopping in this site?” The reliabilities (0.794 and 0.808) and the average variances extracted (0.577 and 0.679) for the desires to explore and shop were satisfactory. This indicated approximately 60–70% of the variances in the two approach–avoidance intentional dimensions being reliably explained.



$\chi^2(39 \text{ df}) = 74.11$ ($p = .000$), RMSEA = .064, GFI = .94, AGFI = .90, NFI = .92, CFI = .96

Note. Entries in parentheses are t-values. The composite reliabilities and variances extracted for the latent factors are .732 and .486 for complexity, .706 and .452 for novelty, .794 and .577 for the intention to explore, and .808 and .679 for the intention to shop.

Fig. 1. The path diagram and solution for the relationship between information load and the desires to explore and to shop.

Unstandardized parameter estimates of the model appear in Fig. 1. All factor loadings were significant ($t > 2.00$). The results provide evidence of the scale’s convergent validity.

5.2. Model specification

Fig. 1 represents the structural equation model. The two dimensions of information load, complexity and novelty are hypothesized to directly influence the desires to explore and shop. Negative parameter estimates for the effect of complexity on the desires to explore and shop are hypothesized, whereas positive parameter estimates for the effect of novelty on the desires to explore and shop are hypothesized. The internal relationships between the desires to explore and shop are expected to be positive. No prior prediction is made for the correlation between information complexity and novelty.

Estimation of the model, as shown in Fig. 1, yielded a χ^2 value of 74.11 with 39 degrees of freedom (RMSEA = 0.064, CFI = 0.96, $p = 0.000$). The RMSEA, root mean square error of approximation, represents the goodness-of-fit that could be expected if the model were estimated in the overall population, not just in the sample drawn for estimation. Values ranging from 0.05 to 0.08 were deemed acceptable (Browne & Cudeck, 1993, p. 144). The CFI, comparative fit index, which measures how much better the model fits as compared to the independence model, lies between 0 and 1, with 1 indicating that the model holds exactly in the overall population (Bentler, 1990). The overall fit indices of both RMSEA and CFI exceed the recommended levels (Bentler, 1990; Browne & Cudeck, 1993, p. 144), indicating a satisfactory fit of the model.

The parameter estimates of the model suggested the following. Complexity decreased the desire to explore (parameter estimate = -0.16 , $t = -3.11$), but increased the desire to shop in the sites marginally (parameter estimate = 0.07 , $t = 1.68$). Novelty increased the desire to explore (parameter estimate = 0.49 , $t = 4.18$), but had no impact on the desire to shop. The two dimensions of information load were positively correlated (parameter estimate = 0.62 , $t = 4.30$), confirming their being components of information load. The desire to explore was found to increase the desire to shop (parameter estimate = 1.61 , $t = 7.65$), suggesting a hierarchical relationship between the desires to explore and shop. This model explained 23% of the variance in the desire to explore, and 98% of the variance in the desire to shop, indicating a highly sufficient but less satisfactory proportion of variance in the desire to explore being explained.

6. Discussion

6.1. Conclusions

Using a structural modeling approach, this study examined the relationship between the information load of virtual shopping environments and the desire to approach these environments. The results are summarized as follows:

Is information load a unidimensional or multidimensional construct? The significant positive correlation between information complexity and novelty reveals that, whereas the information load is fundamental for attracting or turning away consumers, the two dimensions are interwoven, and one must not focus exclusively on any single dimension. Though Mehrabian and Russell (1974) considered that the information load in an environment should be treated as a unidimensional variable, they also suggested the presence of at least three dimensions among their 14 scale items. The positive correlation between information complexity and novelty confirms the view that the information load of virtual shopping environments can be a construct containing more than one intercorrelated sub-dimension.

Does information load attract consumers or turn them away? Without making the distinction of information complexity and novelty, Donovan and Rossiter (1982) found a beneficial effect of general information load on the desire to stay longer in conventional retail environments. They reasoned that it might be due to an expected greater variety of goods available and, hence, a greater probability of an impulse purchase. However, the current findings provide evidence regarding the differential effects of information complexity and novelty. The novelty dimension of information load keeps consumers longer in shopping sites, and the complexity dimension has the potential to induce an impulse purchase.

What determines the desire to shop in virtual environments? The combined effect of complexity and the desire to explore explains 98% of the variance in the desire to shop. Thus a significant causal relationship has been identified. This suggests the following route for managers to attract consumers to virtual shopping: The longer that consumers stay and explore shopping sites, the more likely that they will make their purchases. A better approach to retain consumers, according to the current findings, is to make the virtual shopping environment novel, and thus to increase their desire to explore. Although complexity was found to have a positive effect on the desire to shop, it is

not recommended to increase the informational complexity of the virtual shopping environments because that would run the risk of turning consumers away through complexity's negative impact on the desire to explore.

6.2. Implications for managers

The findings of this study provide the following implications for managers in business.

First, the differential impacts of the two sub-dimensions of information load, complexity and novelty are suggested to be considered by managers approaching the design of virtual shopping environments. On the one hand, as the majority of on-line businesses use their Web sites as a vehicle for displaying information about themselves and their products or services (Cockburn & Wilson, 1996), to make virtual shopping environments both novel and simple is the key to keeping consumers browsing. To create novel environments is like the experiential content suggested by Cartellieri, Parsons, Rao and Zeisser (1997), which will allow consumers to experience the ownership of a product, service, or brand. On the other hand, when the managing objective is to solicit on-line transactions, making the virtual shopping environments complex is essential for inviting consumers to directly make a purchase. To design virtual shopping environments that are perceived as complex, large-scale, and crowded is to promote the image of leading-edge corporations, which according to Watson, Akselsen and Pitt (1998), is one of the driving forces for firms to join the rush to create Web sites. It is also possible that a virtual shopping environment that is perceived as complex, large-scale, and crowded will be deemed as more credible, an important consideration for consumers to make on-line transactions.

Second, for firms capitalizing on business-to-business e-commerce transactions facing numerous potential customers, the current findings based on consumer-oriented Web sites can be easily extended. The purchasing process and architecture for those business-to-business sites are basically the same as those for business-to-consumer e-commerce. Successful examples of this type of Web sites are Dell, Intel, Cisco and IBM, for which business buyers constitute the major purchasers (Turban, Lee, King & Chung, 2000). The ultimate objective for this type of Web site is to reach all potential customers. To achieve this, the innovative use of Web sites to reduce information complexity while increasing novelty is a goal. Senn (2000) demonstrated that the best-known catalog companies, including L. L. Bean, Land's End, and Spiegel are expanding well beyond the limitations of their traditional markets to compete in electronic markets.

6.3. Implications for information studies

The following implications for information studies are brought out in the current findings.

First, one potentially important topic for further research concerns the degree to which the methodology for the informational characteristics of business-to-consumer sites is applicable to the assessment of business-to-business sites such as Internet presence sites, content sites, malls, incentive sites, and search agents. To date, according to Hoffman and Novak (1996), Internet presence sites, rather than on-line storefronts, still dominate commercial activities. Internet presence sites either provide detailed information on a firm's offering (e.g., the Web sites of Federal Express), or create an image and attempt to build an ongoing relationship with the consumer (e.g., the Web sites of Reebok). Such sites would be ideal for extending the current findings as they

provide a form of non-intrusive advertising, in which the consumer actively chooses to visit and interact with the firm's marketing communication efforts. To achieve this, a larger sample size with more diversified respondent backgrounds, such as the inclusion of organizational decision-makers, would extend the methodology to the business-to-business e-commerce realm.

Second, slightly more than half of the variance in information load remaining unexplained suggests directions for future studies to explore better and additional measures for describing the informational characteristics of virtual shopping environments. Similar to the current findings, using this information load measure in conventional retail environments Donovan and Rossiter (1982) found that some of these items of information load might not be appropriate. Several of the informational characteristics that are unique to virtual shopping environments are potential candidates, such as interaction, personalization, and flexibility.

Third, the low variance explained for the desire to explore in this model suggests the need for future research to formulate alternative or competing models for explaining on-line exploration behavior. Potential candidates include exploring additional dimensions of information load relevant to the Web environments, incorporating individual differences in coping with information load, and integrating the experiential aspect of on-line exploration behavior. Since shaping attitudes, delivering content and soliciting responses are all important Internet marketing objectives (Cartellieri et al., 1997), extracting the determinants of on-line exploration behavior is crucial for achieving these non-transaction-oriented purposes.

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