

Consumer Inference: A Review of Processes, Bases, and Judgment Contexts

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Because products are rarely described completely, consumers often form inferences that go beyond the information given. We review research on the processes, bases, and the judgment contexts in which inferences are formed. The most basic processes are induction (inferences from specific instances to general principles) versus deduction (inferences from general principles to specific instances). Stimulus-based inferences are formed on-line (as information is encountered) using situationally available information, whereas memory-based (or theory-based) inferences are formed using prior knowledge and experience. Inferences can pertain to a single product judged in isolation (a singular judgment context) or to multiple products considered in relation to one another (a comparative judgment context). This $2 \times 2 \times 2$ (Induction vs. Deduction \times Stimulus-Based vs. Memory-Based \times Singular vs. Comparative Judgment) theoretical framework suggests that there are 8 different types of inferences that consumers may form. Based on this framework, we identify gaps in the literature and suggest directions for future research.

Consumers frequently make judgments and decisions based on limited information and knowledge. Using a product or hearing about a product (e.g., from advertising, promotion, or word-of-mouth communication) provides information about some properties (e.g., attributes, benefits) but the remaining properties—if they are important—must be inferred by going beyond the information given. Inference formation involves the generation of if–then linkages between information (e.g., cues, heuristics, arguments, knowledge) and conclusions (Kardes, 1993; Kruglanski & Webster, 1996).

Our purpose in writing this article was to forward a theoretical framework that facilitates the summarization and categorization of findings important for consumer researchers interested in such inferences. We use this framework to organize a discussion of the contexts in which judgments and decisions regarding limited or missing information must be made and the inference processes evident in each context. Given that our

focus is on inferences of missing information, it was not our aim to provide an exhaustive review of the inference literature. Thus, we did not consider topics such as causal inference (Jones et al., 1971/1987; Mizerski, Golden, & Kernan, 1979), text comprehension (Graesser & Bower, 1990), conversational inference (Hilton, 1995; Schwarz, 1996), and trait inference (Srull & Wyer, 1989; Wyer & Srull, 1989).

The Induction/Deduction by Stimulus/Memory-Based by Singular/Comparative Inference Framework

Two basic inference processes are possible: Induction (or generalizing from specific information to general conclusions) and deduction (or construing specific conclusions from general principles or assumptions; Beike & Sherman, 1994; Mass, Colombo, Sherman, & Colombo, 2001). The information used as a basis for inference can either be situationally available (stimulus-based or data-based processing) or retrieved from memory (memory-based or theory-based processing; Lynch & Srull, 1982; Wyer & Srull, 1989). Inference

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tial judgment can pertain to a single product judged in isolation (a singular judgment context) or to multiple products considered in relation to one another (a comparative judgment context; Sanbonmatsu, Kardes, Houghton, Ho, & Posavac, 2003). This 2 × 2 × 2 (Induction vs. Deduction × Stimulus-Based vs. Memory-Based × Singular vs. Comparative Judgment) theoretical framework suggests that there are eight different types of inferences that consumers may form.

The distinction between induction versus deduction is important because induction pertains to hypothesis generation (e.g., generating alternatives), learning, generalization, and prediction. Deduction pertains to hypothesis evaluation (e.g., ruling out alternatives), logical reasoning, and diagnosis. Furthermore, recent research showed that forward-looking inductive inferences from specific behaviors to general traits are formed more frequently, relative to backward-looking deductive inferences from traits to behaviors (Mass et al., 2001). Stimulus-based processing involves the use of information that is situationally available, whereas memory-based processing involves the use of information that is retrieved from memory—such as previously formed beliefs, attitudes, categories, and schemata (Lynch & Srull, 1982; Wyer & Srull, 1989). Singular versus comparative judgment contexts are important because inference formation occurs only when consumers detect the absence of relevant information and sensitivity to missing information is greater in comparative (vs. singular) judgment contexts (Sanbonmatsu et al., 2003; Sanbonmatsu, Kardes, Posavac, & Houghton, 1997).

As Table 1 indicates, many examples of the eight types of inferences exist in the consumer inference literature. Inductive, stimulus-based, singular inferences include overall evaluations formed on the basis of specific attributes that are considered separately and integrated algebraically, as well as general judgments based on cue-interaction and aggregation-based learning models. Inductive, stimulus-based, comparative inferences are shifts in judgment toward (assimilation) or away from (contrast) a reference point or standard. Inductive, memory-based, singular inferences involve the use of specific cues (price, warranty, brand name reputation, or other heuristics) to draw general conclusions about benefits that are difficult to assess directly (e.g., quality, reliability, utility). This process is memory-based because previ-

ously formed implicit theories or expectations are used to link the specific cues to the general conclusions. Inductive, memory-based, comparative inferences involve the comparison of brands that are not directly comparable because they are described by different types or amounts of information, and consumers must somehow deal with the uncertainty that this difficulty in comparison creates.

Deductive, stimulus-based, singular inferences involve the construal of specific conclusions implied by general syllogistic arguments (i.e., A has X, if X then Y, therefore A has Y). Deductive, stimulus-based, comparative inferences involve the construal of specific conclusions implied by the linear ordering of the overall evaluations of multiple brands. Deductive, memory-based, singular inferences are inferences about specific attributes drawn from overall evaluations and deductive, memory-based singular inferences are evaluations about specific brands based on general categorical knowledge.

Automatic, Spontaneous, and Deliberative Inferences

The amount of cognitive effort required for inference formation could have been added to our 2 × 2 × 2 framework, but we elected not to do so because effort depends more on the degree of overlap between the stimulus information and prior knowledge (Higgins, 1996; Wyer, 2004) than on the type of inference one is attempting to form. In principle, any of the eight types of inferences in our 2 × 2 × 2 framework could be formed automatically (i.e., without awareness or intention), spontaneously (i.e., without prompting via questions about inferences), or deliberately (i.e., goal-directed inferences formed with awareness and intention).

Some inferences are so basic that they are formed automatically, or without awareness or intention, during the comprehension stage of information processing. For example, when reading a passage stating that an actor pounded a nail into the wall, people automatically infer that the actor used a hammer (Bransford & Johnson, 1972). Other more resource-dependent types of inferences, however, are formed spontaneously only when consumers are sufficiently motivated (Kardes, 1988; Sawyer & Howard, 1991) and able

TABLE 1
An Organizational Framework for Investigating Consumer Inference Processes, Bases, and Judgment Contexts

<i>Stimulus-Based</i>		<i>Memory-Based</i>	
<i>Singular Judgment</i>	<i>Comparative Judgment</i>	<i>Singular Judgment</i>	<i>Comparative Judgment</i>
Induction			
Information integration theory	Assimilation and contrast	Correlation-based inference	Correlation-based inference in choice
Cue interaction effects		Heuristic-based inference	Inferential correction
Aggregation			Category-based induction
Deduction			
Syllogistic inference	Transitive inference	Attitude-based inference	Category-based deduction
		Reconstructive inference	Schema-based deduction

(Maheswaran & Sternthal, 1990) to do so. The degree of motivation and ability required for spontaneous inference formation varies as a function of the strength of the evidence (e.g., the features of a Rolls Royce are so luxurious that it is difficult not to infer that the Rolls Royce is a luxury automobile while examining its features) and on consumers' goals (e.g., consumers interested in purchasing a luxury automobile are likely to evaluate all automobiles in terms of luxuriousness). Hence, the amount of effort required for spontaneous inference formation varies dramatically across situations and across individuals.

Proposition 1. When cognitive resources are required, spontaneous inference formation is more likely when the motivation and the ability to deliberate are high. The degree of motivation and ability required varies as a function of the strength of the evidence and on consumers' goals.

Proposition 1 implies that spontaneous inferences can be formed automatically or deliberately, depending on the situation and on prior knowledge. Spontaneous inferences are formed on-line as judgment-relevant information is encountered and occur without the biasing influence of questions that encourage inference formation during the question-answering phase of an experiment. Because spontaneous inferences are formed on-line, they occur in the field as well as in controlled laboratory settings. In contrast, prompted or measurement-induced inferences are formed only in response to leading questions that instigate inferential processes that would not have been initiated in the absence of direct questioning. In addition to being more generalizable, spontaneous (vs. prompted) inferences are more accessible from memory (Kardes, 1988; Stayman & Kardes, 1992) and are held with greater confidence (Levin, Johnson, & Chapman, 1988). Accessible, confidently held judgments have a greater impact on other judgments and behavior (Fazio, 1995).

Proposition 2. Spontaneous (vs. prompted) inferences are more (a) generalizable, (b) accessible from memory, (c) held with greater confidence, and (d) have a greater impact on other judgments and behavior.

The amount of cognitive resources required is likely to influence the timing of inference formation. Instrumental inferences are formed quickly and automatically during the comprehension stage of information processing (Bransford & Johnson, 1972). As the amount of effort required for inference formation increases, inferences are formed at a later stage of information processing (Gilbert, 2002). Effortful inference formation is disrupted by cognitive load (e.g., time pressure, set size, multiple task demands).

Proposition 3. Inferences requiring minimal cognitive resources are formed during an early stage of information processing (e.g., the comprehension stage). As the amount of cognitive resources required increases, inference formation

occurs at a later stage of information processing (e.g., the encoding, judgment, or choice stages).

Although the motivation and the ability to deliberate are required for resource-dependent inferences, effort carries no guarantee of accuracy. Consumers believe that the validity of their inferences increases with motivation (e.g., involvement) and ability (e.g., knowledge, experience), but accuracy also depends on the structure of the environment in which inferences are formed (Hogarth, 2001). Wicked environments provide minimal, noisy, or delayed feedback, whereas kind environments provide ample immediate feedback with a high signal-to-noise ratio. Although inferential validity increases with the friendliness of the environment, consumers believe that they learn a lot as motivation (Mantel & Kardes, 1999) or experience (Muthukrishnan & Kardes, 2001) increases, regardless of the friendliness of the environment. Consequently, confidently held but invalid inferences are likely to be formed in unfriendly learning environments.

Proposition 4. Inferential validity depends on the motivation to deliberate, the ability to deliberate, and on the structure of the environment. Because consumers neglect the structure of the environment, confidently held but invalid inferences are more likely to be formed as the friendliness of the learning environment decreases.

In this article, we discuss examples of each of the eight types of inference delineated by our framework. The amount of research attention that has been devoted to each of these inference types differs, as does the extent of controversy and number of unresolved issues. Accordingly, our discussions of the different categories vary with respect to both length and detail of coverage.

INDUCTION

Inductive inferences are formed when consumers use specific attributes, brand names, or other cues to draw general conclusions about the likely benefits of using various products. Stimulus-based inductive inferences are formed when the product category is unfamiliar because consumers are unlikely to have much prior knowledge or experience on which to draw. In contrast, memory-based inductive inferences are more likely when the product category is familiar.

Stimulus-Based Singular Inferences

Information Integration Theory

This multi-attribute judgment model suggests that consumers consider the evaluative implications of each product attribute separately and combine these implications into an overall evaluation through the use of a simple algebraic rule (e.g., adding, averaging, multiplying; Anderson 1981, 1982). A weighted-averaging rule is commonly used in consumer

settings (Lynch, 1985; Troutman & Shanteau, 1976). Information integration theory is particularly useful when no prior judgment of the target product is stored in memory (e.g., when the target is novel), when information is easy to analyze into components and integrate (e.g., a verbal description of several attributes presented in a print ad), and when information is provided for a single brand by a single source (Wyer & Srull, 1989). Otherwise, a memory-based model, such as an attitude-based, category-based, or schema-based model, is more appropriate (Wyer, 2004; Wyer & Srull, 1989).

Cue Interaction Effects

Cue interaction learning models suggest that environmental cues compete with one another for predictive strength (van Osselaer & Janiszewski, 2001). Consequently, as the predictive strength of one cue increases, the predictive strength of other cues decreases. Cue interaction models suggest that the order in which associations are learned has an important influence on subsequent learning. For example, animal learning research has shown that after the relation between one conditioned stimulus (e.g., a tone) and a target unconditioned stimulus (e.g., a shock) is learned, learning about the relations between other conditioned stimuli (e.g., a light) and the target unconditioned stimulus are inhibited or blocked (the blocking effect, cf. Kamins, 1969).

Similarly, after consumers learn that a target attribute or brand name is useful for predicting quality, other cues (e.g., other attributes) seem uninformative (van Osselaer & Alba, 2000). During the first learning phase of van Osselaer and Alba's (2000) study, participants received attribute (airecell or closed-cell compartments) and brand name (Hypalon or Riken) information for several products in an unfamiliar category (rafts). Either the type of compartment or the brand name was predictive of quality. During the second learning phase, a redundant cue (tubular or I-beam floor) also predicted quality. During the test phase, participants judged the quality of several new products and difference scores were computed by subtracting the average quality ratings in experimental conditions from the average quality ratings in control conditions separately for each cue.

The results showed that learning about the redundant cue was inhibited or blocked by prior learning about a predictive cue, regardless of whether the predictive cue was a brand name or a different attribute. Follow-up studies showed that blocking occurs even when the redundant cue is strongly related to the predicted benefit (i.e., type of rudder and steering), and even when participants are told that the products in the first and second learning phases are identical.

van Osselaer and Alba (2003) investigated the competition between attribute versus brand name information as signals for quality by manipulating the predictive strength of attribute and brand cues (experimental conditions) or brand cues only (control conditions). During the learning phase, participants received attribute (Alpine class down fill or regu-

lar down fill) and brand name (Hypalon or Riken) information for several products in an unfamiliar category (down jackets). During the test phase, participants judged the quality of several new products.

The results showed that the brand name had a weaker effect on quality judgments when the target attribute was predictive (vs. uninformative) of product quality; this pattern was observed for new products in the original category (down jackets) as well as in an extension category (wool sweaters). Follow-up studies showed that this effect is reduced when brand-quality associations are learned prior to attribute-quality associations and when no information about quality is provided during the learning phase. Although spreading activation models and conventional wisdom suggest that building brand equity involves bolstering a brand with quality-delivering attributes, the results show that attribute equity undermines brand equity in learning environments with unambiguous feedback about quality.

Aggregation

Fiedler (1996) suggested that the manner in which information is distributed in the environment influences a wide range of inferential biases. Because the multiple-cue environment is often noisy, consumers attempt to reduce unsystematic error variance by aggregating over multiple stimuli. Information is lost in the environment before any higher order cognitive operations are performed. Consequently, even a completely unbiased information processor (e.g., a computer program) will exhibit bias due to information loss. Aggregating (e.g., adding or averaging) reduces error variance due to unreliability (e.g., information loss due to misperception or forgetting) and invalidity (e.g., imperfect relations between predictive cues and criteria) by increasing the salience of the common variance while canceling out error. Consequently, as sample size increases, the aggregate will resemble the criterion more closely (the law of large numbers). Fiedler's (1996) linear aggregation models predicted a wide range of inferential biases—including attitude polarization, group polarization, illusory correlation, self-serving attribution, actor-observer bias, out group homogeneity, the range-frequency effect, and the unpacking effect—without invoking any motivational or memory-based inferential mechanisms.

Stimulus-Based Comparative Inferences

How favorably or unfavorably consumers evaluate a target product depends on what standard they compare the target to. The same Toyota Camry seems like a good car when it is compared to a Ford Fiesta and seems like a bad car when it is compared to a Rolls Royce. Of course, it is impossible for a car to be good and bad at the same time, but shifts in perspective lead to shifts in judgment, and consumers are often remarkably inconsistent in what standards of comparison they apply in different situations.

Assimilation is a shift in judgment toward a standard and contrast is a shift in judgment away from a standard (Sherif & Hovland, 1961). Whether assimilation or contrast occurs depends on the extremity of the target, the ambiguity of the standard (Herr, 1986, 1989; Herr, Sherman, & Fazio, 1983), the cognitive resources allocated to the judgment task (Meyers-Levy & Sternthal, 1993), whether or not the target and the standard belong to the same category (Schwarz & Bless, 1992), and whether similarity testing or dissimilarity testing occurs (Mussweiler, 2003).

The feature-matching model suggests that when a target and a standard share many features they seem relatively similar and assimilation results (Herr, 1986, 1989; Herr et al., 1983). When a target and a standard share few features they seem relatively dissimilar and contrast results. A target and a standard are likely to share many features and assimilation is likely when the target is ambiguous (e.g., a hypothetical or unfamiliar product) or the standard is moderate (e.g., a fairly favorable or fairly unfavorable standard). A target and a standard are likely to share few features and contrast is likely when the target is unambiguous and the standard is extreme. In the Herr (1986, 1989; Herr et al., 1983) studies, the accessibility of the standard from memory was manipulated by asking participants to perform a subtle word puzzle priming procedure in an ostensibly unrelated previous study and the results suggested that feature-matching processes similarly mediate priming effects (Srull & Wyer, 1989; Wyer & Srull, 1989) and assimilation and contrast effects (Sherif & Hovland, 1961).

Meyers-Levy and Sternthal's (1993) two-factor model suggests that feature matching and cognitive resources jointly determine whether assimilation or contrast will occur. Contrast occurs when feature overlap is low and when consumers are motivated to allocate a high level of cognitive effort to a judgment task. Otherwise, assimilation is observed. The two-factor model assumes that assimilation is the default response and that contrast is observed only under limited conditions (for an opposing view, see Petty & Wegener, 1993; Wegener & Petty, 1995).

The inclusion-exclusion model emphasizes the importance of category membership in assimilation and contrast (Schwarz & Bless, 1992). German participants were first asked to answer some current events questions and then to evaluate the German Christian Democratic Party. Some participants were asked to indicate the party affiliation of a famous, well-respected politician. Because he was a member of the Christian Democratic Party, evaluations of the politician should be included in evaluations of the Christian Democratic Party and assimilation should result. Other participants were asked to indicate the position held by the famous politician. Because he held an honorary position that excluded him from party politics, evaluations of the politician should be excluded from evaluations of the Christian Democratic Party and contrast should result. As expected, including a referent (the politician) in a larger target category (the Christian Democratic Party) led to assimilation,

whereas excluding the same referent from the category led to contrast.

The selective accessibility model suggests that judgment depends on what subset of information that is stored in memory is activated during the comparison process (Mussweiler, 2003). Consumers begin with a quick holistic assessment of the degree of similarity between a target and a standard. If holistic target-standard similarity is high, consumers engage in similarity testing and search memory for additional information implying that the target and the standard are similar. Instead of searching memory for all judgment-relevant knowledge, memory search is limited to the subset of information that supports the hypothesis that the target and the standard are similar. Conversely, if holistic target-standard similarity is low, dissimilarity testing occurs and memory search focuses on the subset of information that supports the hypothesis that the target and the standard are dissimilar. Biased, selective memory search leads to assimilation when similarity testing occurs and to contrast when dissimilarity testing occurs.

Conversational inferences can also influence what standards consumers use as a basis for comparison. Consumers often assume that communicators provide accurate and useful information, unless there are reasons for questioning this assumption (Gruenfeld & Wyer, 1992; Hilton, 1995; Schwarz, 1996). Consequently, deceptive advertising using comparison omission can be effective because consumers often assume that companies are required by law to be truthful (Johar, 1995, 1996). For example, when an advertisement for an analgesic makes the claim that "no other pain reliever acts faster," consumers often assume that the advertised brand is faster acting than all other pain relievers even though the ad does not state this directly. When involvement is high, consumers are likely to reach this invalid conclusion spontaneously (or without prompting or encouragement) while reading the ad (Johar, 1995). However, when involvement is low, this conclusion eludes consumers until inferences are measured because questions about inferences prompt inference formation. Corrective advertising results in less favorable brand evaluations when prior evaluations of the source are unfavorable and in less favorable source evaluations when prior evaluations of the source are favorable (Johar, 1996). Furthermore, because evaluation adjustment is resource-dependent, evaluation adjustment is disrupted by cognitive load manipulations (e.g., time pressure, simultaneous tasks; Johar & Simmons, 2000).

Memory-Based Singular Inferences

Correlation-Based Inference

Correlation-based inferences are inductive because consumers use given information about a specific attribute or cue (e.g., price, warranty) to draw conclusions about a general property or dimension (e.g., quality, overall evaluation). Correlation-based inferences are memory-based because consumers' prior beliefs (or expectations or implicit theories)

about the correlation between the specific attribute and overall quality are used to guide the inference process. Because memory-based inferences are generated using prior knowledge and experience pertaining to interattribute correlations, moderate levels of expertise are typically needed for correlation-based inference formation (Lee & Olshavsky, 1994, 1995, 1997).

Price-quality inference. Inferences about unknown product quality based on known price information are a common type of correlation-based inference (Huber & McCann, 1982; Johnson, 1987, 1989; Johnson & Levin, 1985; Meyer, 1981). Consumers often rely heavily on price as an indicator of quality and estimate a strong positive correlation between price and quality (Broniarczyk & Alba, 1994c; Dodds, Monroe, & Grewal, 1991). The old adage, "you get what you pay for," is a deeply held belief for many. Scitovszky (1945) pointed out that a consumer's belief that price and quality are generally related represents an actual understanding of the interplay between supply and demand forces in the marketplace and that competing products can often be ordered based on price, resulting in a positive price-quality correlation. But, consumers often tend to overestimate the relation between price and quality and rely too heavily on this perceived relation when drawing inferences about quality. Their prior beliefs persist even when presented with objective evidence to the contrary.

Broniarczyk and Alba (1994c) provided information pertaining to 25 brands of stereo speakers to participants. For each brand, detailed information about price (in dollars), quality (in ratings on a scale from 0 to 100), and amount of advertising (in thousands of dollars per month) was presented. This information was presented in table format and several different versions of this table were created. In each version, the correlation between price and quality was held constant at zero and the correlation between amount of advertising and quality was manipulated. The information format (quality ratings presented in random or rank-ordered format) was also manipulated.

After examining price, quality, and amount of advertising data for 25 brands, participants were asked to rate the quality of 10 hypothetical test brands that were not included in the original set of 25 brands. Participants overestimated the strength of the relation between price and quality in all conditions, except for the condition in which amount of advertising and quality were perfectly correlated. Participants also underestimated the strength of the relation between amount of advertising and quality in all conditions, except for the condition in which amount of advertising and quality were uncorrelated. This pattern of results indicates that consumers' prior beliefs and expectations about the relations among price, quality, and amount of advertising can override objective data as a basis for perceived association between attributes. These findings are also consistent with the conclusions made by van Osselaer and Alba (2000) in that it appears that

consumers' prior knowledge and expectations were able to block the use of the new data that were provided. Interestingly, taken together, it appears that cue interaction effects may occur even when the competing predictive cues are learned at completely different times and have different levels of diagnostic value.

In a series of experiments examining potential influences on the overestimation of the price-quality relation, Kardes, Cronley, Kellaris, and Posavac (in press) also found that participants consistently relied on price as an indication of quality and overestimated price-quality correlations. In two experiments, with experimental procedures similar to Broniarczyk and Alba (1994c), participants received detailed brand information pertaining to wine. The presented information consisted of the brand name, the type of wine, the region of the vineyard, the retail price in dollars, and a quality rating (on a scale from 0 to 100) provided by a panel of experts. The number of brands presented on the information lists was manipulated (100 brands vs. 10 brands) and the information format (quality ratings presented in random vs. rank-ordered format) was varied. The need for cognitive closure refers to a preference or a desire for an answer to a question or problem, any answer, as opposed to confusion and ambiguity (Kruglanski & Webster 1996). In the Kardes et al. (in press) set of studies, the need for cognitive closure sometimes was manipulated using accuracy instructions and sometimes was measured as an individual difference variable.

After examining the data for the brands of wine, participants were asked to provide quality inferences (on a scale from 0 to 100) for 10 hypothetical wines described in terms of the predictors of price, country of origin of the wine, and the number of cases produced per year. The results revealed that participants significantly overestimated the strength of the relation between price and quality in all conditions. This price-quality correlation overestimation was further exaggerated when the amount of information provided was high (100 brands vs. 10 brands) and the information was presented in a rank-ordered (vs. random) format to individuals high (vs. low) in the need for cognitive closure. This pattern of results was replicated in two subsequent experiments using different product contexts (digital cameras, interior house paints, and boxed chocolates). The results are consistent with a selective information processing explanation of correlation perception. When a large amount of information is presented in a random fashion to consumers who are high in the need for cognitive closure, information that is consistent with consumers' expectations (i.e., high-price/high-quality cases, low-price/low-quality cases) is more accessible from memory, relative to information that is inconsistent with consumers' expectations (i.e., high-price/low-quality cases, low-price/high-quality cases).

Dodds et al. (1991) manipulated levels of brand name and store name information (low vs. high vs. absent in terms of familiarity and favorableness) and price (low, medium, high, too

high, and absent in terms of pretest perceptions) and measured perceived quality, value, and willingness to purchase for two products—calculators and stereo headsets. As expected, brand name information and store name information was positively related to quality judgments. Price–quality correlations were similar to findings discussed previously: When price was the only cue available, participants inferred a strong, positive relation between price and quality. More interestingly, the effect of brand name information was larger in the presence of price and store name information, but the effect of price on perceived quality was attenuated when brand name information was included. Dodds et al. suggested that these findings may have been driven by familiarity with brand name and store name information because the products used in the study were infrequently purchased items. As price rose, participants relied more on familiarity and knowledge of the brand name and store information attributes.

Warranty-quality inference. Another attribute that consumers may use to infer product quality is warranty information. Warranties are attractive to consumers because they offer both real and psychological security. Consumers may use a product's warranty to infer quality because they believe the manufacturer could not afford to offer a warranty if the product had a high failure rate and consumers understand that firms are legally obligated to honor provided warranties. In an examination of consumers' perceptions of warranties from an economic signaling theory perspective, Boulding and Kirmani (1993) found that warranty did serve as an indicator of quality, especially when the firm offering the warranty was perceived as credible (i.e., would honor the warranty). When participants believed that the firm was credible, as warranty scope (limited vs. unlimited) and length (3 months vs. 7 years) increased, so did overall product quality perceptions and reported purchase intentions. Interestingly, when the firm was perceived as noncredible, warranty scope and length resulted in lower quality ratings.

Purohit and Srivastava (2001), in developing a cue diagnosticity framework, reported results that suggest manufacturer reputation and retailer reputation influence the extent to which consumers use warranty information to infer quality. Participants were given information pertaining to manufacturer reputation and retailer reputation (*Consumer Reports*-type ratings) and warranty coverage (4 months vs. 24 months) and asked to evaluate a new computer product being introduced by the manufacturer and possibly sold through the retailer. When manufacturer reputation or the retailer reputation was positive, warranty information was utilized to infer product quality and better warranty coverage led to higher perceptions of quality. When manufacturer or retailer reputation was negative, warranty information was not used in quality inferences. Thus, consumers appear to use warranties to infer either high-quality or low-quality, depending on consumers' expectations and experiences, but that perceptions about the firm may moderate this process

(Boulding & Kirmani, 1993; Purohit & Srivastava, 2001; Shimp & Bearden, 1982).

Proposition 5. When expectations and data conflict, expectations typically dominate data because consumers focus on cases consistent with their expectations. Selective processing of expectation-consistent cases is reduced when the need for cognitive closure is low (vs. high), provided that cognitive load is high and the learning environment encourages the processing of expectation-inconsistent cases.

Negative Correlation-Based Inference. Although consumers frequently use their prior beliefs about positive interattribute correlations to guide their inferences, they use their prior beliefs about negative interattribute correlations only under limited conditions. Chernev and Carpenter (2001) suggested that consumers' knowledge and expertise regarding market efficiencies in a given product market (i.e., understanding what attributes are important for a product and how value is assigned to brands in the category) may influence perceived relations between known and inferred attributes and that this market knowledge can lead to negative correlations between known and unknown product attributes. These negative correlations arise out of the expert consumer's intuitive beliefs about the nature of competition in a market. These inferences are referred to as compensatory inferences (Chernev & Carpenter, 2001). For example, assume a set of brands in a product category is perceived as equal in overall quality. If one brand is high in quality on an observable attribute, then it is perceived to be low in quality on an unobserved attribute to compensate for its apparent superiority and match up to the other brands in the category, and this maintains expected parity among brands.

In a series of experiments, market efficiency (scenarios describing the market characteristics), market efficiency intuitions (a priming task to encourage/discourage perceptions of market efficiency), and price information (available vs. unavailable) were manipulated and participants were asked to make inferences about an unknown product attribute (memory) for personal computers. Results suggest that consumers engage in compensatory inferences when the market is known to be efficient, is believed to be efficient, and when other bases for inference, such as knowledge of specific interattribute correlations, are unknown. However, compensatory inferences are likely to be formed spontaneously only under limited conditions because negative correlations are difficult to learn and understand (Johnson, Meyer, & Ghose, 1989).

Heuristic-Based Inference

When the motivation or ability to engage in effortful and systematic product evaluation is low, heuristic processing dominates, and consumers use shortcuts and simplifying strategies to make judgments and decisions quickly. When consumers engage in heuristic processing, they tend to

make inferences using only a single piece of information: a heuristic cue. Although this speeds judgment, the danger lies in the possibility of the focal piece of information actually being irrelevant while crucial information is overlooked, resulting in poor or inaccurate judgments. Tversky and Kahneman (1974; see also Kahneman, Slovic, & Tversky, 1982; Sherman & Corty, 1984) identified four key cognitive heuristics that people use to make predictive inferences: the representativeness heuristic, the availability heuristic, the simulation heuristic, and the anchoring and adjustment heuristic.

The Representativeness Heuristic. This heuristic involves making predictions about unknown outcomes based on similarity. Consumers often make predictions about the performance or characteristics of an object (e.g., a brand, another person) based on its similarity to a known object, schema, or category. For example, suppose a consumer is trying to predict the likelihood that a generic product will perform as well as a given brand name product. Upon seeing the brand name and generic products on the store shelf, the consumer may note how similar the generic brand's package is to that of the name brand (creating a package of similar appearance to a name brand is common merchandising strategy for generic products) and infer that the generic product will perform similarly to the name brand product. Similarity-based judgments often are of acceptable accuracy because exemplars typically share features with categories to which they belong. However, judgments are often overly influenced by similarity, while the typically more relevant statistical evidence (e.g., base rates) is neglected. When the implications of apparent similarity between an exemplar and another object or category are inconsistent with statistical evidence, poor judgments are the rule. For example, the inference made by the hypothetical consumer described earlier is quite tenuous because package characteristics are often unrelated to product performance.

The Availability Heuristic. The availability heuristic describes the estimation of the likelihood of an event occurring based on the ease with which examples of the event can be retrieved from memory. If examples come easily and quickly to mind, the likelihood of the event seems high. For example, a person might try to predict the likelihood of having to wait for a table at a restaurant. If the person can easily remember several previous instances of having to wait for a table, the person will infer that they will likely have to wait. Unfortunately, memories of events are influenced by factors such as recency, salience, and vividness, as well as by frequency.

Our understanding of the availability heuristic is furthered by Schwarz (1998), who examined when likelihood judgments are based on the ease or difficulty with which recalled content can be brought to mind (i.e., subjective accessibility experiences) or on the recalled content itself. Individuals are

most likely to use subjective accessibility experiences when the perceived diagnosticity of the experiences is high (vs. low) and when the judgment task is of low (vs. high) personal relevance. Under these conditions, individuals infer the value of recalled content for making a frequency judgment based on the ease with which recalled content can be brought to mind (see also Schwarz et al., 1991; Schwarz & Vaughn, 2002; Winkielman, Schwarz, & Belli, 1998).

Wanke, Bohner, and Jurkowsch (1997) examined the role of accessibility experiences in product judgment. Specifically, they were interested in whether the anticipated ease of generating product arguments is equivalent to actual experienced ease. Kahneman et al. (1982) suggested that in employing the availability heuristic, a person does not actually have to retrieve the memories and perceived ease of retrieval is sufficient to influence inferences about the product. In the Wanke et al. (1997) study, actual retrieval and anticipated retrieval difficulty were manipulated by asking participants to generate either one pro or con argument for driving a BMW or 10 pro or con arguments for driving a BMW. Subjects were then asked to provide brand evaluations (attitudes toward the brands and purchase interest) based on advertisements for BMW and Mercedes automobiles. Results showed that anticipated ease of retrieval moderated brand evaluations and preferences. In the one-reason condition, participants' generation of pro/con product arguments resulted in more/less favorable evaluations of the target brand because participants used easily accessible information and perceived the task as easy. In the 10-reason condition, ease of retrieval, anticipated or experienced, was very low so the generation of pro/con arguments had little effect on brand evaluations and preferences. Thus, actual and anticipated ease of memory retrieval appear to be functionally equivalent.

The Simulation Heuristic. This heuristic relates to the idea that being able to imagine an event or sequence of events increases the perceived likelihood that it will occur. For example, consumers who are asked to imagine using cable television service are subsequently more likely to actually subscribe to a cable television service (Gregory, Cialdini, & Carpenter, 1982). The simulation heuristic also contributes to the planning fallacy: People often underestimate how long it will take to complete a task, even though they know that they have frequently fallen behind schedule on similar tasks performed in the past (Buehler, Griffin, & Ross, 1994). People frequently imagine themselves working hard every day on the task and imagining a specific sequence of events increases the perceived likelihood of the sequence.

The Anchoring-and-Adjustment Heuristic. This heuristic involves forming an initial judgment (i.e., an anchor) and then adjusting this judgment upward or downward depending on the implications of the imagined possibilities. Because adjustment requires cognitive effort, adjustment is typically insufficient,

and high anchors (or standards) lead to high judgments and low anchors lead to low judgments (Mussweiler, 2003; Tversky & Kahneman, 1974). For example, consumers purchase more units of a packaged good when high anchors (e.g., limit of 12 per person) than when low anchors (e.g., limit of 1) are provided in a grocery store (Wansink, Kent, & Hoch, 1998). High anchors can be presented via purchase quantity limits (e.g., limit of 12 per person), multiple-unit pricing (3 for the price of 2), suggestive selling (e.g., buy 12 for your freezer), and expansion anchors (e.g., 101 uses!).

The Affect Heuristic. Affective feelings of “goodness” or “badness” are often elicited quickly upon to exposure to various objects or issues. These feelings are often used as heuristic cues that guide perceptions of risks and benefits associated with various choice options and tasks (Slovic, Finucane, Peters, & MacGregor, 2002). Positive feelings lead to favorable perceptions of risks (low) and benefits (high), and negative feelings lead to unfavorable perceptions of risks (high) and benefits (low). Affective intensity increases the strength of these perceptions and the strength of the impact of these perceptions on risk taking. Favorable perceptions encourage risk taking and unfavorable perceptions discourage risk taking.

Research on feelings as information has shown that products are often evaluated more favorably when consumers are in a good mood rather than in a bad mood (Schwarz, 2002). The mood effect is often observed even when mood is manipulated in a manner that has nothing to do with the target product (e.g., finding a dime, receiving a small gift, listening to pleasant music, watching a funny movie). Affective states are often misattributed to the target rather than to sources extraneous to the target and the mood effect is eliminated when people are lead to believe (either truly or falsely) that their feelings have nothing to do with the target. The feelings-as-information hypothesis suggests that positive affect encourages heuristic processing and that negative affect encourages systematic processing, but Isen (2001) argued that heuristic processing has been confused with efficient processing and that positive affect results in more flexible, creative, and efficient processing.

The Brand Name Heuristic. Brand name reputation may also be used to infer product quality when it is used as a heuristic cue from the perspective of the heuristic–systematic model (Maheswaran, Mackie, & Chaiken, 1992). This limited-information-processing model suggests that when motivation or ability to engage in systematic product evaluation is low, heuristic processing dominates. Using task importance (telling participants the product would be [vs. would not be] available for purchase soon and that their individual responses were [vs. were not] very important) manipulates motivation toward systematic processing, Maheswaran et al. (1992) found that participants relied on brand name information to make product evaluations when motivation was low.

Further, even when motivation was high, participants used brand name information in conjunction with other attribute information, as long as the brand name was congruent with the attribute information.

Brand equity. Brand equity occurs when a consumer has brand awareness, coupled with strong, favorable, and unique brand associations formed and accessible in memory (Keller, 1993). These brand associations may be related to product attributes, benefits, and attitudes. Inferred associations play an important part in the formation and subsequent strengthening of brand equity. Strengthening the number of positive brand associations in the consumer’s associative memory framework (Anderson, 1983; Wyer & Srull, 1989) is important to building brand equity, and believed brand associations may be inferred, based on existing brand associations. For example, an association between the brand and the product benefit of luxury may exist in a consumer’s associative memory network. Based on this association, the consumer may infer associations to high product quality and positive social status. According to Keller (1993), these inferred associations are based on the perceived correlations between product attributes and benefits and borrows the terminology of Dick, Chakravarti, and Biehal (1990) in characterizing these associative inferences in terms of “probabilistic consistency.”

Brand equity may also be strengthened through inferred associations between the brand and other associations in memory unrelated the brand. Keller (1993) referred to these as “secondary associations” and these secondary associations may be inferred from primary associations about the company, the distribution channel, country of origin, brand endorser or spokesperson, or an event. For example, a consumer may have a primary association to Tiger Woods as a golf expert. Nike golf clubs become associated with golfing expertise indirectly through Woods as Woods uses Nike golf clubs on the tour (see Cronley, Houghton, Goddard, & Kardes, 1998; Rossiter & Percy, 1989, for related evidence). Similarly, a brand can benefit from its retailer’s reputation (e.g., jewelry from Tiffany’s, clothes from Saks Fifth Avenue, and toys from FAO Schwartz) or its country of origin (e.g., German automobiles, Belgian chocolates, and Russian vodka; Hong & Wyer, 1989; 1990; Jacoby & Mazursky, 1984; Keller, 1993).

Dual-process models. The elaboration likelihood model suggests that consumers engage in heuristic processing when the motivation or the ability to elaborate is low; otherwise, consumers engage in effortful processing (Petty & Wegener, 1999). Hence, the elaboration likelihood model is an either/or model: Consumers engage either in heuristic processing or in effortful processing. In contrast, the systematic-heuristic model suggests that consumers often simultaneously engage in heuristic and in effortful processing, particularly when both processes lead to judgments having

similar evaluative implications or when heuristic judgments fail to reach a desired confidence threshold (Chen & Chaiken, 1999; Maheswaran et al., 1992).

Kahneman and Frederick (2002) recently suggested that consumers may always engage in heuristic processing and may simultaneously engage in effortful processing when initial impressions seem implausible. When judging an object or an issue, people form an initial impression based on a relatively quick and effortless appraisal process. A slow effortful reflective system monitors the plausibility of people's initial impressions and adjustment occurs if plausibility concerns arise, provided that people are sufficiently motivated and able to correct their initial impressions.

Contrary to Kahneman and Frederick's (2002) hypothesis that heuristic processing occurs routinely, Cronley (2000) demonstrated that spontaneous attitude formation—assessed using Fazio, Lenn, and Effrein's (1984) response-latency procedures—occurs routinely for attitudes formed via the effortful central/systematic route, but not for attitudes formed via the peripheral/heuristic route. For the latter route, spontaneous attitude formation occurred only for individuals high (vs. low) in the need to evaluate (Jarvis & Petty, 1996). Adopting Fazio's (1995) functional perspective, Cronley (2000) concluded that consumers form attitudes spontaneously only when it is functional for them to do so. Attitudes are more likely to be perceived as functional when attitude formation is goal-directed (e.g., when consumers are motivated to purchase the best brand available or to hold opinions toward a wide variety of attitude objects).

Proposition 6. Spontaneous attitude formation is more likely when consumers follow the central/systematic (vs. peripheral/heuristic) route to persuasion or when the need to evaluate is high (vs. low). Spontaneously formed attitudes guide perception, information processing, and behavior, whereas measurement-induced attitudes do not.

Memory-Based Comparative Inferences

Implicit theories or expectations play an important role in correlation-based inferences in comparative judgment contexts as well as in singular judgment contexts. When an important attribute is missing for a target product but not for other comparison products, a comparative context can increase uncertainty by highlighting the missing attribute or decrease uncertainty by providing an informational basis for drawing inferences about the possible value of the missing attribute (other-brand inferences; Ford & Smith, 1987; Ross & Creyer, 1992). For example, if most brands in a particular category are priced similarly (i.e., the prices are highly correlated across brands), and if price information is missing for one brand, consumers may infer that this brand has the same price as the other brands in the category. In addition to correlation-based inferences, inferential correction and cate-

gory-based induction can occur in memory-based comparative judgment contexts.

Correlation-Based Inference in Choice

Choice contexts can increase sensitivity to missing information by encouraging the comparison of brands described by different amounts and types of attribute information (Broniarczyk & Alba, 1994b; Muthukrishnan & Ramaswami, 1999; Simmons & Leonard, 1990; Simmons & Lynch, 1992; Sanbonmatsu et al., 2003, Sanbonmatsu et al., 1997). When competing cues imply different values for a missing attribute, intuitive beliefs or theories typically dominate stimulus-based inferences. Broniarczyk and Alba (1994b) manipulated the intuitive correlation between the presented and the missing attribute information by varying the missing attribute. In memory-based inference conditions, the missing attribute (repair record) was believed to be correlated with a presented attribute (warranty). In stimulus-based inference conditions, the missing attribute (lens sharpness) was uncorrelated to all four presented 35 mm camera attributes.

During the learning phase of the experiment, participants received information about five attributes for four brands. During the choice phase, participants received information about four attributes for four new brands. Most participants chose the brand with the longest warranty in theory-based inference conditions because they assumed that warranty and repair record were highly correlated. However, most participants chose the brand that was most similar to the learning phase brand with the highest lens sharpness in stimulus-based inference conditions, because no other basis for inferring values for lens sharpness was available. Follow-up studies replicated this result using different stimuli. Moreover, the reliance on memory-based inference was reduced when the predictive attribute was high (vs. low) in variance across learning phase brands and when history (i.e., brand performance on the missing attribute over several years) conflicted with assumptions about the predictive-missing attribute correlation. In the latter case, one type of theory (i.e., history) may have dominated another (i.e., interattribute correlation).

Same-brand versus other-brand inference. The sources of attribute information, upon which correlation-based inferences are formed, can be drawn from the known information about other attributes of the target brand itself (i.e., same brand—quality of brand *n* is inferred from brand *n*'s price and length of warranty duration; e.g., Ford & Smith, 1987; Johnson & Levin, 1985) or from information about the attribute in question from other brands in the product category (i.e., across brand—quality of brand *n* is inferred from price information about brands *n*, *o*, and *p*; e.g., Huber & McCann, 1982; Ross & Creyer, 1992). In an experiment examining how attribute sources (same-brand vs. across-brand) and correlations between known attributes and missing informa-

tion (high vs. low) influence inferences about missing product information, Ford and Smith (1987) showed that participants relied on acquired information about attributes from the partially described target brand and from other brands in the category to form inferences, but that when both sources of information were available, same-brand information was relied on more heavily.

Conversely, Ross and Creyer (1992) suggested that Ford and Smith's (1987) attribute matrices were too simplistic— 2×2 (Workmanship \times Retailer Reputation or Durability) and argued that consumers rely almost exclusively on across-brand attribute information. Ross and Creyer (1992) found that participants relied on across-brand information first, and if this information was insufficient for inference formation, same-brand information was used. In another replication of Ford and Smith, Lee and Olshavsky (1997) reported results that were inconsistent with Ford and Smith and Ross and Creyer. Lee and Olshavsky found that both across-brand and same-brand attributes were relied on equally for drawing inferences about missing attributes, and speculated that conflicting results may be due to a failure to account for product category expertise or the market environment.

Accessibility–Diagnosticity theory. Dick et al. (1990) offered an accessibility–diagnosticity perspective to resolve the same-brand versus other-brand inference debate. According to accessibility–diagnosticity theory, many different types of information can be used as inputs for judgment; the inputs that are most accessible from memory and that are the most relevant or diagnostic are the inputs that are weighed the most heavily in judgment (Feldman & Lynch, 1988; Lynch, Marmorstein, & Weigold, 1988). The likelihood of same-brand versus other-brand inferences depends on the relative accessibility and the relative diagnosticity of same-brand attribute information versus other-brand attribute information.

Dick et al. (1990) demonstrated that accessibility–diagnosticity theory can also predict what information consumers will use when different types of same-brand inferences are possible. When a known attribute of a target brand is expected to be correlated with a missing attribute of the same brand, correlation-based inferences are possible (Dick et al. used the term *probabilistic consistency inferences*). Overall evaluations or attitudes can also be used to draw inferences about the value of a missing attribute (attitude-based inferences; Dick et al. used the term *evaluative consistency inferences*).

Participants were given a choice task in which they had to choose from a set of brands, some of which were present at the time of choice and others of which were not (Dick et al., 1990). First, participants were shown a set of camera brands described by four attributes. The levels of these attributes were varied to manipulate participants' overall brand evaluations. Then, after this initial set was removed, they were shown a new set of brands described on five attributes (the four attributes presented with the initial set plus one new at-

tribute). Finally, they were asked to choose one of the brands from a set that included both the (now absent) brands they had seen earlier and the new ones.

In addition to manipulating overall brand evaluations prior to choice, Dick et al. (1990) also manipulated how accessible brand attributes were in consumers' minds. The results demonstrated that when (a) attribute information was accessible in memory and (b) an attribute of the present brands was highly diagnostic of (i.e., correlated with) the unknown attribute of the initially presented brands, participants made inferences of the missing attribute based on the values of the available attribute (correlation-based inferences). When these conditions were not met, missing attribute inferences were made in accordance with participants' overall attitudes (attitude-based inferences).

We suggest that the accessibility–diagnosticity model can be expanded to include inferential rules as well as the informational inputs for inference formation. This perspective suggests that the accessibility and the diagnosticity of the if–then inferential rules that link evidence to conclusions are as important as the accessibility and the diagnosticity of the evidence (Ginosar & Trope, 1987).

Proposition 7. Which evidence will be used to support conclusions and which if–then inferential rules will be used to link evidence to conclusions depends on the relative accessibility and the relative diagnosticity of the evidence and of the inferential rules.

Discounting and slope effects. Simmons and Lynch (1991) offered a non-inference-making alternative explanation for discounting and slope effects observed in prior investigations of correlation-based inference in comparative judgment contexts. Many studies of judgment based on missing information compare evaluations of products described on two attributes, A and B (e.g., price and quality), with evaluations of products described on one attribute, A or B. Products are evaluated less favorably when information about one attribute is missing than when this attribute is described as average for the product category (Huber & McCann, 1982; Jaccard & Wood, 1988; Johnson, 1987, 1989; Johnson & Levin, 1985; Lim, Olshavsky, & Kim, 1988; Meyer, 1981; Slovic & MacPhillamy, 1974; Yamagishi & Hill, 1981, 1983). Simmons and Lynch (1991) referred to this effect as discounting. Many different processes can lead to discounting: (a) consumers may form correlation-based inferences with a negative adjustment (the correlation-based inference hypothesis), (b) consumers may treat missing information as a negative cue and this cue may be integrated separately with the evaluative implications of the presented information (the negative cue hypothesis), or (c) overall evaluations may be adjusted toward a more moderate position to correct for uncertainty caused by the detection of missing information (the inferential correction hypothesis).

In addition to discounting, many studies have observed a slope effect: In two-attribute contexts, the marginal effect of

manipulations of the favorableness of the presented attribute on overall evaluations (i.e., the slope) is weaker when information about the other attribute is omitted as opposed to presented. Johnson and Levin's (1985) model of correlation-based inference captured the discounting effect and the slope effect. When attribute A is presented and attribute B is missing:

$$R = w_{AS} s_A + w_{BS} s'_B \quad (1)$$

where R is the overall evaluation, s_A is the evaluation of A, s'_B is the inferred value of B, and the w s are weights that sum to one. The inferred value of B is:

$$s'_B = m s_A + k, \quad (2)$$

where m is the subjective correlation between A and B and k is a constant that is often negative to reflect a penalty for missing information. When $m = 0$ and k is negative, discounting is predicted. When m is negative and $k = 0$, a slope reduction is predicted. When m is positive and $k = 0$, a slope increase is predicted, but this effect has been observed in only a few studies (Johnson, 1989; Lim et al., 1988).

Simmons and Lynch (1991) conducted four experiments showing that discounting and slope effects are often not mediated by correlation-based inferences. Instead, they argued that missing information serves as a negative cue that is integrated with the evaluative implications of the presented information. Consistent with this perspective, discounting and slope effects were observed despite little evidence for correlation-based inference in participants' retrospective verbal protocols (Simmons & Lynch, 1991, Experiment 1). This pattern was replicated in a second experiment using a between-subjects (rather than a within-subjects) manipulation of interattribute correlation and using a smaller number of target products. Hence, decreasing the processing load did not increase the likelihood of correlation-based inference generation. Experiment 3 replicated the results of Experiments 1 and 2 using concurrent (rather than retrospective) verbal protocols. Experiment 4 used a response-time-based methodology to determine if the detection of missing information drew attention away from the presented information. It was predicted that cognitive effort and response time would be higher when missing information was salient (i.e., in two-attribute contexts) as opposed to nonsalient (i.e., in one-attribute contexts) and the results supported this prediction even though the previous three experiments indicated that the incidence of correlation-based inference generation was very low. Simmons and Lynch (1991) concluded that inference making is not as likely as prior research suggests, and that it is unnecessary to invoke inference making as a mediator of discounting and slope effects.

Our interpretation of the results of Simmons and Lynch (1991) is quite different. Although we agree that their results show that correlation-based inference formation is not as likely as implied by prior research and we agree that correla-

tion-based inference is not the only mediator of discounting and slope effects, our review suggests that many other types of inferences are possible. Our $2 \times 2 \times 2$ framework implies that there are eight types of inferences and correlation-based inferences fall into only two of the eight categories (correlation-based inferences in singular [same-brand inferences] and in comparative [other-brand inferences] judgment contexts). Instead of invoking a noninference making perspective, in our view, discounting and slope effects can be explained by inferential correction.

Inferential Correction

When people suspect that an initial anchor, impression, or evaluation is invalid, they attempt to adjust this judgment to correct for perceived sources of bias using implicit theories about bias to guide the direction and the magnitude of the inferential correction (Gilbert, 2002; Petty & Wegener, 1993; Wegener & Petty, 1995; Wilson, Centerbar, & Brekke, 2002). Judgment adjustment/correction requires cognitive effort, and consequently, as cognitive load increases (due to time pressure, set size, simultaneous tasks, etc.), the amount of adjustment decreases. Hence, cognitive load manipulations provide a useful diagnostic tool for separating initial and final judgments and for determining the direction and the amount of correction that is likely to be performed in anchoring and adjustment.

Gilbert (2002) showed that people frequently form trait inferences based directly on behavior with little correction for situational influences on behavior (correspondence bias), particularly when cognitive load is high. Petty and Wegener (1993; Wegener & Petty, 1995) showed that either assimilation or contrast can be the default response in comparative judgment, depending on the subtlety of standard activation and on the relevance of the standard, and that the direction of the adjustment performed on the initial judgment depends on implicit theories about the effects of the standard on judgment of the target. Moreover, the amount of adjustment is commensurate with implicit theories about the strength of influence of a bias on judgment (Wegener & Petty, 1995). Wilson et al. (2002) showed that people's implicit theories about how unwanted persuasive messages (e.g., advertisements, innuendos, subliminal messages) influence their judgments have an important affect on how people try to de-bias or undo "mental contamination." Research on omission neglect, however, is more germane to the analysis of consumer response to missing information.

Omission neglect. Consumers often use whatever information is readily available to them and neglect missing, unmentioned, or unknown information (Kardes & Sanbonmatsu, 2003). As a consequence, consumers often form extreme and confidently held judgments on the basis of weak or limited evidence. Sensitivity to omissions increases and more moderate judgments are formed, however, when consumers are warned that information is missing

(Sanbonmatsu, Kardes, & Herr, 1992), when consumers are highly knowledgeable about a product category and have well-articulated standards of comparison (Sanbonmatsu et al., 1992; Sanbonmatsu et al., 1991), and when comparison processes make it painfully obvious that some products are described by a relatively large amount of information and others by a small amount (Kardes & Sanbonmatsu, 1993; Muthukrishnan & Ramaswami, 1999; Sanbonmatsu et al., 2003, Sanbonmatsu et al., 1997).

Although omissions are typically not salient, variables that increase the salience of omissions help consumers to recognize that their judgments are based on weak or limited evidence and this encourages inferential correction toward a more moderate position. When information is weak or limited, moderate (vs. extreme) judgments are more accurate (Griffin & Tversky, 1992), more readily updated as new information becomes available (Cialdini, Levy, Herman, & Evenbeck, 1973), and are more justifiable to oneself and to others (Lerner & Tetlock, 1999; Shafir, Simonson, & Tversky, 1993).

Contextual cues that prompt the recognition of specific omissions are more likely to be present in comparative (vs. singular) judgment contexts and, consequently, set-size effects are more likely to be observed in within-subject than in between-subject designs. However, even in within-subject designs, sensitivity to missing information is greater when the product described by the larger amount of information is presented second as opposed to first (Kardes & Sanbonmatsu, 1993) and when products are described on nonalignable attributes (Sanbonmatsu et al., 1997, in press). Nonalignable attributes are unique to each product (e.g., Brand A has air conditioning, Brand B has anti-lock brakes) and are not directly comparable (Zhang, Kardes, & Cronley, 2002; Zhang & Markman, 1998, 2001). Alignable attributes are shared by both products (e.g., Brand A gets 30 miles per gallon, Brand B gets 25 miles per gallon) and are directly comparable.

More moderate judgments of the product described by a large amount of information and the product described by a small amount of information are formed when the products are described in terms of nonalignable attributes that alert consumers to specific omissions (Sanbonmatsu et al., 1997). More moderate judgments of a target product are also formed when a context product from a completely different product category is described by a large (vs. small) amount of information (a cross-category set-size effect). These results suggest that judgments are adjusted toward a more moderate position either when contextual cues alert consumers to specific omissions or when contextual cues imply a general lack of information due to unspecified omissions.

Comparative judgment contexts also reduce the tendency of consumers to overestimate the importance of the presented information (Sanbonmatsu et al., 2003). Half of the participants judged an automobile described by limited information (three nonalignable favorable attributes) singularly, and half

judged this product in the context of another automobile described by a larger amount of information (six nonalignable favorable attributes). An open-ended measure of attribute importance was employed. Participants were asked to list at least four and not more than eight attributes that are important to consider in evaluating an automobile and to explain why each listed attribute is important. One of three different sets of attributes was used to describe the target product and for whichever set was used, the attributes describing (vs. not describing) the target product were more likely to be reported as important in the singular judgment context, but not in the comparative judgment context. Moreover, as the perceived importance of the information used to describe the target product increased, the perceived sufficiency of this information increased, and evaluation extremity increased. Mediation analyses showed that perceived sufficiency mediates the effect of judgment context on evaluation extremity.

Proposition 8. Spontaneous inference formation is more likely when consumers are sensitive (vs. insensitive) to specified or to unspecified omissions.

Simmons and Lynch (1991) revisited. The discounting effects observed by Simmons and Lynch (1991) can be explained by inferential correction. A comparative judgment context increases sensitivity to omissions, which increases awareness of the perceived insufficiency of the presented information and results in the adjustment of an overall judgment toward a more moderate position. The negative cue hypothesis suggests that missing information is a separate negative cue that results in more negative judgments. However, initially favorable judgments are adjusted negatively toward a more moderate position and initially unfavorable judgments are adjusted positively toward a more moderate position when consumers are sensitive to omissions (Sanbonmatsu et al., 1997). Moreover, cognitive load manipulations (i.e., set size, time pressure) reduce adjustment for omissions even when omissions are salient (Sanbonmatsu, Shavitt, & Gibson, 1994), contrary to implications of the negative cue hypothesis.

The slope effects found by Simmons and Lynch (1991) can also be explained by inferential correction. Consumers overestimate the importance of the presented information when they are insensitive to omissions (Sanbonmatsu et al., 2003). Increasing sensitivity to omissions increases the cognizance of the limitations of the presented information and results in reduced overweighing of the given evidence. As the perceived importance of the presented information diminishes, reduced slope effects are observed.

Proposition 9. When consumers believe that an initial anchor, impression, or evaluation is invalid, they attempt to adjust this judgment to correct for perceived sources of bias using implicit theories about bias to guide the direction and the magnitude of the inferential correction. Consequently,

discounting and slope effects can be interpreted in terms of inferential correction rather than in terms of noninference making or in terms of the negative cue hypothesis.

Category-Based Induction

After learning about a property of one category, consumers may generalize to other categories. According to the similarity-coverage model of category-based induction, generalization depends on the degree of similarity between the former and the latter categories and on the degree to which the former is similar to the lowest level subcategory that includes the former and the latter categories (Osherson, Smith, Wilkie, Lopez, & Shafir, 1990). This model suggests that consumers should commit an inclusion fallacy: Consumers should generalize more readily from a specific category to a general category than from a specific category to another specific category that is included in the general category. For example, after learning that Sony stereo receivers are dependable, consumers are more likely to infer that all Sony products are dependable than to infer that Sony clock radios are dependable even though the Sony clock radio subcategory is included in the more general category of all Sony products (Joiner & Loken, 1998). The inclusion fallacy has been observed across a wide range of brands (e.g., Sony, Frito Lay, Kraft, Ralph Lauren, Gucci) and properties.

DEDUCTION

Deductive inferences are formed when consumers use general premises or arguments to draw specific conclusions. Stimulus-based deductive inferences are formed when the product category is unfamiliar because consumers are unlikely to have much prior knowledge or experience upon which to draw. In contrast, memory-based deductive inferences are likely when the product category is familiar.

Stimulus-Based Singular Inferences

Syllogistic inference involves deducing specific conclusions from general arguments and have the general form: A has X, if X then Y, therefore A has Y. For example, together the arguments "Stresstabs contain B vitamins" (A has X) and "B vitamins give you energy" (if X then Y) imply the conclusion that "Stresstabs give you energy" (A has Y). A total of 44 randomly presented product claims such as these were presented to participants who were asked to judge the believability of each claim (Kardes, 1988a). Conclusions were included in the set of product claims for half of the participants (explicit conclusion conditions) and were excluded for the remaining half (implicit conclusion conditions). Half of the claims were syllogistically related and half were not. Half of the product claims pertained to familiar brands and half pertained to unfamiliar brands. After rating the believability of

each claim, participants were asked to perform an unexpected recognition confidence task in which they were asked to indicate how confident they were that each of 16 test conclusions were presented explicitly during the believability judgment task.

Intrusions or high recognition confidence for conclusions that were implied but not presented (implicit conclusions) were of particular interest because prior research on source monitoring showed that people experience difficulty in discriminating between perceived versus inferred information when inferences are formed with relatively little processing effort (Johnson & Rahe, 1981). As predicted, recognition confidence was higher when the product claims were syllogistically related (vs. unrelated). Even though the arguments were presented randomly, participants inferred implicit conclusions even though they were not asked to do so, and later, participants experienced difficulty determining whether these conclusions were presented or inferred. This pattern was observed for familiar and for unfamiliar brands. A very different pattern emerged for explicit conclusions. In this case, recognition confidence was higher for familiar than for unfamiliar brands regardless of whether the conclusions were logically related to the premises or not. The results imply that consumers form syllogistic inferences naturally and spontaneously (i.e., without prompting) and that memory intrusions (i.e., high recognition or recall confidence for information that was not presented) provide a useful measure of spontaneous inference formation.

Syllogistic inference formation requires more effort when the arguments are more complex and embedded in the text of an ad. Kardes (1988b) manipulated the fear of invalidity (Kruglanski & Webster, 1996), or concern about committing an inferential error, to motivate consumers to draw inferences based on syllogistically related arguments embedded in an ad for a new compact disc player. In high fear of invalidity conditions, the header of the ad stated that compact disc players vary dramatically in quality and some are very good and some are very bad. This perceived variability manipulation was designed to encourage consumers to think carefully about the information presented in the ad. In contrast, in low fear of invalidity conditions, an uninformative header (i.e., "Compact Disc Players") raising no concerns about inferential accuracy was employed. The text of the ad contained three sets of arguments implying three conclusions that were either presented (explicit conclusion conditions) or omitted (implicit conclusion conditions). It was hypothesized that omitting conclusions would enhance advertising effectiveness when consumers were motivated to draw their own conclusions, but not when they were unmotivated to do so.

Participants were asked to judge the validity of each conclusion and response latencies were measured for each judgment (conclusion latencies). Participants were also asked to indicate the favorableness of their overall evaluations of the advertised brand. Finally, response latencies to simple good/bad evaluative judgments were measured

(evaluation latencies). The results showed that conclusion latencies were slower in the low fear of invalidity/implicit conclusion condition than in the remaining three conditions. This pattern was observed because participants failed to draw their own conclusions spontaneously. Therefore, because the target conclusions were omitted from the ad, participants failed to think about these conclusions until they were asked. In response to these questions, participants had to construct an answer by recalling information that was presented in the ad and by construing its judgmental implications (a time-consuming computational process; Lichtenstein & Srull, 1985). In contrast, in the remaining three conditions, participants could retrieve either a previously perceived or an inferred conclusion from memory (a relatively quick retrieval process; Lichtenstein & Srull, 1985). Hence, syllogistic inferences are formed spontaneously (prior to questioning) only when the fear of invalidity is high.

Less favorable evaluations were also formed in the low fear of invalidity/implicit conclusion condition than in the remaining three conditions. Apparently, when explicit conclusions are omitted and consumers are unlikely to draw these conclusions spontaneously, they miss the main point of the message and the ad is ineffective. In contrast, evaluation latencies were faster in the high fear of invalidity/implicit conclusion condition than in the remaining three conditions. This suggests that strong, more accessible attitudes are formed when consumers draw their own conclusions, rather than simply reading conclusions provided by the advertiser. Self-generated inferences are more accessible from memory (Moore, Reardon, & Durso, 1986), are held with greater confidence (Levin et al., 1988) and are less likely to encourage counter-argumentation (Kardes, 1993), relative to information that is simply read.

A follow-up study conducted by Stayman and Kardes (1992) showed that spontaneous inference generation was also more likely when the need for cognition, or the extent to which people enjoy performing effortful cognitive activities (Cacioppo, Petty, Feinstein, & Jarvis, 1996), is high (vs. low). Conclusion latencies were slower in the low need for cognition/implicit conclusion condition than in the remaining three conditions. Although individuals who were high in the need for cognition were more likely to generate inferences spontaneously, these individuals were likely to use these inferences as inputs for attitude formation only when they were also low (vs. high) in self-monitoring (Snyder, 1974). Individuals low (vs. high) in self-monitoring were more likely to use self-generated inferences because such individuals are more sensitive to information stored in memory. Because the need for cognition and self-monitoring were uncorrelated, and because spontaneous inference generation does not guarantee that inferences will be used as inputs for other judgments, stronger and more accessible brand attitudes were formed by individuals who were both high in the need for cognition (and therefore

more likely to generate inferences) and low in self-monitoring (and therefore more likely to utilize inferences).

Kardes, Kim, and Lim (1994) examined the perceived validity of the conclusions used by Stayman and Kardes (1992) from a Bayesian perspective. Bayes theorem states that:

$$\frac{P(H|B)}{P(H'|B)} = \frac{P(B|H)}{P(B|H')} \times \frac{P(H)}{P(H')} \quad (3)$$

From left to right, the terms are the prior odds that hypothesis H (versus alternative hypothesis H') is true given all that is known before forming belief B , the likelihood ratio or the information value of B for evaluating H , and the posterior odds that H is true given all that is known after forming belief B . Likelihood ratios were computed from judgments about the percentage of high-quality brands that possess the implied benefit divided by judgments about the percentage of low-quality brands that possess the implied benefit (or its reciprocal, whichever is larger) for each of four target benefits. Participants were also blocked into high versus low prior knowledge groups based on their scores on a quiz about the target product category.

In explicit conclusion conditions, the target benefits were presented in the ad. In prompted inference conditions, the target benefits were implied and participants were asked to judge the validity of these conclusions prior to the administration of the likelihood ratio judgment measures. In spontaneous inference conditions, the target benefits were implied and no judged validity measures were administered. The results showed that low-knowledge participants perceived the information value of explicit conclusions as greater than prompted or spontaneous inferences. However, high-knowledge participants tended to perceive the information value or explicit conclusions as lower than prompted or spontaneous inferences. Although prior research suggests that inferences are held with greater confidence, relative to information that is simply read (Levin et al., 1988), the results of Kardes et al. (1994) suggested that this is true only for highly knowledgeable consumers. This finding has important implications for inference utilization. High self-monitors often fail to use inferences that they themselves have generated (Stayman & Kardes, 1992) and low-knowledge consumers often trust conclusions provided by others more than they trust their own conclusions (Kardes et al., 1994).

Proposition 10. Inference utilization increases as the likelihood of spontaneous inference generation increases, but only when these inferences are perceived as diagnostic or judgment-relevant.

Kardes, Cronley, Pontes, and Houghton (2001) investigated how changes in one belief affect other beliefs linked together in a belief system. A belief system often consists of multiple sets of syllogistic arguments and conclusions. Each set can be represented by Wyer's (1975) model:

$$P(B) = P(A)P(B|A) + P(A')P(B|A') \quad (4)$$

where $P(B)$ refers to the perceived probability or belief that conclusion B is true; $P(A)$ and $P(A')$ are the beliefs that argument A is true and not true, respectively; and $P(B|A)$ and $P(B|A')$ are the conditional inferences that B is true if A is true and not true, respectively. Wyer's model implied that main effects should be observed for both conditional inferences and interactions should be observed for $P(A) \times P(B|A)$ and for $P(A) \times P(B|A')$. Wyer and Kardes et al. found support for these predictions. However, Wyer's model also implies that the main effect for $P(A)$, the $P(B|A) \times P(B|A')$ interaction, and the three-way interaction should be nonsignificant. The $P(A)$ main effect and the $P(B|A) \times P(B|A')$ interaction were significant in the Wyer study, but not in the Kardes et al. study. It is unclear if this occurred because Kardes et al. used less abstract stimuli, assessed fewer judgments, or both.

In a follow-up study, Kardes et al. (2001) found that the Socratic effect (the tendency for belief systems to become more consistent with repeated measurement) was more pronounced when brand familiarity was low (vs. high). In a third study, Kardes et al. (2001) found that resistance to counter-persuasion is greater when a belief system is organized horizontally (vs. vertically). Horizontal (independent) sets of syllogisms imply a target conclusion via several sets of independent sets of arguments. Vertical (interdependent) sets of syllogisms consist of a chain of arguments in which the conclusion of one set of arguments implies the first premise of the next set and the conclusion of this set implies the first premise of the next set. Together, the interdependent sets of arguments lead to a final target conclusion that is only as strong as the weakest link in the chain.

Stimulus-Based Comparative Inferences

If product A is better than product B , and if product B is better than product C , transitivity implies the conclusion that product A must be better than product C . Although transitive inferences are generally easy to form, recent research shows that transitivity is often violated when consumers make pairwise comparisons of products described with incomplete information (Kivetz & Simonson, 2000). This occurs because shared attributes are weighed more heavily than unique attributes (Slovic & MacPhillamy, 1974) and because inferences about missing attributes tend to be evaluatively consistent with the implications of the shared attributes (Kivetz & Simonson, 2000). That is, more favorable inferences about missing attributes are formed for the product that is better (vs. worse) in terms of the shared attributes. For example, Health Club A costs \$230 per year, Health Club B costs \$420 per year, and the cost of Health Club C is unknown. In this case, cost is a shared or a directly comparable attribute for Health Clubs A and B , but not C . Driving time to the health club is 6 min for B , 18 min for C , and unknown for A . Variety of exercise machines is very good for C , average for A , and

unknown for B . Hence, each alternative has one missing attribute.

When making pairwise comparisons, most consumers prefer A to B because A is less expensive. A and B are difficult to compare in terms of driving time and variety of machines because the first attribute is missing for B and the second is missing for A . Most consumers also prefer B to C because B is closer and because B and C are difficult to compare on the other two attributes due to missing information. Finally, most consumers prefer C to A because variety is better for C and because C and A are difficult to compare on the other two attributes due to missing information. In addition to observing relatively high rates of preference intransitivity, Kivetz and Simonson (2000) collected open-ended think-aloud verbal protocols that revealed relatively high rates of spontaneous inference formation. The comparative judgment context increased the salience of the missing information and this increased the likelihood of spontaneous inference formation (Sanbonmatsu et al., 2003, Sanbonmatsu et al., 1997). Moreover, these inferences supported the alternative that was favored on the shared attribute dimension.

Memory-Based Singular Inferences

Attitude-Based Inference

Consumers frequently use implicit theories to make deductive inferences of singular objects in making conclusions about specific attributes of the object based on their general attitude toward the object (attitude-based inferences or halo effects). For example, in a simultaneous equation analysis of consumers' attitudes toward television programs and their ratings of the attributes of the programs (e.g., extent of personal involvement with the program, quality of production and direction), Beckwith and Lehmann (1975) found that overall attitudes often guide consumers' attribute ratings. Rather than providing independent ratings of attributes (an assumption underlying use of the multiattribute model), consumers tend to exhibit a halo effect such that their overall attitude biases ratings of beliefs about attributes of the object. Accordingly, although the typical belief among multiattribute practitioners is that consumers aggregate their attribute beliefs weighted by importance to create overall attitudes, instead beliefs may often be formed based on an existing overall attitude.

Nisbett and Wilson (1977), in a person perception context, reported results consistent with the notion that attitudes may bias individuals' beliefs about attributes. Participants in their study watched a tape of a foreign born professor speaking in English. The professor either spoke in a warm or cold fashion. After watching the tape, participants were asked to rate the favorableness of the professor on several attributes unrelated to personal warmth—appearance, mannerisms, and accent. Nisbett and Wilson (1977) found that these attributes

were rated much more positively when participants viewed the warm versus cold tape because they developed a positive global attitude toward the professor, which then influenced their perception of his attributes. Interestingly, individuals had no cognizance that their global evaluations affected their attribute perceptions. Thus, the halo effect phenomenon appears to be robust across contexts because Beckwith and Lehmann (1975) showed that beliefs about the attributes of an object with which one has had personal experience may be colored by overall attitudes and Nisbett and Wilson (1977) demonstrated that global evaluations biased the interpretation of attributes of a novel stimulus.

In addition to influencing individuals' attribute beliefs, halo effects have also been shown in inferences about unknown characteristics of brands. Consumers' knowledge about brands is often incomplete and accordingly they must often infer unknown qualities of a brand by making an inference based on general attitudes toward the brand. For example, an ad may be sufficient to induce a favorable brand evaluation, but may not mention an attribute that a consumer perceives to be important in making his or her decision. Sanbonmatsu, Kardes, and Sansone (1991) explored how consumers form inferences of unknown attributes when they do have general evaluative expectancies regarding a brand.

If consumers are cognizant that information about a brand is incomplete, they typically make moderate inferences regarding the unknown attributes because they are unwilling to make an extreme conclusion unless such a conclusion is clearly warranted based on available evidence (Johnson & Levin, 1985). Sanbonmatsu et al. (1991) demonstrated, though, that this conservative strategy may be abandoned when cognizance of the absence of information diminishes, because inferences are more likely to be formed based on consumers' evaluative beliefs regarding the brand.

In one experiment, Sanbonmatsu et al. (1991) provided participants with five positive statements about a bicycle, but no information about the bicycle's durability. Either 1 min or 1 week after learning about the bicycle participants were asked to rate the durability of the bicycle and to recall as many statements about the bicycle as possible. When there was no delay between learning and rating of durability, participants provided moderate durability ratings. In contrast, when 1 week intervened between learning and rating, durability ratings were generally much more positively extreme. Sanbonmatsu et al. argued that participants' cognizance that information was incomplete faded over the course of the week and that instead of forming moderate inferences participants instead inferred that durability was commensurate with the favorable information they received regarding other attributes.

Although the inferences of most participants followed this pattern, participants with high product knowledge typically did not exhibit this halo effect. Instead, bicycle experts formed moderate inferences regardless of whether there was a delay between learning and durability rating, presumably

because they were more aware that information in the learning phase was missing. Consistent with this explanation, participants' recall of statements about the bicycle mediated the effect of time delay on inference, and in a later experiment, focusing participants' attention on lack of durability information during learning precluded subsequently extreme inferences. These effects were remarkably robust and held across numerous processing goals given to participants while they learned about the bicycle, and whether the attribute information was positive or negative.

Dick et al. (1990) found that attitude-based inferences dominated attribute-based inferences when attribute information was difficult to retrieve from memory, but that attribute-based inferences dominated attitude-based inferences when attribute information could be recalled perfectly. In high attribute accessibility conditions, participants were required to relearn the attribute information until perfect memory had been attained. When less heavy-handed approaches are used, however, attitude-based inferences dominate attribute-based inferences and this occurs even when attitudes are based on incomplete information (Kardes, 1986). Moreover, attitudes (vs. attributes) are frequently more accessible from memory and consumers are often able to access their attitudes even when they are unable to retrieve the attributes that were originally used as a basis for attitude formation (Kardes, 1986). Thus, in most situations, consumers will make inferences of missing attributes consistent with their brand attitudes. However, if processing conditions are facilitative, consumers will base inference on the typical relation between a known attribute and the attribute that is not known.

Proposition 11. Attitudes are often more accessible than attributes, and, consequently, attitude-based inferences often dominate attribute-based inferences.

Reconstructive Inference

When information is relatively inaccessible from memory, consumers use currently accessible information to draw inferences about the past (Braun, 1999; Ross, 1989). Misleading advertisements, questions, or suggestions lead people to manufacture memories of the past that seem plausible but that have no basis in reality. When information is difficult to retrieve from memory, currently accessible information is used as an anchor and adjustments are performed based on implicit theories, schemata, or expectations concerning stability or change (Ross, 1989). If stability is expected, little adjustment is performed. Greater adjustment is performed as the amount of change that is expected increases. In general, people assume that their traits, attitudes, and opinions are stable over time, and that their skills and abilities change over time. People are often motivated to believe that their skills and abilities improve over time.

Ross, McFarland, and Fletcher (1981) presented a persuasive message on the harmful consequences of frequent tooth brushing (e.g., gum damage) to some participants but not to others. All participants were asked to indicate how often they brushed their teeth during the past 2 weeks. Participants reported that they brushed their teeth less frequently in the negative-message condition than in the no-message control condition. Similarly, advertising can distort memory for sensory experiences registered during a product taste test conducted earlier (Braun, 1999). Participants tasted an objectively poor-tasting orange juice and later received an ad implying that this brand tasted like fresh squeezed sweet and pulpy orange juice. The orange juice was rated as more flavorful and higher in quality when participants received the misleading ad than when no ad was presented. A follow-up study showed that memory distorting misleading advertising increases the likelihood of brand consideration and choice.

Although reconstructive processes often distort memory, reconstructive processes can also improve memory performance under some circumstances. When the to-be-recalled information is consistent with the implications of currently accessible information and with implicit theories about the nature of the relation between the present and the past, memory performance is actually enhanced (Hirt, 1990; Hirt, McDonald, & Erickson, 1995).

Memory-Based Comparative Inferences

Category-Based Deduction

When consumers size up a new product, they may draw inferences about it based on the category to which the product belongs. To the extent that category knowledge can be applied to a given product, the consumer will be better able to quickly size up the product than if he or she engaged in more of a piecemeal approach, in which appraisals are constructed based on product features (as implied by information integration theory). It is of obvious importance for consumer researchers to understand both when categorical versus piecemeal processing is likely and what implications categorical processing has for consumers' perceptions and evaluations of products.

Fiske and Pavelchak (1986) forwarded a model of person perception that suggests when individuals are likely to engage in categorical processing and when they are likely to adopt a piecemeal approach. Their model focuses on how the information that is provided is likely to facilitate one or the other styles of processing. The first consideration is whether the category membership of a new stimulus is explicitly labeled as belonging to a category. In a marketing context, this may occur via information conveyed on a package or in an ad. If all that an individual knows about an object is that it belongs to some category (i.e., attribute information is not provided), the individual will engage in categorical processing. If, in contrast, attribute information is available, then the

match between the attributes and qualities of the category determines whether the individual will adopt a categorical or piecemeal processing strategy. If the attributes of the target match the category, then category-based processing is likely. If the attributes do not match the category, piecemeal processing will ensue.

In some instances, the category membership of an encountered stimulus is not readily apparent. For example, a product may sometimes be totally new or may belong to an unfamiliar category. In this situation, processing depends on whether the object automatically activates the category in the mind of the perceiver (Fiske & Pavelchak, 1986). If the category is accessed, categorical processing is likely; if not, piecemeal processing will result.

Whereas Fiske and Pavelchak (1986) focused on qualities of the object to be judged and information about the object as determinants of the likelihood of categorical versus piecemeal processing, Brewer (1988) focused on how motivation may influence processing type. The extent of perceiver involvement with the judgment is critical in her conceptualization. Specifically, if the judgment is highly self-involving, individuals may be likely to engage in relatively effortful piecemeal processing to ensure a correct judgment. If the judgment is not involving, the individual is likely to try to assign the object to a category and make inferences based on category membership. If the attributes of the object fit a category, category-based processing will ensue. If the attributes do not match the category, the individual will try to divide the category into subcategories and make inferences based on knowledge of and expectations regarding the subcategory. If a noninvolving object cannot be categorized, there is no option except to make judgments based on piecemeal processing.

Sujan (1985) conducted a study to delineate when individuals would engage in category versus piecemeal processing in a consumer context. She found that expert consumers (i.e., those with well-developed category knowledge) engaged in category-based processing when a target brand fit well with their knowledge of the relevant category. Specifically, they tended to arrive at evaluations of the brand quickly and to consider more category information and less information specific to the singular brand. In contrast, when attributes of a brand did not match the category, expert consumers engaged in more analytical (i.e., piecemeal) processing of brand information that required more time than category-based processing and arrived at final judgments of the brand that were based primarily on attributes of the brand versus the category.

This pattern did not hold for novice consumers, who have much less well-developed category knowledge. Although novices in Sujan's (1985) study were able to recognize when target brands matched versus did not match a given category, they typically made category-based inferences whether the target match matched the category or not. Rather than the normatively appropriate piecemeal processing strategy when a brand does not match its purported category, novices may

be overly likely to use general feelings about a given category in evaluating a new brand claimed to belong to the category.

Categorically based inference processes also have relevance for understanding consumers' responses to comparative advertisements. Sujan and Dekleva (1987) compared three ad types: (a) a noncomparative ad that introduced a new brand as belonging to a given product *class* (i.e., camera), (b) a noncomparative ad that introduced the new brand as belonging to a given product *type* (i.e., 35 mm SLR camera), and (c) an ad in which the new brand was compared to a well known competitor within the given product type. Generally, the more specific a categorization that is made (e.g., product type is more specific than product class), the more specific brand inferences will be. A comparative ad may be beneficial for an advertiser who hopes to provoke inference drawing among consumers because it provides a very specific level of categorization. Sujan and Dekleva (1987) found that for both experts and novices, comparative ads (vs. noncomparative ads) that positioned a new product as belonging to a given product class resulted in the greater perceptions that the ad was informative, greater perceived similarity between the advertised brand and competitors, and greater perceived differences versus brands belonging to another category. For experts, but not novices, comparative ads were superior on these measures versus noncomparative ads that positioned a new product as belonging to a given product type. Importantly, ad-induced inferences were shown to mediate all of these effects. Thus, the inferences consumers generate when they see an ad mediate both ad effectiveness and subsequent brand evaluations.

Country-of-origin-based inferences. Hong and Wyer (1989) used concepts of categorical inference to understand how consumers' knowledge of where a product was made affects their evaluative assessments of the product. Participants in their study learned about products with one of two objectives in mind: either to form an impression of the product based on its features or asked to evaluate the clarity of the given product information. Thus, in the latter condition, participants' task was simply to comprehend the product information that was presented to them. Although the country of a product's origin typically had direct influence on product evaluations, in the comprehension conditions it had the additional role of priming participants' interest in the product and increasing the care with which they processed subsequent attribute information. Attribute information, in turn, had greater influence on product evaluations. In contrast, participants in the impression formation conditions always processed attribute information carefully.

Hong and Wyer (1990) replicated the Hong and Wyer (1989) finding that the country in which a product was made could serve as a category from which evaluative inferences were made and additionally specified the contexts in which country of origin would also influence consumers' attribute evaluations. Hong and Wyer (1990) made a number of contri-

butions beyond Hong and Wyer (1989) by varying when country of origin information was provided to participants and the evaluative ambiguity of product attributes. Specifically, participants received country of origin information either before or after brand attribute information was presented and these two sources of information were either presented sequentially or after a 24-hr delay. After receiving both sources of information, participants completed brand evaluations and were asked to recall the information they received and evaluate the favorableness of each brand attribute.

As with Hong and Wyer (1989), Hong and Wyer (1990) found that the country of origin generally serves as a source of category-based inference, but that it operates differently as a function of whether time elapses between country of origin learning and receipt of attribute information. When attributes were presented before country of origin, or country of origin was revealed immediately before attribute information, country of origin simply served as an ordinary attribute, aggregated along with other attributes in the creation of summary evaluations. In contrast, when country of origin was presented 24 hr before attribute information, country became a distinct concept that guided subsequently received information. Specifically, participants' perceptions of the country of origin directly affected overall evaluations, but additionally affected estimations of the favorableness of brand attributes such that ambiguous attributes were rated more favorably when the country of origin was reputed to make high-versus low-quality products.

In addition to affecting consumers' perceptions of ambiguous attributes, country of origin affected the favorableness of their perceptions of unambiguously positive or negative attributes when there was a delay between the provision of country of origin information and attribute ratings. Specifically, assimilation effects were evident such that when the country was reputed to make positive products, positive attributes were perceived more favorably; when the country was reputed to make poor products, negative attributes were perceived less favorably. Contrast effects were also present. Specifically, when there was a mismatch between the reputation of the country and attribute valence (favorable country reputation paired with a negative attribute or an unfavorable country reputation paired with a positive attribute), the attribute was perceived more extremely in its initial direction. In cases of both match and mismatch between the reputation of the manufacturing country and attribute valence, learning about the country in which a product was made led to more extreme perceptions of the unambiguous attributes.

Li and Wyer (1994) provided further insight into how a product's country of origin affects consumers' evaluations of it. In this study, country was particularly likely to serve as an independent attribute when context facilitated consumers' consideration of all available product information; specifically, when decision importance was high and when country of origin information was conveyed prior to other attribute information. Country of origin was also used in inference

formation regarding missing attributes of a familiar product type (a wristwatch) when little product information was available. Finally, country of origin was shown to serve as a standard of comparison for product evaluations. When a consumer is familiar with a product described by a large amount of information, or is making an unimportant decision in which country information is encountered after attribute information is processed, contrast effects may emerge in which the product is perceived less favorably because of the lofty expectations regarding products made in that country.

Category-based deduction concerning brand extensions. Leveraging brand equity through brand extension relies on consumers inferring that associations related to brand knowledge for the parent brand extend to the brand extension (Aaker & Keller, 1990; Keller, 1993; Keller & Aaker, 1992). Much research has been devoted to better understanding how consumers use parent brand knowledge to evaluate brand extensions (e.g., Aaker & Keller, 1990; Boush & Loken, 1991; Bridges, Keller, & Sood, 2000; Chakravarti, MacInnis, & Nakamoto, 1990; Farquhar, Herr, & Fazio, 1990; Herr, Farquhar, & Fazio, 1996; Keller, 1993; Keller & Aaker, 1992; Park, Milberg, & Lawson, 1991).

Keller and Aaker (1992; Bridges et al., 2000; Keller, 1993; see also Broniarczyk & Alba, 1994a) suggested that the salience (i.e., what specific associations are easily brought to mind) and relevance (i.e., how diagnostic the associations are) of parent brand associations, coupled with the favorableness of parent brand associations (brand affect), are the keys to brand extension evaluations. This conceptualization is akin to accessibility–diagnosticity perspectives offered in the memory-based inference literature (Dick et al., 1990; Feldman & Lynch, 1988). Associations that are determined to be more useful, reliable, and diagnostic for judgment and evaluation receive more consideration and relevant associations that are highly memorable and more accessible in memory may be more likely to be used in evaluation.

Typically, judged relevance of parent brand associations depends on the perceived relatedness (similarity, fit, typicality) between the parent brand and the extension, either in terms of specific product feature associations or category-level associations. In general, when relatedness is high, consumers are more likely to base extension evaluations on parent brand associations and attitudes (Aaker & Keller, 1990; Boush & Loken, 1991; Bridges et al., 2000; Broniarczyk & Alba, 1994a; Chakravarti et al., 1990; Farquhar et al., 1990; Park et al., 1991). For instance, when looking at the degree of similarity between the parent and extension brands in terms of product feature associations, Bridges et al. (2000) found evaluations of brand extensions were less favorable when the parent brand's dominant associations (i.e., those that define the brand within the marketplace along some positioning dimension; e.g., Volvo as "safe") were inconsistent with those of the extension brand. In this case, consistency was defined in terms of attrib-

ute-based vs. non-attribute-based dominant associations. Similarly, Park et al. (1991) found that product feature similarity determined extension evaluations but also found that product-level associations alone do not drive extension evaluations. Park et al. showed that consistency between parent and extension brands with respect to their brand-name-concepts (i.e., brand-unique abstract meanings that are inferred from concrete brand features and are global in nature; e.g., Rolls Royce as "high social status") also influenced extension evaluations, with higher consistency resulting in more favorable evaluations of the extension.

Relatedness also extends to category-level associations. In developing a relational model of brand extensions, Farquhar et al. (1990) proposed that brand extension evaluations should be more favorable when the product categories are more closely (vs. distantly) related. In a subsequent study that tested aspects of this relational model, Herr et al. (1996) found that consumers' brand affect for category-dominant (e.g., Nike evokes the category of athletic shoes) brands transferred better to a proposed brand extension when the parent category and extension (target) category were closely (vs. distantly) related, defining relatedness according to Aaker and Keller's (1990) criteria of similarity of common features, substitutability of function, and complementarity in usage.

Finally, in an interesting study that attempted to order the influences of brand-specific associations (a conceptualization similar to "dominant brand association" of Bridges et al., 2000, and Park et al., 1991), parent brand affect transfer, and category relatedness, Broniarczyk and Alba (1994a) found that salient brand-specific associations dominated brand affect and product category similarity to the extent that consumers used these brand-specific associations to evaluate brand extension. Broniarczyk and Alba used this argument to reinforce the idea that the process by which consumers evaluate brand extensions is based on an inference process (as opposed to other models, such as an affect-transfer model).

Although an exhaustive review of all of the brand equity literature is beyond the scope of this article, the extant research reviewed here suggests that inferring associations between parent and extended brands is facilitated by the degree of perceived relatedness (similarity, fit, typicality) between brand-specific product features and between product categories, the degree of perceived brand-concept consistency between brands, the overall strength and favorableness of parent specific-brand associations, and the degree of category dominance the parent brand possesses. An area of opportunity exists in better understanding the inferential process(es) at work during brand extension.

To summarize, consumers may form inferences of products based on the manufacturer of a brand, the perceptual construction of the "typical" consumer who uses the brand, the retail stores that carry the brand, and celebrity endorsers because each of these instances may provoke categorical processing. The manner in which these inferences are likely to

proceed will be a function of factors discussed earlier, including judgments of the similarity of the brand to the category (Fiske & Pavelchak, 1986), motivation (Brewer, 1988), consumer knowledge and expertise (Li & Wyer, 1994; Sujjan, 1985), goals during impression formation (Hong & Wyer, 1989), and the timing of consideration of the category and the product (Hong & Wyer, 1990).

Proposition 12. Consumers' judgments and choices often reflect reputation effects in which product inferences are made based on knowledge and perceptions of related or relevant entities (e.g., country of origin, manufacturer, brand name, product line, retail outlet, spokesperson, salesperson, typical user).

Recent research has implicated the role of consumers' inferences about an advertiser in determining the effectiveness of advertising (Campbell, 1995; Campbell & Kirmani, 2000; Friestad & Wright, 1994; Jain & Posavac, in press). For example, negative comparative ads (e.g., "The competing brand is bad but our brand is good") typically perform much worse than positive comparative ads (e.g., "The competing brand is good but our brand is better") on a host of outcome measures (Jain & Posavac, in press). This result is obtained because consumers make more negative inferences about the advertiser when a negative comparison is made and are accordingly much less likely to be persuaded by the ad. Thus, the initial negative perception of the advertiser seems to lead to a second inference that the information conveyed in the ad is not to be trusted in forming or updating brand perceptions. As this example suggests, increased understanding of consumers' inferential processes when they encounter ads could yield many more important insights with respect to ad effectiveness.

Proposition 13. Consumers' inferences about advertisers affect ad effectiveness. Inferences about the credibility of advertisers cascade on to inferences about the desirability of advertised brands and brand attributes and benefits.

Schema-Based Deduction

The terms *category-based inference* and *schema-based inference* are often used interchangeably in the social and consumer psychology literatures. However, we suggest that schemata are organized knowledge structures based on prior experience that consists of categorical knowledge, associative networks, implicit theories, or narrative representations (Wyer, 2004). Stories or narrative representations are particularly useful for filling in gaps in knowledge during comprehension; spontaneous (vs. prompted) narrative-based inferences are likely to be formed to explain the reasons underlying actions, events, or states (Graesser, Singer, & Trabasso, 1994). Such inferences include the superordinate goals of individuals that motivate their actions (e.g., the consumer went to the restaurant because he was hungry), causal

antecedents (e.g., the consumer left the restaurant because his favorite dish was not available), and details that flesh out the main points of the story. Other less relevant details are less likely to be inferred spontaneously.

DISCUSSION

Consumer judgment is often based on incomplete or limited knowledge of the relevant information. A wide variety of cues (e.g., attributes, heuristics, experiences, feelings, arguments, knowledge) and processes (e.g., induction vs. deduction, spontaneous vs. prompted, intuitive vs. deliberative) are used to go beyond the information given. In addition, the context (singular vs. comparative) in which inferential judgments are formed influences the types of cues that are likely to be used and the processes that are likely to be performed on these cues.

A summary of the research propositions implied by our $2 \times 2 \times 2$ framework is presented in Table 2. This framework suggests that eight types of inferences are possible and a wide variety of information, ranging from specific attributes and cues to general categories and schemata, can be linked to these inferences. Which information is used depends on the accessibility and the diagnosticity of the information (Dick et al., 1990; Feldman & Lynch, 1988; Lynch et al., 1988). Salience, vividness, frequency or recency of activation, and elaborative processing influence accessibility (Higgins, 1996; Wyer & Srull, 1989), perceived causality, cue specificity, and cue consistency influence diagnosticity (Bar-Hillel, 1980; Lynch & Ofir, 1989).

Our review reveals that relatively few experiments have used procedures that distinguish between spontaneous (or on-line) inferences and prompted (or measurement-induced) inferences. Spontaneous inferences are formed on-line as judgment-relevant information is encountered and occur without the biasing influence of questions that encourage inference formation during the question-answering phase of an experiment. Because spontaneous inferences are formed on-line, they occur in the field as well as in controlled laboratory settings. In contrast, prompted inferences are formed only in response to leading questions that instigate inferential processes that would not have been initiated in the absence of direct questioning. Consequently, prompted inferences do not occur in the field.

In addition to being more generalizable, spontaneous inferences are more accessible from memory (Kardes, 1988; Stayman & Kardes, 1992) and are held with greater confidence (Levin et al., 1988). Because accessible, confidently held judgments have a greater impact on other judgments and behavior (Fazio, 1995), spontaneous inferences should also have greater influence. Again, this suggests that greater attention should be paid to the spontaneous versus prompted inference distinction.

TABLE 2
Summary of the Research Propositions Implied by the $2 \times 2 \times 2$ Framework.

Proposition 1: When cognitive resources are required, spontaneous inference formation is more likely when the motivation and the ability to deliberate are high. The degree of motivation and ability required varies as a function of the strength of the evidence and on consumers' goals.

Proposition 2: Spontaneous (vs. prompted) inferences are more (a) generalizable, (b) accessible from memory, (c) held with greater confidence, and (d) have a greater impact on other judgments and behavior.

Proposition 3: Inferences requiring minimal cognitive resources are formed during an early stage of information processing (e.g., the comprehension stage). As the amount of cognitive resources required increases, inference formation occurs at a later stage of information processing (e.g., the encoding, judgment, or choice stages).

Proposition 4: Inferential validity depends on the motivation to deliberate, the ability to deliberate, and on the structure of the environment. Because consumers neglect the structure of the environment, confidently-held but invalid inferences are more likely to be formed as the friendliness of the learning environment decreases.

Proposition 5: When expectations and data conflict, expectations typically dominate data because consumers focus on cases consistent with their expectations. Selective processing of expectation-consistent cases is reduced when the need for cognitive closure is low (vs. high), provided that cognitive load is high and the learning environment encourages the processing of expectation-inconsistent cases.

Proposition 6: Spontaneous attitude formation is more likely when consumers follow the central/systematic (vs. peripheral/heuristic) route to persuasion or when the need to evaluate is high (vs. low). Spontaneously-formed attitudes guide perception, information processing, and behavior, whereas measurement-induced attitudes do not.

Proposition 7: Which evidence will be used to support conclusions and which if-then inferential rules will be used to link evidence to conclusions depends on the relative accessibility and the relative diagnosticity of the evidence and of the inferential rules.

Proposition 8: Spontaneous inference formation is more likely when consumers are sensitive (vs. insensitive) to specified or to unspecified omissions.

Proposition 9: When consumers believe that an initial anchor, impression, or evaluation is invalid, they attempt to adjust this judgment to correct for perceived sources of bias using implicit theories about bias to guide the direction and the magnitude of the inferential correction. Consequently, discounting and slope effects can be interpreted in terms of inferential correction rather than in terms of non-inference-making or in terms of the negative cue hypothesis.

Proposition 10: Attitudes are often more accessible than attributes, and consequently, attitude-based inferences often dominate attribute-based inferences.

Proposition 11: Inference utilization increases as the likelihood of spontaneous inference generation increases, but only when these inferences are perceived as diagnostic or judgment-relevant.

Proposition 12: Consumers' judgments and choices often reflect reputation effects, in which product inferences are made based on knowledge and perceptions of related or relevant entities (e.g., country of origin, manufacturer, brand name, product line, retail outlet, spokesperson, salesperson, typical user).

Proposition 13: Consumers' inferences about advertisers affect ad effectiveness. Inferences about the credibility of advertisers cascade on to inferences about the desirability of advertised brands and brand attributes and benefits.

Proposition 14: Spontaneous inference formation is more likely for inductive (vs. deductive) inferences.

Proposition 15: Spontaneous inference formation is more likely for memory-based (vs. stimulus-based) inferences.

Proposition 16: Spontaneous inference formation is more likely in comparative (vs. singular) judgment contexts.

Proposition 17: Inductive (vs. deductive), memory-based (vs. stimulus-based), and comparative (vs. singular) inferences are more (a) generalizable, (b) accessible from memory, (c) held with greater confidence, and (d) have a greater impact on other judgments and behavior, but only when these inferences are perceived as diagnostic or judgment-relevant.

Each of the factors in our $2 \times 2 \times 2$ framework influence the likelihood of spontaneous inference formation. Research on the induction-deduction asymmetry in social judgment shows that spontaneous inference generation is more likely for inductive than for deductive inferences (Mass et al., 2001). Response latencies are faster for inferences about general traits (trait inferences) drawn from specific behaviors than on inferences about specific behaviors (behavioral predictions) drawn from general traits. The induction-deduction asymmetry is consistent with the results of prior research suggesting that the perceived relevance of a cue increases as the specificity of the cue increases (Bar-Hillel, 1980; Lynch & Ofir, 1989). To the extent that specific evidence is preferred as a starting point for the inference process, inductive inference will also be preferred.

Proposition 14. Spontaneous inference formation is more likely for inductive (vs. deductive) inferences.

Consumers often attempt to generate memory-based inferences before attempting to form stimulus-based infer-

ences because, in general, searching for information stored in memory is easier than identifying, analyzing, interpreting, and integrating the judgmental implications of information pertaining to a wide variety of attributes of different degrees of relevance to a judgment problem (Fiske & Pavelchak, 1986; Sujar, 1985; but see Brewer, 1988, for an opposing view). Schematic, categorical, and attitudinal knowledge is often highly accessible and functional because this knowledge helps people to make sense of their complex social environments (Fazio, 1995; Wyer, 2004).

Proposition 15. Spontaneous inference formation is more likely for memory-based (vs. stimulus-based) inferences.

Prior research suggests that choice contexts increase the salience of otherwise nonsalient missing information by encouraging the comparison of brands described by different amounts and types of attribute information (Broniarczyk & Alba, 1994c; Muthukrishnan & Ramaswami, 1999; Simmons & Leonard, 1990; Simmons & Lynch, 1992). These studies ex-

amined comparative judgment contexts without attempting to manipulate the type of context that was employed. However, Sanbonmatsu et al. (2003) and Sanbonmatsu et al. (1997) manipulated comparative versus singular judgment contexts within the same experiments and found that comparative judgment contexts increase sensitivity to missing information; this increases the likelihood of spontaneous inference formation. When specific important missing attributes are detected, consumers attempt to draw correlation-based inferences about the possible values of the missing information (Kardes & Sanbonmatsu, 1993). When no implicit theory about interattribute correlations is accessible from memory (Kardes & Sanbonmatsu, 1993) or when nonspecific omissions are detected (e.g., "Something is missing but I do not know what"; Sanbonmatsu et al., 1997), consumers acknowledge the limitations of the given information and adjust their judgments accordingly (Sanbonmatsu et al., 2003).

Proposition 16. Spontaneous inference formation is more likely in comparative (vs. singular) judgment contexts.

Proposition 2 suggests that spontaneous (vs. prompted) inferences are more generalizable, accessible, confidently held, and influential. Considered together with the implications of Proposition 2, Propositions 14, 15, and 16 imply:

Proposition 17. Inductive (vs. deductive), memory-based (vs. stimulus-based), and comparative (vs. singular) inferences are more (a) generalizable, (b) accessible from memory, (c) held with greater confidence, and (d) have a greater impact on other judgments and behavior, but only when these inferences are perceived as diagnostic or judgment-relevant.

Consumer inference is an important but under-researched area of inquiry. It is important because the need to deal with limited information and knowledge is an inescapable fact of life. It is under-researched because direct inquiry cannot be applied to inference formation, unlike in many other areas of investigation. Direct inquiry causes consumers to form inferences that would not have been formed otherwise. To avoid measurement-induced inference formation, sophisticated indirect methods and measures are needed (e.g., recall measures of memory intrusions, recognition confidence measures of source confusion, response latency procedures; see Bargh & Chartrand, 2000; Fazio, 1990). We hope that this review stimulates further research on this challenging but important area of investigation.

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