PRODUCT EXPERTISE: A MODERATOR OF INFORMATION SEARCH IN SEQUENTIAL CHOICE

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People usually focus on just some of the available information when making decisions. This is especially true for experts, which has implications for how firms should provide product relevant information to consumers. To determine the extent to which the sequential acquisition of product-attribute information is moderated by expertise, a preferential choice task for a consumer product (cameras) was studied. When information about alternatives is acquired sequentially, a decision must be made as to when to stop acquiring additional information and commit to a course of action. The stopping strategies of more expert consumers were found to differ from those of novices in two noteworthy aspects. First, experts were more directed in their search strategies, making greater use of certain core product attributes when selecting a brand. Second, they were more successful in rejecting undesirable alternatives. Because expert and novice consumers evidently search not only for different information, but in different orders and in different quantities, there are important implications for practice. One is that producers and retailers should be prepared to provide tailored information to different segments of consumers. Another is that limiting the amount of information readily accessed by less-experienced consumers may increase their confidence, and thus their satisfaction.

INTRODUCTION

When consumers make purchase decisions they usually do not consider all available information. Instead they acquire sufficient information to complete their decision. Traditional economic models typically assume that rational decision makers strive to choose the superior alternative while balancing the costs and benefits of acquiring additional information (e.g., Stigler 1961). However, in empirical studies, information acquisition has been observed to vary not just with the cost of acquiring information (e.g., Zwick, Rapoport, Lo and Muthukrishnan 2003), but with the characteristics of the decision itself, such as the number of attributes and alternatives (e.g., Payne 1982; Lurie 2004), and the characteristics of the decision maker (Johnson and Russo 1984; Moreau, Lehmann and Markman 2001). Peterson and Merino (2003) note, for example, that information search is influenced by the prior knowledge of consumers (see also, Barrick and Spilker 2003). Indeed, in the opinion of Alba and Hutchinson (1987), consumer expertise is a "prime determinant of search behavior" (p. 418).

The present work examines the amount and the kind of information acquired by knowledgeable consumers in a sequential binary-choice task. Consumer knowledge or expertise is a factor of interest to marketers because of the possibilities it offers for segmenting markets for complex consumer products like computers. In a sequential choice situation (in contrast to a choice situation where all of the information is available simultaneously), decision makers first examine one piece of information, then decide whether to acquire another piece of information (and if so, which one). Consumers often come to a point at which they have winnowed their set of alternatives to a binary choice between two competing brands (e.g., Dell and H-P) and are comparing those brands attribute by attribute to make a decision. They must therefore decide when to stop acquiring additional information and commit to a course

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of action. According to Russo and Saad (1999), in such a context the essential decision is to determine the most appropriate time to stop acquiring additional information. Thus for the decision maker the question changes from *Which of the alternatives is best?* to *Should I seek more information before committing to a course of action?*

In such sequential search behavior, decision makers have been observed to acquire either too little information (e.g., Sonnemans 1998; Seale and Rapoport 2000) or too much (e.g., Zwick, Rapoport, Lo and Muthukrishnan 2003) when there is an optimal search quantity. Zwick, Rapoport, Lo and Muthukrishnan (2003) conclude that the amount of information sought is influenced by task circumstances. It also appears to be influenced by decision maker characteristics, as more knowledge seems to improve a decision maker's ability to judge the correct amount of information needed (Shapira and Venezia 1981). Of course, there is not always an optimal or "correct" amount—such as in the selection of a personal computer—because of personal tastes and preferences. There is usually a superior alternative, however, and knowledgeable consumers are better at identifying it. In the present work we ask if knowledgeable consumers also distinguish themselves in the amount (and kind) of information they acquire in a sequential binary-choice decision, and thus in their stopping strategies.

Knowing when to stop acquiring information and make a decision is crucial in many choice situations, especially given the kind and quantity of information available to consumers today. The availability of virtually limitless—and in many ways, costless—product information via the Internet means that the implications of product knowledge for search behavior are "especially important" (Peterson and Merino 2003). Although not all attribute information search through the Internet is sequential in nature, it can serve as an illustration of why different search strategies and stopping strategies might be adopted by consumers with different levels of product knowledge. In part, differences may evolve because sequential choice can be a compensatory form of attribute-oriented information processing. That is, it is compensatory in nature because the deficiency of one attribute can be offset by another compensating attribute. Thus one brand is not ruled out because it scores low on the dimension of one particular attribute. The next piece of information may offset the deficiency—indeed, may actually reverse the relative rankings of two brands if the counterweight of the next attribute is great enough. Usually, however, one alternative begins to emerge as a "leader." The leadership may be tentative, existing only until the next attribute is acquired. But when information acquisition ceases, the leading alternative becomes the candidate to be selected. Because information processing in sequential search is attribute-based, it should accentuate differences in stopping strategies adopted by consumers with different levels of product expertise (Su, Comer and Lee 2008). For this reason a sequential choice task is useful in illustrating potential differences in the decision making strategies of high and low knowledge consumers.

THEORETICAL BACKGROUND AND HYPOTHESES

Information Acquisition

It might be presumed that one of the faculties of an expert is the ability to meaningfully integrate large volumes of information during the decision process. But experts often use surprisingly few pieces of information (Shanteau 1992). The amount acquired seems to depend on the task characteristics. In structured tasks such as solving physics, mathematics, or programming problems, experts tend to use less information than novices (see, e.g., Chi, Feltovich and Glaser 1981). Then, experts' greater knowledge yields more focused (planned or "top-down") search strategies, so they tend to concentrate on information that is important and ignore information which is irrelevant. According to

Shanteau (1992), in these situations what chiefly distinguishes experts from novices is the kind rather than the quantity of information they acquire. Ettenson, Shanteau and Krogstad (1987) have argued that "skilled omission," in other words, the ability to ignore irrelevant information, is a defining characteristic of experts. In ill-structured tasks, on the other hand, experts often search for *more* information (e.g., Devine and Kozlowski 1995). In such circumstances, experts adopt more of a bottom-up, or data-driven, approach as they search for appropriate information (Adelson 1984). In the present work, decision makers engaged in a preferential choice task (i.e., one in which the best option or brand depends at least to some extent on the idiosyncratic preferences of the decision maker), a task that is much less structured than problem solving. In such circumstances, decision makers are expected to use a combination of a top-down and bottom-up based information search. Initial preferences and knowledge dictate some directed search behavior. But bottom-up factors influence information acquisition as well because in a sequential choice task, even if decision makers have control over the attributes acquired, they do not control the product attribute levels, such as price or quality. Thus the relative superiority (or inferiority) of one alternative to the other is revealed only after an attribute is selected. Additional attributes may be needed to sufficiently differentiate the two alternatives. Therefore, an information search incorporating bottom-up information processing is to be expected as well. Because of the greater product knowledge of experts, not only are the benefits of incremental information greater than for novices, but the cognitive costs of assimilating it are less. That is because if incremental costs are largely cognitive, then acquiring and processing more attribute information should be relatively easier for experts than novices (Johnson and Russo 1984; Su, Comer and Lee 2008).

H_1: Experts will acquire a greater number of attributes than novices.

Stopping Strategies

Early work by Wald (1947) posited that when decision makers judge they have acquired sufficient information, they choose the alternative that is ahead or leading at that point. Following the work of Wald is the "criterion-dependent" choice model of Aschenbrenner, Albert, and Schmalhofer (1984). In their model, decision makers are assumed to acquire one attribute of information at a time and to calculate the subjective difference between two competing alternatives, A and B, on that attribute. New information is acquired until the cumulative attribute-difference exceeds some threshold set by the decision maker. According to Aschenbrenner, Albert and Schmalhofer (1984), this process of sequential sampling continues until a decision maker has "accumulated enough evidence to be convinced that one alternative is better than the other" (p. 154). At that point the decision maker stops acquiring information. Later research by Saad and Russo (1996) identified the use of a different stopping strategy. In their study of sequential choice, some decision makers adopted an approach based on the number of attributes acquired before making a decision. Saad and Russo (1996) referred to this acquisition of a relatively stable set of key product features as a "core attributes" (CA) heuristic.

Use of the CA heuristic implies that decision makers stop acquiring information after a specific set of important attributes has been considered, then commit to a course of action (e.g., choosing an alternative). Although slight variation in the number of attributes acquired is to be expected across choices (because the core attributes alone may not provide sufficient discrimination between the alternatives in every choice situation), Saad and Russo (1996) found the number of core attributes to be relatively constant for an individual, but to vary substantially across decision makers. One individual variable that is likely to have an effect on behavior during a sequential decision is expertise in a product category. For the CA heuristic to be invoked, decision makers must

first be able to identify the most important attributes (see, for example, Spence and Brucks 1997). That is precisely the area in which experts should have greater strength than novices. Attribute information acquired by experts tends to be more relevant (i.e., have more diagnostic value) for differentiating between alternatives. As Su, Comer and Lee (2008) point out, the more detailed knowledge of experts makes it easier for them to think in terms of the relative value of attributes. That means not only can experts identify the objectively important attributes (e.g., installed RAM), but also the subjectively important ones (e.g., size of a laptop computer). By focusing on the most important attributes, an expert should be able to readily determine when to stop acquiring information and to choose the brand leading at that point. In essence, in a complex decision experts will be more likely to impose a structure on information acquired, whereas novices are more likely to accept the structure imposed by the sequential presentation of attribute information (Barrick and Spilker 2003):

H_{2a}: Compared to novices, the stopping strategies of experts will be based more heavily on use of the CA heuristic.

H_{2b}: More experts than novices will invoke the CA heuristic.

Decision Confidence

In sequential decision, stopping occurs once decision makers are certain about their decision. Certainty may arise either because they have acquired the most important information (e.g., the core attributes), or because they have reached a certain degree of confidence that one alternative is superior to the other. Hausmann and Lage (2008) refer to this "desired level of confidence" as a "validity threshold" (p. 231) and White and Hoffrage (2009) use the term "confidence threshold" (p. 281). How might experts differ from novices in their achieved levels of confidence? Spence and Brucks (1997) reported that in a real-estate task, experts were more confident of their decision than novices. Spence and Brucks (1997) were mute on the reasons their experts were more confident, but work by Muthukrishnan (1995) offers one plausible explanation, the effect of cognitive elaboration on brand choice confidence: Consumers who spent more time thinking about the brands they were considering had more confidence in their choice. Huneke, Cole and Levin (2004) proffer a supplementary explanation: They correctly predicted that, compared to low knowledge consumers engaged in a laptop-selection task, high knowledge consumers would have more confidence in their decisions because experts were more likely to appreciate what information was most important for selecting brands. Part of the increase in confidence they report for experts may derive from the higher efficiency of the experts in the choice tasks. In the present work, if the more elaborate knowledge structures of experts lead to more cognitive activity during the decision, we would expect them to be more confident. And due to the repeated-measures design of the present study, the potential for experts to process information more efficiently implies greater confidence on their part, as well.

H_{3a}: Experts will be more confident in their decisions than novices.

Hausmann and Lage (2008) noted that decision makers who acquired more information had higher levels of confidence (but not necessarily of objective performance). Consequently, consistent with H1 of the present work (viz,. experts will acquire more information), we also expect that experts will be *increasingly* more confident than novices in their decisions as they acquire additional information. That is because experts assimilate information more easily than novices, so the benefits of more information should be greater. On the other hand, novices are therefore likely to engage in additional information acquisition only in situations where they have been unable to sufficiently discriminate between the alternatives early on. The acquisition of additional, yet possibly uninformative, attribute information, implies that the confidence of novices relative to experts should decline as more information is sought:

H_{3b}: Acquiring a greater number of attributes will lead experts to be have greater confidence in their decisions than novices.

Choosing Versus Rejecting Alternatives

Knowledgeable consumers possess the ability to identify superior alternatives. But what do they do when they face two brands that are approximately equal in overall value? One option is to continue to acquire additional information to further discriminate between them. That strategy is appropriate when both alternatives are good ones. Another option is to choose neither of them, which is more likely when both alternatives are weak options. If there are several alternatives, the natural process may be to screen out the poorer ones, then select from among the more attractive ones (Ordonez et al. 1999). For a choice set perceived to be generally lacking in quality overall, the logical conclusion may be to reject all the alternatives. As Misra (2005) notes, instead of selecting the best brand, consumers may undertake to reject alternatives when the product category is known to be relatively homogeneous (that is, if brands are poorly differentiated). Knowledgeable consumers should be better able to correctly assess the degree of homogeneity of the marketplace than less-knowledgeable consumers. This implies that experts should be more discriminating not only in their selection, but in their rejection, of alternatives.

H_{4a}: Experts will reject alternatives as unsatisfactory more often than novices reject alternatives.

H_{4b}: Compared to novices, more experts will reject alternatives.

METHOD

Materials and Apparatus

Participants were exposed to a decision problem in which they were directed to choose between two alternative brands of compact cameras. Prior to the choice task, knowledge about cameras was experimentally manipulated by having participants read information that was either relevant to the product category, or irrelevant. In the present research, the designation of an expert consumer as "someone who has the [product domain] knowledge necessary to select an appropriate product for a particular usage situation" (attributed to Brucks 1985, by Mitchell and Dacin 1996, p. 220; see also Spence and Brucks 1997) is adopted. A similar definition of an expert consumer promulgated by Alba and Hutchinson (1987) has been adopted by Su, Comer and Lee (2008). Accordingly, in the present study those having higher knowledge were designated as experts, and those having lower knowledge were designated as *novices.*

Cameras were identified in earlier pre-tests as an appropriate product category. The camera choice task was presented on a desktop computer using software designed to track the sequential acquisition of information. As part of the choice task, information for a single attribute was acquired from a list of 25 product features (brand names were not included). Participants selected information by clicking on a specific feature in the list, which presented a complete attribute description for both brands (e.g., for the *weight* information, participants would see the following information—"Scale: 1 = lightest; 7 = heaviest "; "Camera A = 5; Camera B = 4"). Attributes previously viewed were dimmed in the list. After examining an attribute description, participants judged their cumulative confidence in the camera that was the leading alternative at that point in time. Their confidence was reported on a directional scale having a lower boundary of 50 percent (the starting point before any information has been acquired) and an upper confidence boundary of 100 percent ("zero chance that the leading camera will change") for each alternative.

After indicating their confidence at that point, three options were available to the decision makers: (a) choose camera A or camera B; (b) choose neither camera; (c) acquire additional attribute information for cameras A and B. If either of the first two options was selected, a

new binary choice for a different pair of cameras was presented. If the decision maker elected to acquire additional information, the list of 25 product attributes was again presented. The procedure described above was repeated until the decision maker chose either camera A, camera B, or neither. In total, participants were exposed to 15 pairs of cameras. In keeping with the approach adopted by Saad and Russo (1996), each trial was treated as an independent trial given that acquisition and stopping strategies were contingent on the conditions of the trial as well as the participant. They were independent in that in some trials the software was programmed to present small attribute differences between the options regardless of the features acquired; in other trials medium differences; and in still others, large differences. Simultaneously, across the trials the program also controlled whether overall levels of the attributes were attractive or not. Thus all participants sometimes faced choices in which the two options were similar, sometimes attractively so and sometimes not; and choices in which the two options were dissimilar, sometimes greatly, sometimes less so. For all participants, the first trial was discarded to remove non-representative observations resulting from their practicing the use of the various features of the software program.

Participants

A student sample was employed of sixty-three business students in an introductory marketing course at a medium-size West Coast university. Students were in their junior year of studies; the median age was 20.5. College students were judged a suitable population to study because of their experience using Internet search engines, and their level of comfort in acquiring and using information presented on computers. All participants had low initial technical knowledge of the product category of interest, cameras. Each was randomly assigned to one of two conditions, "Expert" or "Novice." Two participants in the novice condition failed to complete the task and were excluded from all analyses, yielding 32 participants in the expert group and 29 in the novice group.

Design and Procedure

The study was conducted in two separate stages set several days apart. In Stage 1, participants were screened for prior knowledge of cameras by having them complete an eight-question multiple-choice test. The questions were selected on the basis of earlier pre-testing. An example of a question is: "The camera lens providing an image most nearly like that of the human eye is: (a) 25mm, (b) 50mm, (c) 75mm." All participants scored lower than four correct responses (50 percent) on the test, which was the cut-off point for screening out high initial knowledge. Participants were randomly assigned to either one of two knowledge conditions, Novice or Expert, given an information packet to study, and instructed to learn the information sufficiently to pass a knowledge test when they participated in Stage 2 of the experiment. Those assigned to the expert condition received a packet of information about cameras to study and a practice exercise to complete before the choice task. The information provided, which was complicated and technical, was essentially a crash course in the various features of cameras and their benefits. Participants in the novice condition received a packet of information and an exercise pertaining to an unrelated product, all-terrain bicycles.

In Stage 2 participants met with the experimenter in groups that ranged in size from five to twenty participants. Groups met in a dedicated computer lab equipped with twenty computers running the sequential-choice software program. The procedure was the same in all cases. First, the experimenter collected participants' packets and exercises, described the task, then provided a demonstration of the software program using a choice situation different from the experimental choice task but familiar to participants. The demonstration lasted about fifteen minutes, during which the experimenter actively involved all or most of the participants in the demonstration task while

explaining the features of the program. Questions from the group were encouraged. Second, participants individually began the task by viewing the display of the 25 attributes. Attribute ranks and weights for each were then elicited. Participants ordered the 25 attributes from most to least important (re-ordering was permitted), then assigned an importance weighting to each using a scale of 5-100, with 100 reflecting the highest importance. This was to establish the attribute list for each participant to select from, ordered from most important to least important. After the attribute weighting procedure, participants engaged in 15 binary choice tasks, one after the other, for the 15 pairs of cameras. At the end of each task they indicated whether they chose camera A, camera B, or neither. For each choice, participants acquired information about both cameras at the same time, one attribute at a time, then decided whether to acquire additional information or to stop and choose.

Finally, after finishing the choice task, all participants completed a 20-question multiple-choice test of their knowledge about cameras. An example of a camera-related test questions is, "Fast lenses: (a) open faster, (b) are longer, (c) admit more light, (d) are quick-change, (e) all of the above." Although it would have been preferable to have had the knowledge test at the beginning of the experiment, we knew from prior experience that the time required by participants to answer the 20 multiple-choice questions varied substantially. In order to have the undivided attention of all participants during the software demonstration, an understanding of which was crucial to the success of the study, the test was placed after the choice task.

In summary, participants were first screened for prior knowledge, then randomly assigned to one of two knowledge conditions, either high (Expert) or low (Novice). Those in the Expert condition received materials in advance to increase their knowledge of cameras. Afterwards, participants in both conditions engaged in the camera choice task, which required them to choose between 15 pairs of alternatives, one pair at a time. As part of the binary choice task, participants could acquire up to 25 pieces of information about the pairs of alternatives. The information was presented to them sequentially in any order they wished. In each of the 15 trials, after viewing sufficient information participants selected one of the alternatives, then moved on to the next trial.

RESULTS

To ensure that the expertise manipulation was successful, results from the second knowledge test administered at the end of the study were compared for the two groups, Expert (n = 32) and Novice (n = 29). Expert scores on the test (M_{Expert} = 10.56 out of 20) were significantly higher than Novice scores (M_{Novice} = 4.76, $t[59] = 3.45$, $p < .001$). Furthermore, the minimum Expert score was 9, with all Novice scores falling below that. Many of the test questions were designed to be quite challenging (the highest expert score was 13). In this task, a score of at least 9 out of 20 correct responses indicated a successful expertise manipulation. Before turning to the broader stopping strategies used by Expert and Novice consumers, we address the specific issues of information acquisition and confidence jointly because of their related analyses.

Information Acquired and Achieved Confidence

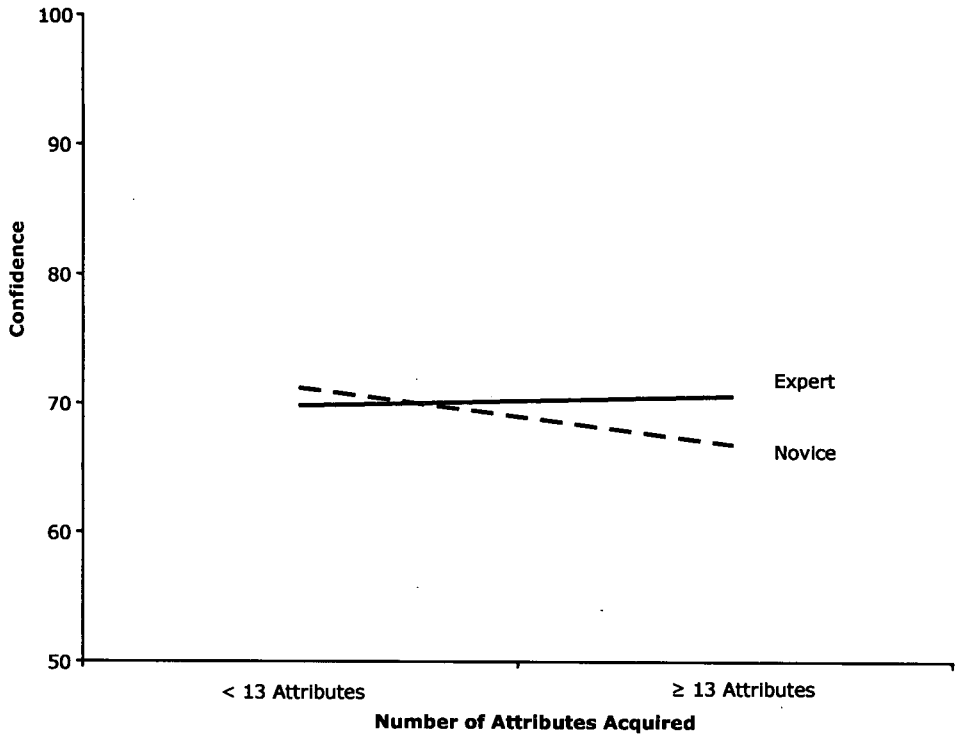
Deciding how much information to acquire before stopping is a fundamental component of a sequential choice task. Recall H_1, namely that in making their choices Experts will acquire more information than Novices. We tested this by examining the overall amount of information acquired by each group, Experts and Novices. Of the 25 available attributes across the 14 trials of each participant, the mean number acquired by Experts was 13.33. This value was significantly higher than the number acquired by Novices (M_{Novice} = 11.05, $t[846] = 4.46$, $p < .001$). Thus support was found for H1, suggesting Experts search for and assimilate more information. Does this extra information, as predicted (H_{3a}), make Experts more

confident in their decisions? The answer is no. The overall confidence of Experts (M_{Expert} = 69.46 percent) was actually slightly less than that of Novices (M_{Novice} = 70.88 percent), but not reliably so ($t[797] = -1.54$, $p > .10$). However, H_{3b}, which predicted that Experts would have greater confidence than Novices in their decisions when many attributes were acquired, was supported. To test H_{3b}, we regressed confidence for each trial on the number of attributes acquired. Trials in which the full 25 attributes were acquired were not included in this analysis because the resultant confidence might reflect not so much a conscious decision to stop acquiring more information as merely the paucity of additional information. In the regression model, an interaction term for the two conditions, high and low knowledge was significant ($t[686] = 2.44$, $p < .02$), indicating that Experts were more confident than Novices when they acquired additional information (see Figure 1). This differential, however, did not arise as expected from an increase in the confidence of Experts (slope of effect of additional information on their confidence = -0.03, which is not significantly different from a slope of zero), but instead from a significant decline in the confidence of Novices in their decision when more attributes were acquired (slope = -0.52, $t[354] = -3.43$, $p < .001$). The conclusion is that Experts maintained a relatively uniform degree of confidence in their decisions regardless of the number of attributes acquired, whereas Novices decreased as they acquired more attributes.

Stopping Strategies

Core attributes heuristic strategy. Because of their more directed search strategies, we predicted (H_{2a}) Experts would acquire a relatively stable set of attributes. This hypothesis was tested by examining the extent

FIGURE 1
Confidence levels as a function of information search for expert and novice consumers



to which Experts and Novices invoked the CA heuristic. Use of the CA heuristic implies the acquiring of a set number of specific attributes to be examined when evaluating any alternative. One measure of how much the heuristic is used is the CA-score, where a value of 100 represents exclusive use of the core attributes heuristic (i.e., always gets exactly the same set of information), and 0 represents the completely random acquisition of attribute information (for a more detailed explanation of the measure, see Saad and Russo, 1996). The CA-score for Experts (M_{Expert} = 80.95) was significantly higher than the CA-score for Novices (M_{Novice} = 70.60, *t[58]* = 2.31, p = .04). This supports the notion that the stopping strategies of Experts are more heavily oriented toward use of the CA heuristic.

Additional support was found as well when H_{2b} was tested by determining the percentage of decision makers in each of the Expert and Novice groups who were "heavy" CA-heuristic users (i.e., those having CA-scores $\geq$ 75). In the Expert condition, 83.9 percent fell into the heavy user category, significantly more than the 58.6 percent of Novices (chi-square = 7.04, df = 1, $p < .01$). Both sets of results suggest that Experts, as compared to Novices, were more reliable in acquiring the same attributes. These findings are consistent with those of previous decision research in areas other than sequential choice situations, namely that experts are more directed or focused in their search for relevant information (e.g., Ettenson et al. 1987).

Choosing versus rejecting alternatives. Recall that the decision-tracking software was programmed to randomly present small, medium, and large differences between the options, such that at times participants faced choices in which two options were quite similar, sometimes attractively so and sometimes not. The presentation of those equivalent alternatives was designed to determine whether Experts were more discriminating in such situations (H_{4a}). In the Expert group, neither of the brands was chosen as an option over three times more often as in the Novice group (in 7.6 percent of the trials vs. 2.2 percent, chi-square = 15.0, df = 1, $p < .001$). As predicted (H_{4b}), a significantly greater percentage of Experts decided to reject at least one pair of cameras (57.5 percent vs. 37.5 percent, chi-square = 4.4, df = 1, p = .04). Apparently, if the cumulative discrimination between the two brands is seen as not sufficiently large after acquiring considerable attribute information, both cameras are abandoned as unsuitable rather than an attempt being made to advance one as superior to the other (when both are inferior in an absolute sense). This is consistent with the lower confidence levels participants achieved when rejecting both cameras (M_{Reject} = 57.08) as compared to choosing one of the cameras (M_{Choose} = 70.78, *t[48]* = 9.68, $p < .001$). There was no significant difference in confidence between Experts and Novices when rejecting ($p > .10$).

DISCUSSION AND IMPLICATIONS

Our goal was to determine if consumer expertise affects stopping behavior during binary choice. The evidence from the present work suggests that this is the case. Two specific research findings point to this. First, expertise moderated information acquisition, which affected stopping points. High knowledge consumers were found to be more directed in their information search behavior. They more often made use of the core attributes heuristic, in which they identified a subset of important attributes and then consistently acquired them when choosing between alternatives. Second, expertise moderated the stopping strategies used. The greater knowledge of experts allowed them to discriminate more carefully between relatively superior and absolutely superior alternatives. Knowledgeable consumers rejected unsuitable pairs of alternatives far more often than those with less knowledge, and thus were more discriminating. They were more discriminating in that when they did reject both alternatives, their confidence levels were lower than when they chose an alternative. Those with low knowledge displayed a similar pattern. Evidently, when a promising level of

discrimination between the two alternatives failed to develop after a reasonable search process, they chose neither brand rather than continue along a perhaps fruitless path. Those with high knowledge, however, rejected both available alternatives more than three times as often as those with low knowledge, lending support to the notion that expert consumers are more discriminating. That higher level of discrimination did not, however, lead knowledgeable consumers to achieve higher levels of confidence in their decisions than those achieved by less-knowledgeable consumers.

Because expert and novice consumers evidently search not only for different information, but in different orders and in different quantities, there are important implications for practice. One is that producers and retailers should be prepared to provide tailored information to different segments of consumers. For illustration, consider two different approaches now utilized: (a) The first is to provide all relevant information in an alternative-by-attribute matrix information-board format (e.g., Payne 1976), whereby consumers evaluate the presented information in a holistic fashion, perhaps with some information manipulation (e.g., sorting by brands or price). (b) A second approach is to provide an "expert" recommendation (in the sense that it is provided by an expert), with little if any attribute information presented. The first approach is the one adopted by many independent Internet resellers who wish to appear objective and to avoid apparent endorsement of any particular brand they offer. Unfortunately, for many buyers such a presentation is a case of information overload. Contrast this approach with a second approach, namely one adopted by *Consumer Reports,* which is published by Consumer Union. *Consumer Reports* provides information that is objective because it subjects all brands to a consistent evaluation procedure. The process typically leads to a ranked-order list of the best-to-worst products, albeit at the expense of detailed information about many of each brand's attributes. For many consumers, this approach is sufficient. But for some expert consumers, whose preferences may subtly differ from *Consumer Reports'* evaluation procedure, it can be a case of one-size-fits-all. For these more-expert consumers, an information-rich format absent a recommendation may actually be preferred.

Expert buyers can usefully deal with more information than novice consumers, and their search strategies reflect this. Less-expert buyers may well be satisfied with their brand selections if the information they view is of a more restricted nature (that is, restricted in terms of attribute detail information, not the available number of alternatives). The challenge is to develop the appropriate options, and to identify those buyers who will benefit from each. Software programs often offer the choice of "basic" or "extended" drop-down menus—with the default being the basic menu. A parallel approach may be appropriate for web sites providing product information, such as a default mode being the basic page for the novice, perhaps with an "expert" recommendation provided as well. How would more-expert consumers proceed to a more extended or advanced information acquisition webpage? One obvious way is simply to provide an "expert" or "advanced" link. A second way is to evaluate the information initially sought by the visitor, with a particular pattern of requests leading to a simplified novice page and another pattern leading to a more detailed information page for expert consumers.

Two additional ways are suggested to permit experts more options to tailor the information they acquire: (a) Passive/Active version: In the "passive" mode, the website arrives at an "expert" recommendation based on the revealed search pattern of site visitors; in the "active" mode, more-expert consumers are afforded the opportunity to directly tweak the "expert" recommendations made by the website by actively changing the parameters of the preferred product attributes. (b) Scorekeeper version, which requires considerably more engagement on the part of the decision maker. A "scorekeeper" is created whereby the leading

alternative rises in value relative to the other alternative. Admittedly, this could be a somewhat unwieldy approach if there are more than two alternatives. But it could be conceivably simplified by using the analogy of, say a horse race, where decision makers move on-screen sliders to portray "which of the horses [that is, the two brands under consideration] is further ahead in the race at this point." To the extent that buyers seek suitable discrimination between two competing brands before making a purchase decision, this approach clearly depicts the leading alternative. In summary, the conclusion is that given the potential for different levels of consumer expertise, complex preferential decisions will benefit from information presentation and delivery designed to take these differences into account.

LIMITATIONS AND FUTURE RESEARCH

Although this study furthers our understanding of the stopping strategies employed by expert and novice consumers, there are still questions unanswered. First of all, in this study knowledge levels of decision makers were experimentally manipulated. This is a strength of the design, but clearly there are limits to how knowledgeable consumers can truly become in a very limited period of time. On the other hand, that significant observable differences in behavior were found given a modest difference in knowledge levels portends well for the insights to be gained from studies involving decision makers with vastly greater knowledge. A worthwhile place to start would be with a decision domain in which there are naturally occurring experts (e.g., livestock judges, medical clinicians—or specifically in the consumer domain, serious hobbyists, e.g., photographers, cyclists). It may also be desirable to add an element of time pressure, which would tend to magnify the outcomes obtained. Second, there is the issue of purchase-experience satisfaction. This is partly, but not entirely, captured by the measure of decision confidence. Novices were less confident when they acquired more attribute information. One implication is that non-expert buyers will feel less satisfaction after they acquire information beyond a certain point. Additionally, to fully understand the thinking processes of decision makers may require that concurrent verbal protocols be collected. Now that baseline information exists on the number of attributes acquired, the cumulative confidence levels achieved, and so on, in the absence of obtrusive measures, it would be worthwhile to trace the decision processes at a much more detailed level as well. Finally, the current findings point to the shortfall in our knowledge of how experts and novices deal with information when the cost of acquiring it is not nominal (i.e., acquiring useful information usually involves a "penalty," perhaps of time or money or effort, for the decision maker). Certainly one would expect experts to manage the implied cost-benefit trade -off more effectively than less-experienced decision makers, especially in situations that involve actual product purchase. An understanding of how these trade-offs are managed would be another important step toward a model fully accounting for how decision makers "decide how to decide."

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