

# A Review of Consumer Judgment and Choice

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Whether the goal is to improve or predict consumer decisions, understanding human judgment and choice processes long has been recognized as an essential component in the study of marketing. Though several reviews of judgment and choice research have been published recently (Abelson and Levi 1985; Einhorn and Hogarth 1981; Pitz and Sachs 1984; Slovic, Lichtenstein, and Fischhoff 1985), relatively little attention has been given to the growing body of knowledge on consumer (including industrial buyer) judgment and choice. Consumer judgment and choice researchers face unique conceptual, contextual, and methodological problems that warrant special attention.

The goals of this review are to introduce the reader to the general study of judgment and choice and to describe the particular contributions of consumer research to our understanding of judgment and choice processes. We begin by describing both normative and descriptive approaches to judgment and choice, then focus our attention on descriptive research issues and studies. The cognitive psychological information processing approach that underlies most of this research is described briefly. The remainder of the review is divided into topic areas of traditional interest to judgment and choice researchers. Within each of these areas, we generally begin by reviewing the primary literature in economics, decision sciences, and psychology and end by describing extant consumer and marketing research that adds to and advances the primary literature. Our focus is on studies reported within the last 10 years in the *Journal of Consumer Research*, *Advances in Consumer Research*, *Journal of Marketing Research*, *Journal of Marketing*, and *Mar-*

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*keting Science*. In our final discussion, problematic aspects of the research are described and a general outline for future research is proposed.

At some level, all marketing and marketing-related research has or is intended to have some relevance to buying decisions, but our concern is with how individual consumers make evaluative judgments and choices. Consistent with many of the reviews in psychology (Abelson and Levi 1985; Einhorn and Hogarth 1981; Slovic, Lichtenstein, and Fischhoff 1985), ours is restricted to research on judgment and choice processes at the individual level. We therefore do not specifically address research on many important and interesting aspects of consumer behavior including, for example, group or family decision making (Davis 1976) and the effects of such factors as mood (Gardner 1985) and mere exposure (Obermiller 1985; Zajonc and Markus 1982) on evaluations. A comprehensive review of these and other aspects of consumer behavior is provided by Bettman (1986).

### *NORMATIVE AND DESCRIPTIVE APPROACHES*

Most research efforts centering on judgment and choice have been either primarily normative or primarily descriptive. Normative studies of decision making are concerned with how individuals ought to make decisions, whereas descriptive studies examine the strategies and processes individuals actually use when making decisions. The normative versus descriptive distinction is relatively unique to human judgment and choice research (Einhorn and Hogarth 1981). Interestingly, over the years the emphasis of decision research has shifted from descriptive to normative and back to descriptive.

Early formulations of expected utility theory (cf. Bernoulli 1738) were introduced to explain and describe why actual choices did not follow the predictions of expected value. The particular behavior Bernoulli sought to explain was the so-called St. Petersburg paradox. The paradox involves the sale of a game in which a fair coin is tossed until heads appears. The payoff of the game is  $\$2^n$  where  $n$  is the number of tosses required for heads to appear. Notice that payoffs increase ( $\$2, 4, 8, \dots 2^n$ ) while probabilities decrease ( $1/2, 1/4, 1/8, \dots 1/[2^n]$ ) such that the expected value of the gamble, the sum of payoffs times probabilities as  $n$  increases, is infinite. The paradox occurs because people typically will pay only a small dollar amount for a game of infinite expected value. To explain the discrepancy between actual choices and those predicted by expected value, Bernoulli proposed the notion of a utility function, logarithmic and expressing utility as a marginally decreasing function of wealth. The notion that utility is a concave or marginally decreasing function of money has survived over the years and can still be found in modern treatments of risky choice (cf. Arrow 1971).

The idea that individuals maximize expected utility took on normative implications when von Neumann and Morgenstern (1944) laid out a series

of axioms of rationality from which expected utility maximization could be derived. (Expected utility theory, its axioms, and research pertaining to the axioms are described in our discussion of risky choice.) If a decision maker accepts the axioms, expected utility theory provides courses of action that *should* be followed. Relying on notions of utility maximization, many researchers have developed techniques and decision aids for assessing utility and making choices normatively. The assessment of multiattribute utility functions has, in the interim, been elevated to an art as much as a science (Keeney 1977; Keeney and Raiffa 1976). (Also see Johnson and Huber 1977 and Farquhar 1984 for reviews of utility assessment techniques.)

However, in the time since von Neumann and Morgenstern's seminal work, empirical evidence has accumulated that suggests individuals do not follow the principles of expected utility maximization. Though the descriptive adequacy of utility maximization long has been disputed (cf. Veblen 1898), a descriptive alternative was not provided until Simon (1959) popularized the notion that individuals "satisfice" rather than "maximize." According to Simon (p. 277), "economic man is a *satisficing* animal whose problem solving is based on search activity to meet certain aspiration levels rather than a *maximizing* animal whose problem solving involves finding the best alternatives in terms of specified criteria." Simon considered the maximization of utility to be impossible given the incomplete nature of information and the limitations of basic human information processing. Actual judgment and choice behavior is more bounded or limited in its rationality.

Following Simon's lead, more recent descriptive research has illustrated many of the simpler heuristics, or rules of thumb, people use to make judgments and decisions within the bounds of their ability. The result is a feeling among decision researchers that people use a variety of such heuristics to approximate more formal decision-making processes and that future research efforts should be directed at expanding our descriptive knowledge of individual decision-making processes (Slovic, Lichtenstein, and Fischhoff 1985). The trend toward descriptive judgment and choice research is important and beneficial for marketing and consumer research. Descriptive research parallels the interests of marketers and complements the marketing concept. Generally, the goal of applied marketing and consumer research is to determine what consumers do or want and then adapt marketing strategies to it. Similarly, theories of consumer behavior traditionally are based on consumers' expected behavior in the marketplace rather than a set of prescriptive rules about how consumers should behave. As a result, descriptive judgment and choice research, as it continues to develop, should offer consumer and marketing researchers important insights and implications. Descriptive research therefore is the focus of the remainder of our review. Before we review the actual studies, it is appropriate to describe briefly the psychological framework underlying descriptive judgment and choice research.

## *THE INFORMATION PROCESSING PARADIGM*

The basic underlying framework of most research on judgment and choice processes is the information processing paradigm from cognitive psychology. At the heart of the information processing approach is the notion that it is very useful to view human beings as general-purpose symbol manipulators, who perform a small number of basic operations on symbol representations to generate new symbols, and who can store these symbol representations and retrieve them when needed (Lachman, Lachman, and Butterfield 1979; Newell and Simon 1972). Psychologically, humans are assumed to represent concepts and objects cognitively and to perform operations on or change these representations to produce new representations or outputs. Outputs (judgments, for example) may be either used as immediate inputs to choice or stored in memory for later use. Importantly, the information processing approach is extremely general and thus provides a very flexible and useful framework for studying judgment and choice processes.

The approach also highlights important aspects of human judgment and choice processing that warrant specific research attention. One aspect is the nature and amount of information gathered or assembled (either from the external environment or from memory) that serves as input to a representation. A second is the nature of the representation itself, or how individuals cognitively represent information about concepts and objects. Consumers' cognitive representations of products and services, in turn, serve as inputs to judgments, evaluations, and purchase decisions. A third aspect of interest therefore is the nature of the comparative or computational operations performed on these cognitive representations, or how the represented information is transformed into a judgment and, eventually, a choice.

These operations take the form of strategies and rules that often differ according to the type of judgments and choices being described. For example, two general classes of judgment and choice problems are identified as risky and riskless decisions. The distinction between these two classes of decisions, along with the various aspects of information processing outlined before, provides a logical framework for describing areas of judgment and choice research. However, because the literature often confuses judgment and choice, we appropriately begin by distinguishing between judgments and choices (Einhorn and Hogarth 1981), then review information gathering, representation, and the evaluative aspects of riskless choice. Finally, we examine likelihood judgments and the question of risky choice.

## *JUDGMENTS AND CHOICES*

Making judgments simply implies forming opinions or estimates. Judgments can be as general as estimating overall similarities among objects or as specific as stating rank order preferences, but they do not constitute choices.

Choices, in contrast, necessitate the selection of a decision alternative, even if the alternative is deciding "not to decide." The relevance of distinguishing between judgments and choices becomes evident when one considers the range of marketing research techniques that use judgments to predict choices. It is important for marketers to realize that, just as judgments often are collected as inputs for analytical techniques, consumer judgments are simply one set of inputs to choice processes. Though the foregoing distinction between judgment and choice seems basic, it is often overlooked.

A consistent empirical finding of studies in both psychology (Lichtenstein and Slovic 1971; Slovic 1975) and economics (Grether and Plott 1979) has helped reinforce the importance of maintaining this distinction in theories of choice. The finding, labeled the "preference reversal phenomenon," appears consistently in studies of preferences among two types of gambles of relatively equal expected value, one involving large probabilities of winning small dollar amounts and the other involving much smaller probabilities of winning much larger amounts. Subjects in these studies often place larger monetary values on the latter gambles but, when given a choice of which gambles to play, they prefer the former. In other words, preferences based on choice are often the reverse of preferences following from judgments of monetary value.

Consumer researchers have further documented systematic differences between judgment and choice. Johnson and Russo (1981, 1984), for example, report a study demonstrating how product familiarity interacts with the nature of the task, whether judgment or choice, in the learning of new information. One group of subjects performed a judgment task in which brands of automobiles in a brand by attribute matrix were evaluated and rated. Based on their recall of product information after performing the judgment task, learning increased monotonically with product familiarity. Another group of subjects were asked to choose an alternative and then recall information after the task. An inverted-U relationship resulted between increased familiarity and information recalled for the choice group. Analysis of verbal protocol data by both Johnson and Russo (1984) and Johnson and Meyer (1984) suggests processing is very different in the two cases. In a choice task, knowledgeable consumers are likely to be more selective in their use of information and more likely to use elimination strategies when making a choice as opposed to a judgment. In other words, more knowledgeable consumers rely more on their expertise in a choice task and, as a result, do not process as much information when making a decision as they would when making judgments about all available alternatives.

Any comprehensive theory of consumer choice is faced with the challenge of describing the interplay between judgments and choices. As both economic and consumer researchers have suggested (Becker 1976; Hauser and Urban 1986; Olshavsky 1985), a major factor in this interplay is the financial and other resource constraints that affect choice. Unlike choices, which imply a commitment to action (Einhorn and Hogarth 1981), judgments are

bounded only by processing and information constraints. Judgments also are affected by a variety of seemingly small changes in the context or nature of the judgment task (e.g., Tversky 1977). Because of these differences, future research on the interplay between judgments and choices, particularly consumer choice, should benefit from a greater integration of the economic and psychological perspectives.

## INFORMATION GATHERING

### *Cost/Benefit Approach*

Within the information processing paradigm, decision makers are viewed as allocating processing capacity, or attention<sup>1</sup> (Kahneman 1973), to gather information from two sources, internal memory (Anderson 1983) and the external environment. For the most part, information gathering has been examined either within the context of more specific judgment tasks, such as the information recalled from memory and used to make probability or similarity judgments (Slovic, Fischhoff, and Lichtenstein 1977; Tversky 1977), or as a means of inferring choice processes (Payne 1976; Russo and Rosen 1975). These aspects of information gathering are described implicitly in our outline of judgment and choice processes in the next section. However, one line of research that uses a cost/benefit approach to describe information search and use is reviewed here.

Traditionally, the economic approach to information search is to assume search is unnecessary, that is, assume consumers already have complete knowledge of the consumption alternatives. Moreover, the alternatives are very centrally located (i.e., no search costs). A major descriptive improvement on the traditional approach was provided by Stigler (1961), who explicitly considered the costs and benefits of information search involving price within an economics framework. According to Stigler's model, price search results in marginally decreasing returns to search, and consumers search for price information until the marginal cost of search equals the marginal benefit. Carlson and Gieseke's (1983) findings are consistent with the model. Using panel data, they showed how the price consumers paid for grocery purchases decreased with stores visited. They also found weak support for diminishing returns to search. More psychologically oriented research suggests, however, that consumers do not follow the principle of equating mar-

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<sup>1</sup>Kahneman (1973) identifies two major determinants of attention allocation: selectivity and intensity. Selectivity refers to the direction and control of attention, or where attention is being allocated. Attention may be goal-directed or voluntary, or more involuntarily directed in response to some environmental cue or interruption. Intensity refers to the amount of the limited capacity that is being used by the information processor and allocated to a particular stimulus or task.

ginal cost and marginal benefit *per se* (Thaler 1980). As Thaler points out, consumers are more sensitive to relative costs and benefits. Thus, a consumer is more likely, for example, to visit another store to save \$5 on a \$15 radio than to save the same \$5 on a \$500 television (*ceteris paribus*).

Nevertheless, the notion that consumers search as long as the perceived benefits exceed the perceived costs has proved very useful in describing consumers' search for information, both theroretically (Hagerty and Aaker 1984; Johnson 1986a; Ratchford 1980; Russo 1981) and empirically (Duncan and Olshavsky 1982; Furse, Punj, and Stewart 1984; Midgley 1983; Punj and Staelin 1983; Schaninger and Sciglimpaglia 1981). Theoretically, Russo (1981) suggests that three major sources or types of information processing cost affect whether consumers will gather and use information at the point of purchase: the cost of gathering or collecting the information, the cost or effort required to comprehend the information collected, and the costs required to compare or integrate the collected, comprehended information. On a relative cost/benefit basis, reducing the costs associated with one or more of these sources should, in turn, increase the amount of information consumers use at the point of purchase (holding benefits constant). To illustrate, in one study Russo (1977) provided consumers with unit price information in a central category location, which reduced both collection and computation costs. The results of the study suggest consumers significantly increased their use of the information.

The power of the cost/benefit approach to explain information search and use has been extended to the observed effects of consumer knowledge. Bettman (1986), for example, suggests more knowledgeable consumers have less incentive to search externally for information because fewer benefits are involved. In general, consumer research studies support a negative relationship between knowledge and external search (Biehal 1983; Kiel and Layton 1981; Punj and Staelin 1983). There is also support for a corresponding positive relationship between knowledge and internal (memory-based) search (Biehal 1983).

Several consumer studies, though not addressing processing *per se*, have documented differences in external information search across consumers. Newman and Staelin (1973), for example, relate visits to retail outlets and the use of advertising, neutral, and personal sources of information to consumer demographic and task variables. They report an increase in visits with increases in education, occupation, the number of alternatives available, the cost of the product, and the working condition of the products currently owned. (Westbrook and Fornell 1979 further classify consumers in terms of their search of retail, neutral, and personal information sources.) Even personality variables, such as anxiety and self-confidence, have been shown to affect information search (Horton 1979; Locander and Hermann 1979).

## *Attribute Redundancy*

Other studies have examined attribute redundancy as a particularly important aspect of information environments that affects the benefits associated with information search (Einhorn and Hogarth 1981; Einhorn, Kleinmuntz, and Kleinmuntz 1979). Interest in redundancy, or the correlation among the informational cues available in the decision maker's environment, is not new. As we discuss shortly, Brunswik's (1943, 1956) lens model of judgment expressly considers cue redundancy and its effects on decision making. The economic importance of redundancy is simple. The more redundant the attribute information, the less there is to gain from gathering and using the information. Redundancy alleviates the need to attend to and use a large number of cues in making judgments and choices. Einhorn and Hogarth (1981) describe a study by Phelps and Shanteau (1978) to demonstrate this point. A group of livestock judges were given several orthogonal attributes for judging sows. The judges showed the capacity to use all of the orthogonal cues in their judgments. When shown stimuli involving more naturally redundant cues (photographs of the sows), the judges were comfortable using significantly fewer cues in making their judgments.

Psychological studies of redundancy suggest, however, that individuals often are relatively poor judges of redundancy, or covariation (Peterson and Beach 1967; Smedslund 1963). One general finding is that individuals tend to overestimate the relationship between various cues (Alloy and Tabachnik 1984; Crocker 1981; Einhorn and Hogarth 1978). Biases and limitations that result in the overestimation of attribute redundancy may be present at more than one stage of information processing. Such biases may affect both the information available to judge relationships (Einhorn and Hogarth 1978) and how we code and use available information (Alloy and Tabachnik 1984; Crocker 1981).

The result is a potentially large effect on consumer information use. If consumers in fact overestimate redundancy, they are likely to underestimate the marginal benefit of gathering and processing information. Research on consumers' use of price as a means of judging product quality illustrates this point. Though consumers often rely on price to judge quality (Brooker, Wheatley, and Chiu 1986; Dodds and Monroe 1985; Monroe 1971, 1973; Obermiller and Wheatley 1984), studies typically find very little systematic relationship between price and quality rankings (Geistfeld 1982; Gerstner 1985; Riesz 1978, 1979).

Consumer researchers recently have directed attention to attribute level redundancy, its perception, and its effects on information search. Theoretically, consumer researchers are starting to incorporate attribute redundancy into models of search (cf. Hagerty and Aaker 1984). Meanwhile, two recent empirical studies provide insight into consumers' ability to perceive attribute redundancy. Bettman, John, and Scott (1984) demonstrated how subjects lacking prior expectations can distinguish between high and low redundant



attributes when presented product information in a laboratory setting. In a second study, John, Scott, and Bettman (1986) showed how inflated, inaccurate perceptions may be perpetuated. They found that consumers who believe price and quality are related positively are more likely to sample only higher priced products to test their perceptions. As argued by Einhorn and Hogarth (1978), this type of limited search does not expose consumers to all the information necessary to judge attribute relationships accurately. The results of these early studies are consistent with those described in the psychological literature. When expectations are not operating and information is unbiased, perceptions are relatively accurate. However, when expectations are present, perceived redundancy or covariation is relatively inaccurate and inflated (see Alloy and Tabachnik 1984 for a discussion). Future research should continue to explore the effects of perceived redundancy, particularly its potentially negative effects on information use. We now turn our attention to how consumers cognitively represent or describe products by using the information they have gathered or recalled.

### *COGNITIVE REPRESENTATIONS*

Central to cognitive representation is the nature of the aspects or attributes individuals use to describe judgment or choice alternatives (Garner 1978). Implicit in many approaches to judgment and choice, including expected utility theory, is the assumption that these aspects are naturally dimensional. That is, alternatives usually are seen as varying by a matter of degree on attributes or characteristics of importance to the decision maker (e.g., probability, dollar value). Given either information processing limitations or the nature of particular alternatives, simpler representations may be used. As a simple alternative to dimensional representations, many researchers have suggested individuals often represent alternatives (and make judgments and choices) on the basis of associated features (Garner 1978; Gati and Tversky 1982, 1984; Restle 1959; Tversky 1977; Tversky and Gati 1982). Though dimensions are continuous, features are dichotomous attributes; objects are perceived either as having them or as not. If one uses a dimensional representation, for example, a decision outcome may be associated with some probability of occurrence ranging from 0 to 1. If one uses a feature-based representation, the same outcome or event may be described simply as "likely" or "unlikely." Recent research on cognitive representations suggests a systematic use of feature-based and dimensional representations across judgmental stimuli (Pruzansky, Tversky, and Carroll 1982; Tversky and Hutchinson 1986). Generally these studies suggest that features are more likely to be used to represent or describe conceptual stimuli, such as occupations or animals, whereas continuous dimensions are more likely to be used to represent perceptual stimuli, such as colors or tones.

The difference between dimensional and feature-based representations is important because different judgment and choice models, as well as different techniques for analyzing judgments, involve assumptions about those rep-

representations. For example, some choice models, such as elimination by aspects (Tversky 1972), assume individuals adopt a relatively feature-based representation. Other choice models, such as the lexicographic rule (Coombs 1964), assume a more dimensional representation. (These and other strategies are described in detail subsequently.) Carroll (1976; see also Pruzansky, Tversky, and Carroll 1982) also points out that different similarity scaling techniques presume different representations. Multidimensional scaling, which represents objects as points in an underlying dimensional space, naturally presumes a dimensional cognitive representation. In contrast, clustering techniques, such as additive clustering (Shepard and Arabie 1979) or additive trees (Sattath and Tversky 1977), presume feature-based representations. As a result, dimensional spaces may better capture judgments based on dimensions and feature trees may better capture judgments based on features.

Consumer and marketing researchers have provided useful insights into consumers' cognitive representations. Several techniques, including multidimensional scaling (Green and Rao 1972), hierarchical clustering (Srivastava, Leone, and Shocker 1981), discriminant analysis (Johnson 1971), and factor analysis (Hauser and Urban 1977), have been used to help marketers understand how consumers cognitively describe or represent products. (See Shocker and Srinivasan 1979 for a review of these approaches.) Consumer researchers also have gained a better psychological understanding of how consumers cognitively represent products and services. For example, research by Johnson (1981, 1986b) suggests feature-based representations are common among brands within product categories. Park (1978) describes a process by which consumers may categorize dimensions into more feature-like representations, or value ranges, within which products are acceptable or unacceptable (similar to Tversky's 1972 elimination-by-aspects strategy described hereafter).

A recent study by Johnson and Fornell (1987) more systematically shows how consumers' cognitive representations of products vary across choice tasks. They argue that more noncomparable or abstract products are described by means of more abstract attributes (following Johnson 1984 and Howard 1977) and that these abstract attributes are more naturally dimensional. Abstract attributes, like dimensions, capture more information than more concrete attributes. Given information processing limitations, consumers also may use relatively complex dimensions to represent products when fewer, more abstract attributes are involved. In one experiment, subjects were given products at increasing levels of abstraction and asked to elicit the attributes that came to mind about the products. The results supported both increased attribute abstraction with product abstraction and more abstract attributes being more naturally dimensional. In a second experiment, the methodological implications of the findings were demonstrated. Similarity judgments based on attributes that differed in abstraction were fit by means of both dimensional (MDS) and feature-based (ADDTREE; Sattath and Tversky 1977) techniques. Consistent with the hypothesis that ab-

stract attributes are more dimensional, the fit of the dimensional MDS solutions improved more than the fit of the ADDTREE solutions as the representations became more abstract.

The fact that judgments and choices use cognitive representations as inputs, which then may affect the use of choice strategies and the applicability of research methods, highlights the need for further consumer research into the nature and implications of consumers' cognitive representations. Consumer researchers also have explored cognitive representations and their effects on processing in relation to the interplay between visual and verbal information (Childers and Houston 1984; Childers, Houston, and Heckler 1985; Edell and Staelin 1983; Kisielius and Sternthal 1984; Mitchell 1986). Visual information processing, though important to consumer researchers, has not typically been studied by judgment and choice researchers and hence is not reviewed here. We refer interested readers to the articles cited or Bettman's (1986) summary of this literature.

In the next section we describe how cognitive representations serve as inputs to judgment and choice processes. Indeed, much of the descriptive research effort on judgment and choice has focused on the strategies and rules people use to combine information and make a subsequent decision. The degree to which these processes are specified, however, varies across studies. This specification is greatest in process models whereby researchers seek to follow cognitive processing between input and output (Abelson and Levi 1985). Judgment and choice processes also are described by structural models whereby the relationship between the inputs to a judgment and the resulting output is represented mathematically. Such models involve certain general assumptions about the information in a representation and how that information is combined functionally (e.g. adding, averaging, etc.). However, they typically do not explore the details of processing directly. The important point is that both process and structural models attempt to describe judgment and choice processes and therefore warrant attention. We first review process models and then turn to structural models of choice.

## *PROCESS MODELS AND DECISION STRATEGIES*

### *Alternative Strategies*

Several choice models or strategies have been advanced to describe the details of choice processing, or how evaluative judgments are formed and choices are made. Generally these models differ in two strategic aspects of processing: whether evaluation proceeds within or across attributes and whether the processing is compensatory or noncompensatory. Within-attribute strategies compare alternatives directly on descriptive attributes whereas across-attribute strategies evaluate alternatives more holistically, across their descriptive attributes. Compensatory strategies posit explicit tradeoffs of at-

tribute information. Thus, a low value on one attribute can be made up or compensated by a large value on another attribute. In contrast, noncompensatory strategies are characterized by the elimination of choice alternatives that do not meet prespecified cutoffs on evaluative attributes. Such strategies are noncompensatory because attribute values are not allowed to trade off.

A linear compensatory or additive strategy is an example of a compensatory across-attribute model. By this strategy, attribute values for each available alternative first are combined in a compensatory way into overall evaluations. The resulting evaluations then are compared to make a choice. Disjunctive and conjunctive strategies are examples of noncompensatory across-attribute models (Einhorn 1970). By a conjunctive rule, an alternative must pass minimally acceptable levels on all relevant criteria to be acceptable overall. By a disjunctive rule, an alternative must be outstanding on at least one attribute or it is eliminated. Unlike the linear compensatory model, these models do not allow values on some attributes to trade off or compensate for values on other attributes.

An example of a compensatory within-attribute model is additive difference (Tversky 1969). Alternatives are compared directly on successive attributes and the attribute differences are combined into an overall measure of relative performance. (Depending on the exactness of the differences, the resulting relative evaluation is more or less compensatory; Tversky 1969). Finally, noncompensatory within-attribute evaluation is characterized by the lexicographic rule (Coombs 1964) and by elimination by aspects (Tversky 1972). By a lexicographic rule, choice alternatives are compared directly on the decision maker's most important choice attribute and the alternative ranking highest on that attribute is chosen. If more than one alternative ranks high, the decision maker compares the remaining alternatives on the second most important attribute, then the third, and so on until the tie is broken. In elimination by aspects, the order in which attributes or aspects are considered is determined by a probability proportional to their importance and alternatives that do not contain the aspects (or acceptable attribute levels) are successively eliminated. As suggested in our discussion of cognitive representations, different rules often presume different representations. The elimination-type rules assume product attributes are either naturally feature-based or at least are represented roughly as features (i.e., acceptable or unacceptable value ranges). Other strategies, such as the lexicographic rule and additive difference, presume a more dimensional representation.

These strategies also differ in the effort required to implement them and in their ability to minimize errors in choice. One reason why Tversky (1969) postulated the use of additive-difference-type strategies was the ease of within-attribute comparisons relative to across-attribute combinations; it is much easier to compare the value of two alternatives on a single attribute than to combine values across two different attributes. Several decision and consumer researchers actually have modeled the cognitive effort and decision error (or costs and benefits) associated with different choice strategies (Beach

and Mitchell 1978; Huber 1980; Johnson 1986a; Johnson and Payne 1985; Shugan 1980) to predict the strategies people are likely to use in various contexts. (See Johnson and Payne 1985 or Johnson 1986a for a discussion of this general approach.) Generally, the more compensatory the strategy, the greater the effort involved and the fewer the likely errors (Johnson and Payne 1985). Also, given the ease of within-attribute comparisons in relation to across-attribute combinations, within-attribute strategies are likely for choices involving products either from the same or from different categories (Johnson 1986a). These predictions depend, however, on the nature of the alternatives and the task (Johnson 1986a; Johnson and Payne 1985; Klein 1983).

In an early consumer study, Wright (1975) specified four different choice strategies for consumers to use and examined the consumers' accuracy in selecting the correct alternative under each rule. He found a prespecified lexicographic strategy easier to use (as indicated by selection accuracy) than either a conjunctive model or averaging models. Generally, accuracy also decreased as the number of choice options increased. Similarly, Bettman and Zins (1979) studied the combined effects of information format and the choice task on decision making. Subjects were given different strategies to perform (additive, a heuristic form of additive difference, conjunctive, and lexicographic) in different formats (matrix, by brand, by attribute). The authors hypothesized that accuracy, again measured as the consumers' ability to carry out the prespecified rule, would interact with format. The lexicographic strategy, for example, is more compatible with an attribute-based format whereas an additive (linear compensatory) strategy is more congruent with a brand format. The authors found task/format congruence increased the time required to perform the strategy but did not significantly affect accuracy.

In a different vein, Sheluga, Jaccard, and Jacoby (1979) measured the quality of consumer decisions on the basis of the information consumers processed. Consumer attribute utilities first were measured, then information monitoring (described in the next section) was used to measure information search and choice. The interesting result, in terms of bounded rationality, is that although consumers generally did not choose their best alternatives (according to their derived attribute utilities), they did choose their best alternatives given the information they gathered.

### *Process Tracing Research*

Decision researchers have used two general types of methods to study or trace the use of different choice strategies by decision makers: verbal protocols (Ericsson and Simon 1980) and information monitoring via either information boards (Wilkins 1967) or eye fixations (Russo and Rosen 1975). Verbal protocols are obtained by having an individual "think aloud" while making a decision. The statements in the protocol then are analyzed to de-

termine the across- versus within-attribute nature of the information search and the compensatory versus noncompensatory nature of the evaluations. There is some question as to just how well self-reported verbal protocols mirror cognitive processing (Nisbett and Wilson 1977). Generally, however, self-reports are informative when task processing occurs primarily in short-term memory or consciousness and the protocol is obtained concurrently, at the time of processing (Ericsson and Simon 1980). When processing relies more on stored information, when the process is automatized, or when the protocol is retrospective, protocols are less reliable.

Information boards consist of alternative by attribute matrices of decision-relevant information. The values of the different alternatives on the attributes are concealed and the sequence in which the decision maker searches through the matrix for information is recorded. The decision process then is inferred from the pattern of information search. Both the within- or across-attribute and the compensatory or noncompensatory nature of the strategy can be inferred. The more complete the information search done for a particular alternative, the less likely it is that an elimination strategy is being used (Payne 1976). Eye fixations are interpreted similarly. Subjects are shown attribute-based descriptions of choice alternatives and the pattern of information search, as revealed by the eye fixations, is used to infer choice processing. Like verbal protocols, information monitoring, whether by eye fixations or information boards, mirrors cognitive processing when that processing occurs primarily in short-term memory or consciousness and the consumer is processing information provided in the task environment rather than in memory (Just and Carpenter 1976).

Psychological studies using these methods have led to several interesting findings. Russo and Rosen (1975), for example, used both eye fixations and prompted verbal protocols to study strategies for choosing among several used cars. Their results revealed a dominance of paired comparisons, suggesting predominantly within-attribute processing. Russo and Doshier (1983) used eye fixations and verbal protocols to study strategies for binary choices involving scholarship candidates and again found a dominance of within-attribute processing. Payne (1976) used information boards and verbal protocols to determine changes in information acquisition and processing with changes in task complexity (i.e., increases in the number of alternatives and descriptive attributes involved) for apartments. He found support for increased within-attribute processing when few alternatives were involved. Of particular importance is his finding that as the number of alternatives increased, subjects made increasing use of "phased" decision strategies in which different types of processing were used at different phases of the decision. An elimination strategy, such as elimination by aspects, often was used to reduce the choice set to a manageable size. The remaining alternatives then were evaluated in a compensatory manner.

The preceding description of strategies and methods provides a background, both conceptual and methodological, for consumer researchers interested in the strategies consumers use to make decisions. Several early studies used information monitoring, typically information boards (Jacoby et al. 1976), to monitor information search and infer choice processes. Bettman and Jacoby (1976), for example, used breakfast cereals as stimuli and found consumers generally preferring either to evaluate brands within attributes or to choose according to brand names. Jacoby et al. (1976), again using breakfast cereals, found approximately equal use of within- and across-attribute processing, with across-attribute or relative "brand-based" processing increasing with consumption frequency. Bettman and Kakkar (1977), also using breakfast cereals, found a systematic relationship between the format of the information provided in choice and information acquisition. Basically the acquisition strategy followed the format. When attribute information was organized by brand, acquisition was predominantly across attributes. When it was organized by attribute, acquisition was predominantly by attribute.

One problem with the different processing strategies we have described, such as a linear compensatory or lexicographic strategy, is the rigidity with which information supposedly is processed. As Payne's (1976) study suggests, decision makers do not always proceed in a purely compensatory, noncompensatory, within-attribute, or across-attribute fashion. Two similar studies are reported in the consumer and marketing literature by Lussier and Olshavsky (1979) and Crow, Olshavsky, and Summers (1980). Lussier and Olshavsky used concurrent verbal protocols and portable typewriters as stimuli to study changes in consumer information acquisition and processing with increases in task complexity. Consistent with Payne's finding, subjects again used phased strategies as the number of alternatives increased. After elimination of several alternatives, or when there were few alternatives to start with, processing was largely within attributes. Crow and his colleagues analyzed protocols to develop individual models of industrial buyers' decision processes. Their results also suggest a frequent use of multistage or phased processing, including the use of conjunctive processing to eliminate "unworthy" candidates, when industrial buyers select a final supplier.

The general support for phased rules (Bettman 1979) is consistent with a more flexible approach to choice processing. More realistically, consumers appear to adapt to changing environments and use combinations of different strategies, often constructing a strategy as they proceed (Bettman and Zins 1977). Even research on phased strategies, however, is relatively unclear about the nature of the transition from one type of processing to another. For example, is the transition from elimination-type to compensatory processing within a phased strategy very abrupt or more gradual? Two studies have begun to address this question. Park (1978) proposed a strategy that

simultaneously incorporates both elimination-type and compensatory processing. Within Park's model, called the "sequential conflict resolution" (SCR) model, brands are not eliminated mechanically. A brand is eliminated only if it is below certain minimum cutoffs *and* does not have any other desirable characteristics. Park used the SCR model effectively to predict automobile choices. Though this model does not describe strategy transition *per se*, it does incorporate more than one qualitatively different type of processing. More recently, Biehal and Chakravarti (1986), in reanalyzing the data they had reported earlier (1983, described shortly), found relative changes in the incidence of different types of processing by choice phase. For example, the farther along consumers are in the choice, the less they compare sets of brands on particular attributes and the more they compare brand pairs on one or more attributes.

### *Consumer Processing Differences*

The progression of process tracing studies in consumer research has led to an increased focus on processing differences across consumers as well as choice tasks. Capon and Burke (1980), for example, used information boards to explore processing differences between subjects classified as either low or medium/high in socioeconomic status for product categories of increasing purchase risk (steam irons, toaster ovens, and microwave ovens). Overall, they found higher SES consumers, in comparison with low SES consumers, to be more accomplished, sophisticated information processors who prefer more attribute-based processing. As predicted, increased perceived risk also resulted in increased information search.

In two studies, Biehal and Chakravarti (1982, 1983) explored differences in processing and resulting product knowledge across different tasks and different information presentation formats. In the first study, they asked consumers either to learn information about fictitious toothpaste brands and then make a choice or to make a choice and later recall information about the brands. Direct learning of the product information led to brand-based processing in recalling the information. This result, which is consistent with the results of Russo and Johnson (1980) and Howard's (1977) notion of stored brand concepts, suggests product information in memory is stored primarily by brand. Interestingly, information learned during choice and later recalled indicated higher levels of attribute-based processing. This finding suggests that when a choice is based on externally provided information, preference for within-attribute processing increases. Biehal and Chakravarti also varied the information presentation format and, consistent with Bettman and Kakkar's (1977) findings, found that attribute-based processing was highest when information was learned in an attribute-based format. In a followup study, Biehal and Chakravarti (1983) showed that when subjects in the learning-first and choice-first conditions were given information about new attributes and alternatives, systematic differences resulted. Subjects in the choice-



first condition, having poor memory for many of the originally rejected choice alternatives, were less able to reevaluate those alternatives.

Consumer researchers have paid particular attention to the mediating effects of knowledge and experience on choice processing. Recall that Jacoby et al. (1976) found an increase in across-attribute or brand-based processing with consumption frequency. In one of the other early studies on this topic, Bettman and Park (1980) used concurrent verbal protocols and a matrix of microwave ovens as stimuli to study processing differences across experience levels. Like Jacoby et al., they found that brand processing increased with consumer experience. Like Johnson and Russo (1981, 1984), they also found an inverted-U relationship between experience and amount of information searched. Their moderate experience group appeared to do more processing of the available information and relied on prior knowledge to a lesser extent than did either the low or high experience groups. Apparently the low experience subjects did not have the ability to process much of the information. Conversely, the high experience subjects appeared to have the ability, but not the motivation, to process much information. They relied more on brand-based information stored in memory.

Evidence about the generality of an inverted-U relationship between knowledge or experience and the extent of external processing is mixed. Bettman and Park's (1980) inverted-U was observed between a combined knowledge/experience measure, based predominantly on self-reported differences in experience, and information searched during choice. Johnson and Russo (1981, 1984) found an inverted-U relationship between information recalled after choice and self-rated knowledge. Other studies have failed to support an inverted-U relationship (see Brucks 1985 for a review and discussion). The use of different dependent variables and different independent variables across studies helps explain the lack of consensus. In particular, Brucks (1985) emphasizes the conceptual distinction between a consumer's experience and product knowledge as well as the distinction between subjective and objective knowledge measures. Whereas "experience" refers to consumers' actual interaction with a product, knowledge is what results from that interaction. Also, subjective knowledge may indicate both a consumer's objective knowledge and his or her confidence level (Park and Lessig 1981). Brucks reports an experiment that measured objective and subjective product knowledge and then examined how choice processing varied across consumers. In the experiment, consumers gathered and processed information about sewing machines from a computer data base. The results revealed a positive relationship between objective knowledge and information seeking, though search did not follow an inverted-U relationship. There was also some evidence supporting the conceptual distinction between objective and subjective knowledge.

In another study, Sujan (1985) looked at a different effect of consumer knowledge on processing. She hypothesized that more knowledgeable consumers make greater use of stored evaluations at the product category level

when evaluating alternatives that are relatively typical of the category. More systematic attribute-level or piecemeal processing should be required when the choice alternatives are relatively atypical of the category in general. Less knowledgeable consumers, in contrast, will not be in the position to judge typicality as well as the experts and as a result should rely on category-based evaluations more or less equally for both typical and atypical alternatives. Using cameras as stimuli, Sujan examined cognitive responses and evaluations across consumers who differed in their objective knowledge of cameras. Consistent with the hypothesis, when processing prototypical cameras, knowledgeable consumers more quickly formed their impressions and generated more category and fewer specific product-attribute-related thoughts. When processing atypical cameras, knowledgeable consumers engaged in more piecemeal processing involving more attribute information and longer response times. Also consistent with the hypothesis was the finding that novice consumers used category-based evaluations that were more independent of the prototypicality of the cameras.

Overall, the foregoing studies suggest some general conclusions about consumer information processing. First, product knowledge generally is organized by categories and brands rather than by attributes, most likely because of the generally brand-based nature of consumer interactions with products (Biehal and Chakravarti 1982; Russo and Johnson 1980). Second, when consumers can use this knowledge in a choice task, as in the studies by Jacoby et al. (1976), Bettman and Park (1980), and Biehal and Chakravarti (1982), across-attribute or brand-based processing often results, which is consistent with how information about the products is stored. Third, when consumers are not as familiar with the products in question and must rely more on centrally located external information, within-attribute processing usually is preferred. This conclusion is consistent with Tversky's (1969) argument about the relative ease of within-attribute comparisons and the results of process tracing studies in psychology (Russo and Doshier 1983; Russo and Rosen 1975). Fourth, consumers, including industrial buyers, adapt their strategies as choice tasks become more complex by using hybrid (Park 1978) or phased strategies (Crow, Olshavsky, and Summers 1980; Lussier and Olshavsky 1979; Payne 1976). Finally, the controversy over the inverted-U hypothesis has not been reconciled. More research effort directed at understanding the differences among the dependent and independent variables of interest, particularly the difference between knowledge and experience (Brucks 1985), will be required before consumer researchers will be able to explain the present divergent results.

### *Expanding the Range of Choices and Choice Processing*

Consumer and marketing researchers have expanded the range of choices and decision processes of interest to judgment and choice researchers. Choice research in general has been limited to choices involving very comparable, concrete alternatives described on concrete attributes (such as size, price,

gas mileage, etc.). The interesting range of choices facing consumers in the marketplace, however, has led consumer researchers to explore choices involving more abstract and noncomparable choice alternatives that are described by more abstract attributes.

Viewing choice as a hierarchical process, Howard (1977) suggested consumer choice alternatives range from abstract product categories to more concrete brands. Furthermore, Howard hypothesized a corresponding attribute hierarchy of choice criteria ranging from the concrete to the abstract. The more abstract or categorical the choice, the more abstract the corresponding choice criteria. Boote (1975) found indirect support for this hypothesis. In Boote's study, subjects rated the importance of Rokeach's (1973) instrumental and terminal values to both product-category and brand-level choices involving various major household appliances. Consistent with the hypothesis, the subjects rated the more abstract terminal values as more important to category-level choice and the more concrete instrumental values as more important to brand-level choice.

However, not all choices facing consumers are hierarchical. Other interesting situations occur when consumers are presented with nonhierarchical choices involving specific alternatives in very different product or service categories (Johnson 1984, 1986a). Such alternatives, described by very different concrete, nonprice attributes, are less comparable than either product categories or brands within categories. Choosing between a particular stereo and a particular television, for example, is very different from choosing between two stereos. Johnson (1984) proposed two general choice strategies consumers might use to compare these noncomparable alternatives. Independent of comparability, consumers may use one of the more holistic, across-attribute strategies described before (such as a linear compensatory rule) to form and compare overall evaluations. Alternatively, a preference for relatively easy within-attribute comparisons may result in consumers forming more abstract cognitive representations of the alternatives and then using a within-attribute strategy such as additive difference. The more noncomparable the alternatives, the more abstract is the required representation. Using verbal protocols in a projective choice task and verbal protocols and eye fixations collected during an actual choice task, Johnson found support for both of these strategies. The more noncomparable the alternatives, the more abstract were the attributes used to compare the alternatives directly and the more across-attribute processing versus within-attribute processing was used.

Consumer researchers have assumed a leading role in exploring information processing across a range of decisions and decision makers. We are continuously learning how consumers adapt to particular choice environments, use the knowledge they gain, and compare and contrast a variety of product and service alternatives. Future research should continue to explore choices that are distinctively and uniquely a part of consumer behavior. It appears particularly important to increase consumer choice research in the areas of product category and noncomparable choice. Such choices affect

basic consumer resource allocations and are inherently interesting decisions for consumers to make.

## *STRUCTURAL MODELS OF JUDGMENT AND CHOICE*

### *From Process to Structural Models*

Recall that structural models of judgment and choice, unlike process models, describe the relationship between input and output in a mathematically representable form. Though such models do not specify information processing to the same degree as process tracing studies, they do involve basic assumptions about how people use information to arrive at a judgment or decision. Thus process tracing and structural models may be capturing the same underlying process at different levels of generality (Einhorn, Kleinmuntz, and Kleinmuntz 1979). Compensatory processing, for example, is implicit within many of the structural models described hereafter in which information is combined or averaged to arrive at a judgment or choice.

The gap between processing strategies and structural models also is bridged by the notion that, consistent with an information processing approach, certain basic cognitive operations underlie both. One such basic operation, called "anchoring and adjustment" (Tversky and Kahneman 1974), is assumed to underlie many of the structural models as well as processing strategies reported by decision researchers (Einhorn and Hogarth 1981, 1985; Lopes 1981a; Lopes and Johnson 1982). Using anchoring and adjustment, an individual first anchors his or her judgment on one particular aspect of the task or judgment, such as an alternative's value on a particular attribute or the availability of a particularly salient past event, and then adjusts the judgment by taking into account additional relevant information. Consumer researchers have picked up on anchoring and adjustment as a likely cognitive operation underlying product evaluations and judgments (Davis, Hoch, and Ragsdale 1986; Hoch 1984; Johnson 1986a,b). Though we separate process and structural models for the purposes of this review, it is important to remember the underlying similarity in the two approaches.

### *Alternative Structural Modeling Approaches*

Several prominent structural models have been used by decision researchers to describe judgment and choice processes. We describe the basic conceptual approach underlying each model. More detailed discussions of the similarities and differences among these models are available elsewhere (Abelson and Levi 1985; Einhorn and Hogarth 1981). The models include social judgment theory, information integration theory, linear models of judgment, and the contrast model of similarity.

Social judgment theory is derived from theoretical work by Brunswik (1956; see also Hammond et al. 1975). Human judgment is viewed as an attempt to determine the relationships between some distal criteria or performance variable (such as the acceptability of some individual or object) and the observable or proximal cues available in the task environment. By Brunswik's notion of a lens model, the relationships between judgments and the use of observable cues can be examined as well as the ecological relationships between the cues and actual performance. In other words, the lens model approach examines how environmental cues relate to both people's judgments of performance and actual performance. Judged and actual performance measures also can be compared directly to measure judgmental ability. Another important aspect of this approach is the overt consideration of the relationships among the observable cues, or cue redundancy, as we described before in discussing factors affecting information search. Methodologically, social judgment theory typically uses multiple regression to model quantitatively both individual judgments and judgmental ability.

Information integration theory (Anderson 1970, 1974, 1981) uses a variety of algebraic models to capture judgment processes. The theory views judgments as resulting from a three-stage process. First, scale values are assigned to each piece of information to reflect the implications or importance of the information. In the integration stage, the scale values are combined by means of some cognitive operation (e.g., adding, averaging, multiplying, subtracting). Finally, the result of the integration is transformed into some overt response. One important aspect of integration theory pertains to the implications the different integration rules have for evaluations. Adding and averaging, for example, may result in very different evaluations. Consider an alternative with a positive evaluation. Adding to the evaluation an attribute on which the alternative is neutral will have little effect. In contrast, averaging the neutral attribute into the evaluation will reduce the overall positive evaluation of the alternative (McGuire 1976). Another advantage of averaging as a judgment rule is that it is very consistent with the anchoring and adjustment process described before (Lopes 1981a).

The third and perhaps most common structural model in decision research is the simple linear model (Dawes and Corrigan 1974). Over the years, linear models have been used to describe not only clinical judgments (Goldberg 1968; Hoffman 1960), but a variety of judgment tasks ranging from graduate school admissions decisions (Dawes 1971) to stockbrokers' judgments (Slovic 1969). Linear models of judgment have two desirable qualities. First, they are conceptually simple and the resulting judgments can be analyzed with simple linear regressions. Second, they have proved to be very powerful predictors (Dawes 1979). Even unit-weighted models, which treat the included attributes as equally important, are very good predictors. A particularly interesting finding is that linear models derived from judges' evaluations often outperform the judges themselves, a phenomenon known as "bootstrapping" (see Camerer 1981 for a discussion). Linear models may perform well only in certain tasks, however. Abelson and Levi (1985) sug-

gest the robustness of linear models stems from their applications to tasks that are characterized by (1) conditional monotonicity between the cues used to make judgments and the corresponding performance or objective being judged and (2) large error components (where nonlinear relationships are easily hidden).

Social judgment theory, information integration theory, and linear models of judgment all focus on evaluation. In a different vein, Tversky (1977) proposed an important structural model to describe perceptual judgments of interobject or stimulus similarity. When judging similarity, Tversky suggests, people extract and compile from memory a limited list of relevant features. Similarity judgments then are obtained by contrasting the common and distinctive features of the objects or alternatives in question. The resulting model treats similarity as a linear combination of common and distinctive features; common features add to similarity and distinctive features detract. The weight placed on the different feature sets enables the model to explain a number of contextual effects on proximity judgments. For example, if two alternatives are associated with many common as well as many distinctive features, they may be judged as very similar in a similarity context (assuming the similarity context focuses the weight on common features) as well as very dissimilar in a dissimilarity context (assuming the dissimilarity context focuses the weight on distinctive features). By conceptualizing alternatives as associated with dichotomous features, the model also provides an alternative to the predominantly dimensional approach to cognitive representations.

### *Structural Models in Consumer Research*

Marketing and consumer researchers generally have taken two broad approaches in using structural models to represent buying decisions. One approach is to use mathematical relationships involving attribute characteristics and individual consumer preferences to predict choices among an evoked set of brands (e.g., Chapman and Staelin 1982; Kamakura and Srivastava 1984). This group of formal choice models has been reviewed thoroughly by Corstjens and Gautschi (1983) and is not reviewed here. The second broad approach involves the derivation and/or testing of mathematical models that represent the processes used by consumers in acquiring information, integrating that information, and making choices. These models include those developed in the more general decision literature as well as models that more specifically address theories of consumer choice.

Following Anderson's information integration approach, Troutman and Shanteau (1976) investigated whether consumers use adding or averaging of attribute information in their judgments of product quality. Consumers judged hypothetical brands (e.g., disposable diapers) on the basis of information given on one attribute (e.g., high absorbency) or on two attributes (e.g., high absorbency and above-average durability) and their judgments were

compared to determine whether they used an adding or an averaging rule. An adding rule would predict that the brand judged on the two attributes would be rated higher than the brand judged on the one attribute, whereas an averaging rule would predict the opposite. In two separate experiments involving durable goods, nondurable goods, and services, support was found for a simple (equal-weighted) averaging model.

However, Cohen, Miniard, and Dickson (1979) criticized Troutman and Shanteau's methodology and findings, as well as the information integration approach in general. The method deprives subjects of valuable contextual information that they would be likely to use in actual buying situations. Perhaps an even stronger criticism levied by Cohen and his coworkers is the failure of the experimenters to control for inferential beliefs. In the foregoing example, it is possible that subjects inferred the level of the missing attribute to be equal to the "high" level specified for the original attribute. Thus, though the experimenters assumed that a more favorable rating for the single-attribute judgment supported an averaging model, the same outcome would result from an adding model based on an inferred high level for the missing attribute.

Lynch (1985) recently developed a thorough conceptual argument supporting the use of the information integration paradigm in consumer judgment research. His argument centers on the usefulness of the methodology and on various corrective measures to improve the validity of the derived integration models. Two reasons for using this paradigm are that the models do an excellent job of predicting actual choice behavior and that the parameters of these models logically relate to the characteristics of the consumer rendering the judgment. The major problem is determining the validity of the scale values generated by a specific model. To do this, the researcher must derive an independent set of estimates of the scale values for comparison. Lynch proposes that tests of the validity of the hypothesized composition rule should be performed in preliminary studies, prior to full-scale data collection and estimation of the final model.

Some of the major work in developing mathematical representations of consumer decision processes has been done by Meyer and his associates (Meyer 1982; Meyer and Eagle 1982; Johnson and Meyer 1984). Meyer and Eagle proposed a stochastic choice model representing a hierarchical elimination process. The attribute weights in the model are allowed to vary with the stage of the choice process. As the choice set is reduced and its composition is changed because of the hierarchical elimination of alternatives, the remaining alternatives become increasingly similar and the decision maker's attention shifts to differences on minor attributes. Meyer and Eagle formulated a bilinear difference model that captures these behavioral characteristics and they provide an empirical assessment using subjects' preferences for hypothetical grocery stores. The results support their hypothesis and a shifting of weight to lesser attributes as the choice set decreases.

Meyer (1982) then incorporated this model into a formal mathematical representation of a consumer's information search process. The model posits that consumers continuously update expectations and perceptions about the choice set while engaging in a sequential information search. Specifically, the decision maker is conceptualized as sequentially sampling from a distribution of possible choice alternatives. Each sample provides information about some of the attributes of the alternative being inspected and each iteration affords the opportunity of making a choice or continuing the search. Meyer posits a four-stage process whereby the decision maker (1) assigns a set of *a priori* utility values to each potential alternative, (2) reduces the number of alternatives to a smaller set for further comparison, (3) gathers additional information on one of the remaining alternatives, and (4) revises the utilities on the remaining alternatives in light of additional information. Meyer reports the results of two experiments that examine and strongly support the impression updating and the recursive alternative inspection characteristics of the model.

Both of the foregoing models attempt to explain shifts in the saliency or weight of choice-relevant attributes and are essentially variations on the linear compensatory models described before. In a more recent study, Johnson and Meyer (1984) examined the effect of using these compensatory choice models to represent the noncompensatory evaluation strategies decision makers employ as choice alternatives increase. Specifically, they investigated the errors in parameter specification resulting from using a compensatory model when a noncompensatory process is believed to apply. In an experiment using verbal protocols to capture the subjects' judgment processes and a compensatory model to predict choices, Johnson and Meyer found the compensatory models to be very accurate in predicting choice even when the verbal protocols revealed a noncompensatory strategy. Though based on hypothetical choice problems, these results are consistent with the "robust beauty" of linear models found in the decision literature.

Using a slightly different approach, Bernardo and Blin (1977) proposed that consumers' choice processes among multiattribute items can be formulated as a simple linear programming problem. If one assumes consumers use a linear compensatory evaluation strategy, an optimal compromise among the various component rankings can be solved analytically by formulating a simple linear assignment model. The data needed to formulate the model are (1) the individual's set of salient attributes for the product class, (2) a rank ordering of the available brands according to each attribute, and (3) the individual's weighting of each attribute. The linear programming algorithm produces an overall ranking that simultaneously uses all information contained in the attribute rankings. Bernardo and Blin include an empirical illustration in which a sample of graduate students provided the necessary preference information for toothpaste. The model was used to predict the top-ranked brand and the overall ranking of the brands for each subject. This optimal solution then was compared with the reported percentage of pur-



chase behavior for each individual. The predicted rankings correlated highly with the observed preferences (Kendall's tau = .769).

Grether and Wilde (1984) similarly formulated the decision process as a constrained optimization problem, though assuming a conjunctive choice rule rather than the linear compensatory rule. Recall from the previous discussion that the conjunctive rule establishes minimum acceptable cutoff levels for each attribute. One of the problems in operationalizing the conjunctive rule is resolving the ties that occur when more than one alternative meets all the cutoff criteria. Grether and Wilde resolved this problem by formulating a conjunctive satisficing model in which the first alternative meeting all cutoff points is chosen. Thus, they were concerned with two major research issues: (1) the choice of cutoff points and (2) the order of inspection of the attributes. Their model was formulated as a utility maximization problem in which information costs are considered explicitly for each decision maker. They first developed an optimal model, described by a set of equations, that identifies a set of cutoff levels and an order of attribute inspection that maximizes the decision maker's utility while simultaneously allowing for information acquisition costs. Then, acknowledging that consumers may not be able to execute the optimal model realistically, they relaxed some of the more restrictive conditions and formulated a nonoptimal conjunctive model. Finally, the two models were examined and compared in an experimental setting. The results revealed that the subjects failed to conform to the optimal model either in their choice of cutoff levels or in their selection of attribute inspection orderings. Both cutoff levels and selection orderings were predicted best by the nonoptimal model.

Important contributions have been provided by consumer researchers who model choice processes as a means of testing theories of consumer behavior and choice. For example, Lehmann, Moore, and Elrod (1982) explicitly examined Howard's model of consumer behavior (cf. Howard 1977). They were particularly interested in whether consumers used limited problem solving (LPS) or routine response behavior (RRB) when making a series of purchases involving a new brand in an existing product class. Volunteer subjects were allowed to acquire as much or as little information as they wished before choosing one of five available (but previously unknown to them) brands of bread. The experiment was repeated weekly for six weeks with the same subjects and the same five brands of bread. Information acquisition was monitored through an information display board. The basic premise was that high levels of information acquisition indicated LPS and low levels of information acquisition indicated RRB. Lehmann and his colleagues sought to establish whether one or both forms of processing occurred during the course of the experiment.

Using two nested stochastic models, the Gamma-Poisson (Ehrenberg 1972) and an extended Gamma-Poisson (Morrison 1969), they determined that the subjects' information acquisition behavior (measured and modeled weekly for each of the six weeks in the experiment) was bimodal, indicating the

presence of two distinct segments. One segment (RRB) acquired little or no information and the other segment (LPS) acquired a moderate amount of information. The two segments remained distinct throughout the experiment, but the RRB segment increased in size (as would be expected) with each succeeding week and the LPS segment acquired less information (though still more than the RRB) each week. In general, these results provide support for Howard's (1977) theory that consumers engage in different forms of choice behavior (RRB and LPS in this case) at different levels of familiarity with new brands in a product class. The models used by the authors to infer the existence of the behavioral segments also represent an interesting and beneficial contribution to marketers' attempts to blend behavioral processes with distinct mathematical representations.

In another study, McAlister (1982) used a variant of the linear compensatory model to explain variety-seeking behavior among consumers of non-durable, frequently purchased goods. Her model builds on the theoretical view of Lancaster (1971) in which utility is provided not by products but by the characteristics of products. Accordingly, McAlister reasoned that a collection of brands can be represented by the sum of values, across the collection, on the respective attributes or characteristics. An individual consumer's attribute inventory thus consists of the sum of the attributes consumed *across brands*. Added to this view is the notion that, over time, these attribute inventories are depleted. Finally, she assumes a decreasing marginal relationship between the attribute inventories that would result from the consumption of a particular item and the consumer's preference for that item. McAlister combines these three assumptions to formulate a dynamic attribute satiation model in which an individual's preference for an item at a given point in time is a function of the contributions of that item's constituent attributes. The actual preference contribution of each attribute is then a function of the individual's consumption history and the point of satiation for that attribute. By measuring an individual's recent attribute consumption history and the relative preferences for each attribute, and combining this information with a hypothesized decay function, one can predict an individual's choice behavior among a set of brands containing various amounts of each attribute. McAlister reports the results of an experiment in which subjects' consumption histories and preferences for specific soft drink attributes were used to calibrate the model and predict future soft drink consumption. The performance of the dynamic attribute satiation model was compared with that of two variants of a stochastic choice model. The dynamic attribute satiation model was a significantly superior predictor of actual choice.

Unlike the evaluation and choice models, Tversky's (1977) contrast model was developed to explain and describe how individuals judge similarity or proximity. Recall that the model views similarity judgments as resulting from a contrasting of common and distinctive features whose salience or weight varies among contexts. Though marketers frequently use proximity judgments in research, relatively little attention has been paid to the way con-

sumers produce those judgments. Two studies (Johnson 1981, 1986b) suggest the contrast model offers a potentially useful view of how consumers judge similarities and differences among products.

Using consumer products as stimuli, Johnson (1981) replicated different contextual effects on proximity judgments (initially reported by Tversky 1977 and Tversky and Gati 1978) that are very consistent with the model. Particular brands of soft drinks and beer, for example, were judged as both very similar in a similarity context and very dissimilar in a dissimilarity context. In a later study, Johnson (1986b) used a memory probe to measure the feature sets consumers associated with the brands in the original study. He tested the explanatory power of the contrast model by using the estimated feature sets within a linear model formulation to explain the original judgments. Across three different judgment tasks (similarity, dissimilarity, and subject/referent similarity), the feature sets explained most of the variance in the judgments and were related consistently to the judgments in the predicted directions. The contrast model appears very applicable to consumer judgment and offers marketers several interesting potential applications (see Johnson 1986b for a discussion).

Mathematical models are vastly improved in their ability to represent behavioral processes formally. The results reported suggest at least two research opportunities for marketing researchers in this area. First, continued research using convergent methodologies, such as verbal protocols and other process tracing techniques (cf. Johnson and Meyer 1984), should help to refine these models even further. Second, the extremely complicated step of transferring laboratory results for hypothetical brands and product classes to actual brands in more realistic settings should begin. Only then can these models be calibrated for use by marketing managers. Advancements in this area will not only contribute to marketing knowledge, but also increase our understanding of decision making in general.

### *LIKELIHOOD JUDGMENT AND RISKY CHOICE*

Though at some level all decisions can be viewed as involving some degree of risk, the research we have described is characterized by situations in which "preferences but not probabilities are involved," that is, riskless choice, whereas risky choice involves probabilistic outcomes (Abelson and Levi 1985). In this section we take up this second general context of interest to judgment and choice researchers, including research on heuristics for judging likelihood and on risky choice itself.

#### *Likelihood Judgments*

A body of research suggests people use something other than relative frequency to judge probability or likelihood (Kahneman and Tversky 1973, 1982a; Tversky and Kahneman 1971, 1974). Kahneman and Tversky pop-

ularized two such heuristics for judging likelihood, representativeness and availability. Using the representativeness heuristic, for example, a consumer might estimate whether a particular automobile is a "lemon" by judging how representative the auto is of that class of objects (e.g., how similar it is to the consumer's prototype of a "lemon"). Because the consumer expects every car that he or she considers a lemon to be representative of that category, biases may result. One such bias is the "belief in the law of small numbers" (Tversky and Kahneman 1974), whereby people expect a small sample from a distribution to mirror much larger samples.

The availability heuristic applies when consumers judge the probability of an event by the ease with which instances or occurrences of the event can be brought to mind or made vivid. The problem with this heuristic is that probability is judged more on the basis of absolute than relative frequency. If a consumer can recall several instances when a particular type of automobile has had mechanical problems, he or she may judge the likelihood of such problems to be high, even though the relative frequency of repair is much lower than that for most other cars on the market. Availability also can lead to what Tversky and Kahneman (1983) have termed the "conjunction fallacy." The laws of probability require the probability of a conjunction to be less than or equal to the probability of its constituents. A kitchen appliance, for example, is as likely (or more likely) to be a toaster (of any color) as it is to be a silver-colored toaster. Thinking of silver toasters, however, provides a better search set for naturally assessing the number of times an individual recalls a toaster having been used as a kitchen appliance. As a result, the individual may judge people as more likely to use a silver toaster than simply a toaster.

Likelihood is not a unidimensional construct, however. Ellsberg (1961) distinguishes in this sense between risk, where some known or well-established probability is involved, and uncertainty, where probabilities may not be available or well known. Drawing on one of Ellsberg's examples, consider betting on which color bead, red or black, will be drawn from an urn that you know contains half red and half black beads versus an urn containing red and black beads of an unknown proportion. In the latter case, there is greater uncertainty or ambiguity about the outcome even though the *a priori* probability of drawing a red or black bead is equal in the two cases. Recently Einhorn and Hogarth (1985) postulated an anchoring and adjustment type of process to explain how individuals heuristically combine information when making probabilistic inferences involving ambiguous or uncertain outcomes. According to their model, people anchor their judgment on some initial assessment of probability and adjust this estimate by considering possible distributions of this value, or the uncertainty associated with the value.

Unfortunately, the existence and implications of heuristics for judging likelihood, such as availability, have been relatively ignored by consumer decision researchers. An important exception is Dickson's (1982) study of

the effect of case information on expectancy judgments. Dickson provided one group of subjects concrete case history scenarios about refrigerator breakdown and gave another group summary statistical information about incidences of breakdown. He hypothesized that because of the vividness or availability of the concrete scenarios, consumers in that condition would give greater failure-rate estimates than would the consumers who had received only statistical information. In the case history condition, consumers' estimates were in fact 30% higher. Other recent studies by Hoch (1984) and Alba and Marmorstein (1986) also support availability, or frequency-based judgments, as systematically affecting consumer expectations. Findings such as these may have very important marketing implications. They suggest, for example, that personal experiences, or experiences related by word of mouth from friends or relatives, disproportionately affect consumer judgments of product or service performance.

Taken together, these and other empirical findings on people's heuristics for judging likelihood and resulting biases, including failure to recognize and use base rate information (Kahneman and Tversky 1973) or to recognize possible unstated decision outcomes (Fischhoff, Slovic, and Lichtenstein 1978), call into question the ability of current concepts of probability and randomness to help describe human decision making. Not only do people approximate objective probabilities, but probabilities themselves are normatively problematic. Lopes (1981b), for example, argues that objective probabilities do not necessarily apply to "decision making in the short run." She points out that decision makers rarely see an entire distribution of events in their lifetimes and, as a result, should not necessarily make decisions that follow from large-sample probability inferences. (This view offers a normative alternative for the otherwise nonrational choices observed in the case of the St. Petersburg paradox.) Overall, future research should pay more attention to the heuristic nature of consumer expectations and its consequences. In particular, the uncertainty associated with consumer expectations (cf. Einhorn and Hogarth 1985) has not been studied systematically by consumer researchers.

### *Risky Choice*

The major models used to explain risky choice include expected value, expected utility, and, more recently, prospect theory. The simplest and most straightforward model of risky choice is the maximization of expected monetary value. A decision maker simply multiplies the monetary value of each decision outcome by the probability of its occurrence, sums the expectations over each alternative's outcomes, and chooses the alternative with the largest overall expected monetary value. As noted before, Bernoulli introduced the notion of utility as a replacement for monetary value to explain decisions that were inconsistent with expected value maximization. Variations on Bernoulli's original utility function have been advanced to explain a variety of choice behavior (Schoemaker 1982).

The expected utility model first proposed by Bernoulli and later formalized by von Neumann and Morgenstern (1944) has been a dominant factor in guiding research on risky choice behavior. As we note in the introductory section, it has been used as a descriptive model, both to explain the processes individuals actually follow in making decisions under risk and to predict the outcome of a pending decision, and as a normative model to prescribe how individuals should make decisions when their goal is to optimize a stated preference function. We also note that the expected utility model has numerous shortcomings as a descriptor of individual choice processes. Chief among these problems are context effects, the effects a particular choice alternative or consideration set may have on choice outcomes (Payne 1982).

The primary focus of the succeeding sections is on the descriptive aspects of the expected utility model and the problems experienced in empirical studies addressing this issue. We begin with a brief recounting of expected utility theory and the von Neumann-Morgenstern axioms, then review context effects reported in the psychology and marketing literature that call into question the descriptive validity of the axioms. Next we examine one of the more promising descriptive enhancements to the expected utility model, prospect theory (Kahneman and Tversky 1979). Finally, Thaler's (1980, 1983, 1985) theory of transaction utility, a deterministic analog of prospect theory, is reviewed.

### *Expected Utility Theory*

The term "utility" originally was developed to describe the overall pain and pleasure or net satisfaction derived from a particular commodity or choice alternative (Bentham 1789). Expected utility theory is the risky choice extension of classical utility theory, which economists (and decision scientists) have used to describe the rational decision maker (Stigler 1966).

Von Neumann and Morgenstern (1944) specified a series of axioms that imply the existence of numerical utilities for outcomes which, when computed as expectations over lotteries, preserve the preference order over the lotteries (i.e., greater expected utility corresponds to higher preference). Schoemaker's (1982) recent review of the expected utility model and its variants includes an informal statement of the following von Neumann-Morgenstern axioms.

1. Preferences for gambles ( $G_i$ ) are complete and transitive. Completeness means that for any choice between gambles  $G_1$  and  $G_2$ , either  $G_1$  is preferred to  $G_2$  (denoted  $G_1 > G_2$ ),  $G_2 > G_1$ , or both are equally attractive. Transitivity implies that if  $G_1 \geq G_2$  and  $G_2 \geq G_3$ ,  $G_1 \geq G_3$  (where  $\geq$  denotes "at least as preferred as").
2. If object (outcome)  $x_1 > x_2 > x_3$ , there exists some probability " $p$ " between zero and one such that the gamble  $(x_1, p; x_3, 1 - p)$  is as attractive as receiving  $x_2$  for certain.
3. If objects  $x_1$  and  $x_2$  (being either risky or riskless prospects) are equally at-

tractive, the gambles  $(x_1, p; x_3, 1 - p)$  and  $(x_2, p; x_3, 1 - p)$  also are equally attractive (for any values of  $p$  and  $x_3$ ).

4. For gambles  $(x_1, p; x_2, 1 - p)$  and  $(x_1, q; x_2, 1 - q)$ , which differ only in probability, if  $x_1 > x_2$ , the first gamble will be preferred to the second if and only if  $p > q$ .
5. A compound gamble (i.e., one whose outcomes are themselves gambles) is equally as attractive as the single gamble that would result when multiplying the probabilities through according to standard probability theory (Schoemaker 1982, p. 531-2).

Within the framework of expected utility theory, early investigators also observed the general tendency of decision makers toward risk-averse choices. As a result, risk aversion became a generally accepted assumption in most expected utility models (cf. Arrow 1971). Decision makers are risk averse if they prefer a sure outcome to a risky one in a fair gamble and they are risk seeking if they prefer the probabilistic outcome. (A "fair" gamble is one in which the decision maker has a choice between an outcome offered with certainty and a probabilistic outcome whose expected value is equal to the sure outcome.) Thus, a concave utility function (with respect to the origin), such as that originally proposed by Bernoulli, implies risk-averse preferences among gambles within the range of the concavity.

### *Empirical Research Using the Expected Utility Model*

The value of the expected utility model as a descriptive tool is predicated on the empirical validity of the von Neumann-Morgenstern axioms. Several laboratory studies reported by numerous authors have cast considerable doubt on the descriptive validity of the axioms themselves. We review a representative sampling of this research.

Tversky (1969) tested the transitivity axiom and found that intransitive preferences are likely to occur if individuals use evaluation strategies involving comparisons within dimensions, such as comparing alternatives first on price, then on style, then on performance. In the two studies reported, Tversky found repeated, predictable violations of transitivity. The second axiom refers to the so-called "in-betweenness" property (Coombs 1975), namely that a gamble offering two outcomes A and B should have a preference level within the range of preferences for either outcome alone. Coombs (1975) tested this axiom using subjects' preferences for a series of gambles. He found that 46% of the subjects violated it by ranking the "in-between" gamble either above or below each of the outcomes treated separately. The third axiom, which assumes a consistent risk attitude for similar decision problems, was tested by Kahneman and Tversky (1979) using the following variation of Allais' (1953) paradox (where amounts refer to gains).

*Problem 1. Choose between:*

- A. 2500 with probability .33  
2400 with probability .66  
0 with probability .01
- B. 2400 with certainty

*Problem 2. Choose between:*

- C. 2500 with probability .33  
0 with probability .67
- D. 2400 with probability .34  
0 with probability .66

In problem 1, 82% of the subjects chose alternative B, 2400 with certainty. However, in problem 2, 83% of the subjects chose alternative C, 2500 with probability .33 or 0 with probability .67. This outcome violates expected utility theory because, assuming  $u(0) = 0$ , it implies  $u(2400) > .33u(2500) + .66u(2400)$ , or, by transposition,  $.34u(2400) > .33u(2500)$ , whereas the choices in problem 2 imply  $.33u(2500) > .34u(2400)$ . (Kahneman and Tversky have labeled this the “certainty effect.” It is discussed in more detail in the section on prospect theory.)

Recall that the fifth axiom states preferences for compound gambles will be the same as preferences for comparable simple gambles formed through the proper combining of the probabilities as permitted by probability theory. However, Bar-Hillel (1973) found subjects tend to overestimate the probability associated with conjunctive events and thus prefer a conjunctive compound gamble to a simple gamble having slightly more favorable outcomes. Conversely, subjects tend to underestimate the probability associated with disjunctive events and thus prefer a simple gamble having a slightly less favorable outcome.

The widely accepted assumption of risk aversion, perhaps the cornerstone of the casualty insurance industry, has been challenged by several laboratory studies that reveal a reluctance on the part of subjects to accept actuarially fair insurance (Hershey and Schoemaker 1980; Kahneman and Tversky 1979; Schoemaker and Kunreuther 1979; Slovic, Fischhoff, and Lichtenstein 1977). Additionally, Laughhunn, Payne, and Crum (1980; Payne, Laughhunn, and Crum 1980, 1981) reported risk-seeking behavior for both student and business executive subjects in choosing among gambles with either losses or below-target returns. This risk-seeking behavior for losses has not been a universal finding, however. Laughhunn and Payne (1984) reported mixed risk preferences among corporate executives making decisions about continuing or canceling of hypothetical investments involving sunk costs. These mixed findings highlight the importance of understanding context variables such as the aspiration level and the current circumstances facing the decision maker. In the following section we examine these and other reported context effects in greater detail.

### *Context Effects in Decision Making*

Most decision theorists agree that a major deficiency of the expected utility model is its inability to account for context effects, which include such factors as the verbal labels, modes of information presentation, response



modes, social dimensions, and other circumstances associated with the decision problem. As a descriptor of individual choice, the model itself is mute with respect to the effects of context variables.

One of the more controversial forms of context effects is decision framing. The classic example from behavioral decision theory (Tversky and Kahneman 1981) follows.

*Problem 1 (N = 152)*

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume the exact scientific estimates of the consequences are:

If Program A is adopted, 200 people will be saved.  
(% choosing A = 72%)

If Program B is adopted, there is a  $\frac{1}{3}$  probability that 600 people will be saved and a  $\frac{2}{3}$  probability that no people will be saved.  
(% choosing B = 28%)

Which of the two programs would you favor?

*Problem 2 (N = 155)*

Same introduction as Problem 1, but with the following alternative presentation of programs:

If Program A is adopted, 400 people will die.  
(% choosing A = 22%)

If Program B is adopted, there is a  $\frac{1}{3}$  probability that nobody will die and a  $\frac{2}{3}$  probability that 600 people will die.  
(% choosing B = 78%)

Which of the two programs would you favor?

One group of 152 subjects was given problem 1 and a second group was given problem 2. In an expected utility context, the two choice problems are mathematically identical. Yet problem 1, expressed in terms of lives saved, evoked a strong preference (72%) for the certain alternative whereas problem 2, expressed in terms of lives lost, evoked an equally strong preference for the probabilistic alternative. Subjects apparently framed alternative A in problem 1 as an opportunity to achieve a sure saving of 200 lives and alternative B in problem 2 as an opportunity to avoid 400 deaths.

In the marketing literature, several authors describe similar context effects in both deterministic (e.g., nonrisky) and risky choice that illustrate the descriptive shortcomings of utility theory and its axioms. Deterministic choice studies have been reported for age and gender (Kehret-Ward and Yalch 1984) and for set size and composition (Huber, Payne, and Puto 1982; Huber and Puto 1983).

Kehret-Ward and Yalch reasoned that individuals choose products at least

partly on the basis that the product communicates something about their self-concept to others. Specifically, choosing a unique product over like-performing but more readily available products enables one to make a positive assertion of distinction about oneself and others like oneself. In some social contexts, however, the same choice can engender an invidious comparison (e.g., "I've got something you can't have") that may create resentment. On the basis of prior findings, Kehret-Ward and Yalch argued (1) that choosing a unique product over similar but more plentiful products is likely to depend on the availability of either the positive or the invidious connotation and (2) that females and children under the age of 11 would be more susceptible to external attempts to influence the availability of these two connotations. Their reasoning was supported by the results of two studies, a field experiment conducted among trick-or-treaters during Halloween and a quasilaboratory experiment conducted in an elementary school classroom. The findings suggest the probability of choosing a unique item is higher for females who have been complimented on their uniqueness than for males given a similar treatment. Similarly, the probability of choosing a unique item is higher for children younger than 11 years of age. (These differences were not observed for a control group.)

In another marketing study on context effects, Huber, Payne, and Puto (1982) found that adding an asymmetrically dominated alternative to a choice set influenced the probability of choice in the direction of the dominant alternative. (Dominance occurs when one item in a choice set is equal to another item in the set on every dimension and is superior on at least one dimension. An asymmetrically dominated alternative is dominated by at least one item in the choice and not dominated by at least one other.) The following example illustrates the effect. One choice set consisted of two initial, equally favored restaurants (A and B). Restaurant A had a driving time of 25 minutes and a 5-star quality rating whereas restaurant B had a driving time of 5 minutes and a 3-star rating. Adding alternative A', which had a driving time of 35 minutes and a 4-star quality rating (clearly dominated by restaurant A on both dimensions), actually increased the market share (i.e., the choice probability) for A and decreased it for B. Similar results were observed (i.e., B's share increased and A's share decreased) when the added third alternative was dominated by B. Huber and Puto (1983) extended these results to include situations involving partially dominated, or relatively inferior, alternatives added to 2-item and 3-item choice sets.

These particular findings contradict two widely held tenets in choice modeling, the similarity hypothesis and the regularity condition. The similarity hypothesis (Tversky 1972) posits that a new product takes disproportionately more share from items similar to it than from dissimilar items. The regularity condition (Luce 1977) states that the addition of a new alternative cannot increase the probability of choosing a member of the original set. Overall, the results described in this section are important to marketers because most of these context variables represent factors that are either controllable ele-

ments of marketing strategy or environmental factors that can be accommodated by marketing strategies.

### *Prospect Theory*

Many though not all of the descriptive inadequacies of expected utility theory are addressed in prospect theory, a psychologically based descriptive theory of individual choice under risk (Kahneman and Tversky 1979, 1982b; Tversky and Kahneman 1981). "A prospect  $(x_1, p_1; \dots; x_n, p_n)$  is a contract that yields outcome  $x_i$  with probability  $p_i$ , where  $p_1 + p_2 + \dots + p_n = 1$ " (Kahneman and Tversky 1979, p. 263). Following the notational convention used in the original presentation of the theory, we omit null outcomes and use  $(x, p)$  to denote the prospect  $(x, p; 0, 1 - p)$  that yields outcome  $x$  with probability  $p$  and zero with probability  $1 - p$ . A riskless prospect that yields outcome  $x$  with certainty is denoted  $(x)$ . Thus, the two prospects  $(100)$   $(200, .5)$  denote the choice between receiving 100 for sure and receiving 200 with probability = .5 or else receiving nothing. Prospect theory describes the manner in which individuals choose among prospects.

Central to prospect theory is the proposition that the choice process has two distinct stages, an editing stage (in which context effects can have a significant role) and an evaluation stage. The editing stage represents the initial analysis of the problem, in which the decision maker restructures, or frames, the decision problem into a more simplified form using some or all of six possible editing operations: coding, combination, segregation, cancellation, simplification, and dominance. For example, in the coding operation, the decision maker identifies a reference point and then codes each prospect as a gain or a loss with respect to that reference point. Combination, in contrast, enables a decision maker to simplify a prospect by combining the probabilities associated with identical outcomes. (See Kahneman and Tversky 1979 for examples of the other operations.) The evaluation stage describes the process whereby the decision maker assigns a value to each of the edited prospects and chooses the one with the highest value.

The overall value of an edited prospect, denoted  $V$ , is expressed as the product of two functions,  $v$  and  $\pi$ .

$$(1) \quad V = \sum_i v(x_i) \pi(p_i)$$

The first function,  $v$ , assigns to each outcome  $x$  a number  $v(x)$  that reflects the subjective value of that outcome. The outcomes are defined in relation to a reference point, which serves as the zero point on the value scale, such that  $v$  measures the value of deviations from that reference point. The second function,  $\pi$ , associates with each probability " $p$ " a decision weight  $\pi(p)$  that reflects the effect of " $p$ " on the overall value of the prospect. Note, however, that  $\pi$  is not a probability scale (Kahneman and Tversky 1979), that is, the weighted probabilities need not sum to one.

The value function,  $v$ , has the following properties: (1) the value of the reference point  $v(0)$  is equal to 0, (2) the function is generally concave for gains and convex for losses, and (3) because the aggravation of a loss appears to be greater than the pleasure of an equivalent gain (Galanter and Pliner 1974), the function is steeper for losses than for gains. The decision weighting function,  $\pi$ , is an increasing function of the probability ( $p$ ), with  $\pi(0) = 0$  and  $\pi(1) = 1$ . Other properties are subadditivity (i.e.,  $\pi(rp) > r\pi(p)$  for  $0 < r < 1$ ) and overweighting (i.e.,  $\pi(p) > p$ ), both of which apply only to very small probabilities.

More important are the properties of subcertainty, suggesting that for all  $0 < p < 1$ ,  $\pi(p) + \pi(1 - p) < 1$  (Kahneman and Tversky 1979), and overweighting of certainty, which is proposed as an explanation for the differential preferences reported for the lives saved/lives lost problem. This overweighting of certainty (*vis-à-vis* probabilistic prospects) contributes to the risk-averse preferences for the sure gain versus a larger gain that is merely probable. Conversely, this overweighting also leads to the opposite result in the domain of losses, that is, a risk-seeking preference for a loss that is probable over a loss that is certain. Clearly there is considerable similarity between prospect theory and the expected utility model (Schoemaker 1982). However, to account for the many context effects, it was necessary for Kahneman and Tversky to assume that the value function applies to relative gains and losses rather than to final wealth positions and that the decision weights do not coincide with stated probabilities.

The preceding discussion suggests both that the descriptive value of the expected utility model is clearly open to challenge and that prospect theory offers a reasonable, though relatively untested, descriptive alternative. In particular, in both decision theoretic and applied marketing contexts, the importance of the reference point in the prospect theory formulation warrants attention. It locates the origin of the value function from which all outcomes are judged. Moreover, empirical tests of prospect theory remain suspect without a clear, unequivocal specification of the reference point.

### *Reference Points and Decision Frames*

The concept of a reference point has its roots in the basic principles of perception and judgment. The human perceptual apparatus adjusts to particular stimulus levels and evaluates changes or differences rather than absolute magnitudes. In psychophysical perception, the past and present context of experience defines an adaptation level, or initial reference point, relative to which incoming stimuli are perceived and compared (Helson 1964). The same principle is applicable for judgments involving wealth, such as buying decisions.

Empirical support for prospect theory in the decision making literature generally relies on choice problems in which it is reasonable to assume either

that the original formulation of the prospects (i.e., the problem presentation) leaves no room for further framing or that the edited prospects can be specified without ambiguity. However, there are very few published reports of research on the decision-framing process itself (Fischhoff 1983). Interestingly, most of the work in this area can be found in the marketing and consumer behavior literature (Puto, Patton, and King 1985; Weiner, Gentry, and Miller 1986).

In the first published report exclusively addressing framing, Fischhoff (1983) reasoned that a finite number of frames exist for a given choice problem and that "In order to predict behavior in less controlled situations, one must be able to anticipate how problems will be represented and what frames people will use to interpret them" (p. 100). Fischhoff presented subjects with a hypothetical choice problem that could be framed in three ways, with each frame leading to different choice predictions under prospect theory. Subjects read the decision problem and selected the frame that seemed the "most natural." After determining whether there was indeed a natural frame or reference point, Fischhoff used the second phase of the analysis to determine whether the natural frame produced a choice consistent with prospect theory (i.e., risk averse for gains and risk seeking for losses). Unfortunately, the results of this experiment shed no light on the relationship between the three proposed frames and the resultant choice of options. There was no demonstrable relationship between Fischhoff's *a priori* frames and the subjects' choice of options.

In one of the earliest marketing applications involving prospect theory, Puto, Patton, and King (1985) explored industrial buyers' choices as a function of the way they framed the buying decision problem. A national sample of industrial buyers responded to a series of purchase decision scenarios (one per buyer) requiring that they award a purchase contract to one of two competing suppliers. One supplier submitted a guaranteed performance offer, which was less than the buyer's budgeted amount for the purchase (i.e., a "sure" saving). The other supplier submitted a conditional offer in which one outcome, if it occurred, would be more favorable than the guaranteed offer and the other outcome, if it occurred, would be less favorable than the guaranteed offer but would still meet the buyer's budget (i.e., a probabilistic saving). The offers were constructed so that the expected value of the probabilistic (i.e., risky) offer was always more favorable than that of the guaranteed (sure) offer. After choosing a supplier, buyers were asked to indicate which of six possible decision frames best represented the way they viewed the decision. The list of frames included the three frames used by Fischhoff (1983) and three additional frames hypothesized by the authors to affect choice. The results indicated a relationship between the buyer's self-reported reference point and choice. Specifically, and consistent with prospect theory, reference points that emphasized gains were accompanied by risk-averse choices and reference points that emphasized losses were accompanied by risk-taking choices.

Weiner, Gentry, and Miller (1986) similarly investigated decision framing in an insurance buying context with mixed results. Student subjects were presented with hypothetical flood insurance buying situations framed either as losses or as the preservation of assets. The researchers hypothesized that if the purchase of flood insurance were framed in the asset preservation domain (e.g., final wealth position, as would be assumed under expected utility theory), subjects would be willing to buy the insurance. Conversely, if it were framed in the loss domain (as would be assumed under prospect theory), subjects would be less willing to buy insurance. Dependent measures included scales of the likelihood of buying flood insurance, the intention to buy the insurance, the intention to acquire additional information, and subjects' attitudes toward flood insurance. The experimentally manipulated decision frames revealed no differential effect on buying intentions or attitudes. However, the researchers also included a manipulation check, which constitutes a weak measure of the subjects' self-reported decision frames, and these measured decision frames showed a significant and directionally correct effect on the intention to buy insurance. Subjects who reported framing the situation as a loss expressed lower mean intentions to buy than did those who reported using the asset frame.

More recently, Puto (1987) focused specifically on the decision framing process. Puto views reference point formation as an iterative process that begins with the decision maker's objectives and knowledge of current conditions relative to the purchase. These factors form an initial reference point or anchor, which can be modified or adjusted by decision-specific information to form the final reference point used in evaluating the alternatives. As mentioned before, anchoring and adjustment is a simple intuitive process assumed to underlie several decision heuristics (Einhorn and Hogarth 1981). With industrial buyers as subjects, and using hypothetical decision scenarios similar to those used by Puto, Patton, and King (1985), Puto experimentally manipulated the reference point, measured it, and found a significant relationship between it and the buyer's choice in the direction predicted by prospect theory.

The manipulation of the reference point was accomplished by changing the buyer's budget within the procurement scenarios to represent suppliers' offerings as either gains or losses. Buyers also were asked to indicate which of three possible reference points was the closest to the one they used in comparing and evaluating the alternatives. Subjects who reported using a low price as a reference point or target, and hence viewed the suppliers' offers in a negative frame, were risk seeking in their choices (i.e., only 12% chose the guaranteed offer). Conversely, subjects who reported using either an intermediate or a high price as their reference point (positive frame) were risk averse in their choices (i.e., 91% and 60%, respectively, chose the guaranteed offer). In addition to affording empirical support for prospect theory in a marketing context, this research provides a successful measure of the reference point and posits a conceptual model of how reference points are formed by buyers.

Rowe and Puto (1987) report similar findings in an experiment involving consumers' choices of retail stores. Subjects who framed the choice as a gain tended to choose the guaranteed option and subjects who framed the choice as a loss tended to choose the risky option. Finally, Rowe and Puto also report the effect of an individual difference variable, self-esteem, on reference point formation. Consistent with the general notion that extreme levels of self-esteem result in unrealistic goals, subjects with very low and very high levels of self-esteem tended to form reference points consistent with positive (risk-averse) frames whereas consumers with moderate and moderately high levels of self-esteem tended to form reference points consistent with negative (risk-taking) frames.

The marketing implications of the reference point are manifold. The reference point is a perceptual phenomenon, and marketing (especially the advertising and personal selling components) addresses perceptual phenomena. Hence, research opportunities include learning what marketing-controlled factors can influence reference points and determining which attributes are likely dimensions on which reference points will be formed. There is a clear possibility that the reference point is a multidimensional phenomenon. Research investigating and measuring it will make a major contribution to both marketing and decision theory.

### *Transaction Utility*

Though technically a deterministic (i.e., riskless) theory of consumer choice, Thaler's (1980, 1983, 1985) transaction utility theory incorporates many of the principles of prospect theory. Like prospect theory, transaction utility theory seeks to explain contextual effects on choices that are not explained by traditional utility theory. Transaction utility theory describes the buying decision as a two-stage process in which individuals first evaluate potential transactions and then either approve or disapprove each potential transaction (Thaler 1985). Thaler distinguished between acquisition utility, which depends on the value of the good received in comparison with the outlay, and transaction utility, which depends solely on the perceived merits of the exchange.

An important characteristic of evaluation under the theory is what Thaler (1985) describes as "mental arithmetic." It involves a series of operations labeled "segregation," "integration," and "cancellation," which operate in conjunction with prospect theory's value function to produce distinctly different evaluations from identical inputs. Segregation treats multiple gains as separate transactions. Thus, a gain of \$50 and a gain of \$25 are viewed as more satisfying than a single gain of \$75. Integration, in contrast, combines outcomes when desirable. Under integration, a single loss of \$75 is less painful than separate losses of \$50 and \$25. Cancellation offsets small losses against larger gains.

Little is known about the processes or rules individuals use to determine which operation applies in a given situation. However, the conceptual implications for marketing suggest that, wherever possible, gains should be segregated and losses should be integrated. Respective examples would be (1) adding free "bonus" items without increasing the price of a low or moderately priced good and (2) charging for small "extras" on a high priced good.

Both transaction utility theory and prospect theory are presented as descriptive theories of choice and they are based on essentially the same principles. Choosing between them in a research context depends considerably on the way the researcher views the purchase process. If the process is seen as deterministic, transaction utility theory offers a fruitful opportunity for research on buying behavior; if the process is seen as one involving risk and/or uncertainty, prospect theory offers the same research opportunity.

## DISCUSSION

At the start of this review, we set out both to introduce the reader to the general area of judgment and choice and to review the contributions of consumer and marketing researchers to the area. Looking back over the research issues and studies we describe and looking ahead to future research on consumer judgment and choice, we see three final points for discussion: the overall progress made by consumer decision researchers, the opportunities facing researchers in this area, and the methodological advances that will be necessary for consumer judgment and choice research to realize its opportunities.

### *Research Progress*

Consumer judgment and choice research has provided important insights into a variety of choice processes and related judgments. As is evident in our review, consumer researchers have studied a wide range of both decisions and decision makers. Choices have been examined at both the consumer and industrial levels. The effects of a decision maker's experience on both knowledge and choice processing also have been addressed. The importance of contextual effects on choice as well as on decision makers' perceptions of risk has been demonstrated. Moreover, choice processes have been studied for choices involving alternatives from either the same or different product categories having attributes ranging from very concrete to very abstract.

It is important to emphasize that these advances have relied heavily on the information processing paradigm from cognitive psychology. Some consumer researchers question the ability of this approach to account for many



consumer choices, particularly those involving symbolic or abstract aspects of consumption (Holbrook and Hirschman 1982) and relatively low involvement or effortless decisions (Olshavsky and Granbois 1979). In reviewing the variety of both choices and contexts that have been studied with an information processing perspective, we hope to prevent both present and future researchers from abandoning the approach prematurely. As described at the beginning of our review, the information processing approach is extremely flexible and not limited either to high involvement or to concrete information processing. Information processing research, particularly that applying to consumer judgment and choice, seems limited more by the range of problems addressed than by the nature of the underlying cognitive psychological paradigm (Johnson 1984). It is important to separate the limitations of many methodologies, such as the use of verbal protocols or information monitoring, from what they are used to study. Though many authors call for new approaches, consumer research to date suggests much can be gained from new and creative applications of an information processing approach.

### *Research Opportunities*

Our second point is that judgment and choice research in economics, psychology, and decision sciences offers consumer and marketing researchers a wealth of relatively unexplored and important research areas. In the course of our review we indicate many of these potentially interesting consumer research topics, including how consumers form expectations about product performance, the effect of uncertain outcomes on expectations, how cognitive representations affect the use of choice strategies and the usefulness of marketing research techniques, using structural models of judgment in conjunction with process tracing methods to study consumer judgment and choice, and exploring the effects of reference points and decision framing on risky and riskless choice. A wealth of research opportunity also is afforded by the unique choices consumers face and the judgment and choice processes they employ, particularly for choices involving product categories and specific alternatives from different categories.

Another aspect of information processing also is open to consumer judgment and choice researchers. As Lynch and Srull (1982) suggest, decision researchers have studied overt decision strategies to the exclusion of the involuntary and automatized aspects of information processing that affect information availability and use. This emphasis suggests a need for consumer researchers to concentrate more on perceptual and preperceptual information processing, including attention allocation, preperceptual information storage, and the interplay between memory and the recognition of

incoming stimuli (Massaro 1975). Consumer researchers have taken many of these early information processing stages for granted.

### *Research Methods*

Our final point is that to realize this wealth of opportunity, consumer judgment and choice researchers face an important challenge. An increased emphasis on attentional and memory effects, cognitive representations, and a wider range of choices and choice alternatives must be accompanied by advances in the methodologies used by consumer researchers. Lynch and Srull, for example, suggest exploring the use of reaction time data (cf. Sternberg 1966) to infer cognitive processes and pupil dilation (Kahneman 1973) to measure attentional capacity or intensity. Such measures should prove particularly useful for studying low involvement (Gardner, Mitchell, and Russo 1978) or perceptual (Massaro 1975) tasks. Memory probes (Johnson 1986b; Johnson and Fornell 1987) also have been useful in studying consumers' cognitive representations. As the choices and types of processing we study continue to expand, the limits of current methods must be evaluated and new methods developed. Many new methods are being explored. For example, Brucks (1985) replaced the traditional brand by attribute matrix with an interactive data collection system to study information search. Weitz and Wright (1979) report relatively accurate retrospections from consumers about choice criteria. Finally, Johnson (1984) used a projective choice task effectively to study choice involving noncomparable alternatives.

Furthermore, as consumer researchers we must not be content simply to study consumer choice in the constrained artificiality of laboratory environments. Results reported by Smead, Wilcox, and Wilkes (1981), for example, suggest the use of actual products, as opposed to product descriptions, results in more difficult choices and the use of very different choice criteria. Laboratory studies will continue to serve an important role in basic consumer choice research. They provide an efficient and practical first approximation given the time and resource constraints of academic research environments. Nevertheless, the field stands to gain significantly from an increase in realism in experimentation. We must not forget that one of the strengths of our area is the everyday relevance of the choices we address. For consumer decision making research to become an effective marketing field, important contributions based on laboratory environments and/or student subjects should be replicated in more realistic environments with representative consumers making actual decisions.

The study of consumer judgment and choice has added significantly to our knowledge of judgment and choice processes. Opportunities for future research abound in this area. Realizing these opportunities will require consumer researchers to develop and borrow new methodologies to study aspects of judgment and choice that are uniquely a part of consumer behavior.

## REFERENCES

- Abelson, Robert P. and Ariel Levi (1985), "Decision Making and Decision Theory," in *The Handbook of Social Psychology*, Vol. 3, G. Lindzey and E. Aronson, eds. New York: Academic Press, Inc., 231-309.
- Alba, Joseph W. and Howard Marmorstein (1986), "Frequency Information as a Dimension of Consumer Knowledge," in *Advances in Consumer Research*, Vol. 13, Richard J. Lutz, ed. Ann Arbor, MI: Association for Consumer Research, 446-9.
- Allais, Maurice (1953), "Le Comportement de l'Homme Rationnel devant le Risque, Critique des Postulats et Axiomes del l'Ecole Americaine," *Econometrica*, 21, 503-46.
- Alloy, Lauren B. and Naomi Tabachnik (1984), "Assessment of Covariation by Humans and Animals: The Joint Influence of Prior Expectations and Current Situational Information," *Psychological Review*, 91 (1), 112-49.
- Anderson, John R. (1983), "A Spreading Activation Theory of Memory," *Journal of Verbal Learning and Verbal Behavior*, 22 (3), 261-95.
- Anderson, Norman H. (1970), "Functional Measurement and Psychophysical Judgment," *Psychological Review*, 77 (3), 153-70.
- (1974), "Algebraic Models in Perception," in *Handbook of Perception*, Vol. 2, E. C. Carterette and M. P. Friedman, eds. New York: Academic Press, Inc.
- (1981), *Foundations of Information Integration Theory*. New York: Academic Press, Inc.
- Arrow, Kenneth J. (1971), *Essays in the Theory of Risk*. Chicago: Markham Press.
- Bar-Hillel, Maya (1973), "On the Subjective Probability of Compound Events," *Organizational Behavior and Human Performance*, 19 (June), 396-406.
- Beach, Lee Roy and Terence R. Mitchell (1978), "A Contingency Model for the Selection of Decision Strategies," *Academy of Management Review*, 3 (July), 439-49.
- Becker, Gary S. (1976), *The Economic Approach to Human Behavior*. Chicago: The University of Chicago Press.
- Bentham, Jeremy (1789), *An Introduction to the Principles of Morals and Legislation*, in *Utilitarianism* (1962), Mary Warnock, ed. London: Fontana.
- Bernardo, John J. and J. M. Blin (1977), "A Programming Model of Consumer

- Choice Among Multi-Attributed Brands," *Journal of Consumer Research*, 4 (September), 111-18.
- Bernoulli, Daniel (1738), "Specimen Theoriae Novae de Mensura Sortis," *Commentarii Academiae Scientiarum Imperialis Petropolitanae*, Tomus V, 175-92. Translated by Louise Sommer (1954) as "Expositions of a New Theory on the Measurement of Risk," *Econometrica*, 22 (January), 23-6.
- Bettman, James R. (1979), *An Information Processing Theory of Consumer Choice*. Reading, MA: Addison-Wesley Publishing Company.
- (1986), "Consumer Psychology," *Annual Review of Psychology*, 37, 257-89.
- and Jacob Jacoby (1976), "Patterns of Processing in Consumer Information Acquisition," in *Advances in Consumer Research*, Vol. 3, Beverlee Anderson, ed. Ann Arbor, MI: Association for Consumer Research, 315-20.
- , Deborah Roedder John, and Carol A. Scott (1984), "Consumers' Assessment of Covariation," in *Advances in Consumer Research*, Vol. 11, Thomas C. Kinnear, ed. Ann Arbor, MI: Association for Consumer Research, 466-71.
- and Pradeep Kakkar (1977), "Effects of Information Presentation Format on Consumer Information Acquisition Strategies," *Journal of Consumer Research*, 3 (March), 233-40.
- and C. Whan Park (1980), "Effects of Prior Knowledge and Experience and Phase of the Choice Process on Consumer Decision Processes: A Protocol Analysis," *Journal of Consumer Research*, 7 (December), 234-48.
- and Michel A. Zins (1977), "Constructive Processes in Consumer Choice," *Journal of Consumer Research*, 4 (September), 75-85.
- and ——— (1979), "Information Format and Choice Task Effects in Decision Making," *Journal of Consumer Research*, 6 (September), 141-53.
- Biehal, Gabriel J. (1983), "Consumers' Prior Experiences and Perceptions in Auto Repair Choice," *Journal of Marketing*, 47 (Summer), 82-91.
- and Dipankar Chakravarti (1982), "Information-Presentation Format and Learning Goals as Determinants of Consumers' Memory Retrieval and Choice Processes," *Journal of Consumer Research*, 8 (March), 431-41.
- and ——— (1983), "Information Accessibility as a Moderator of Consumer Choice," *Journal of Consumer Research*, 10 (June), 1-14.
- and ——— (1986), "Consumers' Use of Memory and External Information in Choice: Macro and Micro Perspectives," *Journal of Consumer Research*, 12 (March), 382-405.
- Boote, Arthur S. (1975), "An Exploratory Investigation of the Roles of Needs and

- Personal Values in the Theory of Buyer Behavior," unpublished doctoral dissertation, Columbia University.
- Brooker, George, John J. Wheatley, and John S. Y. Chiu (1986), "The Effects of Sampling and Information on Brand Choice When Beliefs in Quality Differences are Ambiguous," in *Advances in Consumer Research*, Vol. 13, Richard J. Lutz, ed. Ann Arbor, MI: Association for Consumer Research, 272-6.
- Brucks, Merrie (1985), "The Effects of Product Class Knowledge on Information Search Behavior," *Journal of Consumer Research*, 12 (June), 1-16.
- Brunswik, Egon (1943), "Organismic Achievement and Environmental Probability," *Psychological Review*, 50 (3), 255-72.
- (1956), *Perception and the Representative Design of Experiments*. Berkeley: University of California Press.
- Camerer, Colin (1981), "General Conditions for the Success of Bootstrapping Models," *Organizational Behavior and Human Performance*, 27 (3), 411-22.
- Capon, Noel and Marian Burke (1980), "Individual, Product Class, and Task-Related Factors in Consumer Information Processing," *Journal of Consumer Research*, 7 (December), 314-26.
- Carlson, John A. and Robert J. Gieseke (1983), "Price Search in a Product Market," *Journal of Consumer Research*, 9 (March), 357-62.
- Carroll, J. Douglas (1976), "Spatial, Non-Spatial and Hybrid Models for Scaling," *Psychometrika*, 41 (4), 439-63.
- Chapman, Randall G. and Richard Staelin (1982), "Exploiting Rank Ordered Choice Set Data Within the Stochastic Utility Model," *Journal of Marketing Research*, 19 (August), 288-301.
- Childers, Terry L. and Michael J. Houston (1984), "Conditions for a Picture-Superiority Effect on Consumer Memory," *Journal of Consumer Research*, 11 (September), 643-54.
- , ———, and Susan E. Heckler (1985), "Measurement of Individual Differences in Visual Versus Verbal Information Processing," *Journal of Consumer Research*, 12 (September), 125-34.
- Cohen, Joel B., Paul W. Miniard, and Peter R. Dickson (1979), "Information Integration: An Information Processing Perspective," in *Advances in Consumer Research*, Vol. 6, William L. Wilkie, ed. Ann Arbor, MI: Association for Consumer Research, 161-70.
- Coombs, Clyde (1964), *A Theory of Data*. New York: John Wiley & Sons, Inc.
- (1975), "Portfolio Theory and the Measurement of Risk," in *Human Judgment and Decision Processes*, Martin F. Kaplan and Steven Schwartz, eds. New York: Academic Press, Inc., 63-86.

- Corstjens, Marcel L. and David A. Gautschi (1983), "Formal Choice Models in Marketing," *Marketing Science*, 2 (Winter), 19-56.
- Crocker, Jennifer (1981), "Judgments of Covariation by Social Perceivers," *Psychological Bulletin*, 90 (2), 272-92.
- Crow, Lowell E., Richard W. Olshavsky, and John O. Summers (1980), "Industrial Buyers' Choice Strategies: A Protocol Analysis," *Journal of Marketing Research*, 17 (February), 34-44.
- Davis, Harry L. (1976), "Decision Making Within the Household," *Journal of Consumer Research*, 3 (March), 241-60.
- , Stephen J. Hoch, and E. K. Easton Ragsdale (1986), "An Anchoring and Adjustment Model of Spousal Predictions," *Journal of Consumer Research*, 13 (June), 25-37.
- Dawes, Robyn M. (1971), "A Case Study of Graduate Admissions: Application of Three Principles of Human Decision Making," *American Psychologist*, 26 (1), 180-8.
- (1979), "The Robust Beauty of Improper Linear Models in Decision Making," *American Psychologist*, 34 (7), 571-82.
- and Bernard Corrigan (1974), "Linear Models in Decision Making," *Psychological Bulletin*, 81 (2), 95-106.
- Dickson, Peter R. (1982), "The Impact of Enriching Case and Statistical Information on Consumer Judgments," *Journal of Consumer Research*, 8 (March), 398-408.
- Dodds, William B. and Kent B. Monroe (1985), "The Effect of Brand and Price Information on Subjective Product Evaluations," in *Advances in Consumer Research*, Vol. 12, Elizabeth C. Hirschman and Morris B. Holbrook, eds. Ann Arbor, MI: Association for Consumer Research, 85-90.
- Duncan, Calvin P. and Richard W. Olshavsky (1982), "External Search: The Role of Consumer Beliefs," *Journal of Marketing Research*, 19 (February), 32-43.
- Edell, Julie A. and Richard Staelin (1983), "The Information Processing of Pictures in Print Advertisements," *Journal of Consumer Research*, 10 (June), 45-61.
- Ehrenberg, A. S. C. (1972), *Repeat Buying: Theory and Application*. Amsterdam: North-Holland Press.
- Einhorn, Hillel J. (1970), "The Use of Nonlinear, Noncompensatory Models in Decision Making," *Psychological Bulletin*, 73 (3), 221-30.
- and Robin M. Hogarth (1978), "Confidence in Judgment: Persistence of the Illusion of Validity," *Psychological Review*, 85 (5), 395-416.
- and ——— (1981), "Behavioral Decision Theory: Processes of Judgment and Choice," *Annual Review of Psychology*, 32, 53-88.

- and ——— (1985), "Ambiguity and Uncertainty in Probabilistic Inference," *Psychological Review*, 92 (4), 433–61.
- , Don N. Kleinmuntz, and Benjamin Kleinmuntz (1979), "Linear Regression and Process-Tracing Models of Judgment," *Psychological Review*, 86 (5), 465–85.
- Ellsberg, Daniel (1961), "Risk, Ambiguity, and the Savage Axioms," *Quarterly Journal of Economics*, 75 (4), 643–69.
- Ericsson, K. Anders and Herbert A. Simon (1980), "Verbal Reports as Data," *Psychological Review*, 87 (3), 215–51.
- Farquhar, Peter H. (1984), "Utility Assessment Methods," *Management Science*, 30 (11), 1283–1300.
- Fischhoff, Baruch (1983), "Predicting Frames," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 9 (1), 103–16.
- , Paul Slovic, and Sarah Lichtenstein (1978), "Fault Trees: Sensitivity of Estimated Failure Probabilities to Problem Representation," *Journal of Experimental Psychology: Human Perception and Performance*, 4 (2), 330–44.
- Furse, David H., Girish N. Punj, and David W. Stewart (1984), "A Typology of Individual Search Strategies Among Purchasers of New Automobiles," *Journal of Consumer Research*, 10 (March), 417–31.
- Galanter, E. and P. Pliner (1974), "Cross-Modality Matching of Money Against Other Continua," in *Sensation and Measurement*, H. R. Moskowitz et al., eds. Dordrecht, Holland: Reidel, Inc., 65–76.
- Gardner, Meryl Paula (1985), "Mood States and Consumer Behavior: A Critical Review," *Journal of Consumer Research*, 12 (December), 281–300.
- , Andrew A. Mitchell, and J. Edward Russo (1978), "Chronometric Analysis: An Introduction and an Application to Low Involvement Perception of Advertising," in *Advances in Consumer Research*, Vol. 5, H. Keith Hunt, ed. Ann Arbor, MI: Association for Consumer Research, 581–9.
- Garner, W. (1978), "Aspects of a Stimulus: Features, Dimensions, and Configurations," in *Cognition and Categorization*, E. Rosch and B. Lloyd, eds. New York: John Wiley & Sons, Inc.
- Gati, Itamar and Amos Tversky (1982), "Representations of Qualitative and Quantitative Dimensions," *Journal of Experimental Psychology: Human Perception and Performance*, 8 (2), 325–40.
- and ——— (1984), "Weighting Common and Distinctive Features in Perceptual and Conceptual Judgments," *Cognitive Psychology*, 16 (3), 341–70.
- Geistfeld, Loren V. (1982), "The Price-Quality Relationship—Revisited," *Journal of Consumer Affairs*, 16 (Winter), 334–5.

- Gerstner, Eitan (1985), "Do Higher Prices Signal Higher Quality?", *Journal of Marketing Research*, 22 (May), 209–15.
- Goldberg, Lewis R. (1968), "Simple Models or Simple Processes? Some Research on Clinical Judgments," *American Psychologist*, 23 (7), 483–96.
- Green, Paul E. and Vithala R. Rao (1972), *Applied Multidimensional Scaling: A Comparison of Approaches and Algorithms*. New York: Holt, Rinehart and Winston, Inc.
- Grether, David M. and Charles R. Plott (1979), "Economic Theory of Choice and the Preference Reversal Phenomenon," *American Economic Review*, 69 (4), 623–37.
- and Louis Wilde (1984), "An Analysis of Conjunctive Choice: Theory and Experiments," *Journal of Consumer Research*, 10 (March), 373–85.
- Hagerty, Michael R. and David A. Aaker (1984), "A Normative Model of Consumer Information Processing," *Marketing Science*, 3 (3), 227–46.
- Hammond, Kenneth R., Thomas R. Stewart, Berndt Brehmer, and Derick O. Steinmann (1975), "Social Judgment Theory," in *Human Judgment and Decision Processes*, Martin F. Kaplan and Steven Schwartz, eds. New York: Academic Press, Inc., 271–312.
- Hauser, John R. and Glen L. Urban (1977), "A Normative Methodology for Modeling Consumer Response to Innovation," *Operations Research*, 25 (July–August), 579–619.
- and ——— (1986), "The Value Priority Hypotheses for Consumer Budget Plans," *Journal of Consumer Research*, 12 (March), 446–62.
- Helson, Harry (1964), *Adaptation-Level Theory*. New York: Harper & Row Publishers, Inc.
- Hershey, John C. and Paul J. H. Schoemaker (1980), "Prospect Theory's Reflection Hypothesis: A Critical Examination," *Organizational Behavior and Human Performance*, 26, 395–418.
- Hoch, Stephen J. (1984), "Availability and Interference in Predictive Judgment," *Journal of Experimental Psychology: Learning, Memory and Cognition*, 10 (4), 649–62.
- Hoffman, Paul J. (1960), "The Paramorphic Representation of Clinical Judgment," *Psychological Bulletin*, 57 (2), 116–31.
- Holbrook, Morris B. and Elizabeth C. Hirschman (1982), "The Experiential Aspects of Consumption: Consumer Fantasies, Feelings, and Fun," *Journal of Consumer Research*, 9 (September), 132–40.
- Horton, Raymond L. (1979), "Some Relationships Between Personality and Consumer Decision Making," *Journal of Marketing Research*, 16 (May), 233–46.



- Howard, John (1977), *Consumer Behavior: Application of Theory*. New York: McGraw-Hill Book Company.
- Huber, Joel, John W. Payne, and Christopher Puto (1982), "Adding Asymmetrically Dominated Alternatives: Violations of Regularity and the Similarity Hypothesis," *Journal of Consumer Research*, 9 (June), 90-8.
- and Christopher Puto (1983), "Market Boundaries and Product Choice: Illustrating Attraction and Substitution Effects," *Journal of Consumer Research*, 10 (June), 31-44.
- Huber, Oswald (1980), "The Influence of Some Task Variables on Cognitive Operations in an Information-Processing Decision Model," *Acta Psychologica*, 45, 187-96.
- Jacoby, Jacob, Robert Chestnut, Karl Weigl, and William Fisher (1976), "Prepurchase Information Acquisition: Description of a Process Methodology, Research Paradigm, and Pilot Investigation," in *Advances in Consumer Research*, Vol. 3, Beverlee B. Anderson, ed. Ann Arbor, MI: Association for Consumer Research, 306-14.
- John, Deborah Roedder, Carol A. Scott, and James R. Bettman (1986), "Sampling Data for Covariation Assessment: The Effects of Prior Beliefs on Search Patterns," *Journal of Consumer Research*, 13 (June), 38-47.
- Johnson, Edgar M. and George P. Huber (1977), "The Technology of Utility Assessment," *IEEE Transactions on Systems, Man, and Cybernetics*, 7 (5), 311-25.
- Johnson, Eric J. and Robert J. Meyer (1984), "Compensatory Choice Models of Noncompensatory Processes: The Effect of Varying Context," *Journal of Consumer Research*, 11 (June), 528-41.
- and John W. Payne (1985), "Effort and Accuracy in Choice," *Management Science*, 31 (4), 395-414.
- and J. Edward Russo (1981), "Product Familiarity and Learning New Information," in *Advances in Consumer Research*, Vol. 8, Kent B. Monroe, ed. Ann Arbor, MI: Association for Consumer Research, 151-5.
- and ——— (1984), "Product Familiarity and Learning New Information," *Journal of Consumer Research*, 11 (June), 542-50.
- Johnson, Michael D. (1981), "Context Effects in Product Perception," in *Advances in Consumer Research*, Vol. 8, Kent B. Monroe, ed. Ann Arbor, MI: Association for Consumer Research, 116-21.
- (1984), "Consumer Choice Strategies for Comparing Noncomparable Alternatives," *Journal of Consumer Research*, 11 (December), 741-53.
- (1986a), "Modeling Choice Strategies for Noncomparable Alternatives," *Marketing Science*, 5 (1), 37-54.

- (1986b), "Consumer Similarity Judgments: A Test of the Contrast Model," *Psychology and Marketing*, 3 (1), 47–60.
- and Claes Fornell (1987), "The Nature and Methodological Implications of the Cognitive Representation of Products," *Journal of Consumer Research*, forthcoming.
- Johnson, Richard M. (1971), "Marketing Segmentation: A Strategic Management Tool," *Journal of Marketing Research*, 8 (February), 13–18.
- Just, M. A. and Patricia A. Carpenter (1976), "Eye Fixations and Cognitive Processes," *Cognitive Psychology*, 8 (4), 441–80.
- Kahneman, Daniel (1973), *Attention and Effort*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- and Amos Tversky (1973), "On the Psychology of Prediction," *Psychological Review*, 80 (4), 237–51.
- and ——— (1979), "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica*, 47 (2), 263–91.
- and ——— (1982a), "On the Study of Statistical Intuitions," *Cognition*, 11 (1), 123–41.
- and ——— (1982b), "The Psychology of Preferences," *Scientific American*, 246 (January), 160–73.
- Kamakura, Wagner A. and Rajendra K. Srivastava (1984), "Predicting Choice Shares Under Conditions of Brand Interdependence," *Journal of Marketing Research*, 21 (November), 420–34.
- Keeney, Ralph L. (1977), "The Art of Assessing Multiattribute Utility Functions," *Organizational Behavior and Human Performance*, 19 (2), 267–310.
- and Howard Raiffa (1976), *Decisions with Multiple Objectives*. New York: John Wiley & Sons, Inc.
- Kehret-Ward, Trudy and Richard Yalch (1984), "To Take or Not to Take the Only One: Effects of Changing the Meaning of a Product Attribute on Choice Behavior," *Journal of Consumer Research*, 10 (March), 410–16.
- Kiel, Geoffrey C. and Roger A. Layton (1981), "Dimensions of Consumer Information Seeking Behavior," *Journal of Marketing Research*, 18 (May), 233–9.
- Kisielius, Jolita and Brian Sternthal (1984), "Detecting and Explaining Vividness Effects in Attitudinal Judgments," *Journal of Marketing Research*, 21 (February), 54–64.
- Klein, Noreen M. (1983), "Utility and Decision Strategies: A Second Look at the Rational Decision Maker," *Organizational Behavior and Human Performance*, 31 (February), 1–25.

Lachman, Roy, Janet L. Lachman, and Earl C. Butterfield (1979), *Cognitive Psychology and Information Processing: An Introduction*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Lancaster, Kelvin (1971), *Consumer Demand: A New Approach*. New York: Columbia University Press.

Laughhunn, Daniel J. and John W. Payne (1984), "The Impact of Sunk Outcomes on Risky Choice Behavior," *INFOR (Canadian Journal of Operational Research and Information Processing)*, 22 (May), 155-81.

———, ———, and Roy Crum (1980), "Managerial Risk Preferences for Below Target Returns," *Management Science*, 26 (December), 1238-49.

Lehmann, Donald R., William L. Moore, and Terry Elrod (1982), "The Development of Distinct Choice Process Segments Over Time: A Stochastic Modeling Approach," *Journal of Marketing*, 46 (Spring), 48-59.

Lichtenstein, Sarah and Paul Slovic (1971), "Reversal of Preferences Between Bids and Choices in Gambling Decisions," *Journal of Experimental Psychology*, 89 (July), 46-55.

Locander, William B. and Peter W. Hermann (1979), "The Effect of Self-Confidence and Anxiety on Information Seeking in Consumer Risk Reduction," *Journal of Marketing Research*, 16 (May), 168-274.

Lopes, Lola L. (1981a), "Averaging Rules and Adjustment Processes: The Role of Averaging in Inference," Wisconsin Human Information Processing Program, Report #13 (December).

——— (1981b), "Notes, Comments, and New Findings: Decision Making in the Short Run," *Journal of Experimental Psychology: Human Learning and Memory*, 7 (5), 377-85.

——— and Michael D. Johnson (1982), "Judging Similarity Among Strings Described by Hierarchical Trees," *Acta Psychologica*, 48 (1), 13-26.

Luce, R. Duncan (1977), "The Choice Axiom after Twenty Years," *Journal of Mathematical Psychology*, 15 (June), 215-33.

Lussier, Denis A. and Richard W. Olshavsky (1979), "Task Complexity and Contingent Processing in Brand Choice," *Journal of Consumer Research*, 6 (September), 154-65.

Lynch, John G., Jr. (1985), "Uniqueness Issues in the Decompositional Modeling of Multiattribute Overall Evaluations: An Information Integration Perspective," *Journal of Marketing Research*, 22 (February), 1-19.

——— and Thomas K. Srull (1982), "Memory and Attentional Factors in Consumer Choice: Concepts and Research Methods," *Journal of Consumer Research*, 9 (June), 18-37.

- Massaro, Dominic W. (1975), *Experimental Psychology and Information Processing*. Chicago: Rand McNally, Inc.
- McAlister, Leigh (1982), "A Dynamic Attribute Satiation Model of Variety Seeking Behavior," *Journal of Consumer Research*, 9 (September), 141-50.
- McGuire, William J. (1976), "Some Internal Psychological Factors Influencing Consumer Choice," *Journal of Consumer Research*, 2 (March), 302-19.
- Meyer, Robert J. (1982), "A Descriptive Model of Consumer Information Search Behavior," *Marketing Science*, 1 (1), 93-121.
- and Thomas C. Eagle (1982), "Context-Induced Parameter Instability in a Disaggregate-Stochastic Model of Store Choice," *Journal of Marketing Research*, 19 (February), 62-71.
- Midgley, David F. (1983), "Patterns of Interpersonal Information Seeking for the Purchase of a Symbolic Product," *Journal of Marketing Research*, 20 (February), 74-83.
- Mitchell, Andrew A. (1986), "The Effect of Verbal and Visual Components of Advertisements on Brand Attitudes and Attitude Toward the Advertisement," *Journal of Consumer Research*, 13 (June), 12-24.
- Monroe, Kent B. (1971), "Psychophysics of Prices: A Reappraisal," *Journal of Marketing Research*, 8 (May), 248-51.
- (1973), "Buyers' Subjective Perceptions of Price," *Journal of Marketing Research*, 10 (February), 70-80.
- Morrison, Donald G. (1969), "Conditional Trend Analysis: A Model that Allows for Nonusers," *Journal of Marketing Research*, 6 (August), 342-6.
- Newell, Alan and Herbert Simon (1972), *Human Problem Solving*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Newman, Joseph W. and Richard Staelin (1973), "Information Sources of Durable Goods," *Journal of Advertising Research*, 13 (April), 19-29.
- Nisbett, Richard E. and Timothy DeCamp Wilson (1977), "Telling More Than We Can Know: Verbal Reports on Mental Processes," *Psychological Review*, 84 (3), 231-59.
- Obermiller, Carl (1985), "Varieties of Mere Exposure: The Effects of Processing Style and Repetition on Affective Response," *Journal of Consumer Research*, 12 (June), 17-30.
- and John J. Wheatley (1984), "Price Effects on Choice and Perceptions under Varying Conditions of Experience, Information, and Beliefs in Quality Differences," in *Advances in Consumer Research*, Vol. 11, Thomas C. Kinnear, ed. Ann Arbor, MI: Association for Consumer Research, 453-8.

- Olshavsky, Richard W. (1985), "Toward a More Comprehensive Theory of Choice," in *Advances in Consumer Research*, Vol. 12, Elizabeth C. Hirschman and Morris B. Holbrook, eds. Ann Arbor, MI: Association for Consumer Research, 465–70.
- and Donald H. Granbois (1979), "Consumer Decision Making—Fact or Fiction?", *Journal of Consumer Research*, 6 (September), 93–100.
- Park, C. Whan (1978), "A Conflict Resolution Choice Model," *Journal of Consumer Research*, 5 (September), 124–37.
- and V. Parker Lessig (1981), "Familiarity and Its Impact on Consumer Decision Biases and Heuristics," *Journal of Consumer Research*, 8 (September), 223–30.
- Payne, John (1976), "Task Complexity and Contingent Processing in Decision Making: An Information Search and Protocol Analysis," *Organizational Behavior and Human Performance*, 16 (August), 366–87.
- (1982), "Contingent Decision Behavior: A Review and Discussion of Issues," *Psychological Bulletin*, 92 (2), 382–402.
- , D. J. Laughhunn, and R. Crum (1980), "Translation of Gambles and Aspiration Level Effects in Risky Choice Behavior," *Management Science*, 26 (October), 1039–60.
- , ———, and ——— (1981), "Further Tests of Aspiration Level Effects in Risky Choice Behavior," *Management Science*, 27 (August), 953–58.
- Peterson, Cameron and Lee Roy Beach (1967), "Man as an Intuitive Statistician," *Psychological Bulletin*, 68 (1), 29–46.
- Phelps, Ruth H. and James Shanteau (1978), "Livestock Judges: How Much Information Can an Expert Use?", *Organizational Behavior and Human Performance*, 21 (2), 209–19.
- Pitz, Gordon F. and Natalie J. Sachs (1984), "Judgment and Decision: Theory and Application," *Annual Review of Psychology*, 35, 139–63.
- Pruzansky, Sandra, Amos Tversky, and J. Douglas Carroll (1982), "Spatial Versus Tree Representations of Proximity Data," *Psychometrika*, 47 (1), 3–24.
- Punj, Girish N. and Richard Staelin (1983), "A Model of Consumer Information Search Behavior for New Automobiles," *Journal of Consumer Research*, 9 (March), 366–80.
- Puto, Christopher P. (1987), "The Framing of Buying Decisions," *Journal of Consumer Research*, forthcoming.
- , W. E. Patton, III, and Ronald H. King (1985), "Risk Handling Strategies in Industrial Vendor Selection Decisions," *Journal of Marketing*, 49 (January), 89–98.

- Ratchford, Brian T. (1980), "The Value of Information for Selected Appliances," *Journal of Marketing Research*, 17 (February), 14–25.
- Restle, Frank A. (1959), "A Metric and an Ordering on Sets," *Psychometrika*, 24 (3), 207–20.
- Riesz, Peter C. (1978), "Price Versus Quality in the Marketplace, 1961–1975," *Journal of Retailing*, 54 (Winter), 15–28.
- (1979), "Price-Quality Correlations for Packaged Food Products," *Journal of Consumer Affairs*, 13 (Winter), 236–47.
- Rokeach, Milton (1973), *The Nature of Human Values*. New York: John Wiley & Sons, Inc.
- Rowe, Debra and Christopher P. Puto (1987), "Do Consumers' Reference Points Affect Their Buying Decisions?" in *Advances in Consumer Research*, Vol. 14, Paul Anderson and Melanie Wallendorf, eds. Ann Arbor, MI: Association for Consumer Research, 188–92.
- Russo, J. Edward (1977), "The Value of Unit Price Information," *Journal of Marketing Research*, 14 (May), 192–201.
- (1981), "The Decision to Use Product Information at the Point of Purchase," in *Theory in Retailing: Traditional and Nontraditional Sources*, Ronald W. Stampfl and Elizabeth C. Hirschman, eds. Chicago: American Marketing Association, 155–67.
- and Barbara A. Doshier (1983), "Strategies for Multialternative Binary Choice," *Journal of Experimental Psychology: Learning, Memory and Cognition*, 9 (4), 676–96.
- and Eric J. Johnson (1980), "What Do Consumers Know About Familiar Products?" in *Advances in Consumer Research*, Vol. 7, Jerry C. Olson, ed. Ann Arbor, MI: Association for Consumer Research, 417–23.
- and Larry Rosen (1975), "An Eye Fixation Analysis of Multi-Alternative Choice," *Memory and Cognition*, 8 (3), 267–76.
- Sattath, Shmuel and Amos Tversky (1977), "Additive Similarity Trees," *Psychometrika*, 42 (3), 319–45.
- Schaninger, Charles M. and Donald Sciglimpaglia (1981), "The Influence of Cognitive Personality Traits and Demographics on Consumer Information Acquisition," *Journal of Consumer Research*, 8 (September), 208–16.
- Schoemaker, Paul J. H. (1982), "The Expected Utility Model: Its Variants, Purposes, Evidence and Limitations," *Journal of Economic Literature*, 20 (2), 529–63.
- and Howard C. Kunreuther (1979), "An Experimental Study of Insurance Decisions," *Journal of Risk and Insurance*, 46 (December), 603–18.

- Sheluga, David A., James Jaccard, and Jacob Jacoby (1979), "Preference, Search, and Choice: An Integrative Approach," *Journal of Consumer Research*, 6 (September), 166-76.
- Shepard, Roger N. and Phipps Arabie (1979), "Additive Clustering: Representation of Similarities as Combinations of Discrete Overlapping Properties," *Psychological Review*, 86 (2), 87-123.
- Shocker, Allan D. and V. Srinivasan (1979), "Multiattribute Approaches for Product Concept Evaluation and Generation: A Critical Review," *Journal of Marketing Research*, 16 (May), 159-80.
- Shugan, Steven (1980), "The Cost of Thinking," *Journal of Consumer Research*, 7 (September), 99-111.
- Simon, Herbert (1959), "Theories of Decision Making in Economics and Behavioral Science," *American Economic Review*, 49 (3), 253-83.
- Slovic, Paul (1969), "Analyzing the Expert Judge: A Descriptive Study of a Stockbroker's Decision Processes," *Journal of Applied Psychology*, 53 (4), 255-63.
- (1975), "Choice Between Equally Valued Alternatives," *Journal of Experimental Psychology: Human Perception and Performance*, 1 (3), 280-7.
- , Baruch Fischhoff, and Sarah Lichtenstein (1977), "Behavioral Decision Theory," *Annual Review of Psychology*, 28, 1-39.
- , Sarah Lichtenstein, and Baruch Fischhoff (1985), "Decision Making," in *Stevens' Handbook of Experimental Psychology*, 2nd ed., R. C. Atkinson, R. J. Herrnstein, G. Lindzey, and R. D. Luce, eds. New York: John Wiley & Sons, Inc.
- Smead, Raymond J., James B. Wilcox, and Robert E. Wilkes (1981), "How Valid are Product Descriptions and Protocols in Choice Experiments?," *Journal of Consumer Research*, 8 (June), 37-42.
- Smedslund, Jan (1963), "The Concept of Correlation in Adults," *Scandinavian Journal of Psychology*, 4 (3), 165-73.
- Srivastava, Rajendra K., Robert P. Leone, and Allan D. Shocker (1981), "Market Structure Analysis: Hierarchical Clustering of Products Based on Substitution-in-Use," *Journal of Marketing*, 45 (Summer), 38-48.
- Sternberg, Saul (1966), "High-Speed Scanning in Human Memory," *Science*, 153 (August 5), 652-4.
- Stigler, George J. (1961), "The Economics of Information," *Journal of Political Economy*, 69 (3), 213-25.
- (1966), *The Theory of Price*, 3rd ed. New York: Macmillan Publishing Co., Inc.

- Sujan, Mita (1985), "Consumer Knowledge: Effects on Evaluation Strategies Mediating Consumer Judgments," *Journal of Consumer Research*, 12 (June), 31–46.
- Thaler, Richard (1980), "Toward a Positive Theory of Consumer Choice," *Journal of Economic Behavior and Organization*, 1, 39–60.
- (1983), "Transaction Utility Theory," in *Advances in Consumer Research*, Vol. 10, Richard P. Bagozzi and Alice M. Tybout, eds. Ann Arbor, MI: Association for Consumer Research, 229–32.
- (1985), "Mental Accounting and Consumer Choice," *Marketing Science*, 4 (3), 199–214.
- Troutman, C. Michael and James Shanteau (1976), "Do Consumers Evaluate Products by Adding or Averaging Attribute Information?", *Journal of Consumer Research*, 3 (September), 101–6.
- Tversky, Amos (1969), "Intransitivity of Preferences," *Psychological Review*, 76 (1), 31–48.
- (1972), "Elimination by Aspects: A Theory of Choice," *Psychological Review*, 79 (4), 281–99.
- (1977), "Features of Similarity," *Psychological Review*, 84 (4), 327–52.
- and Itamar Gati (1978), "Studies of Similarity," in *Cognition and Categorization*, E. Rosch and B. Lloyd, eds. New York: John Wiley & Sons, Inc.
- and ——— (1982), "Similarity, Separability, and the Triangle Inequality," *Psychological Review*, 89 (2), 123–54.
- and J. Wesley Hutchinson (1986), "Nearest Neighbor Analysis of Psychological Spaces," *Psychological Review*, 93 (1), 3–22.
- and Daniel Kahneman (1971), "Belief in the Law of Small Numbers," *Psychological Bulletin*, 76 (2), 105–10.
- and ——— (1974), "Judgment Under Uncertainty: Heuristics and Biases," *Science*, 185 (September 27), 1124–31.
- and ——— (1981), "The Framing of Decisions and the Psychology of Choice," *Science*, 211 (January), 453–8.
- and ——— (1983), "Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment," *Psychological Review*, 90 (4), 293–315.
- Veblen, Thorstein (1898), "Why is Economics Not an Evolutionary Science?" in *The Portable Veblen*, Max Lerner, ed. (1976), 215–40.
- von Neumann, John and Oskar Morgenstern (1944), *Theory of Games and Economic*



*Behavior*. Princeton, NJ: Princeton University Press.

Weiner, Joshua L., James W. Gentry, and Ronald K. Miller (1986), "The Framing of the Insurance Purchase Decision," in *Advances in Consumer Research*, Vol. 13, Richard J. Lutz, ed. Ann Arbor, MI: Association for Consumer Research, 251–6.

Weitz, Barton and Peter Wright (1979), "Retrospective Self-Insight on Factors Considered in Product Evaluation," *Journal of Consumer Research*, 6 (December), 280–94.

Westbrook, Robert A. and Claes Fornell (1979), "Patterns of Information Source Usage Among Durable Goods Buyers," *Journal of Marketing Research*, 16 (August), 303–12.

Wilkins, Leslie (1967), *Social Deviance*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Wright, Peter (1975), "Consumer Choice Strategies: Simplifying vs. Optimizing," *Journal of Marketing Research*, 12 (February), 60–7.

Zajonc, Robert B. and Hazel Markus (1982), "Affective and Cognitive Factors in Preferences," *Journal of Consumer Research*, 9 (September), 123–31.