CYBERPSYCHOLOGY & BEHAVIOR
Volume 9, Number 3, 2006

Online Shopping Interface Components: Relative Importance as Peripheral and Central Cues

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ABSTRACT

The Elaboration Likelihood Model (ELM) uses central (more thoughtful) and peripheral (less thoughtful) routes of persuasion to maximize communication effectiveness. This research implements ELM to investigate the relative importance of different aspects of the user experience in online shopping. Of all the issues surrounding online shopping, convenience, access to information, and trust were found to be the most important. These were implemented in an online conjoint shopping task. Respondents were found to use the central route of the ELM on marketing messages that involved issues of minimizing travel, information access, and assurances of system security. Users employed the peripheral ELM route when considering usability, price comparison, and personal information protection. A descriptive model of Web-based marketing components, their roles in the central and peripheral routes, and their relative importance to online consumer segments was developed.

INTRODUCTION

CONSUMERS are willing to purchase products they cannot physically inspect and then endure the risk of lost orders, dishonest traders, and products not up to expectations. Rather than a description of shopping in the Internet economy, this sentence describes consumers in the British colonies of pre-Revolutionary America, who were importers of British finished goods.[1–3] Marketing channels are products of their time, yet address issues of exchange that persist over generations. Today's online channels present the latest challenge to understand what consumers value in marketing communication, which in the case of the Web involves interface components seen by the user, such as product descriptions, graphics, and security guarantees.

Web site design components have been found to influence attitude toward the Web site (A_{WS}).[4,5] This parallels previous research on Attitude-toward-the-ad (A_{AD}), itself combining cognitive evaluations of the ad and affective reactions to the ad.[6–8] These two tracks of persuasion are well represented in the Elaboration Likelihood Model (ELM),[9–11] which has been successfully used in understanding cognitive preferences of Web users.[12] According to the ELM, attitudes formed under central route persuasion (messages that are paid attention to in a thoughtful way) have a greater influence on behavior, are longer lasting, and more resistant to change. Attitude change from the central route is brought about by effortful issue-relevant cognitive activity.[10] Since involvement determines whether or not the message will be elaborated, it is important to know if certain Web interface components can be classified as inherently conducive to high involvement or low involvement and the role of consumers' characteristics in both states. This research direction can thus

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begin to answer questions concerning cognitive preferences within the interactive context.[13]

METHODS

Study 1: Interface components

Keeney[14] described classifications of important online international consumer shopping concerns, which were confirmed in Taiwan through our own Web survey, with 306 respondents. Three factors with eigenvalues over one were observed (Table 1). Factors were labeled convenience, access to information (hereafter, access), and trust.

Sixty-two percent Web users in Study 1 had experience in making online purchases and all were frequent users of the Web (accessing the Web at least three times a week). Convenience–Access–Trust (CAT) formed a triangle of emphasis (Fig. 1), indicating the areas in online shopping that have the greatest potential to influence likelihood for elaboration. Study 2 was next undertaken to understand how the components of CAT fit with the expectations of online consumers within an actual shopping Web site interface design.

Study 2: Relative importance of interface components

Study 2 employed an online conjoint experiment (a simulated online product search and purchase) based on the CAT components. Relevant literature for each of the CAT components was first reviewed in order to inform construct creation within the shopping interface.

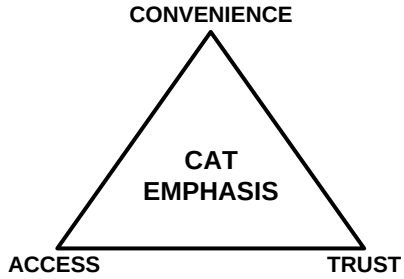

FIG. 1. Convenience–Access–Trust (CAT) emphasis model.

Convenience. Shoppers seeking product information consider Internet searches more convenient than physical searches.[15,16] Other factors, such as home delivery,[17] that have contributed to the success of catalog and television shopping, are important to online shoppers. Kim and Eom[18] found a strong component of convenience sought by online shoppers is a clear statement, within the interface, concerning prompt delivery. This led to the first hypothesis:

H_1: Notification, within the interface, of product delivery will have a positive effect on A_{WS} for task-oriented shoppers.

Web shopping's low switching cost means that a poor interface design can drive visitors away.[19] Visitors use the interface to predict post-consumption satisfaction.[20] Expectations of control in the search

TABLE 1. PURIFIED FACTOR LOADINGS (VARIMAX ROTATION)

	Convenience	*Access*	*Trust*	*Item-to-factor correlation*
Maximize convenience	0.74	—	—	0.71
Minimize personal travel	0.72	—	—	0.69
Limit impulse buying	0.64	—	—	0.71
Minimize time spent	0.55	—	—	0.67
Maximize shop enjoyment	0.54	—	—	0.68
Enhance comparison shopping	—	0.66	—	0.67
Maximize access to information	—	0.66	—	0.72
Maximize ease of use	—	0.61	—	0.75
Minimize misuse of personal information	—	—	0.84	0.87
Assure system security	—	—	0.83	0.85
Minimize misuse of credit card	—	—	0.81	0.79
Minimize fraud	—	—	0.81	0.88
Maximize accuracy of transaction	—	—	0.67	0.78
Eigenvalue	1.35	2.11	6.14	—
Percent of variance	7.49	11.73	34.09	—

experience make interface accessibility a primary issue[21] and if a Web surfer cannot find the content (s)he is looking for, then the visitor quickly leaves.[22,23] Thus, the most basic issue faced when designing a Web page is the amount of complexity versus simplicity.[24] Research results point to contrary perspectives.[4,5] A simple and clean interface helps viewers quickly find what they want, while a complex and busy interface attracts attention and interest and encourages discovery.[25,26] Nielsen and Norman[27] emphasize that reactions to specific designs can give accurate information for designing a better shopping interface, thus the complexity issue was tested in the second hypothesis:

H_2: Lower Web page complexity will have a positive effect on A_{WS} for task-oriented shoppers.

Access to information. The Internet as a whole can be viewed as a value-added service, with the value being information.[28] Online shoppers tend to be goal-oriented[21]; thus, marketers must shift from being an agent of the seller to an agent of the buyer.[29] Web use has been found to be dominated by search/deliberation behavior,[30–32] with increasing value placed on information search as network externalities multiply.[33] This emphasis on information seeking led to the next hypothesis:

H_3: Increased levels of product information will have a positive effect on A_{WS} for task-oriented shoppers.

Sites offering product price comparisons result in increased welfare for consumers,[34] similar to the common use of a reference price, which has been shown to increase perception of value in brick-and-mortar retail channels.[35] Online consumers find comparison shopping important[36] and have come to expect lower prices, indicated through display of comparison prices online,[37] leading to the next hypothesis:

H_4: Including price comparisons in the search result will have a positive A_{WS} for task-oriented shoppers.

Trust. Potential abuse of personal data is an issue for experienced Internet users.[38–40] Direct marketing has dealt with similar matters in relation to the collection and use of personal information.[41–44] Milne[45] showed that transparency of purpose helps ease this concern. Trust grows when vulnerability is not taken advantage of[46]; thus an interchange of communication can improve trust[47] without the need to totally eliminate risk (an impossible task). Schoenbachler and Gordon[48] found consumers' trust significantly related to the effectiveness of communicating the firms's dependability. One of the strongest antecedents to online trust is a promise to protect data collected during online shopping.[49] This promise thereby opens an opportunity for trust to be built upon. These issues led to the next hypothesis:

H_5: Including assurances, within the interface, that personal information will not be given to any third party will have a positive effect on A_{WS} for task-oriented shoppers.

Publicity surrounding viruses and hackers raises cognitive concerns (rational or not) that databases containing credit information are not safe from outside invaders. Online sellers must balance the openness of their systems with security issues.[50,51] Such a balance has included pledges of consumer protection by mail-order companies as far back as 1875.[52] When consumers know that there is a controlling mechanism overseeing security, trust may be increased.[49,53] This led to the next hypothesis:

H_6: Including assurances, within the interface, that the most up-to-date security software is being used to protect against fraud will have a positive effect on A_{WS} for task-oriented shoppers.

Procedures

A conjoint approach was chosen for its emphasis on understanding tradeoffs consumers make when evaluating competing options.[54–58] The use of conjoint analysis in previous e-commerce consumer behavior studies[59–61] also suggested its suitability here. Within conjoint experiments, manipulated variables (attributes), represent clear different states (levels) to the subjects who rate combinations of product features. The highest loading CAT factor items were re-examined for their potential implementation within the browser interface. This resulted in the CAT construct being represented by six independent variables, the study's conjoint stimuli, with each having two levels (Table 2).

Convenience's highest loading variables were maximize convenience and minimize personal travel. In light of the literature, it was clear that saving time is a priority for online shoppers. Saving time was represented in the interface design through personal travel. Nielsen[24] observed that the home page acts as the flagship of a Web site in that it answers the questions *Where am I?* and *What does this site do?* Thus, the first page of a Web site determines just how convenient the shopping experience will be, as was found to be the case in the findings of Chakraborty et al.[62]—that a clear and organized page design improved Web site effectiveness. With this in mind, maximize convenience was represented in the experiment's interface with

TABLE 2. CONJOINT VARIABLES IMPLEMENTED IN SHOPPING INTERFACE

CAT	*Study 1 item*	*Conjoint attribute*	*Level*	*Representation in experiment interface*
Convenience	Minimize personal travel	Personal travel customer	High	Large text, in the checkout stage, explained the purchase will be sent directly to the
			Low	Large text, in the checkout stage, explained the customer is required to pick up the purchase.
	Maximize convenience	Usability	High	The experiments' front page emphasized a clean interface with minimal use of graphics and text organized by topics in an outline structure.
			Low	The experiments' front page emphasized a more complex design with graphics, colors, and numerous text groupings that followed no apparent structure.
Access	Maximize access to	Information access	High	Product description was detailed and expanded, including a picture.
			Low	Product description was condensed and lacked a picture.
	Enhance comparison shopping	Price comparison	High	A range of prices indicating the current result to be the lowest price across all firms searched for the same product.
			Low	A single price displayed for each product.
Trust	Assure system security	Assure system security	High	A popup window, before checkout, explaining the server was running a new security system that assured credit card security.
			Low	No security system was mentioned.
	Minimize misuse of personal information	Personal information protection	High	Large text, in the checkout stage, explained the hosting firm would not use the customer's personal data for other purposes, and would not sell or distribute the information to other companies.
			Low	No use of personal information was mentioned.

CAT, Convenience–Access–Trust.

the variable usability on the first page of the shopping site.

The two highest loading access variables included enhancing comparison shopping (represented in the interface design as price comparison) and maximize access to information (represented by the variable information access). In the case of trust, the two top loading factors were minimize misuse of personal information and assure system security, represented by the two variables: personal information protection and assure system security respectively.

Validity of the attributes in describing the CAT constructs was tested with confirmatory factor analysis. The survey data from Study 1 was used in Analysis of Moment Structures (AMOS)[63] with acceptable results (Fig. 2). The model obtained a good fit ($\chi^2 = 7.86$; $p = 0.25$; GFI = 0.99; RMSEA = 0.034), reinforcing confidence that the six attributes accurately represent the latent CAT factors.

The resulting six variables were implemented within an online shopping interface based on a survey of Web site designs from *PC Magazine's* year 2000 top 100 Web sites. Salient levels of differences between the variables' high/low states as well as products for purchase were pre-tested with focus groups and adjustments made (for manipulation check, see Appendix). A cover

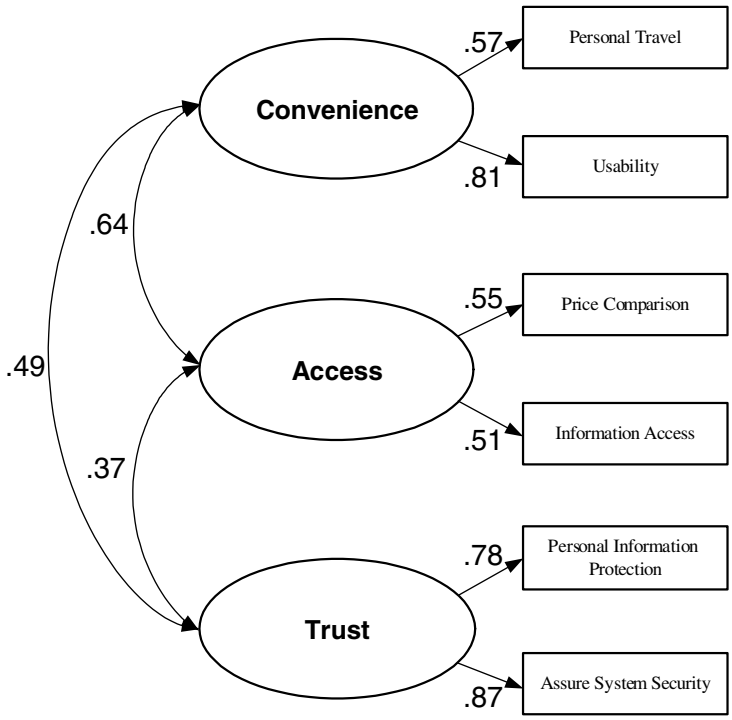

FIG. 2. Path diagram for Confirmatory Factor Analysis (CFA). All numbers are standardized and all paths are significant at $p < .01$

story explained a purchase was to be made online by the experimenter and participants were to help in evaluating different online shopping designs as if they were to make the purchase themselves.* Half the participants were asked to search for a physical product (a set of encyclopedias with CD-ROM), while the remainder searched for a service (an overseas tour). These are both familiar and popular products in Taiwan. Shopping stages followed the steps common to commercial Web sites as shown in Table 3. Users chose from a simulated search result the product that best matched the search brief (Fig. 3). Information required for checkout, including name, address, and credit card number, was supplied to participants.

An orthogonal design, for testing main effects,[57,64] was generated in SPSS Conjoint 8.0, resulting in eight somewhat different shopping tasks. At the end of each shopping task, after checkout, participants scored the overall shopping experience on an 11-point scale (0–10). The process then repeated until all eight profiles were scored.

A banner advertising the experiment was placed on a commercial portal in Taiwan in 2001, resulting in 506 Web site visits during a 1-week

TABLE 3. SEQUENCE IN EXPERIMENT

Experiment (shopping) stage	*Conjoint implementation (high/low)*
Front page/search portal	Usability high/usability low
Search result	Information access high/information access low
Search result	Price comparison high/price comparison low
After product selection	Assure system security high/assure system security low
Checkout	Exclude personal travel/include personal travel
Checkout	Personal information protection high/personal information protection low

*Pre-testing found the shopping simulation convincing to the extent that participants reported concern the procedure was leading to an actual purchase, thus discouraging completion. The cover story was modified to decrease this problem by emphasizing a participant was assisting in evaluating online shopping designs and asked to review the process based on his or her own preferences.

FIG. 3. Examples of search result pages. Information access and price comparison high on the left and low on the right

period in October with 429 respondents' data complete and usable. The sample compared well with statistics on Internet usage in Taiwan at the time,[65,66] with the experiment's participants exhibiting higher levels of education than the sample frame's average (Table 4). This difference in education may be linked to the specific Web portal used to attract participants and brings a slight bias to any generalizations from results. It is also likely that the self-selected nature of the survey, offering a gift certificate for participation, biased the sample slightly. For purposes of this study, it was important that participants had experience with online purchasing or were favorable towards making an online purchase so that results reflected what experienced users' perceived within the shopping interface. Of the online respondents, 59% of the total sample had some online buying experience, with 77% having some intention of making an online purchase in the future. The most frequent online purchases were books and magazines (24%); electronics, computers, and software (33%); and financial securities (6%). Of those who had purchased online, 83% were satisfied, and the remainder expressing some dissatisfaction.

RESULTS AND DISCUSSION

Responses to the online shopping simulation exhibited good internal reliability with a Cronbach's alpha of 0.91 and a Guttman split-half reliability of 0.92. There was a general lack of correlation between demographic data and online buying experience, confirming previous similar findings.[38]

Excluding personal travel did have a statistically significant positive effect on the shopping experience with a utility of 0.081, confirming hypothesis 1 (*Notification, within the interface, of product delivery will have a positive effect on AWS for task-oriented shoppers*.) Interface usability part-worth utility showed that the simple interface was preferred over the complex, with a positive utility (0.023)

TABLE 4. SAMPLE AND TAIWAN WEB USERS' DEMOGRAPHIC COMPARISON

	Average age (years)	*Female*	*Student*	*Married*	*College graduate*	*Graduate school graduate*	*Average income (NT$)*
Taiwan Web users[a]	25.3	45.6%	40.9%	29.1%	40.5%	10.1%	20–30K
Experiment sample	27.4	47%	41.8%	27.5%	67.4%	11.4%	20–30K

[a]Taiwan averages from Find, 2001.[65]

TABLE 5. PART-WORTH UTILITY VALUES

	Minimize travel high	*Usability high*	*Information access high*	*Price comparison high*	*Personal information protection high*	*Assure system security high*
Overall results (n = 428)	0.081* (0.486)	0.023 (0.494)	0.579* (0.731)	−0.006 (0.465)	−0.21 (0.435)	0.12* (0.487)

*$p < 0.05$.

Values in parentheses represent standard deviation; significance level represents difference between the two levels of the utility values tested with a paired t-test.

(Table 5). The difference between the high and low states for this component, however, was not statistically significant, meaning that hypothesis 2 (*Lower Web page complexity will have a positive effect on AWS for task-oriented shoppers*.) could not be supported. Information access displayed the highest part-worth utility level (.579) of all the components studied and was statistically significant. Thus, hypothesis 3 (*Increased levels of product information will have a positive effect on AWS for task-oriented shoppers*.) was supported. Opportunity to view price comparisons, however, exhibited a small negative utility (−0.006) while not reaching statistical significance, thus leading us to reject hypothesis 4 (*Including price comparisons in the search result will have a positive AWS for task-oriented shoppers*.) Personal information protection, the second component of trust, displayed a negative part-worth utility value (−0.021) and was not statistically significant, rejecting hypothesis 5 (*Including assurances, within the interface, that personal information will not be given to any third party will have a positive effect on AWS for task-oriented shoppers*.). Assure system security, the first component of trust, exhibited the second highest part-worth utility for the online shopping bundle (.12) and was statistically significant, thereby supporting hypothesis 6 (*Including assurances, within the interface, that the most up-to-date security software is being used to protect against fraud will have a positive effect on AWS for task-oriented shoppers*.).

Part-worth utility scores are centered directly on consumer preferences[58,67] and thus are commonly used in market segmentation.[68] This experiment's part-worth utility scores were used in a Ward's cluster analysis. A three-cluster pattern of dendrograms were discerned by the authors and followed up with a K-means cluster analysis using the initial seed points from the hierarchical analysis. Independent conjoint analysis showed that each cluster contained respondents that approached the online shopping exercise with different expectations (Table 6).

CONCLUSION

Results show that CAT interface components can play differential roles in A_{WS} shopping experiences. Out of the six CAT interface elements, three have the potential to play a moderating role in the cognitive processing stage of the ELM (minimize personal travel, information access, and assure system security). The remaining three CAT elements (usability, price comparison, and personal information protection) may be useful as moderating peripheral cues. The specific direction of the influence (negative or positive thoughts) depends on the market segment the consumer is from.

Results are combined and summarized in the online CAT model seen in Figure 4, where the central and peripheral routes split the circle, and each CAT component is concentrically represented in both routes. Market segments are displayed as straight lines crossing over the circles. Differences in attitude among the market segments toward the CAT components are represented by favorable, unfavorable, or ambiguous in the central route and favorable or unfavorable in the peripheral route (the three and two cognitive processing possibilities of the central and peripheral routes, respectively).

The CAT model presented here is a starting point for customization of Web sites that integrates the multi-dimensional nature of consumer values and market segmentation that can impact the success of a commercial Web site. Rather than a prescription, the model is an example of how a firm can rationally approach analysis of vital interface components so that site design choices can be made that satisfy the firm's target market segments.

Although this study used actual online participants, with Web experience, specific consumer segments or even actual customers were not included. Subjects joining this experiment may have had less concern with Web security issues than those who did not join the experiment and less involvement

TABLE 6. CLUSTER PART-WORTH UTILITY MEANS

	Cluster 1 (time) savers), n = 91	*Cluster 2 (general surfers), n = 240*	*Cluster 3 (information seekers), n = 98*	*F (DF = 1,427)*	*Significance*
Minimize personal travel	0.62*G,I (0.48)	−0.07*T (0.35)	−0.07T (0.43)	104.71	0.000
Usability high	−0.08 (0.47)	0.05 (0.49)	0.02 (0.54)	2.24	0.11
Information access high	0.54*I (0.4)	0.18*I (0.41)	1.59*T,G (0.56)	343.95	0.000
Price comparison high	−0.09 (0.57)	0.01 (0.38)	0.04 (0.52)	2.42	0.009
Assure system security high	0.46*G (0.52)	−0.03TI (0.39)	0.19*G (0.49)	40.56	0.000
Personal information protection high	0.01 (0.49)	0.01 (0.41)	−0.10* (0.43)	2.68	0.07

Significance of part-worth utility values tested with a paired *t*-test.
*$p < 0.05$ on *t*-test.
Values in parentheses represent standard deviation; F test evaluates difference in utility score among the three clusters; subscripts indicate significant differences between clusters, Tukey-Honestly-Significant-Difference paired comparisons: $p < 0.05$, where T = cluster 1; G = cluster 2; I = cluster 3.

with the products than actual consumers searching the Web with an intention to make a purchase. Analysis of the pre-test survey shows that respondents who have a high level of security concerns were still willing to supply their names and addresses in order to receive a gift for participation in this experiment. While sample demographics closely matched those of Web users in Taiwan, the sample's predisposition toward risk was not investigated and compared to the population of Web users. Results from the current sample can be applied to the CAT model, as a general example only. Specific, actionable recommendations for any firm's target market segments will require participation of the relevant consumers. There are some general guidelines, however, that can be gleaned from the current sample.

Starting with the most favorable CAT element, access to information was most valued with its central route component, information access, eliciting positive thoughts among all three segments (especially for Information Seekers). Web sites that do not emphasize content run the risk of activating negative thoughts that are potentially intense and long-lasting. Price comparison, the peripheral component of access to information, was also favorable except to Time Savers, which may be related to the lack of utility of such information to those under time pressure. System security, the central component of trust, was positively valued by all segments except General Surfers who were ambivalent (its presence has no advantage or disadvantage of them). Personal data protection, the peripheral component of trust, was actually disliked by Information Seekers. It is possible that Information Seekers prefer to process information rather than give any out. Due to the peripheral nature of this component, its inclusion will not have a serious negative effect. Finally, convenience's central component, minimize travel, was favored by both Time Savers and Information Seekers, but disfavored by General Surfers who may have been more interested in physical inspection of any purchase. Usability, the peripheral component of convenience, was favorable to all segments except Time Savers who apparently preferred the busy (complex) interface design.

Catalogs gave 19th century rural Americans a new convenience that was bundled with payment systems, product delivery procedures, and guarantees of quality in order to create an environment where exchange could occur smoothly. Catalogs—like those from retailers such as Sears, Roebuck & Company—included product descriptions and graphics that were relevant (central route) to the rural farmers who were suspicious of city folks and

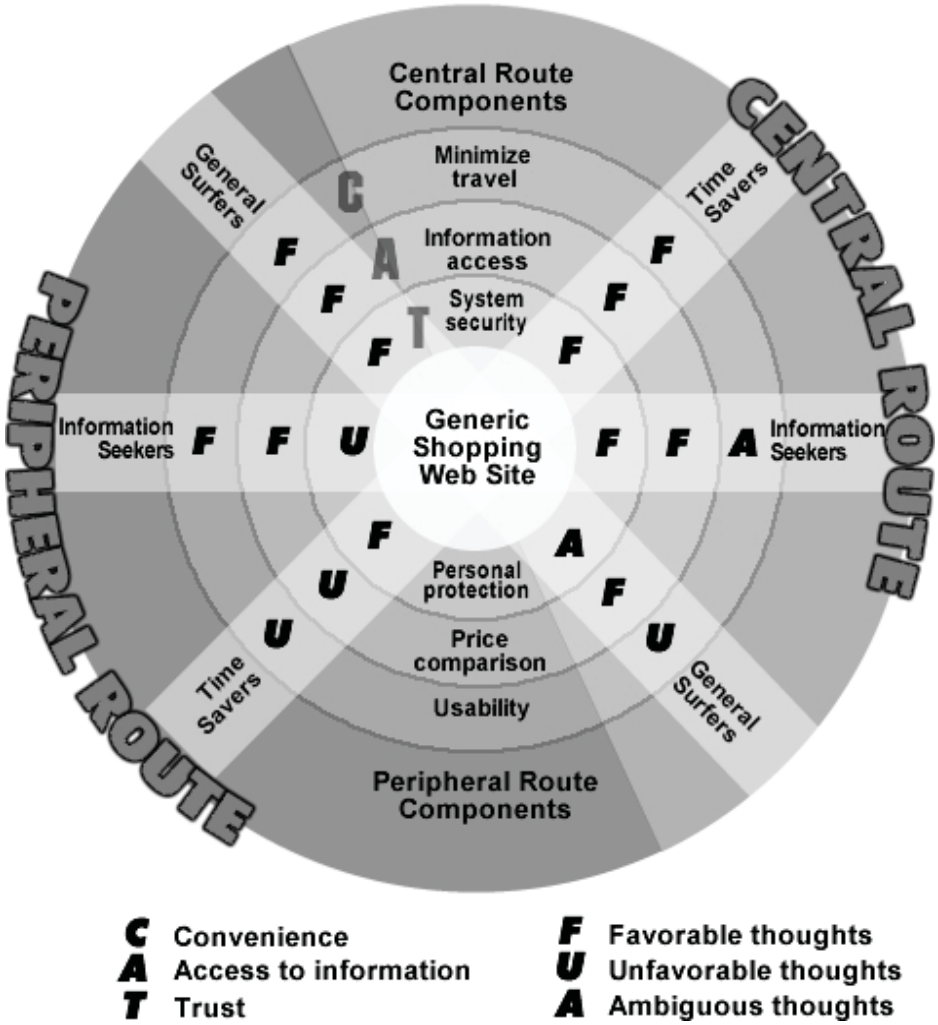

FIG. 4. CAT online shopping model.

TABLE 7. PAIRED *t*-TEST RESULTS

		Difference mean	*t*	*Importance mean*	*t*
Personal travel	Difference between high/low	5.97 (3.51)	21.9	7.43 (2.96)	26.90
	Difference between control	0.12 (0.70)	1*	0.60 (2.14)	*
Usability	Difference between high/low	6.94 (2.31)	35.8	5.86 (2.89)	21.50
	Difference between control	0.26 (1.24)	8*	0.70 (2.27)	*
Information access	Difference between high/low	7.76 (2.47)	40.3	7.90 (2.15)	37.66
	Difference between control	0.13 (0.78)	7*	0.54 (1.93)	*
Price comparison	Difference between high/low	4.11 (2.70)	16.9	4.37 (3.12)	11.87
	Difference between control	0.37 (1.35)	9*	0.98 (2.62)	*
Assure system security	Difference between high/low	6.91 (3.54)	25.5	8.81 (2.21)	33.96
	Difference between control	0.11 (0.64)	1*	0.69 (2.33)	*
Personal information protection	Difference between high/low	5.61 (3.09)	20.9	7.17 (2.72)	26.81
	Difference between control	0.29 (1.14)	6*	0.68 (2.05)	*

*$p < 0.001$.
Values in parentheses represent standard deviation; $n = 184$.

money scams during the early 20th century. Those early developments of marketing communication bundles eventually led to today's successful catalog market. By understanding the vital components that consumers pay attention to when shopping at a Web site, firms can today repeat that success.

APPENDIX

Manipulation check

A post-test survey was administered to 184 participants through email invitation (with similar demographics to Study 2). Six sets of two screens represented the six components of CAT. In each set, the attribute was high in one screen and low in the other. Six more sets were controls. Each control set contained the same screen twice. Order of test/control screens, order of CAT components, and pair order were all randomized. Ratings of the difference and its importance when shopping online (on a ten point scale) were tested with Paired *t*-tests (Table 7). Predicted differences were supported, while importance patterns parallel the conjoint findings.

ACKNOWLEDGMENTS

Funding for this research was provided by the R.O.C. Government's National Science Council.

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