Shaping Online Consumer Choice by Partitioning the Web

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ABSTRACT

This research explores how partitioning attributes in online search interfaces changes the valuations of those attributes—and impacts subsequent choice—such that attributes that are displayed as separate categories tend to receive greater decision weight than attributes grouped under umbrella categories. Across several choice domains—cars, dates, and hotels—we show that different attribute partitions impact the importance assigned to attributes (Studies 1 and 2), as well as consumer choices (Studies 3 and 4). We argue that these effects are due in part to users' willingness to use the implicit recommendations of interface designers to determine the importance of attributes, a willingness that extends to following explicit recommendations of online agents based on those attributes (Study 5).

One of the many features that social networking sites such as Facebook.com and Match.com have added to the process of acquaintanceship is a feature whereby one can click on any attribute of some user (for instance, that person's favorite television show from the 1980s), and receive a list of other users who share that attribute. In the real world, discovering fellow devotees of *The Golden Girls* is a difficult proposition; online search interfaces, on the other hand, offer instant access to such information. Imagine an online dating Web site that allows users to search on four attributes—age, height, weight, and television preferences—as opposed to one that groups the first three attributes under a

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"demographics" category. We suggest that the latter partitioning might cause users to implicitly group the three demographic attributes together and therefore divert some of the weight accorded to them, such that television preferences might suddenly be weighted as heavily as all three demographic attributes combined.

We explore one common instance of how the partitioning of attributes on online interfaces can impact both their importance to consumers and those consumers' subsequent decisions, even when holding the attributes themselves constant. Most importantly, we study this phenomenon in the context of online consumer choice: Compared with offline marketing—where changing the importance of an attribute might require new packaging, new advertising, or both—online interfaces allow marketers to engage in moment-to-moment management of the presence, absence, and partitioning of attributes with remarkable ease. As a result, understanding how and why the presentation of attributes affects choice has the potential to offer numerous opportunities for marketers to guide online consumer decision making.

CONTEXT-DEPENDENT CHOICE

While we focus on cases in which different partitions of attributes might reshape consumer preferences, different presentations of search criteria do not necessarily lead people down the wrong path. Indeed, in a world of abundant product choices, organizing information can serve the very useful purpose of helping people filter out irrelevant attributes to home in on those attributes about which they care most. As such, many online retailers design interfaces in a deliberate effort to improve the search process for consumers (Bakos, 1997; Hearst, 2006; Schafer, Konstan, & Riedl, 1999). Grouping options can assist consumers in part because categories provide important information about the shared attributes of items in that category (Huber & Kline, 1991; Roberts & Lattin, 1991), which can then help choosers refine their set of options (Chakravarti & Janiszewski, 2003; Diehl, 2005; Diehl & Zauberman, 2005; Zhang & Fitzsimons, 1999); in Diehl, Kornish, and Lynch (2003), for example, providing users with screening devices improved their decision making. Likewise, presenting choices in narrower or broader brackets may determine whether consequences are considered in isolation or in combination (Read, Loewenstein, & Rabin, 1999); for instance, the aggregate effects of pack-a-day smoking may not be perceived until the decision is framed as one of smoking 7300 cigarettes per year.

At the same time, however, changes in how information is presented can also alter consumer preferences in ways that do not necessarily improve outcomes. A large body of research has explored the tendency for individuals to construct their preferences based on whatever information happens to be salient in the environment (Ariely & Norton, 2008; Bettman, Luce, & Payne, 1998; Payne, Bettman, & Johnson, 1992), leading consumers to infer the attractiveness of options from contextual cues such as which competing options are made salient (Prelec, Wernerfelt, & Zettelmeyer, 1997; Read, Loewenstein, & Rabin, 1999). Indeed, Tversky's (1972) seminal work on elimination by aspects has at its core the notion that the order in which information is considered—a factor that should be irrelevant in a rational model—can influence the option that is ultimately chosen (Bettman & Kakkar, 1977; Chakravarti, Janiszewski, & Ulkumen,

2006). In the online domain, subtle changes to interfaces can similarly bring some options or attributes to the forefront (Kleinmuntz & Schkade, 1993; Lurie & Mason, 2007); Mandel and Johnson (2002), for example, showed that visual priming on Web sites makes some information more focal to decision makers. Regardless of the outcome Web designers have in mind for consumers, they must make a number of decisions about which attributes to include or exclude (should television preferences be included?) and how prominent to make such attributes (should they be presented alone or in conjunction with other preferences such as music and movies?). Given research on the impact of such environmental cues on the malleability of preferences, there is little doubt that such decisions impact consumer choice (Johnson et al., 2004).

THE PRESENT RESEARCH

In this paper, we explore specifically how the partitioning of attributes influences the weight that people place on them in online choice. A growing body of research has documented a "diversification bias," the tendency for individuals to spread consumption evenly across categories of options (Read & Loewenstein, 1995; Simonson, 1990; Simonson & Winer, 1992). For instance, in an experiment in which participants chose between five investment funds, those presented with four equity funds and one fixed-income fund allocated 68% to equities, while those presented with just one equity fund and four fixed-income funds allocated just 43% to equities (Benartzi & Thaler, 2001). Similarly, partitioning options even more explicitly into different categories—such as grouping wines by grape compared with region—can impact subsequent choices, with consumers diversifying more across different grapes when wines are grouped by grape, but diversifying more across different regions when wines are grouped by region (Fox, Ratner, & Lieb, 2005).

Here, we examine groupings not of options themselves but of the attributes that decision makers use to compare options. Just as the unpacking of hypotheses about the world into components may increase their estimated aggregate likelihood (Rottenstreich & Tversky, 1997), refinement of attribute descriptions may increase their perceived importance. Fischoff, Slovic, and Lichtenstein (1978), for example, showed participants lists of 4–8 causes for why a car failed to start (such as "battery charge insufficient"); one cause always had a catch-all "all other problems" label. Fischoff, Slovic, and Lichtenstein (1978) found that while battery charge was weighted highly when listed as a distinct cause, when it was not listed (and thus was an unnamed component of the "all other reasons" category), the catch-all category failed to receive as much weight as it should have had participants incorporated the weight previously assigned to the battery charge cause. Similarly, Weber, Eisenfuhr, and Von Winterfeldt (1988) showed that participants in a job selection task placed more total weight on a set of attributes when they were listed as separate categories than when they were not listed but instead labeled with a catch-all category name. Weber, Eisenfuhr, and Von Winterfeldt (1988) argue that distinctly listed attributes become more salient in the decision process because their specification draws attention to them where they might have otherwise not have been taken into account.

We suggest that while partitioning can impact judgment by making attributes "top-of-mind" or not, different partitions can keep all attributes equally

salient but still influence their impact on decision making by altering their underlying importance. We demonstrate that the weighting of attributes differs even when the same information content is displayed across partitions: Rather than group attributes into ambiguous "catch-all" categories, we use a paradigm in which we hold attributes constant and simply alter consumers' perceptions of how much weight they should be accorded, by providing category labels for attributes but continuing to list those attributes. This simple change in the presentation of attributes compared to previous investigations allows us to address the important question—from both a practical and a theoretical standpoint—of whether salience is the sole driver of the impact of partitions. We suggest that consumers are not driven solely by salience in weighting attributes, but that they may treat partitions—and the marketers and interface designers who choose them—as signaling the actual importance of different attributes, reflective of Gricean norms to make communication both informative and succinct (Grice, 1975). If this is the case—that consumers are willing to use the implicit recommendations of interface designers to shape their weighting of attributes—then we would also expect that consumers should be willing to use their explicit recommendations as well, which we explore by integrating our attribute partitioning paradigm with an online recommendation agent.

Studies 1 and 2 explore how different attribute partitions change the value participants place on attributes for choosing both cars and people to date. Studies 3 and 4 investigate the impact of these partitions on choices between both dating partners and hotels, exploring whether these altered valuations can influence decisions. Finally, Study 5 examines whether consumers' endorsement of the attribute weights implicit in partitions are also reflected in their acceptance of explicit recommendations by recommendation agents regarding their ideal dating partner.

STUDY 1

In this first study, we wanted to establish our basic effect, that partitioning attributes in online search interfaces can change the weight that people place on them. In contrast to previous research (Fischoff, Slovic, & Lichtenstein, 1978; Weber, Eisenfuhr, & Von Winterfeldt, 1988), we held the salience of attributes constant by always including each attribute, and merely varying whether they were grouped under an umbrella category or not. We expected that grouping attributes would lead them to receive less weight than when they were partitioned and presented separately, akin to our opening example of age, height, and weight being afforded less weight when perceived as a group of demographic attributes. We explored this phenomenon in the domain of purchasing a car.

Method

Participants (N = 98, 52 female, M_{age} = 22.7) received $20 to complete the task along with several unrelated studies.

Participants were asked to imagine they were considering the purchase of a new car, and to distribute 100 points across various attributes to indicate their relative importance in making that decision. Each participant was randomized

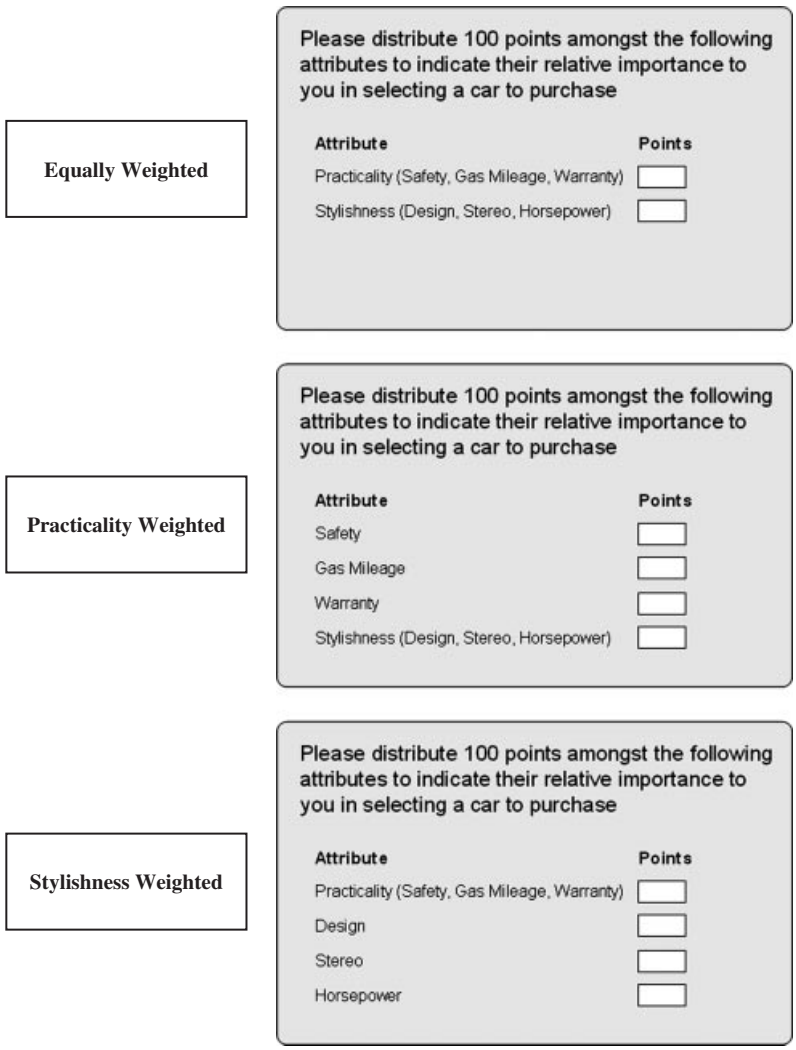

Figure 1. Attribute presentations used for the "Choosing a Car" task in Study 1.

into one of three conditions: Those in the "Equally Weighted" condition saw three practicality attributes (Safety, Gas Mileage, and Warranty) grouped into a single category and three stylishness attributes (Design, Stereo, and Horsepower) grouped into another category; those in the "Practicality Weighted" condition saw each practicality attribute listed separately but all stylishness attributes grouped; and those in the "Stylishness Weighted" condition saw each stylishness attribute listed separately but all practicality attributes grouped (see Figure 1). We counterbalanced whether stylishness or practicality attributes appeared first.

Finally, to ensure that participants in the three conditions had similar experience in the product category, participants indicated whether they owned a car (Yes/No), and whether they had purchased a car in the last year (Yes/No).

Table 1. Average Number of Points Given to Attributes when "Choosing a Car" (Study 1).

	Equally Weighted	Practicality Weighted	Stylishness Weighted
Practicality	68.3		47.4
Safety		22.0	
Gas Mileage		35.7	
Warranty		16.0	
Stylishness	31.7	26.3	
Design			25.9
Stereo			13.6
Horsepower			13.1
Dependent Variable (Sum of Practicality Points)	68.3	73.7	47.4

Results and Discussion

There were no differences among the three conditions in current car ownership, $\chi^2(2,98) = 2.48, p > 0.28$, or in frequency of new car purchase in the last two years, $\chi^2(2,98) = 2.38, p > 0.30$, suggesting that participants in the different conditions did not vary on consumer experience in the product category.

In order to compare the relative importance ascribed to a car's practicality versus stylishness, we computed the sum of points given to practicality attributes in all versions (equal to 100 minus the sum of points given to stylishness attributes). As expected, weighting of the two types of information varied by condition [$F(2,86) = 11.3, p < 0.0001$] (see Table 1). In the "Equally Weighted" condition, participants demonstrated a slight preference for practicality over stylishness ($M = 68.3$, $SD = 21.0$). As predicted, however, this preference for practicality increased ($M = 73.7, SD = 22.2$) when practicality attributes were broken out into separate categories but stylishness attributes were grouped in the "Practicality Weighted" condition, while the preference for practicality was reduced ($M = 47.4$, $SD = 23.5$) when stylishness attributes were broken out into separate categories and practicality attributes were grouped in the "Stylishness Weighted" condition, such that the linear contrast was significant [$t(95) = 4.89, p < 0.001$].

There was no main effect of order of attribute presentation, nor did this variable interact with any other variables (Fs < 1, ps > 0.59). We did observe a main effect for gender, such that females ($M = 68.2, SD = 22.3$) showed a stronger overall preference for practicality than did males [$M = 57.2, SD = 26.7; F(1,86) = 3.9, p = 0.05$], but importantly, gender did not interact with any of our primary analyses (Fs < 1, ps > 0.35).

STUDY 2

In Study 1, we chose six attributes that we believed to be important in car purchasing, but it is possible that the impact of partitions is due in part to the fact that consumers may not see these particular attributes as important in choosing a car. A strong test of the impact of partitions is to show that partitions impact

ratings of attribute importance even when we use attributes that we know to be particularly important to consumers. To test this, in Study 2 we asked participants to list attributes they considered most important in making a decision, and then partitioned these *very same* attributes in different ways. In addition, we used a domain more familiar to our primarily college-aged students, choosing someone to date using an online dating Web site (Frost et al., 2008; Norton, Frost, & Ariely, 2007).

Method

Participants ($N = 145$; 70 female; $M_{age} = 22.2$) received $25 to complete this computer study along with several unrelated studies.

Participants in the "Self-Generated" condition were first asked to list six personality attributes that would be most important to them in selecting a person to date. Those in the "Provided" condition did not complete this task, but were instead provided with a list of six personality attributes: Intelligence, Sense of Humor, Common Sense, Kindness, Generosity, and Friendliness.

On the next screen, participants were asked to distribute 100 points among attributes of a potential date to indicate their relative importance. For this task, each participant was further randomized into one of two conditions: All participants saw one category labeled "Appearance," while participants in the "Personality Weighted" condition saw six personality attributes listed separately and those in the "Equally Weighted" condition saw six personality attributes grouped under a "Personality" heading. Thus, participants in the "Equally Weighted" condition provided two numbers, one for appearance and one for personality, while those in the "Personality Weighted" condition provided seven numbers, one for appearance and one for each of the six personality attributes. For participants in the "Self-Generated" condition, these personality attributes were the six they had generated previously, while those in the "Provided" condition were always given the same six personality attributes they had been shown previously. As in Study 1, we controlled for salience by listing the personality attributes in parentheses in the "Equally Weighted" condition, so that they were visible to participants even when they assigned points to them in the aggregate. The overall design was thus 2 ("Self-Generated" vs. "Provided") $\times$ 2 ("Personality Weighted" vs. "Equally Weighted").

We predicted a main effect of more total points allocated to personality attributes in the "Personality Weighted" condition. In addition, we predicted an interaction such that the effect of attribute grouping would be stronger when participants were provided with our set of personality attributes rather than those that they had generated themselves. Most importantly, however, we expected that our partition manipulation would have a significant impact on importance ratings even for those participants who had listed the personality traits they idiosyncratically thought most important, suggesting that our effects are not just an artifact of picking attributes that participants do not find relevant, but instead can influence even participants' chronic preferences.

Results and Discussion

We computed a metric of attribute importance by summing the points allocated to personality attributes. As predicted, participants allocated more points to

personality attributes in the "Personality Weighted" condition (M = 78.7, SD = 13.1) than in the "Equally Weighted" condition [M = 56.6, SD = 17.0; $F(1,141) = 79.44, p < 0.001$]. We also observed a significant interaction, such that the difference between importance assigned to personality was larger in the "Provided" than the "Self-Generated" condition [$F(1,141) = 79.44$, $p < 0.001$]. However, while the difference between the two was relatively smaller in the "Self-Generated" condition (Ms = 76.4 and 59.6, SDs = 13.0 and 15.2) than in the "Provided" condition (Ms = 80.2 and 53.8, SDs = 10.4 and 18.3), both differences were significant (ts $> 4.69, p$s < 0.001).

Finally, while we observed a main effect of participant gender, such that women assigned more points to personality than did men [Ms = 80.2 and 53.8, SDs = 10.4 and 18.3; $F(1,141) = 10.33, p < 0.01$], there was no evidence of an interaction between gender and our predicted two-way interaction [$F(1,141) = 0.16, p = 0.69$].

Results from Study 2 suggest that partitioning impacts the weighting that participants place not only on provided attributes, but even on those attributes that participants themselves deem most important, offering strong evidence for the powerful influence of partitioning on preferences.

STUDY 3

Studies 1 and 2 demonstrate the impact of attribute partitions on the relative weight afforded to different attributes, even for those attributes consumers idiosyncratically consider most important. In Studies 3 and 4, we move to exploring the impact of partitions on the variable of most interest to marketers: consumer choice. In Study 3, we specifically explore whether, as our account suggests, the impact of partitions on choice is driven by the different levels of attribute importance that partitions cause, by examining whether the shifts in attribute weights mediate the impact of partitions on choice.

In addition, Study 3 is designed to explore whether salience of attributes or importance of attributes underlies the changes in attribute weights caused by different partitions. Results from Study 2 support an importance account, as it is unlikely that attributes recently generated by participants are not still salient. In Study 3, however, we examine this issue directly by testing participants' memory for attributes. A salience account might predict that partitions impact memory for attributes since grouping renders them literally less noticeable in the choice environment; our account predicts that memory for attributes under different partitions will remain intact, and only the importance of those attributes will change.

Method

Participants (N = 38; 30 female; M_{age} = 21.0) completed the survey online.

As in Study 2, participants were asked to imagine they were considering choosing someone to date. Each participant was randomized into one of two conditions: Those in the "Personality Weighted" condition saw two personality attributes (Intelligence, Kindness) listed separately but two appearance attributes (Body, Face) grouped, while those in the "Appearance Weighted" condition saw the

two appearance attributes listed separately but the two personality attributes grouped. We counterbalanced whether appearance or personality attributes appeared first.

Participants first distributed 100 points across the attributes to indicate their relative importance in making a decision. On the following page, they were presented with a choice between two potential dates; one date—the "Personality Date" (not labeled as such to participants) was described as "above average" on the two personality attributes but "average" on the two appearance attributes, while the other—the "Appearance Date" (also not labeled) was described as "above average" on the two appearance attributes but "average" on the two personality attributes. On the next page, participants were instructed to free recall the four attributes we had asked them to use to make their choices, by filling in four response boxes.

Finally, to ensure that participants in the two conditions had similar dating experience, participants indicated how many people they had dated in the past year, as well as their total number of dates.

Results and Discussion

Participants in the two conditions did not differ in either their number of dates in the last year or their total number of dates (ts $< 1, p$s > 0.36), suggesting that participants in the different conditions did not vary in their dating experience.

Importance. We again created a metric of attribute importance by computing the sum of points given to personality attributes. As predicted, the relative weighting of personality differed across conditions [$F(1,20) = 13.1, p < 0.001$]. Participants in the "Personality Weighted" condition ($M = 75.3, SD = 8.1$) gave greater weight to personality traits than did those in the "Appearance Weighted" condition ($M = 57.1, SD = 10.6$). There were no main effects of either order of attribute presentation or participant gender, nor were there any significant interactions (all Fs < 1, all ps > 0.69).

Choice. Our partitions impacted participants' choices as well. While fully 100% of participants chose the "Personality Date" option in the "Personality Weighted" condition, the preference for this option decreased to just 68.4% in the "Appearance Weighted" condition [$\chi^2(1,38) = 7.13, p < 0.01$]. As with importance ratings, we observed no main effects of attribute order or participant gender, and no interactions (all Fs < 2, all ps > 0.16).

Mediation. To test whether the importance assigned to attributes as a result of our partitions drives the effects we observed for choice, we conducted a mediational analysis following the procedures outlined by Baron and Kenny (1986). Condition was a significant predictor of both choice ($\beta = -0.43, p < 0.01$) and of importance ($\beta = -0.70, p < 0.001$). When we entered both condition and importance into a regression predicting choice, importance remained a significant predictor ($\beta = 0.42, p < 0.05$), while the relationship between condition and choice dropped to nonsignificant ($\beta = -0.14, p > 0.49$; Sobel's $Z = 1.90, p = 0.058$).

Memory for Attributes. Finally, to test whether our partition manipulations impacted choice not merely through salience but through changes in importance,

we examined whether participants accurately remembered attributes. Again, while a salience account might posit that grouped attributes would receive less attention, leading to decreased memory for those attributes, we suggest that attributes remain equally salient—and therefore memorable—when grouped, but that partitions subtly impact the weight that participants lend them. In support of our account, we observed nearly perfect free recall of attributes across partition conditions—some 92% of participants recalled all four attributes. In addition, of the three participants who did make errors, two accurately recalled three of the four, while only one participant recalled no attributes. We note, however, that our memory test was based on just four quite common attributes, perhaps biasing our results in favor of accurate recall. Clearly, using a greater number of unfamiliar traits would help to shed light on whether salience plays a role in the impact of partitions on choice. At the same time, however, many consumer decisions are based on a small number of familiar attributes, such that even if memory effects emerged for very novel attributes (say, number of freckles), it would be unclear whether such effects would impact the bulk of real-world decisions. We revisit the possible role of salience in the General Discussion.

STUDY 4

Results from Study 3 provide support for our hypothesis that decision makers weight attributes differently depending on partitions, which then impacts their choices. We note, however, that these choice results might be due in part to demand effects. In most real-world choices, individuals make their selections without explicitly stating the relative importance they place on different attributes. In Study 4, therefore, we presented participants with a more realistic task—choosing a hotel—in which we altered the presentation of attribute information but gave them only the task of choosing the hotel they preferred, as they would be likely to do if visiting an actual Web site.

Method

Participants (N = 124; 69 female; M_{age} = 24.0) received $20 to complete this computer study in addition to several unrelated studies. They were randomized into three conditions, in which they viewed an interface analogous to that used in Study 1: The "Equally Weighted" condition aggregated both room attributes (cleanliness and comfort) and hotel attributes (service and condition), the "Room Weighted" condition grouped the hotel attributes but presented the two room attributes separately, and the "Hotel Weighted" condition grouped the room attributes but presented the two hotel attributes separately.

Participants were asked to choose one of ten hotel options based on 5-point ratings for each of the categories displayed (two categories for the "Equally Weighted" condition; three categories each for the "Room Weighted" and "Hotel Weighted" conditions). We structured these ten options such that five options were always stronger on room attributes (random ratings drawn from a uniform distribution ranging from 3 to 5 for both room cleanliness and comfort) but weaker on hotel attributes (uniform ratings between 1 and 3 for both hotel service and condition); this was reversed for the other five options, which were therefore

Table 2. An Example of the Hotel Options Shown to Participants in Study 4.

	Room Cleanliness	Room Comfort	Hotel Service and Condition
Hotel 1	4.1	4.7	1.8
Hotel 2	1.8	2.1	4.4
Hotel 3	4.8	3.1	2.2
Hotel 4	3.8	4.2	1.8
Hotel 5	3.3	3.2	1.4
Hotel 6	2.6	1.1	3.9
Hotel 7	1.6	2.3	3.7
Hotel 8	1.8	2.6	4.5
Hotel 9	4.3	4.2	2.4
Hotel 10	1.9	2.5	3.9

stronger on hotel attributes and weaker on room attributes. For attributes that were aggregated into a single category, the ratings of the two component attributes were averaged to compute the category rating.

We counterbalanced whether room or hotel attributes appeared on the left or right, which did not impact the analyses below, so we do not report it further; in addition, the ten options were presented in random order. Note that since the information shown in each condition was based on the same underlying attribute ratings, participants had the option to "unpack" the ratings that were aggregated into a single category; upon noticing that room cleanliness and comfort were grouped, for example, a participant could have weighted the aggregated rating twice as heavily in her decision.

Table 2 contains an example of the options that might have been offered to a participant. In this example, Hotels 1, 3, 4, 5, and 9 are the random five hotels that are stronger on room attributes than hotel attributes; we predicted that participants in the "Room Weighted" condition would be more likely to pick one of these options than participants in the "Hotel Weighted" condition.

After reviewing their options, all participants indicated which hotel they would choose.

Results and Discussion

We computed a binary dependent variable indicating whether a participant selected a hotel that was stronger on room attributes. As expected, participants' hotel selections differed across conditions [$\chi^2(2,124) = 6.58, p < 0.04$]. In the "Equally Weighted" condition, participants exhibited a strong preference for options stronger on room attributes (84% of choices); as predicted, this preference for hotels with better rooms increased even further (98%) in the "Room Weighted" version but decreased (80%) in the "Hotel Weighted" condition. Thus, the preference for hotels with better rooms followed a linear pattern that mirrored the extent to which room attributes were highlighted ($\beta = 0.22, p < 0.02$).

We observed no main effect of participant gender, and no interaction (Fs < 1, ps > 0.47).

Study 4 demonstrates that choice is influenced by partitioning without participants ever having stated explicitly how heavily they weight component attributes.

These results suggest that partitions can impact consumer choice even in more real-world choice settings, in which marketers are frequently unable to solicit attribute weights from consumers.

STUDY 5

Studies 2 and 3 both offered support for our account that the shifts in attribute weightings caused by interfaces with different partitions are due not merely to salience of attributes, but also to the inferences that consumers make about the actual importance of attributes. In Study 5, we tested whether this acceptance of marketers' implicit suggestions (their partitions of attributes) would also be reflected in acceptance of marketers' explicit suggestions. We explored whether participants whose attribute weights have been altered by partitions will follow recommendations from an online recommendation agent based on those altered attribute weights (Adomavicius & Tuzhilin, 2005; Ansari, Essegaier, & Kohli, 2000; Hirsh, Basu, & Davison, 2000; Spiekerman & Paraschiv, 2002). As another check of participants' acceptance of recommendations—and since trust in the integrity of such agents is crucial (Fitzsimons & Lehmann, 2004; Pu & Chen, 2006; Smith, Menon, & Sivakumar, 2005)—we also assessed participants' satisfaction with their choices.

Method

Participants ($N = 76$; 36 female; $M_{age} = 22.1$) received $20 to complete this computer study in addition to several unrelated studies.

Participants were instructed to distribute 100 points across attributes to indicate their importance in choosing someone to date; they were assigned to the "Equally Weighted," "Personality Weighted," or "Appearance Weighted" condition. We used the same six attributes as in Study 2. The next screen then presented participants with three possible dating options from which to choose. Each option had ratings for all six attributes on 10-point scales (see Table 3 for the three options). We calculated the expected value of each option based on each participant's point distribution, and then presented the options in order of expected value from highest to lowest. For example, if a participant in the "Personality Weighted" condition allotted 25 points to each of the four available categories (intelligence, sense of humor, kindness, and aggregated appearance attributes), a date option with a rating of 5 on each attribute would have an expected value of $0.25*5 + 0.25*5 + 0.25*5 + (0.25/3)*5 + (0.25/3)*5 + (0.25/3)*5 = 5$. We assumed an equal distribution of points across component attributes when points were only given to the grouped category. Thus the three options were

Table 3. The Three Dating Options Shown to Participants in Study 5; Options Were Presented According to Participants' Attribute Ratings.

	Intelligence	Sense of Humor	Kindness	Body	Face	Hair
Person 1	5	5	5	6	5	9
Person 2	8	3	4	7	6	5
Person 3	4	5	5	9	7	4

always the same for all participants, but were shown in different orders depending on their expected values implied by participants' previous point distributions. This decision to present choice options based on participants' distribution of points creates a crucial difference between Study 5 and Study 3, in which participants' allocation of points did not impact the order in which options were presented. Because we have made point allocations and choices non-independent in Study 5—a necessary design feature in order to accurately simulate a real-world recommendation agent—the mediational analysis we conducted in Study 3 is not appropriate.

After selecting one of the three options, participants were asked on a final screen to report satisfaction with their choice on a 7-point scale (1 = *very dissatisfied* to 7 = *very satisfied*).

Results and Discussion

Our first dependent measure was the sum of points given to personality attributes. As in Study 2, the weighting of personality attributes varied across conditions [$F(2,73) = 42.17, p < 0.001$]. In the "Equally Weighted" condition, there was no preference for personality over demographic information ($M = 51.0$, SD = 15.1), but preference for personality traits increased in the "Personality Weighted" condition ($M = 75.5$, SD = 12.0) and decreased in the "Appearance Weighted" condition ($M = 35.1$, SD = 18.9), such that the linear contrast was significant [$t(73) = 9.10, p < 0.001$].

In addition, these differences in point allocations were mirrored by choices between date options. Preferences for the three options varied as a function of condition [$\chi^2(4,76) = 9.48, p = 0.05$], because participants tended to select the option that we had "designed" for them to find most appealing based on their distribution of points. Person 1 was the most popular selection (chosen by 48% of participants) in the "Equally Weighted" condition, Person 2 was the most popular choice (36%) in the "Personality Weighted" condition, and Person 3 was the most popular choice (50%) in the "Appearance Weighted" condition.

Finally, we explored whether our participants might be unhappy about having been duped, reacting against our presenting options according to their (experimentally manipulated) point distributions. This was not the case, as participants were equally satisfied with their selections across all three conditions, with means ranging from 4.36 to 4.46 [$F(2,73) = 0.06$, *ns*]. While these results for satisfaction warrant further investigation—for instance, via measures that assess participants' feelings of fairness or trust in the Web site—these initial results suggest at least the possibility that combining partitioning strategies with recommendation agents may not have a negative impact on satisfaction.

GENERAL DISCUSSION

The above studies illustrate the powerful impact that organization of information can have on online consumer choice. Specifically, our studies show that the weight that different attributes receive depends on how they are partitioned: Attributes that are displayed as separate categories tend to receive greater weight, whereas those that are grouped together under umbrella categories are discounted as less important (Studies 1 and 2), and these altered weights guide

consumer choice (Studies 3 and 4). The impact of partitions is due in part to consumers' acceptance of the implicit importance of attributes signaled by different partitions, an acceptance that extended to the selection of options suggested by online recommendation agents—even when those agents suggested options based on attribute weights that had been altered by partitions (Study 5).

We suggested that the impact of partitions on attribute weightings is not due exclusively to the differential salience of attributes but to changes in importance underlying those attributes. We attempted to demonstrate the distinction between salience and importance in a number of ways. First, unlike previous paradigms (Fischoff, Slovic, & Lichtenstein, 1978; Weber, Eisenfuhr, & Von Winterfeldt, 1988) that removed some information in the process of grouping (e.g., eliminating any mention of "battery charge insufficient" in the catch-all residual category for causes of car start failure), we kept the salience of these attributes constant across partitions: Our paradigm presented participants with either "Safety" and "Warranty" or "Practicality (Safety and Warranty)" (see Figure 1). This subtle design change controlling for salience allows us to show that the decreased impact of grouped attributes is due not merely to their unavailability in the environment as in previous investigations, but rather to the greater importance accorded to them in the decision-making process. We showed that partitions impacted attribute weights and consumer choices even when participants clearly remembered each attribute (Study 3), even when they generated those attributes themselves (Study 2), our strongest evidence for our proposition that importance can impact choice independent of salience.

Another intriguing explanation for the impact of partitions on judgment is raised by Zeithaml (1988), who suggests that concrete attributes receive more weight than abstract ones; in our terms, we might suggest that more concrete specific attributes (e.g., Safety and Warranty) would receive more weight than more abstract catch-all categories (e.g., Practicality). Again, however, our paradigm controls for the availability of attributes (see Figure 1), suggesting that the mere presence or absence of concrete or abstract attributes cannot account fully for our effects. This is not to say that a model in which salience impacts importance, which in turn impacts decision making is not possible; indeed, Bertini and Wathieu (2008) offer interesting evidence for this process in the domain of pricing (see also Taylor & Thompson, 1982). Future research should experimentally manipulate salience and importance simultaneously, to unpack the relative contribution of each to the impact of partitions on judgment.

Customer-Focused or Retailer-Focused Partitions?

Given the ease with which Web sites can change the presentation of attributes, these findings have clear implications for the design of retail Web sites, though we hasten to add that these design objectives can be either consumer-focused or retailer-focused. In the offline world, congruency between a store's layout and a consumer's product categorization or shopping goals increases consumer satisfaction (Morales et al., 2005); similarly, a Web designer with knowledge of which attributes are most important to ultimate consumer satisfaction could present attributes in a way that signals their appropriate relative weighting, thus enabling users to make decisions in their own best interests (Benbasat & Todd, 1992; Todd & Benbasat, 1994). At the same time, however, while decision aids can reduce effort and increase satisfaction, the inclusion of and emphasis on

selected attributes almost inevitably introduces the designer's bias into the consumer's decision-making process (Häubl & Trifts, 2000). Thus, while one view of the role of agents—from the decision analysis literature—is to detect and correct suboptimal behavior (Fischhoff, Slovic, & Lichtenstein, 1978), another more cynical view is that agents are designed to recommend products and services that marketers deem optimal. Indeed, a designer who wishes to increase his own profit (e.g., to sell overstocked items) can drive users to weight attributes such that they select products they might otherwise have ignored. Our results from Study 5—in which participants were equally satisfied with their choices regardless of how attributes were grouped—suggest that consumer satisfaction might be relatively insensitive to such manipulations. Indeed, if individuals distort the weighting of various attributes according to how they are grouped, they may even use the same weighting to assess the quality of their outcomes, such that their expected and actual utilities would correspond closely.

Further Opportunities

We have focused primarily on one way in which the presentation of information impacts choice, but the possibilities for online interfaces to change decision making are seemingly limitless—as are the opportunities for experimentation to explore these possibilities. Indeed, existing research has already examined several interesting potential moderators of partitioning effects, from the valence framing of attributes (Levin et al., 2002) to comparison of product choice versus rejection (Park, Jun, & MacInnis, 2000; see Levin, Schneider, & Gaeth, 1998). While we demonstrate how changing the grouping of multiple attributes changes the valuations of those attributes, Web sites are also able simply to change which attributes are available to users. A quick glance at existing Web sites reveals just this kind of wide variability in the criteria emphasized in search interfaces. As just one example, consider several major online vendors of digital cameras: Amazon, Best Buy, Circuit City, and Ritz Camera. Each site allows shoppers to filter camera options according to personal preferences; as Figure 2

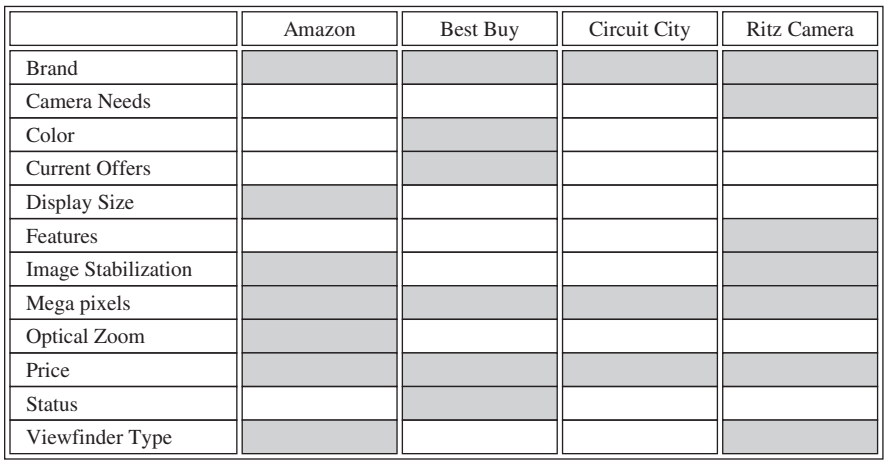

Figure 2. Shading indicates the presence of search criteria on different vendor Web sites (as of February 2008).

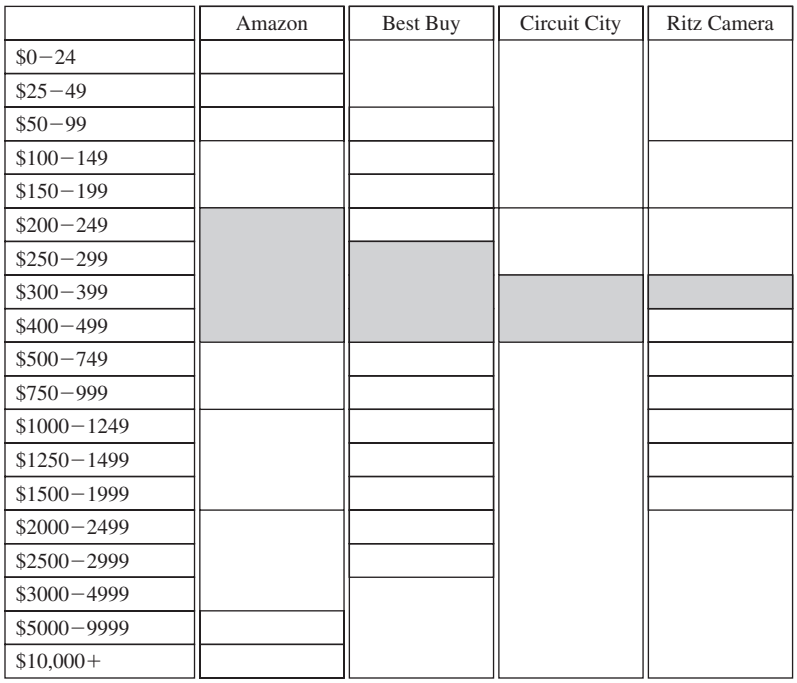

Figure 3. Horizontal bars indicate dividers between price ranges for online vendors of digital cameras. Shading indicates the range of prices that would be included for a consumer searching for a $300 camera.

shows, however, the criteria differ widely from one site to the next, in both number (Circuit City allows search on three attributes, Amazon seven) and type (all four offer "Brand," but Best Buy offers "Color" but not "Image Stabilization," while Amazon offers the reverse).

In addition, there are opportunities for marketers to impact consumer choice, even focusing solely on the presentation of one attribute. Consider again the aforementioned online vendors of digital cameras, Amazon, Best Buy, Circuit City, and Ritz Camera. All four sites allow shoppers to filter their options by price, but the exact price ranges for inclusion/exclusion vary and thus could lead to different choice sets even if this was the only attribute used. Figure 3 shows the price ranges for each of the four sites in September 2007. A consumer who searches for cameras that cost roughly $300, for example, would be left with cameras ranging from $200 to $499 at Amazon, but a much narrower range of $300–$399 at Ritz Camera. But do such groupings impact decision making? We asked another group of participants ($N = 164$) to imagine they were looking for a date and to indicate the marital status that they considered acceptable in a potential partner. When we presented participants with just two options—"never married" or "married in the past"—just 17% included potential dates who were "married in the past," even though they were allowed to check all acceptable categories. When we presented a different set of participants with the "never married" option as before, but replaced the "married in the past" category with three subcategories—"currently separated," "widowed," and "divorced"—some 38% included at least one of the three, which, of course, are subsets of the

"never married" option in the first version. This change in share from 17% to 38%—based solely on how this attribute was broken out—suggests the potential for such subtle changes to impact choice, and offers a promising direction for future research.

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