

Running Head: PROCESSES OF PREFERENCE CONSTRUCTION

Processes of Preference Construction in Agent-Assisted Online Shopping

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Abstract

In recent years, few questions have been of greater interest to consumer researchers, as well as to marketers of consumer products, than the viability of the internet as a platform for commercial transactions. At the heart of this debate is the issue of whether or not the internet provides anything that is substantially new or different from traditional business-to-consumer (B2C) channels. We believe that, indeed, the internet does provide some unique opportunities to marketers in their quest to better understand and ultimately influence their target customers. In particular, retailers on the internet have an unprecedented opportunity to personalize the shopping experience and control the shopping environment. In this chapter we will examine three specific psychological mechanisms that can play a central role in influencing the interaction between shoppers and recommendation agents in electronic marketplaces.

PERSONALIZATION AND THE OPPORTUNITY TO INFLUENCE

Thanks to Moore's Law¹, marketers now have the ability to remember and respond to the tastes and preferences of many individual consumers. Advances in technology, and techniques for database marketing, have created the opportunity for retailers to resurrect business practices over one hundred years old. At that time, the local shop owner was able to develop individual relationships with each of his customers, providing them with personalized service and product recommendations. Don Peppers and Martha Rogers (1997) explain it this way:

We are facing a paradigm shift of epic proportions – from the industrial era to the Information Age. As a result, we are witnessing a meltdown of the mass-marketing paradigm that has governed business competition throughout the twentieth century. The new paradigm is one to one (1:1) – mandated by cheaper and faster data management, interactive media, and increasing capabilities for mass customization.

While the idea of one to one marketing is no longer revolutionary, the effective implementation of such systems in an online retail setting is still in its infancy. The leaders in the field, such as Amazon.com and ActiveBuyersGuide.com, continue to experiment with their approach and refine their techniques, yet their execution remains awkward and is often rudimentary. For example, Amazon.com recently found itself in hot water over the apparent personalization of prices across different segments of consumers. According to USA today (USA Today 2000): “Amazon has faced allegations — which it denies — that the varying prices were based on customer data it obtained via software interactions with shoppers as they visited

¹ Moore's law states that computing power doubles approximately every 18 months.

its site . . . because of the consumer outcry, Amazon ended up refunding 6,896 customers an average of \$3.” While such dynamic pricing has been common place among airline passengers for years, customers buying DVDs at Amazon were not willing to accept different prices (whether they were randomly chosen, as Amazon claims, or based on knowledge about the individual shoppers as some customers have claimed).

In addition, some early anecdotal evidence and academic research has suggested that the personalized recommendations of firms such as Active Buyers Guide may not be meeting customers needs. For example, in some cases the personalized recommendation may be inappropriate or completely unacceptable to the consumer (Fitzsimons and Lehmann 2001). Therefore, it appears that while the potential benefit of personalization on the internet is substantial, effectively implementing such a system remains an elusive goal. Although the science and practice of influence has been thoroughly researched and refined for interactions between humans (e.g. Cialdini 2001), for example between a shopper and a retail salesperson, little is known about the ability of an electronic device, such as a computer, to influence a human. In the quest to play a more active role in their customers’ decision processes, e-tailers have turned to personalizing individual shopping experiences, without a detailed understanding of what the underlying processes of influence may be when the interaction is between a human and a computer. This chapter reviews some well established theories from marketing and psychology that we believe can contribute to a solid foundation for the personalization of the shopping experience and provide internet merchants with the conceptual keys to taking a more active role in online consumers’ decision making processes. In particular, we will focus on some of the early evidence regarding the personalization of product recommendations by interactive computer-mediated decision aids.

CONSUMER RATIONALITY AND THE STABILITY OF PREFERENCES

The Standard Economic Model

Given that we are interested in how consumers make decisions in environments that can be personalized at the individual level, a brief review of contemporary perspectives on consumer decision making is in order. Traditional economic analyses of preference and consumer choice are based on a formal axiomatic approach. According to McFadden (2000, p. 75) “the *standard model* in economics is that consumers behave *as if* information is processed to form perceptions and beliefs using strict Bayesian statistical principles (*perception-rationality*), preferences are primitive, consistent and immutable (*preference-rationality*), and the cognitive process is simply preference maximization, given market constraints (*process-rationality*).” The economic perspective is primarily concerned with connecting the inputs of the decision process to the ultimate decision. This approach has contributed a great deal to the development of models that aim to predict consumer choice. However, the past twenty-five years of research into consumer judgment and decision making has found evidence that the standard assumptions about preference, perception, and process rationality almost never hold. While most human behavior is to some degree rational, there is overwhelming evidence against the assumptions of rationality as the basis of any broadly applicable model of consumer decision making. In the following section we will briefly review two approaches² to understanding consumer choice that have led the way in the accumulation of evidence against the standard economic theory.

² See Payne (1982) or Bettman, Luce and Payne (1998) for a more complete review of these two approaches.

The Perceptual Framework

One approach, the perceptual framework, is most closely associated with the work of Tversky and Kahneman (e.g. Tversky and Kahneman 1974; Kahneman and Tversky 1979; Tversky and Simonson 1993), and is built upon a large body of research, which demonstrates that consumers' preferences are sensitive to the way in which a choice is presented. In their 1981 article, *The Framing of Decisions and the Psychology of Choice*, Tversky and Kahneman summarized their findings as follows: "The psychological principles that govern the perception of decision problems and the evaluation of probabilities and outcomes produce predictable shifts of preference when the same problem is framed in different ways" (p. 453). In essence, they found in study after study that the choices people made were not based so much on the objective merits of the choice alternatives under investigation as on the subjective context in which the problem was set. This evidence is in direct contrast to assumption that preferences are consistent and immutable (preference-rationality).

The Effort-Accuracy Framework

Another approach to the study of consumer decision making takes a cost-benefit perspective and views the decision making process as a trade-off between the accuracy of the decision and the effort required to make the decision. This approach to understanding choice, epitomized by Payne, Bettman and Johnson (1993) is based on the idea that consumers have a number of different strategies available to them that they can use to make any particular choice. Which strategy is ultimately chosen depends "on some compromise between the desire to make

an accurate decision and the desire to minimize cognitive effort. Since the accuracy and effort characteristics generally differ across strategies for a given decision environment and across environments for a given strategy, strategy usage will vary depending on the properties of the decision task” (Bettman, Luce and Payne 1998, p. 192). The evidence from this stream of research contradicts the assumption that value maximization is the only strategy used by decision makers (i.e., process-rationality), and the assumption that consumers form beliefs and preference using strict Bayesian statistical principles (i.e., perception-rationality).

Constructive Consumer Choice Processes

Recently, Bettman, Luce and Payne (1998)³ have argued that these two streams of research can be tied together under a more general heading of constructive preferences. They propose a framework, which recognizes that individuals’ information-processing capacity is limited (e.g., Bettman, 1979) and that most decisions are consistent with the notion of bounded rationality in that decision makers seek to attain some satisfactory, although not necessarily maximal, level of achievement (Simon, 1955). As a result of these constraints, individuals typically do not have well-defined preferences that are stable over time and invariant to the context in which decisions are made (Bettman, Luce, & Payne, 1998). Instead, decision makers tend to construct their preferences on the spot when they are prompted either to express an evaluative judgment or to make a decision (Payne, Bettman, & Johnson, 1992).

³ The reader is directed to the original paper for more detail on the constructive preferences theory of consumer decision making.

THE POTENTIAL FOR INFLUENCE IN ELECTRONIC ENVIRONMENTS

The theory of constructive preferences views choice as a function of the task, the decision maker and the environment in which the decision is made. Because the task environment plays an important role in consumers' construction of preference, digital environments, such as those found on the world wide web, which are interactive (rather than static) and personalizable at the individual level (rather than standardized), have the potential to influence consumer preferences and, ultimately, purchase decisions in a significant way (Johnson, Lohse and Mandel 1999).

Recent research has highlighted the role of one particular type of online personalization tool in the construction of consumer preference (Häubl and Murray 2002): a recommendation agent⁴. We conceptualize an electronic recommendation agent as a software tool that (1) attempts to understand a human decision maker's multi-attribute preference with respect to a particular domain or product category based on a learning (or "calibration") phase during which the human reveals subjective preference information to the agent and (2) makes recommendations in the form of a sorted list of alternatives to the human based on its understanding of that individual's preference structure (see also Häubl & Trifts, 2000).

One real world example of this type of recommendation agent can be found at Nike.com. Nike.com has employed *shoe advisor* that plays the role of a virtual salesperson by asking the shopper questions about his or her preferences regarding particular running shoe features. For example, if you are in the market for a running shoe, the shoe advisor may ask you how competitive you are, where you like to run, what sort of support you prefer and how much you want to spend. After a brief discussion with the advisor you are presented with an initial

⁴ Recommendation agents come in many different forms and varieties and they can function using different processes and algorithms. For an overview, the interested reader is directed to Ansari, Essegaiar, and Kohli (2000).

recommendation. This recommendation has been personalized for you (see Figure 1). In fact, Nike's entire line of running shoes has now been rated according to the information you have provided.

The ability of this type of recommendation agent to effectively assist consumers in their decision making process has recently come under investigation. In general, researchers have found that a recommendation agent can be a very effective decision aid, which allows consumers to make better decisions with less effort than decisions made by consumers without access to a agent (Haubl and Trifts 2000). This is an important benefit to consumers who have traditionally been forced to make a trade-off between the quality of their choice and the amount of effort they devote to making a decision. However, for the recommendation agent to effectively improve decision quality while simultaneously reducing the consumer's effort, the human must rely upon the machine to screen the universe of products (i.e., the marketplace) and return a personalized recommendation. Clearly, this requires that the human place some trust in the operation of the recommendation agent⁵. As a result, the consumer can become vulnerable to being influenced by such agent.

We recently examined this possibility in a laboratory study that used an online store in which participants were invited to shop for a backpacking tent (Häubl and Murray 2002). All participants used a recommendation agent, which asked the shoppers to specify their preferences for particular tent attributes. However, unlike the recommendation agent in Häubl and Trifts (2000), this agent was very selective in terms of the information it elicited from different

⁵ Interesting, the Godek and Yates chapter in this book suggests that consumers might devote cognitive resources to determining the motivations of recommendation agents before accepting the recommendations.

shoppers⁶. In particular, shoppers were separated into two groups. One group was asked how important weight and warranty is to them when choosing a tent. The other group was asked how important durability and fly fabric is to them when choosing a tent (see Figure 2). Therefore, the recommendation agent in this experiment was highly selective: each group was asked about only two attributes, and the agent did not attempt to elicit any further preference information. The recommendation agent then searched the product space based only on this selective preference information, and provided the shopper with a list of tents that was rank-ordered based on the attribute preferences the shopper had reported. As a result, although all products were available to the shopper for viewing, their presentation order was based only on the preference information for two attributes.

The recommendation agent was made selective because, almost inevitably, real-world attribute-based recommendation agents are selective in the sense that only a subset of all the relevant product attributes can be used in their calibration and, thus, in the algorithm used to generate the recommendations. This is apparent in the implementation of many commercial recommendation systems for online shopping (see, e.g., Active Buyer's Guide or Nike's shoe advisor). The reasons for such selectivity in recommendation agents include (1) the very large number of attributes that exist in many product categories, (2) the substantial amount of data about, or interaction with, a consumer that would be required to develop an accurate understanding of the consumer's subjective preference in a high-dimensional attribute space, (3) an inclination to use only those attributes that are common to most or all available products, and (4) a tendency to include only attributes that are quantitative in nature (i.e., the levels of which

⁶ Recommendation agent's of the type used in Häubl and Trifts (2000) and Häubl and Murray (2002) elicit consumer preferences for particular attributes that are relevant to the recommendation being made. The recommendation agent then develops a model, typically a multi-attribute preference model, based, for example, on a weighted additive evaluation rule (Payne, Bettman, and Johnson, 1993), which it uses to develop its recommendation.

can be represented numerically). Apart from the above reasons, the selective inclusion of attributes in a recommendation agent may also be driven by strategic objectives (e.g., to de-emphasize specific attributes) on the part of whoever controls the design of the agent.

We found that the attributes that were included in the recommendation agent became more important in the shoppers' decision-making process than those attributes that were excluded from the agent. Therefore, the majority of subjects chose products that were superior on attributes included in the recommendation agent (see Figure 3). This *inclusion effect* was especially strong when subjects were forced to make trade-offs between attributes in choosing a tent – i.e., when buying a more durable tent means that the tent is heavier or when buying a lighter tent means that the tent is less durable⁷. When trade-offs were necessary, we found that the vast majority of shoppers chose the tent that was superior on the attributes that were included in the recommendation agent. However, this effect was not ubiquitous. We did not find any effect when subjects shopped in a marketplace that did not require trade-offs between attributes – i.e., when buying a more durable tent meant that the tent was also lighter⁸ (see Figure 3). Moreover, we found that the amount of effort, in terms of the number of alternatives searched and the time spent searching through the marketplace, that consumers exerted during the decision

⁷ With regards to the experimental design, subjects who shopped in such a marketplace were choosing among tents whose primary attributes (weight and durability) were negatively correlated in terms of utility. This marketplace closely resembles real-world marketplaces wherein trade-offs between attributes (for example, price and quality) must normally be made.

⁸ A marketplace wherein the primary attributes (weight and durability) were positively correlated in terms of utility.

process was influenced by the rationale we provided for the selectivity of the agent⁹ (see Table 1). These results clearly indicate that the preferences of human decision makers can be influenced in a systematic and predictable manner by an electronic recommendation agent.

Consumer Susceptibility to Influence

Given the potential influence of a recommendation agent on consumers' choice processes, one may wonder why a consumer would be willing provide personal preference information to such an agent. Earlier we suggested one of the reasons, which is apparent from the results of Häubl and Trifts 2000: by using a recommendation agent, consumers can make a better decision with less effort. As a result, the consumer is able to circumvent the usual effort-accuracy trade-off when they rely on the recommendations provided by an agent.

A second reason that consumers may use a recommendation agent even though it can affect their choice process stems from consumers' own beliefs about the strength of their preferences and about the ability of an electronic tool to influence them (Godek and Yates, this volume). Research in this area recognizes that consumers, and human decision makers in general, tend to be overconfident about what they know and their ability to make appropriate choices (Alba and Hutchinson 2000). Of particular relevance to our discussion here is the tendency for people to be overconfident or overly optimistic about their abilities when the

⁹ The *perceived rationale for attribute inclusion* (the reason provided to participants as to why the recommendation agent was selective) was manipulated at three levels. Subjects were informed that the attributes included in the recommendation agent were selected (1) because of their high importance to a relevant group of consumers who participated in a recent study ("strong" rationale), (2) randomly from the set of pertinent attributes ("neutral" rationale), or (3) because, although they have been considered to be of low importance by other consumers who participated in a recent study, they should be given some attention in the decision process ("weak" rationale). This manipulation was embedded (as one sentence) in the task instructions that participants were asked to read at the beginning of the experiment. For greater detail on the method, procedure and results of this study, see Häubl and Murray (2002).

outcome is potentially desirable, but difficult to forecast (Pulford and Colman 1996) – the desirability bias. This applies to consumers and their relationship with agents insofar as they may be overly optimistic about their ability to counteract any influence that an electronic recommendation system may have on their behavior. Alba and Hutchinson (2000, p. 137) explain this general tendency as follows:

Some biases are too subtle to be corrected by even the most vigilant decision maker. Other biases achieve a level of awareness that may prompt efforts to take corrective action. Wilson and Brekke (1994) reviewed various aspects of “mental contamination” and provide some preliminary evidence that people overestimate their ability to avoid it. We speculate, based in part on the evidence reviewed above, that it would be unsurprising to find overconfidence is one’s immunity to the biasing influences in life. Indeed, embedded throughout Nisbett and Wilson’s (1977) critique of verbal reports is informal evidence that people hold confident but erroneous beliefs about the determinants of their own decisions.

Consumers may not be aware of the influence that a recommendation agent can have on their decision making; however, even if they are, evidence exists to suggest that they may be overly optimistic about their ability to correct for this bias and to avoid “mental contamination” in their decision making. Therefore, it is reasonable to believe that consumers will rely on recommendation agents to assist them in their shopping, even though such reliance may make the consumer vulnerable to the agent’s influence. This trust and reliance on the recommendation agent is analogous to a traditional shopper’s reliance on a salesperson. The shopper may know that recommendations are partial, yet believe that s/he is capable of correcting for this bias in

their decision-making. Therefore, consumers may be willing to rely upon biased recommendations, hoping to reduce their effort while improving the quality of their decisions.

Given the potential for electronic decision aids to influence consumers' decision making processes, their preferences and ultimately their choice of products, it is important for us to better understand the processes by which online shoppers may be influenced. In the next section, we will discuss three mechanisms for preference construction in digital marketplaces and in particular examine the potential of each of these mechanisms to operate when an online shopper uses a recommendation agent.

PROCESSES OF PREFERENCE CONSTRUCTION IN PERSONALIZED DIGITAL SHOPPING ENVIRONMENTS

In this chapter we will consider three mechanisms that can play an important part in preference construction when on-line shoppers rely on a recommendation agent to personalize their shopping environment: priming, format driven processing, and inferences based on conversational logic. While other mechanisms may also be at work in situations that allow for a personalized presentation of product information, these three mechanisms have been selected because they have strong theoretical foundations and because early research into online consumer behavior has recognized their importance (Häubl and Murray 2002). These mechanisms range in the level of consumer consciousness at which they operate from the unaware (priming) to conscious cognitive processes (inference based on conversational logic). Although a combination of these mechanisms may play a part in consumers' preference construction in electronic environments, different processes are likely to play a predominant role in different situations.

Priming

One mechanism for influencing consumer preference formation in online environments is through the use of associative feature-based priming. This form of priming renders one or more cognitive concepts more easily accessible in memory (see, e.g., Srull and Wyer 1979; McNamara 1994). In turn, this enhanced accessibility may lead to an increase in the likelihood that the primed concept (e.g., a category, decision rule, or feature) is used by an individual, as long as the concept is relevant to the cognitive task at hand and no other, competing concept is chronically more accessible (see Herr 1989, p. 74)¹⁰.

In a consumer-decision-making context, exposure to a prime that is associated with a particular product-category-relevant feature or attribute may lead a consumer to attach greater weight to this attribute when evaluating available products or making a purchase decision. For example, priming certain product attributes prior to exposure to an advertisement may increase the salience of these attributes in consumers' minds and, by affecting the manner in which ambiguous advertising information is processed, influence product evaluations (see Yi 1990). Similar feature-based priming is also evident in recent work by Mandel and Johnson (1999), which demonstrates the possibility of influencing individuals' preferences by merely altering the background of a web page that subjects view prior to completing a product choice task. These researchers systematically varied the background of an introductory web page, with different types of backgrounds intended to prime different product attributes, and showed that the weight of an attribute in preferential choice was enhanced as a result of the priming manipulation. For example, in one experiment Mandel and Johnson invited participants to shop for a sofa in a simulated online store. They then primed the participants using either a background with clouds,

¹⁰ The interested reader should also review the work of Crow and Shanteau (this volume), which has some parallels to our discussion of priming in their manipulation of attribute suggestions with the use of default values.

which pretests indicated was a prime for comfort, or a background with pennies, which pretests indicated was a prime for price. They found that those who had pennies in the background preferred cheaper, less comfortable sofas as compared to those who were primed on comfort.

In general, the effectiveness of a prime depends on subjects being unaware of the priming effect (Higgins, Bargh, and Lombardi 1985). Because priming-related increases in construct activation and accessibility are temporary (Wyer and Srull 1981), one would expect any preference construction effects based on feature priming to be confined to situations in which the exposure to the prime occurs. The long-term effect on consumer preferences is likely to be minimal. In other words, because the priming effect simply increases accessibility and does not involve a change in the internal representation of preference for the primed attributes, the effect of priming a particular attribute or set of attributes in a choice task should not persist beyond the initial context of the prime. However, the preference constructed as a result of the influence of the prime may persist if the preference itself is reflected upon and therefore becomes deeply encoded. For example, in our sofa buying scenario, it may be the case that the buyer is unaware of the impact of the pennies prime. Nevertheless, the prime activates the concept of price, which leads to thoughts about the importance of price, which in turn results in a preference for cheaper sofas that may endure long after exposure to the initial prime. Having purchased a cheaper sofa results in a preference for cheaper sofas, because price is subsequently considered an important feature by which sofas should be compared (Carpenter and Nakamoto 1989).

This type of feature-based priming — where a given attribute is primed by exposure to a stimulus associated with that feature immediately before an evaluation or choice task — may explain the predicted preference-construction effect due to the inclusion of an attribute in a recommendation agent. In the process of interacting with (i.e., calibrating) such an agent,

consumers may be primed on those attributes that are considered by this decision aid. As a result, the inclusion of a set of attributes in a recommendation agent during an online shopping trip may enhance the salience and importance of these attributes in the consumers' minds, which in turn affects the decisions made during the shopping trip.

Format of Information Presentation

A substantial amount of research effort has been devoted to studying the effects of the format of information presentation on how individuals acquire and process information. The results of this body of work suggest that the manner in which information is presented tends to have a substantial impact on human information processing and decision making¹¹ (Bettman and Kakkar 1977; Jarvenpaa 1989, 1990; MacGregor and Slovic 1986). The notion that the format of information presentation may influence decision making is formalized in Slovic's (1972) *principle of concreteness*. The latter suggests that human decision makers tend to (1) use only that information which is explicitly displayed in a stimulus environment and (2) process this information only in the form in which it is presented. This principle is based on the argument that, in order to reduce the cognitive costs associated with the integration of information, decision makers will discount, or even ignore, any information that has to be stored in memory, inferred from the display, or transformed (see Payne, Bettman, and Johnson 1993, p. 48).

An important property of the information presentation format created by a recommendation agent is that decision makers are provided with a rank-ordered list of products. The findings of a classic study by Russo (1977) suggest that information displays that are in the form of a list in which the available alternatives are sorted by a particular attribute (unit price, in

¹¹ The interested reader should also review the work of Crow and Shanteau (this volume), which has some parallels to our discussion of the format of information presentation in their use of default values.

his case) make it easier for individuals to process that attribute and increase the latter's importance in decision making. Similarly, a selective recommendation agent's list format¹² may render the included attributes relatively more processable, since it is these attributes that determine the order in which alternatives are displayed.¹³ In turn, this enhanced processability may lead to an increase in the relative weight that consumers attach to the included attributes when making a purchase decision. Thus, the mere inclusion of an attribute in a recommendation agent may affect consumer preferences via the format in which information about available products is presented.

However, such an effect on consumer preferences cannot be expected to hold under all circumstances. In particular, individuals do tend to depart from the particular type of processing that is encouraged by the format of information presentation if the cost of the potential inaccuracy (e.g., of making an inferior choice) that may result from such processing is significant (see Coupey 1994, p. 97). Consumers will use the information in the format in which it is provided when doing so results in acceptable decision quality, but not when this would lead to a vastly inferior decision outcome. This suggests that, if the inclusion effect were a result of the format of information presentation, it would depend critically upon the level of decision quality that may be achieved by considering only the attributes that are included in the recommendation agent relative to the quality of a decision that is based on all attributes.

¹² In general, recommendation agents make their recommendations in the form of a list, ranked in descending order with the most attractive products (based on the preference information provided by the shopper) at the top of the list.

¹³ It is worth noting, however, that a recommendation agent does not merely provide a list of products that are sorted by a single attribute, but rather a list that is *personalized* in that products are rank-ordered by their likely attractiveness to the consumer based on the agent's understanding of the consumer's preference with respect to (a subspace of) the multiattribute product space.

Similar to, but distinct from, the format driven processing mechanism is the notion recently articulated by Kivetz and Simonson (2000) that, in their decision making, consumers give more weight to attributes that are common between options. In other words, when information is selectively presented or when complete information about each product is unavailable, buyers will tend to compare the alternatives on the basis of the information (or attributes) that are common between the alternatives. Moreover, the authors demonstrated that consumers tend to interpret the information that is not common between alternatives (i.e., the missing information) in a way that supports the choice they made based on the common information. This is interesting because it suggests that when presenting products in side-by-side comparisons, an online store can influence consumer choice by controlling what information is common across products and what information is unavailable. Although not directly applicable to the recommendation agent example from Häubl and Murray (2002), these findings do provide further evidence that the format in which information is presented can have a considerable effect on consumer judgment and decision making.

Inferences based on Conversational Logic

A third possible mechanism by which a recommendation agent may influence consumer preferences is based on the notion that the inclusion of an attribute in the agent may be *informative* with respect to the *importance* of that attribute. Consumers might assume that the particular attributes that are used in the calibration of a recommendation agent have been

included because they are relevant and important aspects of the alternatives in the product category of interest. In line with the theory of conversational logic, which suggests that exchanges of information are generally guided by a cooperative principle (Grice 1975; Levinson 1983), consumers are likely to believe that the electronic agent has been designed so as to be a meaningful tool that is capable of assisting them in their decision making. This is also consistent with the finding by Wernerfelt (1996) that, in most circumstances, it is in a firm's best interest not to mislead its customers, but rather to help them make purchase decisions that, given their subjective preference, are optimal for them. Since the providers of recommendation agents (e.g., online retailers) can be expected to be well-informed with respect to the nature of preferences in the population (e.g., which attributes are, on average, the most important ones), this expertise should be reflected in the choice of attributes that are included in such tools. Therefore, the composition of the set of included attributes may carry information about the relative importance of the different attributes in the marketplace.

Since consumers tend to have preferences that are less than well-defined (see Bettman, Luce, and Payne 1998), they may revise or refine these preferences on the basis of what they learn about other consumers' preferences. Through the set of attributes that it is based on, a recommendation agent may convey information about attribute importance in the population of relevant consumers. Individuals may use this information regarding others' preferences to make inferences about their own preferences and, consequently, revise their beliefs as to how important different attributes are to them personally. That is, the selective inclusion of certain attributes in a recommendation agent — and thereby, the exclusion of other attributes — may cause consumers to alter the internal representation of their preference such that the subjective importance of the included attributes is increased relative to that of the excluded attributes. The

information value of the inclusion of attributes in an electronic agent and its effect on preferences is, therefore, a potential explanation of the inclusion effect found by Häubl and Murray (2002). This mechanism is similar in spirit to the one documented by Prelec, Wernerfelt, and Zettelmeyer (1997), who found that consumers tend to view the characteristics of the set of available alternatives as carrying some information about the distribution of tastes in the population of consumers and, in turn, use this information as a basis for making inferences about their own preferences. The difference is that, in the present context, it is the inclusion of attributes in a recommendation agent, rather than the composition of the set of available alternatives, that is deemed to convey information about others' preferences.

The 3 Mechanisms and The Inclusion Effect

While the format driven processing and the priming mechanisms may well have played a role in the inclusion effect found by Häubl and Murray (2002), these two mechanisms are unable to provide an adequate explanation as to why the effect fails to appear in the marketplace where no attribute trade-offs are required (i.e., the marketplace with positive inter-attribute correlations, see Figure 4). In contrast, the mechanism based on the information value of attribute inclusion *predicts* that this preference-construction effect will be more pronounced when the correlation between included and excluded attributes is negative than when this correlation is positive. In a decision environment in which inter-attribute correlations are positive, consumers may quickly realize that any attribute can be used as a basis for their decisions without sacrificing accuracy, because an alternative that is favorable on one attribute tends to also be favorable on other attributes. However, in a marketplace characterized by negative inter-attribute correlations, a more attractive level of one attribute tends to be associated with a less attractive level of another

attribute and, therefore, purchase decisions require trade-offs among attributes. In such an environment, which may be characterized as a highly efficient market, the relative importance that is attached to different attributes tends to be highly consequential with respect to the decision outcome — even very small changes in relative attribute importance may affect which of a set of alternatives is chosen. Therefore, if the inclusion effect were due to a revision or refinement of subjective importance weights based on the information value of attribute inclusion, we would expect this type of preference-construction effect to be stronger when the correlation between included and excluded attributes is negative rather than positive.

Does Preference Construction in Digital Marketplaces Persist?

Given the evidence that preferences can be constructed during online shopping with the assistance of a recommendation agent, it is interesting to consider whether or not such preferences will persist into situations where the agent is no longer present. In the experiment described earlier (Häubl and Murray 2002), we investigated this possibility by asking participants to make choices between pairs of tents after they had completed their shopping trip. We found that the constructed preferences did persist into decision making situations where the agent is not present and does not make any recommendations. In choices made without agent assistance, we found that consumers whose preferences were initially affected by the selectivity of the recommendation agent had a 48% greater preference for those attributes that had been included in the agent during an earlier agent-assisted shopping trip than for those that had not been included.

Recent work by Muthukrishnan and Kardes (2001), examining persistent preferences for attributes, provides support and context for our findings. In particular, their research has

demonstrated that in “choice contexts that create very little preference uncertainty, the initial preference for the focal attribute offers a tentative causal theory that links the attributes of the chosen brand with the key benefits of the product” (p. 101). We know from the work of Häubl and Trifts (2000) that an external (and objective) recommendation from an agent can increase consumers’ confidence in (i.e., reduce their uncertainty about) the choice they have made. In the case of a selective recommendation agent, the focal attributes are those that the agent asks the consumer for preference information about, which results in a constructed preference for those attributes (Häubl and Murray 2002). Therefore, it is likely that when a recommendation agent leads a consumer to believe a particular attribute (or set of attributes) is important – whether that belief is driven by priming, the format of presentation of the information, or an inference based on conversational logic – the preference for that attribute will persist beyond the initial decision making context to subsequent choices within the same product category. This notion of persistent preferences based on preference construction in an earlier choice environment is also supported by the literature on pioneering and the first-mover advantage (e.g., Carpenter and Nakamoto 1989; Carpenter, Glazer and Nakamoto 1994).

Preference Construction and Online Shopping

Over 30 years of research in consumer behavior and decision making has taught us that, in many instances, consumer preferences are constructed as opposed to the traditional economic assumption that preferences are consistent and immutable. As a result, consumers are highly

sensitive, even vulnerable, to the properties of the task environment. In this chapter we have discussed three cognitive processes that can influence consumer choice: priming, format driven processing, and inferences based on conversational logic. Although we have used the example of recommendation agents, and discussed their ability to influence consumers' preferences and consumers' choices, these same processes are likely to apply much more broadly in digital shopping environments. Because consumers are limited in their ability to process information, and because they are weighing required effort against decision accuracy, a personalized choice environment that reduces effort while improving accuracy is very attractive. However, relying on an electronic tool to personalize a digital environment may make the consumer vulnerable to influence within that environment.

Based on the research discussed in this chapter, it is apparent that some important differences do exist between shopping in a traditional retail format and shopping in electronic environments. In particular, we have focused on the potential of a retailer to influence consumers' choice processes by exerting control over the decision environment to an extent that would be very difficult, if not impossible, in a traditional store. For example, Nike's shoe advisor is able to relabel all the shoes in its "inventory" based on the information provided by the shopper. Moreover, it is able to do this for each individual shopper, whether there is one person visiting the store or thousands shopping simultaneously. Clearly, it is worth the effort to better understand the processes that affect consumer choice in electronic environments, because the ability to personalize the shopping environment, and thereby influence the shopper, has the potential to be a significant source of competitive advantage for online retailers.

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Table 1
Effect of Perceived Rationale for Attribute Inclusion on Amount of Information Search

Perceived Rationale for Attribute Inclusion in Recommendation Agent	Mean Amount of Time Spent Searching (in seconds)	Mean Number of Alternatives Searched
Strong (Attributes were selected because they are important.)	62.71	7.75
Neutral (Attributes were selected arbitrarily.)	81.91	9.00
Weak (Attributes were selected because they are unimportant.)	83.60	9.64

Figure 1: Nike's Shoe Advisor Recommendations Screen Shot

Information

ASK NIKE POLICIES

STORE LOCATOR PRODUCT SEARCH **SHOE ADVISOR** SIZING

SHOE ADVISOR | Results

Based on what you've told us so far, we suggest the following three shoes.

	Air Durham (men) \$100 Buy It!	Air Structure Triax (men) \$90 Buy It!	Air Span Triax (men) \$85 Buy It!
Surface	Road Shoe	Road Shoe	Road Shoe
Midsole	PU midsole	Phylon midsole	Phylon midsole
Width	Standard	Standard	Standard
Motion Control	★★★★	★★★★☆	★★★★☆
Feel: Impact Protection	★★★★☆	★★★★☆	★★★★☆
Feel: Responsiveness	★★★★☆	★★★★☆	★★★★☆
Breathability	★★★★☆	★★★★☆	★★★★☆
Water Resistance	No	No	No
Weight	14.5 ounces	12.6 ounces	12 ounces

Figure 2 – Elicitation of Preference Information

Importance of Features

Note: The information you provide here is very important, as it will serve as the basis for the agent's recommendation. The more accurate the information you provide is, the better the recommendation agent will be able to suggest backpacking tents to you that match your personal preference. Consider your answers carefully, it will pay off later.

Use the following scale to rate the importance of each feature:
0 = "not at all important" to 100 = "extremely important"

How important is it to you personally that a backpacking tent has each of the following features?

High Durability	<input type="text"/>
Strong Fly Fabric	<input type="text"/>

Show me the recommendation list

Figure 3
Attribute Inclusion in the Agent and Choice Shares in Agent-Assisted Shopping Task

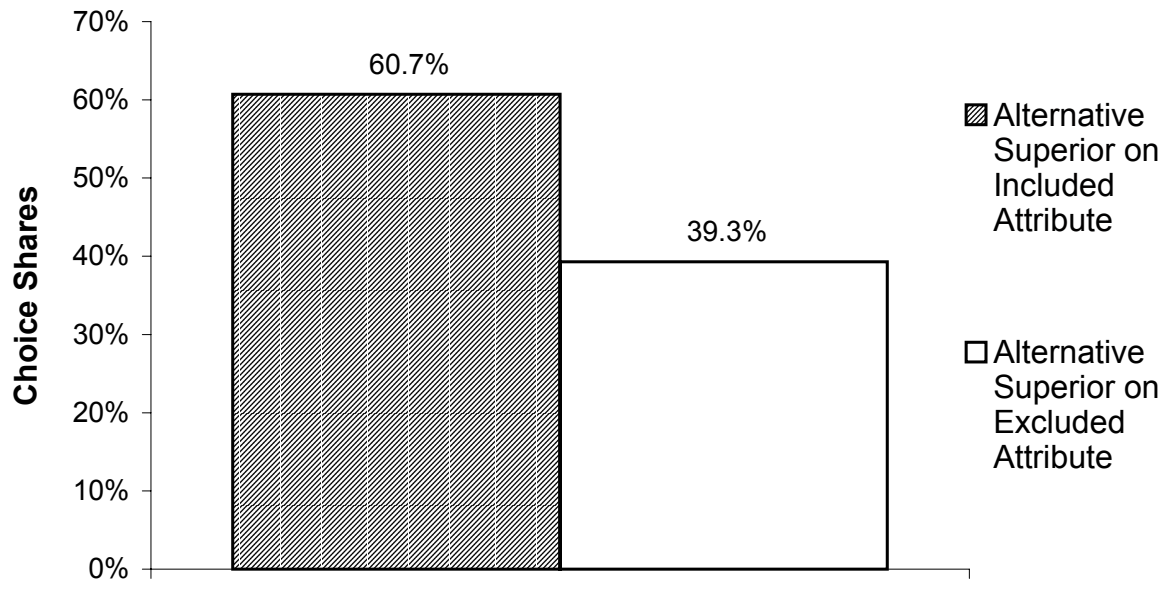


Figure 4
Inclusion Effect: Moderating Role of Inter-Attribute Correlation

