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THE PREDICTIVE AND DESCRIPTIVE EFFICACY
OF FIVE EVALUATION MODELS IN DIVERSE
CONSUMER DECISIONAL ENVIRONMENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

John Reed Walton, B.S., M.A.

* * * * *

The Ohio State University

1976

Reading Committee:
Clark Leavitt
Roger Blackwell
Paul Isaac
Terry Deutscher

Approved By
Adviser
Department of Marketing
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VITA

December 21, 1943

Born - Newark, New Jersey

1969

B.S., The Ohio State University, Columbus, Ohio

1971-1973

Research Associate, Center for Vocational Education, The Ohio State University, Columbus, Ohio

1973

M.A., The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: Marketing

Studies in Marketing Management: Professor Louis W. Stern

Studies in Marketing Theory: Professor Robert Bartels

Studies in Consumer Behavior: Professor Roger D. Blackwell
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CHAPTER I

INTRODUCTION

Decisions pervade the lives of most individuals. Some decisions, like choosing among marriage partners or occupations, occur infrequently. Other decisions, like choosing among television programs, menu entrees, and laundry detergents are more routinized. This research investigates a particular routinized decision--consumer brand choice.

In this study, consumer brand choice is defined as a decision made by a consumer to select a particular brand from a set of brands that comprise a product category. While the term consumer brand choice may refer to any product category, routinization implies low unit value, non-durable goods. This research is concerned exclusively with these types of products.

In this chapter, approaches to the study of consumer brand choice are explored. Then, specific research objectives and hypotheses are delineated. Finally, the significance of this research is discussed.

Approaches to Consumer Brand Choice

Engel, Kollat, and Blackwell (1973) have identified two approaches that have been used to study consumer behavior generally. These include a distributive approach
and a decision process approach. Each of these approaches has been applied in consumer brand choice research.

Using a distributive approach, researchers attempt to establish a relationship between psychological, demographic, or socio-economic variables and brand choice. The purpose of this research is to predict future brand choice on the basis of this empirical relationship. However, results have not been encouraging. Personality research offers an excellent example.

Evans (1959) measured personality variables for a sample of Ford and Chevrolet owners. While minor differences were found, explained variance in brand choice accounted for by personality variables was less than ten percent. This result typifies the majority of findings in personality brand choice research. Generally, the distributive approach has not been successfully applied in brand choice research.

The decision process approach examines not just behavioral outcomes (brand choice), but pre-choice and post-choice elements as well. The sequence of these elements is shown in Figure 1.

Viewed longitudinally, a decision process approach for routine brand choice behavior involves the following activities.
Figure 1. The decision process.
After a problem has been recognized, a purposive search for information begins. As a result of this search behavior, the consumer adds to an existing store of information about the product category. Information inputs are derived from previous brand choices (if any), promotional messages, word of mouth communication, etc. From this activity, a set of alternatives is identified, and an initial choice is made. At this point, a variety of post choice behaviors (e.g., recommending the brand to a friend) may occur.

After a number of subsequent choices, a set of evaluative attributes becomes standardized. In addition, these attributes may be ranked hierarchically in terms of importance to the consumer. Also, for most product categories, a large number of brands is available. Since the consideration of a large number of brands is impractical for most consumers, only a subset of those brands is actively considered. Over time, however, the content of this subset may change.

For each decision situation, each brand in this subset is rated on the evaluative attributes. Actual choice depends upon the manner in which these data are combined. As a result of each subsequent choice, the consumer's store of information increases. In addition, further
feedback may affect the use of specific evaluative attributes, the content of the consideration set, and the perceptions of individual brands in this set in relation to the evaluative attributes. This discussion of the routinized brand choice decision making is documented in Chapter II.

Central to this decision process approach is the notion that alternatives are perceived as a set of evaluative aspects or attributes (Restle, 1961). Most substantive research has focused on the evaluation of the set of alternatives leading to the choice of a particular alternative. Several divergent types of multiattribute evaluation models have been proposed (MacCrimmon, 1968; 1973).

This overview highlights the importance of perception and the manipulation of information in routine brand choice decision making. The term information processing is used to denote the range of these perceptual and cognitive activities.

The conceptual work of Engel, Kollat, and Blackwell (1973) and Howard and Sheth (1969) not only reflects the decision process approach, but also emphasizes the key role of multiattribute information processing. In addition, a substantial amount of multiattribute attitude
research has investigated brand choice. Many of these studies have reported encouraging results (Bass & Talarzyk, 1972; Sheth & Talarzyk, 1972; Winter, 1973; Ginter, 1974).

**Research Issues and Rationale**

While a complete review of multiattribute marketing research is beyond the scope of this dissertation, two issues are of special importance. These issues are (1) the exclusive use of linear compensatory evaluation models and (2) the assumption, usually implicit, that a single evaluation model is best in all situations.

Linear compensatory models are those that allow trade-offs between attributes; that is, a low value on any attribute may be compensated for by high values on other attributes. Noncompensatory models generally do not allow such trade-offs. Low values on any attribute may not necessarily be compensated for by high values on other attributes.

Almost all multiattribute marketing studies have assumed a linear compensatory evaluation model. Indeed, in a recent review of 42 multiattribute attitude studies, only 2 studies cited tested compensatory and noncompensatory evaluation model structures (Wilkie & Pessemier, 1973). The remaining studies tested compensatory models
exclusively. In defense of this seeming imbalance, linear representations usually provide at least adequate predictive results.

Yet, the predictive power of linear models has been well documented (Wright, 1972; Wright, 1973). Dawes and Corrigan (1974) have suggested that these results may be more artifactual than substantive; that is, decision making is tested in situations that are conducive to linear representation. In these situations, a large percentage of explained linear variation does not necessarily imply that the underlying evaluation process is linear.

Two implications follow from this assertion. First, research should be conducted in experimental situations contrived to demonstrate differences between compensatory and noncompensatory models. Second, predictive validity should not be the sole criterion for evaluation model acceptance. Rather, descriptive validity, the degree to which a model actually describes the evaluation process, should also be considered.

When compensatory and noncompensatory models have been tested against each other, predictive results have been equivocal. Both compensatory models (Goldberg, 1971; Heeler, Kearney, & Mehaffey, 1973) and noncompensatory models (Einhorn, 1970, 1971; Wright, 1975) have been
reported to be superior. In other studies, no significant predictive differences were found (Pras & Summers, 1975; Russ, 1971a; Perreault & Russ, Note 1; Park, Note 2). When descriptive validity has been assessed, similar ambiguous results have been reported (Russ, 1971a; Wright, 1975; Perreault & Russ, Note 1).

Few studies have tested compensatory and noncompensatory evaluation models. Furthermore, data that are available show conflicting results. Therefore, research on this question may contribute to resolving these conflicts (Day, 1972; Wright, 1973b).

The second issue concerns the notion, usually implicit, that a single evaluation model is best in all situations. A variety of compensatory and noncompensatory model structures are available. The idea that one of these structures is best in all environments is counter-intuitive. Rather, the notion that certain structures are better in certain environments is more compelling (Coombs, Dawes, & Tversky, 1970; Wright, 1974). Only a few studies have examined the effects of environmental variables on evaluation model usage.

Park (Note 2) hypothesized that product complexity and product familiarity were related to evaluation model usage. That is, compensatory model usage was more likely
in certain complexity-familiarity conditions while non-compensatory model usage was more likely in other complexity-familiarity conditions. These hypotheses were supported. In addition, in two studies, Wright reported that time pressure and distraction (Wright, 1974) and incomplete data, noncomparable data scaling, and extraneous data (Wright, Note 3) were related to compensatory or noncompensatory model usage.

For the routine consumer brand choice situation, these environmental dimensions may not be especially relevant. Rather, in this situation, the number of evaluative attributes and the number of brand alternatives considered may be more important (Coombs et al., 1970; Bettman, Capon, & Lutz, 1975). Wright (1975) and Pras and Summers (1975) found significant differences in the use of compensatory and noncompensatory evaluation models when the number of brand alternatives was varied. In addition, Jacoby and others (Jacoby, Speller, & Kohn, 1974; Jacoby, Speller, & Berning, 1974) have examined the predictive efficacy of a single compensatory model in environments in which the number of attributes and brand alternatives were varied. Data show clear predictive differences that are dependent upon the attribute-brand conditions. This conclusion remains despite numerous methodological criticisms of these
Information load is the term used to denote the total amount of information an individual has with which to make a decision. In the studies described above, Jacoby and his co-workers used the term to describe attribute-brand environments. In the routine brand choice situation, however, the number of attributes and brands are the principal evaluation parameters used by the consumer. In this dissertation, therefore, the term decisional environment is used to denote attribute-brand information conditions.

Finally, uncertainty or risk facing the consumer may be relevant in diverse routine brand choice situations. Wright (1973) has pointed out that risk is not considered in multiattribute evaluation models. It is possible that risk associated with particular product categories may affect the use of specific evaluation models. If this is the case, then complete theories of consumer choice must account for these product specific differences. Unfortunately, no research has addressed this issue.

Research Objectives and Hypotheses

The intent of this research is to investigate each of these issues. More specifically, the objective of this dissertation research is to ascertain the
relative predictive and descriptive ability of five compensatory and noncompensatory evaluation models and to determine the effectiveness of each of these models in different decisional environments.

In this regard, two compensatory and three non-compensatory models are tested. Compensatory models include weighted and unweighted linear models, while noncompensatory models include conjunctive, lexigraphic, and lexicographic semi-order. In addition, three levels of attributes and brands are specified. Finally, three routinely purchased products that differ in terms of perceived risk are used.

Within specific decisional environments, subjects are presented with attribute profiles for a set of disguised brands of deodorant, toothpaste, and toilet tissue. Each subject provides an actual rank order of brands for all three products. Additional data are collected to operationalize the five evaluation models. Actual subject data are then compared with the model output. The dependent variables in these analyses include: a) first choice accuracy: disguised brands, b) rank order accuracy: disguised brands, c) critical paired comparisons: disguised brands, d) decision description: disguised brands, and e) choice accuracy: actual brands. All research variables
are described in detail in Chapter III.

Predictive ability of these evaluation models is assessed by first choice, rank order, and paired comparisons data for disguised brands. Descriptive ability of these models for hypothetical brand choices is measured by decision descriptions for hypothetical brands. Finally, predictive ability for actual brand choice data is assessed by choice accuracy: actual brands. These relations are formalized in the hypothesis statements below.

**Hypothesis 1:**
The evaluation models will differ in predictive ability for each of the disguised set of brands.

**Hypothesis 2:**
The predictive ability measures will not differ across the three product categories.

**Hypothesis 3:**
Specific evaluation models will differ in predictive ability across decisional environments for each disguised set of brands.

**Hypothesis 4:**
The evaluation models will differ in descriptive ability for each of the disguised set of brands.

**Hypothesis 5:**
The evaluation models will differ in predictive ability for each actual set of brands.

The reasoning behind each of the expectations is discussed in Chapter III.
**Significance of Research**

Several reasons may be cited to underscore the significance of this research. First, the relative predictive ability of compensatory and noncompensatory evaluation models and the efficacy of these models in diverse situations is a vastly underresearched area. The few studies that are available report largely conflicting results. This research effort may clarify existing data and provide new insights.

In addition, several important managerial issues are relevant in this research. Manufacturers of low unit value, nondurable products are faced with particular decisional environments in the short run. If these decisional environments affect the type of evaluation models employed by consumers, then promotional and product strategies should be adjusted to these conditions.

For example, a conjunctive evaluation model\(^1\) specifies that a decision maker establishes minimum criterial values for each evaluative attribute. An alternative must meet or exceed all of these criterial values to be considered acceptable. Therefore, if a

\(^1\)Conjunctive models are discussed in detail in Chapters II and III.
particular decisional environment is characterized by the use of a conjunctive model, then promotional objectives should be aimed at meeting the minimum criterial values on all relevant attributes. Also, products should actually be modified when necessary to support these perceptions.

Finally, very few studies have examined consumer decision strategies in controlled settings. Complex methodological issues permeate this research area. This research expands existing methodologies and develops new procedures to meet these requirements. In this sense, this research represents an important methodological contribution to decision making research in all applied fields.

**Summary and Organization of Volume**

Most brand choice research has employed linear compensatory evaluation models exclusively. In addition, little published research has examined the efficacy of specific evaluation models in routinized brand choice environments. The purpose of this research is to investigate empirically each of these issues. More specifically, the objectives of this dissertation are to determine the predictive and descriptive ability of selected compensatory and noncompensatory evaluation
models and to ascertain the effectiveness of these models in diverse routinized brand choice situations.

In Chapter II, the relevant literature is reviewed. This review includes an analysis of decision situations and models with specific emphasis on routine brand choice situations and particular evaluation models. The research methodology used in this study is described in Chapter III. In Chapter IV, the results of this study are presented. Finally, conclusions and implications of this research are discussed in Chapter V.
CHAPTER II
LITERATURE REVIEW

In this chapter, the relevant literature concerning individual decision making is discussed. First, taxonomies of decision situations and decision models are developed. These taxonomies are then used to highlight the situation and models relevant to this study. Then, routinized brand choice decision making is discussed in terms of decisional environments and evaluation models appropriate for this study.

A Taxonomy of Decision Situations

Simon (1957) defines the term decision in the following manner:

"...there are a multitude of alternative possible actions, any one of which a given individual may undertake; by some process, these numerous alternatives are narrowed down to that one which is, in fact, acted out."

Several important decisional elements are implicit or explicit in this definition. These elements include problem recognition, specification of a goal or objective, generation of a set of alternatives, evaluation of alternatives, and actual choice. In addition, once a choice has been made, consequences of that behavior may impact on subsequent decisions.
Simon's description of the decision process includes a large number of potential decision situations. For example, the air traffic controller identifying aircraft on his radar scope is in a decision situation. Similarly, the chess master contemplating a move, a university president planning annual fiscal expenditures, and a consumer deliberating a purchase are also in decision situations. It is reasonable to assume that the specific decision processes in each of these situations may differ.

More specifically, these situations differ in terms of processing speed and response complexity. Each of these dimensions is discussed below.

Both perceptual and cognitive components mediate individual decision making. Perceptual components determine the way in which relations among alternatives and other elements of the choice situation are perceived, while cognitive factors affect the manner in which a decision is formulated and solved (Coombs et al., 1970). In some decision situations, major emphasis is placed on perceptual components. In other cases, cognitive components bear that burden. A complete discussion of the relative effects of perceptual and cognitive processes is beyond the scope of this work. However, Shepard (1964) has pointed out that a major difference between perceptual and cognitive processes is processing speed. That is, when the burden is on the perceptual mediators, processing is very rapid. Conversely, when the burden
is on the cognitive mediators, decision responses are slow. Processing speed, therefore, may be an important dimension in differentiating among decision situations.

A second potentially important dimension is response complexity. The complexity of the decision response is a function of the decision objectives, the number of alternatives, and the consequences of the decision on subsequent decisions. To the extent that the number of objectives and alternatives increase, the complexity of the response increases. More important, however, is the extent to which Decision A affects Decision B. If Decision A has only a minimal effect on Decision B, then the response for Decision A is relatively simple. However, if Decision A is a necessary prerequisite for Decision B, then the response is more complex. Rapoport and Wallsten (1972) have used the terms single-staged and multi-staged to describe these situations.

Four distinct decision quadrants are specified by these dimensions. These quadrants are shown in Figure 2 and include rapid processing--simple responses, rapid processing--complex responses, slow processing--complex responses, and slow processing--simple responses.

Each of the previously identified decision situations may be classified in one of these quadrants. The air traffic controller's attempt to identify aircraft X's signal on his radar scope is an example of a rapid processing--simple response situation. The visual stimulus
Figure 2. A classification system for decision situations.
suggests an important perceptual component. In addition, a simple response is required. That is, the single objective is the accurate identification of aircraft X. Also, two alternatives (signal is aircraft X, signal is not aircraft X) are considered. Finally, the identification of aircraft X has a minimal effect on the controller's identification of aircraft W. Signal detection situations of this type are discussed at length by Coombs et al. (1970).

The chess master contemplating a move represents a rapid processing—complex response situation. Again, visual stimuli from the chess board imply an important perceptual component. In addition, a single objective (to win), a moderately large number of alternatives (moves), and clear multi-staged effects (the first move affects the tenth move) suggests a complex response. Newell and Simon (1972) have conducted an extensive amount of research on decision situations of this type. This problem solving approach has been adapted by several consumer behavior researchers (Bettman, 1972; Haines, 1972).

Fiscal decisions of university presidents portray slow processing—complex response situations. Multi-attribute alternatives and positive marginal gains from information search suggest important cognitive components. In addition, multiple objectives, a large number of alternatives, and multi-staged effects imply a complex response. Forrester (1969, 1971) and Ansoff and Hayes (1973) have extensively researched decision situations of this type.
Finally, consumer choice decisions characterize slow processing—simple response situations. Once more, multiattribute alternatives and search benefits suggest important cognitive components for this type of decision. Therefore, after a problem has been recognized, attendant search and evaluation processes suggest that the decision will require an extended amount of time to complete.

However, a single objective, a moderate number of alternatives, and minimal consequences on subsequent decisions suggest simple responses. This dissertation is concerned exclusively with consumer decision making in slow processing—simple response situations. The following discussion describes decision models that may be applicable for this type of situation.

A Taxonomy of Decision Models

A decision model is a representation of an individual’s decision process. More specifically, Green and Tull (1975) define a decision model as:

"...a conceptual scheme that specifies a measure of the outcome to be achieved, their relevant variables, and their functional relationship to the outcome."

This definition implies that an individual employs a structural model and an evaluation model as part of the more generic decision process. The structural model is used to identify relevant input variables and to specify the appropriate information required. An evaluation model is then used to transform these structural output data in such a way that alternatives can be compared. The output of the evaluation model is the selection of one of
these alternatives according to a stated choice criterion.

Decision models may be classified into three major groups: certainty, risky, and uncertainty models. Figure 3 depicts the structural and evaluation model differences among these decision models.

For certainty models, structural input data are information dimensions, while output data include ratings or rankings on these dimensions for each alternative. The evaluation model consists of (1) a process which establishes an unambiguous preference ordering among the alternatives, and (2) a choice criterion which specifies that the most preferred alternative is chosen.

Structural input data for risky decision models are probability distributions of potential outcomes. Output data consist of the values and/or utilities associated with these probability distributions. The evaluation process results in the choice of the most preferred alternative given these probabilities.

Finally, structural input data for uncertainty models include the identification of states of nature, while output data consist of outcomes (payoffs) for each alternative under each state of nature. Application of the evaluation model results in the choice of the most preferred alternative given particular state of nature assumptions. Specific examples of each of these three types of decision models are discussed below.
### Decision Models

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<td>Probability Distributions</td>
<td>States of Nature</td>
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<td>Values/Utilities Associated with Probabilities</td>
<td>Outcome for Each State of Nature</td>
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<td>Preference Ordering Given Probability Distribution</td>
<td>Assumptions About States of Nature</td>
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<td>Choose Most Preferred Alternative Given Probabilities</td>
<td>Choose Most Preferred Alternative Given Assumptions</td>
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</table>

Figure 3. A comparison of the structural and evaluation models for certainty, risky, and uncertainty models.
Risky Models

Four types of risky decision models are available in the literature. These types include expectation models, special preference models, probability revision models, and heuristic models.

Expectation models represent the most familiar type of risky decision models. The expected value model assumes that both the probability of occurrence and the value associated with each alternative are defined objectively. Given these objective inputs, the alternative with the highest expected value is chosen. The expected value model has been found deficient on both normative and descriptive grounds; that is, individuals do not behave that way, and do not think they should (Coombs et al., 1970).

An expected utility model was postulated to account for these deficiencies. The principal difference in this model is that the objective scale of value is replaced with a subjective scale of utility. The final expectation model, subjective expected utility (SEU), replaced objective probabilities with subjective estimates. The SEU model has provided a reasonable account for most data obtained in simple gambling experiments (Coombs, et al., 1970).

The SEU model assumes that a decision is made on the basis of expectation and that probability and utility estimates are independent. Three special preference models
offer alternative explanations for risky decision behavior.

Coombs (1964) suggested that variance preference also mediates a decision in risky situations. More specifically, each individual has an ideal point along the variance continuum. The individual chooses the alternative with a variance closest to his ideal point. In a second experiment, Payne (1973) hypothesized that risky decisions are made on the basis of certain risk dimensions. These dimensions include the probabilities of winning and losing and the absolute amounts to win and lose. Both researchers found some support for their hypotheses.

Finally, Atkinson (1964) attempted to explain risky decisions when outcomes were contingent upon individual skills. In his theory of achievement motivation, Atkinson explains variance preferences in terms of need to achieve success or avoid failure. In this situation, utilities are not independent of subjective probabilities. Moderately favorable results have been obtained in a limited number of studies.

Probability revision models represent a very different approach to risky decision making. These models assume that initial opinions of the decision maker are expressed in terms of subjective or personal probabilities. Given the input of relevant information, these probabilities are revised accordingly. Decisions are made on the basis of these revised probabilities. Bayes theorem is the most widely used probability revision model.
Heuristic models represent the final type of risky models. A heuristic is a rule of thumb used by individuals which may aid in solution but does not guarantee a satisfactory solution to a decision problem. Event matching is a well researched heuristic (Taylor, 1963). For example, a decision maker is told that an urn contains 75 blue chips and 25 red chips. The decision task is to guess the color of chips sampled at random with replacement. Most subjects do not use the maximizing strategy of guessing blue each time. Rather, they attempt to match events by guessing blue to red in proportions of three to one. Tversky and Kahneman (1974) have researched a variety of other heuristics.

Risky decision models have analyzed simple gambling decision behavior in substantial depth. These models, however, are too simple and/or contrived to be useful in more complex consumer decision situations.

Uncertainty Models

Decisions made under uncertainty conditions are rare. Usually, some data are available concerning the likelihood of possible outcomes. For situations where these conditions do not obtain, a number of normative models have been applied. These models are enumerated and briefly described below.

1. MAXIMIN

Choose the alternative that maximizes the minimum outcome.
2. **MAXIMAX**

Choose the alternative that maximizes the maximum outcome.

3. **INSUFFICIENT REASON**

Assign equal probabilities to outcomes and use an expectation model.

4. **REGRET**

Choose the alternative which minimizes the maximum regret (i.e., loss) experienced by the decision maker.

Routinized consumer decisions do not occur under uncertainty. Therefore, these models will not be useful in researching these types of decisions.

**Certainty Models**

A classification method for certainty decision models is shown in Figure 4.\(^1\) The initial distinction is between explicit and implicit structure models. For explicit structure models, appropriate information dimensions are known prior to data collection. Conversely, implicit structure models make no a priori judgments about these dimensions. This distinction is analogous to the composition-decomposition issue discussed by Pessemier (1972).

Explicit structure models include representations of the decision maker and his environment and of the decision maker only. Brunswik and his students have researched extensively in this first area. This lens model approach emphasizes not just the individual, but the

---

\(^1\)This classification system was developed from the viewpoint of the researcher, not the individual decision maker.
Figure 4. A classification of certainty decision models.
adaptive interrelationship between the individual and its environment (Slovic & Lichtenstein, 1971).

Most substantive research, however, has concentrated on modeling the decision maker only. These approaches have stressed a formal description of an individual's idiosyncratic method of weighting and combining information dimensions through mathematical or algorithmic approaches.

Two mathematical approaches, scaling and statistical, are apparent in the psychometric literature (Burke, 1963). Scaling approaches emphasize the role of measurement considerations in decision making research. Integration theory and conjoint measurement are examples of scaling approaches to decision making.

Integration theory and conjoint measurement are basically concerned with two problems. These problems include (1) determining weighting parameters for a given set of attributes and (2) testing alternative evaluation models for those attributes. Integration theory has been extensively applied to impression formation problems (Anderson, 1962; Lampel & Anderson, 1968). Conjoint measurement has been extended to a broader range of decision problems (Green & Rao, 1971; Green & Wind, 1974; Ullrich & Painter, 1974). The principal distinction among these methods is the level of data input required. Conjoint measurement is appropriate for both ordinal and metric input. Integration theory is limited to metric input only.
Statistical approaches imply the use of standard linear and nonlinear models as approximations to the evaluation model used by individuals. **Linear models** assume that an individual's choice is a linear combination of each of the available cues. Many researchers have successfully applied linear models to a variety of decision situations (Goldberg, 1968; Dawes & Corrigan, 1974; Einhorn, 1974; Huber, J., 1974).

**Nonlinear models** imply that individual choice can best be represented as a nonlinear combination of available cues. Two distinct nonlinear traditions are apparent: *curvilinear* and *configural*. Curvilinear research has employed transformations of linear models (Einhorn, 1970, 1971; Ford, 1973; Huber, G., 1974) or nonlinear techniques (Raju & Sheth, 1974) to represent the individual's combinatorial process. The configural approach emphasizes the clinician's or expert's insight; that is, an individual's interpretation and/or weighting of a cue varies according to the nature of other available cues (Slovic & Lichtenstein, 1971). Configural models imply higher order, often complex, interactions among cues. Therefore, analysis of variance has been used extensively to test for configurality in decision making (Hoffman, Slovic, & Rorer, 1968; Anderson, 1972).

Many investigators have been critical of the rote application of these models in decision making research. The predominant criticism has been that strictly
mathematical approaches lack descriptive validity (Russ, 1971a; Wright, 1972). These researchers have suggested that algorithmic approaches may increase descriptive validity.

An algorithm is a "prescription defining a computational process that leads from various input data to a desired result" (Wheatley & Unwin, 1972). Algorithmic representations include compensatory and noncompensatory models.

Compensatory models are those which allow trade-offs between attributes; that is, a low value on any attribute may be compensated for by high values on other attributes. Most compensatory models are linear. These representations are classified separately from linear models because of an accompanying descriptive theory. Fishbein and Rosenberg attitude models are a good example of the development of compensatory models in marketing (Bass & Talarzyk, 1972; Sheth & Talarzyk, 1972).

Noncompensatory models do not allow trade-offs between attributes; that is, a low value of any attribute will not be compensated for by high values on other attributes. Specific noncompensatory models include conjunctive, disjunctive, and lexicographic representations (Coombs, 1964). Russ (1971a), Pras and Summers (1975), Wright (1975) and Park (Note 2) have researched these models in marketing situations.
Multidimensional scaling is the only implicit structure model available. This technique is concerned with portraying the psychological relations among decision alternatives as points in a multidimensional geometric space. The dimensions of the space are assumed to represent attributes along which the individual evaluates the alternatives. It is further assumed that the individual has an ideal point within the space and the alternative closest to that ideal point is selected. Green and others have conducted a significant amount of research using this technique (Green & Carmone, 1970; Green & Wind, 1974).

This research is concerned exclusively with certainty models in a consumer decision situation. More specifically, the efficacy of the two types of algorithmic approaches, compensatory and noncompensatory models will be compared in a series of brand choice decisions. Routinized brand choice decision making is explored in depth in the following section.

**Routinized Brand Choice Decision Making**

Several comprehensive models of consumer behavior have been developed (Nicosia, 1966; Howard & Sheth, 1969; Engel, Kollat, & Blackwell, 1973). A discussion of the specific elements in each of these models is well beyond the scope of this research. However, an important collective contribution of these efforts for brand choice decision making should be emphasized.
Each of these models suggests that the amount of cognitive activity associated with a particular type of decision is related to the frequency with which that decision is made. That is, the greater the frequency of a particular decision, the more routinized the decision process becomes. Howard and Sheth (1969) refer to this phenomenon as the psychology of simplification.

For brand choice decision situations, this phenomenon is most associated with frequently purchased, low unit value, nondurable goods. Routinization in these situations implies that evaluative cues (attributes) become standardized, and a subset of the universe of possible alternatives (brands) is identified and considered.

Brand choice research of this type has two principal tasks: (1) the identification of these evaluative attributes and candidate alternatives or structural model and (2) the specification of an evaluation model to select a particular alternative. Most marketing and consumer researchers have concentrated on the first issue. Recently, a few researchers have focused on the second issue (Pras & Summers, 1975; Russ, 1971a; Wright, 1974; 1975; Perreault and Russ, Note 1). Indeed, Wright (1973) has suggested that these issues may not be independent. That is, the decisional environment (attributes and brands) may affect the evaluation model employed by the consumer.
In the following discussion, elements of the decisional environment are described in detail. Then, alternative evaluation models are presented.

**Decisional Environment**

Two elements define a specific decisional environment in which a routine brand choice decision is made. These elements include the number of alternative brands considered and the number of attributes relevant for those alternatives. In addition, the degree of risk associated with particular product categories may also be a relevant dimension.

**Number of Brands.** The potential number of alternatives in a brand choice decision may be very large. The consumer decision maker does not consider all possible brands. Rather, as stated above, the consumer identifies an acceptable subset of those brands for active consideration. Howard and Sheth (1969) have identified this subset of alternative brands as the consumer's evoked set.

The size of the evoked set is related to the product category and individual consumer differences. Extant empirical data show that mean evoked sets varied from three to six brands for a variety of product categories (Jacoby & Olson, 1970; Campbell, 1973; Jarvis & Wilcox, 1973; Ostlund, 1973). These product categories included coffee, dishwashing liquid, table napkins, toothpaste, laundry detergent, cake mix, and subcompact cars.
Individual consumer differences may be manifested in the personality and/or level of involvement of the consumer. Pettigrew (1958) hypothesized that the width of categories for classifying any set of stimuli reflects personality differences among individuals. That is, individuals classify stimuli such as brands in narrow, medium, or broad category widths as a result of these personality differences and independent of the type of product under consideration. Therefore, to the extent that these personality differences are operative in routine brand choice situations, broad categorizers should consider a large number of alternatives, while narrow categorizers should consider a small number.

In addition, the degree of individual involvement with a particular product type may be related to the size of the evoked set. Social judgment theory posits the existence of latitudes of acceptance and rejection. (Sherif, Sherif, & Nebergall, 1965). Latitudes of acceptance include all acceptable alternatives, while latitudes of rejection denote unacceptable alternatives. In a routine brand choice situation, the theory predicts that when individual involvement with a product is high, the individual’s latitude of acceptance for alternatives is narrow. This implies that the number of brands in this individual’s evoked set is small. The opposite result should obtain for low involvement products. Some support for both the personality and social judgment
positions has been reported in marketing studies (Campbell, 1970; Jarvis & Wilcox, 1973).

These data suggest that the number of brands consumers actively evaluate is limited. In researching number of alternatives, therefore, choice categories should be wide enough to accommodate product and individual consumer differences.

**Number of Attributes.** A product attribute is any perceived characteristic upon which two or more brands seem to differ. The terms evaluative criteria (Engel, Kollat, & Blackwell, 1973) and choice criteria (Howard & Sheth, 1969) have been used to specify these elements in models of consumer behavior.

Psychological research results suggest that the number of attributes used by individual decision makers is limited. Miller (1956), in a now classic paper, hypothesized that seven, plus or minus two, chunks, or bits, of information was the maximum a human information processor could handle. Shepard (1964) reported that individuals have difficulty in even using more than a single attribute to judge alternatives. Finally, a number of studies have reported an inverse relationship between the number of attributes presented to subjects and the accuracy of resulting judgments (Hoffman & Blanchard, 1961; Hayes, 1964; Einhorn, 1971).
The number of attributes used in brand choice decisions has not been dealt with adequately in research. Two studies have examined the effect of the number of attributes included in multiattribute attitudinal models. Wilkie and Weinreich (1973) reported that attitude scores were more highly correlated with brand preference when fewer attributes were considered. In a review of twelve marketing studies, Wilkie and Pessemier (1973) found that the minimum number of attributes reported useful by consumers varied between one and eleven.

Consumers limit the number of brands and the number of attributes they consider in making a brand choice. In these limited relevant ranges, however, the combinations of the number of attributes and brands can pose very different information processing situations. Jacoby and his coworkers have investigated the concept of information load in a brand choice situation (Jacoby, Speller & Kohn, 1974; Jacoby, Speller, & Berning, 1974). Information load was operationalized as the number of brands of laundry detergent (4, 8, and 12 brands) and the number of items of information about those brands (2, 4, and 6 items of information). Nine treatment conditions of low, moderate, and high information load were used. Brand choice accuracy and information load were inversely related. These results support the assertion that differing decisional environments pose different processing problems, and, therefore, invariant evaluation strategies should not be assumed.
Product Risk. The concept of risk has been extensively researched in the marketing literature. Bauer (1960) conceptualized risk as the perceived uncertainty surrounding the purchase and/or use of a product or brand. Bauer hypothesized that when high risk was perceived, the individual consumer would take action to reduce that risk. A large number of studies have supported this hypothesis (Sheth and Venkatesan, 1968; Spence, Engel, & Blackwell, 1970; Zikmund & Scott, 1973).

Risk has been operationalized for consumer products in many different ways (Ross, 1974). One approach has been to compare products on specific risk dimensions. Jacoby and Kaplan (1972) have identified five specific risk dimensions: financial, performance, physical, psychological, and social risk. The authors measured these risk dimensions for a variety of consumer products. Results indicated clear perceived risk differences among the products. In a cross validation study, Kaplan, Syzbillo, and Jacoby (1974) reported similar results.

These studies show that risk may be effectively manipulated by choosing products which vary on specific risk dimensions. For products possessing different levels of risk, invariant evaluation strategies again should not be assumed.

Evaluation Models

When a structural model has been implemented, the resulting set of multiattribute alternatives is evaluated
by the consumer. Russ (1971a) defines evaluation as:

"...the process of determining the (relative) positions of one or more alternatives with respect either to some criterion or to each other."

More specifically, an evaluation model in this situation specifies the manner in which individual consumers choose a particular brand from an evoked set of multi-attribute brands. In the discussion of individual decision models, two types of evaluation models were distinguished: compensatory and noncompensatory. Each of these types of evaluation models is discussed below.

**Compensatory Evaluation Models.** Compensatory evaluation models permit trade-offs between brand attributes. These evaluation models are linear representations of the form:

\[ X_i = \sum_{j=1}^{m} b_j A_{ij} \]

where,

- \( X_i \) = the evaluation score for brand \( i \)
- \( A_{ij} \) = the amount of attribute \( A_j \) that an individual consumer perceives in brand \( i \)
- \( b_j \) = the importance of attribute \( A_j \) to the consumer

This model implies that the evaluation of brand \( i \) is the product of the amount of attribute \( A_j \) perceived in brand \( i \) and the importance of attribute \( A_j \) summed over \( m \) attributes. When evaluation scores are calculated for each brand, the brand with the highest evaluation score is chosen.
A second compensatory formulation ignores the importance parameter $b$. In this case the model reduces to:

$$X_1 = \sum_{j=1}^{m} A_{ij}$$

This model suggests that the evaluation of brand $i$ is represented by the summation of the perceived attribute values for brand $i$.

Perreault and Russ (Note 1) and Park (Note 2) have investigated both of these compensatory representations for consumer decision situations for small household appliances and automobiles. Results reported by these researchers suggest that the predictive validity of these models is adequate. That is, brand choice predictions are significantly better than chance predictions. The descriptive validity of these models, however, has been questioned by both authors. More specifically, these models are not descriptive of the way consumers actually make brand choice decisions.


Conjunctive and disjunctive evaluation models were first conceptualized by Coombs (1964). These models are described below for a brand choice decision.\(^2\)

\(^2\)The description of these processes borrows heavily from Dawes (1964).
An individual brand considered for purchase may be viewed as a vector \( x_1 = (a_1, a_2, \ldots, a_j, \ldots, a_m) \) where the \( a_j \)'s are real numbers that represent the individual consumer's amount of the \( j^{th} \) attribute relevant to selection of a brand from a particular product category.

The selection procedure may then be viewed as a function \( S \) operating on the vector \( X \) and mapping it into some final evaluation \( e \). Symbolically, this process is viewed as:

\[
S(X) \rightarrow e
\]

Given this general treatment, the evaluation procedure for the conjunctive model may be expressed as:

\[
S(X_1) = \min a_j (\rightarrow e).
\]

In this formulation, the individual consumer is assumed to establish minimum criterial values for each attribute \( (a_j) \). Brands that meet and/or surpass each of these values are accepted. Conversely, brands that fail to meet and/or surpass any of these values are rejected.

Finally, the evaluation procedure for the disjunctive model is:

\[
S(X_1) = \max a_j (\rightarrow e).
\]

In this representation, the individual consumer is assumed to accept any brand that meets a criterial value on any relevant attribute.

Conjunctive and disjunctive models have been used successfully in several nonmarketing applications (Coombs, 1964; Dawes, 1964; Einhorn, 1970). However, disjunctive models applied in certain brand choice
situations may lack face validity. For example, consider the situation in which a consumer has two relevant attributes for automobiles: styling and safety. A disjunctive model implies that a very stylish automobile will be acceptable regardless of the rating it receives on safety. Therefore, only the conjunctive evaluation model is investigated in this dissertation.

Conjunctive and disjunctive approaches represent a comparison across attributes for a given alternative brand. That is, attributes of individual brands are compared with standard criterial values. A second method is to compare all alternative brands on a single attribute. This latter method characterizes lexicographic evaluation models.

Lexicographic models can be described for a brand choice decision as follows. The consumer orders the brand attributes in terms of importance to her or him. Then, each alternative brand is compared on the most important attribute. Brands tied with the highest rating on the first attribute are then compared on the second ranked attribute. This process continues until a single brand alternative remains.

A lexicographic semi-order model does not require that brands must be tied on the most important attribute to remain in the consideration set. Rather, brands tied with the highest rating on the first attribute and brands with values that are not significantly different on that
attribute remain in consideration. This expanded set of brands is then compared on the second ranked attribute. Again, the process continues until a single alternative remains. A lexicographic semi-order is obtained by adding a j.n.d. (just noticeable difference) structure to a regular lexicographic model (Tversky, 1969). Operationally, this implies that brands ranked within one or two scale units on an attribute are treated as equivalent.

Few marketing studies have compared compensatory and noncompensatory evaluation models. Data that are available show conflicting findings. One study found compensatory models superior to noncompensatory models in explaining product selection decisions for supermarkets (Heeler, Kearney, & Mehaffey, 1973). In this study, however, the authors compared linear and curvilinear mathematical models. Wright (1973) has argued that mathematical models of this type do not adequately represent noncompensatory models. When algorithmic approaches were used, either no differences were reported (Russ, 1971a; Pras & Summers, 1975; Perreault & Russ, (Note 1); Park, (Note 2)) or noncompensatory models were superior in terms of predictive ability (Wright, 1975).

Three studies have used a variety of techniques to assess descriptive validity. Russ (1971a) analyzed protocol data for 80 housewives making a brand choice decision. He found that the choice behavior of almost
93 per cent of these subjects was lexicographic. Wright (1975) explained different evaluation strategies to groups of students. After a choice situation was presented, Wright asked the subjects how often they used that particular strategy in comparable everyday situations. Results indicated that conjunctive and unweighted linear models were used with greater frequency. Finally, Perreault and Russ (Note 1) reported that a weighted linear model was perceived as superior to lexicographic and lexicographic semi-order models for a descriptive criterion. However, subjects in this study were graduate business students that were biased toward using or reporting the use of more rational decision strategies. More comparative research should provide data to reconcile these conflicting predictive and descriptive findings.

In this dissertation, five evaluation models are compared. These models include (1) unweighted linear model, (2) weighted linear model, (3) conjunctive model, (4) lexicographic model, and (5) lexicographic semi-order model.

This set of evaluation models does not exhaust the universe of algorithmic models that could have been considered. For example, Tversky (1972) has described an elimination by aspects (EBA) model. The EBA model is similar to the lexicographic model with the exception that attributes or aspects of alternatives are not hierarchically ordered. Rather, the order of aspects used to
compare alternatives depends upon an underlying probabilistic process.

Additionally, Wright (Note 3) has proposed the use of phased evaluation models. A phased model specifies the use of multiple evaluation models in a prescribed order. Thus, a conjunctive-lexicographic phased model implies that a conjunctive model is used to identify acceptable alternatives, and a lexicographic model is then employed to identify a particular alternative from this reduced set.

Despite the availability of alternative models, little research data are available. More important, however, most of these alternatives are more sophisticated versions of the models under study in this dissertation. Therefore, it seems appropriate to begin with simple approaches and then expand to more complex formulations in future research.

**Summary**

In this chapter, taxonomies of decision situations and decision models were specified. These taxonomies were used to highlight the decision situation and the model comparisons relevant to this research.

Routinized brand choice decision situations were discussed in detail. This review indicated that the number of brands, number of attributes, and perceived product risk are important parameters in this type of decision situation. These elements comprise the
decisional environment for a particular product category. Finally, two compensatory and three noncompensatory models were described. Available research data were insufficient to establish predictive and/or descriptive superiority for either model type. The following chapter describes the research methodology used to determine the predictive and descriptive ability of these compensatory and noncompensatory models in diverse decisional environments.
CHAPTER III
RESEARCH METHODOLOGY

Elements of the research methodology are delineated in this chapter. Experimental subjects are described, and research variables, instrument development, and hypothesis testing are discussed. This chapter concludes with an elaboration of the research procedures.

Subjects

Subjects participating in this study were undergraduates enrolled in the introductory marketing course at The Ohio State University. Response data were collected from 175 subjects. Of these, eight subjects were eliminated for missing data or misinterpretation of task. One hundred sixty-seven subjects were retained for the final analysis.

Additional data concerning these subjects are shown in Table 1. These data indicate that the subjects were predominately male, 26 years of age or below, and not married. Additionally, most subjects did not live at home with their parents. Rather, the majority lived in apartments or other communal facilities.

The use of college students as experimental subjects in consumer brand choice research has obvious limitations. College students are not average consumers and should not be expected to behave like average consumers. Therefore, generalization of results from
### TABLE 1

Descriptive Data for the Experimental Subjects

<table>
<thead>
<tr>
<th>Descriptive Variable</th>
<th>Descriptive Group</th>
<th>Percentage of Subjects in Each Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>76.6</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>23.4</td>
</tr>
<tr>
<td>Age</td>
<td>21-below</td>
<td>59.3</td>
</tr>
<tr>
<td></td>
<td>22-26</td>
<td>32.3</td>
</tr>
<tr>
<td></td>
<td>27-above</td>
<td>8.4</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single</td>
<td>84.4</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>15.6</td>
</tr>
<tr>
<td>Place of Residence</td>
<td>Home with parents</td>
<td>19.2</td>
</tr>
<tr>
<td></td>
<td>Apartment</td>
<td>53.9</td>
</tr>
<tr>
<td></td>
<td>Communal&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20.3</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Note. Total sample = 167

<sup>a</sup>Communal residences refer to dormitories, sorority or fraternity houses, and rooming houses.
studies utilizing college students is usually restricted. However, college students are repetitive purchasers of a wide variety of low unit value, nondurable products. Most of these students are at least moderately familiar with several brands of these products available commercially.

Furthermore, many students buy these types of products for themselves or others. Therefore, the evaluation behavior of college students for these kinds of products may give insights into the behavior of other consumption groups.

**Research Variables**

Independent and dependent variables were discussed conceptually in Chapter II. In this section, these variables are operationally described.

**Independent Variables**

The independent variables in this study are riskiness of products, number of attributes and number of brands (decisional environments), and evaluation models. Operational procedures for each of these variables are discussed below.

Products must meet certain criteria to be considered for use in this study. First, they must be repetitively purchased goods. This effectively limits consideration to low unit value, nondurable goods. Second, it must be possible to evaluate each product in terms of several dimensions or attributes. Products with only a few
evaluative dimensions are not applicable for this study. Third, these products must be used by both male and female college students. Finally, these products must differ in terms of specific risk dimensions.

Using these criteria, deodorant, toothpaste, and toilet tissue were chosen. These are repetitively purchased products used by most college students. In addition, multiple evaluative attributes are relevant for each product. Finally, these products differ on several pertinent risk dimensions. Two studies have demonstrated that deodorant has a higher degree of perceived risk than toothpaste (Jacoby & Kaplan, 1972; Kaplan, Syzbillo, & Jacoby, 1974). Intuitively, it seems reasonable to hypothesize that toilet tissue is lower in perceived risk than both of these products.

This hypothesis was tested empirically. An instrument measuring physical, social, and performance risk for ten products including deodorant, toothpaste, and toilet tissue was constructed. A variation of the Lutz and Reilly (1973) measurement procedure was used. Subjects were asked to rank each product for all dimensions on a 1 (no amount of that type of risk) to 9 (the highest amount of that type of risk) scale. A copy of this instrument is included as Appendix A.
The instrument was administered to a sample of 51 undergraduate students at The Ohio State University. These data are shown in Table 2.

TABLE 2

Mean Ratings for Experimental Products on Three Risk Dimensions

<table>
<thead>
<tr>
<th>Products</th>
<th>Physical</th>
<th>Social</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deodorant</td>
<td>4.31</td>
<td>4.37</td>
<td>4.88</td>
</tr>
<tr>
<td>Toothpaste</td>
<td>3.12</td>
<td>3.06</td>
<td>3.84</td>
</tr>
<tr>
<td>Toilet Tissue</td>
<td>2.27</td>
<td>2.49</td>
<td>2.80</td>
</tr>
</tbody>
</table>

Since this dissertation is concerned with products only, a one way analysis of variance with repeated measures was performed on the product data. This analysis supported the hypothesis that deodorant, toothpaste, and toilet tissue differ in degree of perceived risk \( (F (2,100) = 93.8, p < .001) \).

After products were selected, specification of the evaluative attributes for those products was necessary. Two major sources of information were used. First, issues of Consumer Reports were consulted for each product category. In addition, brand advertisements from each product category were studied. Copies
of print advertisements were collected from national magazines while television advertisements were summarized by this author. Three judges were given these data and asked to identify dimensions that were stressed. The judges worked independently at these tasks. While terminology varied among the judges, a reasonable degree of agreement was apparent. A synthesis of these data and subsequent modification after the pretest resulted in the attributes defined in Table 3.

Price was not included as an evaluative attribute for any of the experimental products for several reasons. First, this study concerns decision making for low unit value products. While it is very misleading to suggest that price is unimportant, price is probably less important in this situation than in the purchase of high unit value goods. Indeed, one study shows that a large percentage of purchasers of a new brand of toothpaste were unaware of relative price differences (Haines, 1966). Second, a price-quality effect has been demonstrated by several researchers (Stafford & Enis, 1969; Peterson, 1970). That is, higher prices are associated with higher quality and vice-versa. Such inferences by subjects in this study would introduce important confounding effects. Finally, price has an implied normative interpretation that, ceteris paribus, consumers should buy lower price goods. In experimental settings, this normative component may create a demand
### TABLE 3

Attribute Definitions for Each Product Category

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deodorant</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fragrance</strong></td>
<td>The extent to which a brand of deodorant has a pleasant fragrance.</td>
</tr>
<tr>
<td><strong>Non-staining</strong></td>
<td>The extent to which a brand of deodorant does not stain clothes.</td>
</tr>
<tr>
<td><strong>Lasting protection</strong></td>
<td>The extent to which a brand of deodorant provides lasting protection.</td>
</tr>
<tr>
<td><strong>Mildness</strong></td>
<td>The extent to which a brand of deodorant is mild to the skin.</td>
</tr>
<tr>
<td><strong>Prevents wetness</strong></td>
<td>The extent to which a brand of deodorant prevents wetness.</td>
</tr>
<tr>
<td><strong>Non-sticky</strong></td>
<td>The extent to which a brand of deodorant does not stick to clothes or skin.</td>
</tr>
<tr>
<td><strong>Ease of application</strong></td>
<td>The extent to which a brand of deodorant is easy to apply.</td>
</tr>
<tr>
<td><strong>Toothpaste</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Kills germs</strong></td>
<td>The extent to which a brand of toothpaste is effective in killing germs.</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Whitens teeth</td>
<td>The extent to which a brand of toothpaste whitens teeth.</td>
</tr>
<tr>
<td>Clean feeling</td>
<td>The extent to which a brand of toothpaste leaves your mouth feeling clean.</td>
</tr>
<tr>
<td>Pleasant taste</td>
<td>The extent to which a brand of toothpaste has a pleasant taste.</td>
</tr>
<tr>
<td>Decay prevention</td>
<td>The extent to which a brand of toothpaste aids in prevention of tooth decay.</td>
</tr>
<tr>
<td>Freshens breath</td>
<td>The extent to which a brand of toothpaste freshens breath.</td>
</tr>
<tr>
<td>Non-abrasiveness</td>
<td>The extent to which a brand of toothpaste is not abrasive to tooth enamel.</td>
</tr>
</tbody>
</table>

**Toilet Tissue**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softness</td>
<td>The extent to which a brand of toilet tissue feels soft.</td>
</tr>
<tr>
<td>Absorbency</td>
<td>The extent to which a brand of toilet tissue is highly absorbent.</td>
</tr>
<tr>
<td>Color variety</td>
<td>The extent to which a brand of toilet tissue is available in a variety of colors.</td>
</tr>
<tr>
<td>Size variety</td>
<td>The extent to which a brand of toilet tissue is available in a variety of package sizes.</td>
</tr>
<tr>
<td>Dispensing ease</td>
<td>The extent to which a brand of toilet tissue unrolls without tearing.</td>
</tr>
<tr>
<td>Fragrance</td>
<td>The extent to which a brand of toilet tissue has a pleasant fragrance.</td>
</tr>
<tr>
<td>Strength</td>
<td>The extent to which a brand of toilet tissue exhibits strength in use.</td>
</tr>
</tbody>
</table>
characteristic (Orne, 1962). That is, the subject discerns that the experimenter wants him to act rationally and, therefore, he does. For all these reasons, price was not used as an evaluative attribute.

Three levels of evaluative attributes were used in this study. Subjects received either three, five, or seven attributes for each product category. For the seven attribute condition, subjects received all the attributes shown in Table 3. For the remaining conditions, attributes were assigned nonrandomly. However, every subject in the three or five attribute conditions received the same attributes.

Three levels of brands were also used. Subjects were presented either four, seven, or ten brands. These specific levels were chosen for several reasons. First, these levels encompass most of the evoked sets as described in Chapter II. Second, these specific levels reflect the reality of many consumer product situations. Finally, available research evidence shows that information processing requirements differ substantially for these levels (Jacoby, Speller, & Berning, 1974; Jacoby, Speller, & Kohn, 1974).

When levels of attributes and brands are completely crossed, nine decisional environments are defined. Within each of these decisional environments, individual brands were distinguished by letter designation. Subjects were informed that the brand stimuli represented national
brands that were disguised so that they (the subjects) could concentrate on the attribute information. In reality, disguised brands were used to avoid halo effects from actual brands. In addition, attribute ratings for disguised brands could be constructed such that the choice of specific brands implied the use of particular evaluation models. For example, the choice of a brand with moderate values on all attributes may suggest the use of a conjunctive strategy. In addition, the selection of a brand with high values on certain attributes and low values on other attributes may imply the use of a lexicographic or weighted linear model. The construction of brand stimuli is explored further in the instrument development section.

Every subject within a particular decisional environment received the same brand stimuli. However, these brand stimuli differed across decisional environments. Therefore, some confounding effects were introduced into the research design. Since the achievement of the objectives of this dissertation was not affected, these confounding effects were considered acceptable.

The final independent variable used in this study was evaluation models. Procedures used to develop rank orders of brands for each of these models are described in the paragraphs below.
1. **Unweighted Linear Model**

   Individual attribute ratings are summed for each brand. The brand with the highest evaluation rating is ranked first, the brand with the second highest rating is ranked second, and so forth. Brands with equal evaluation ratings are assigned tied ranks.

2. **Weighted Linear Model**

   Individual attribute ratings are first multiplied by appropriate importance weights and then summed for each brand. A rank order of brands is generated in the same manner as the unweighted model. Indeed, the unweighted model is a special case of the weighted model in which all importance weights are equal to one.

3. **Conjunctive Model**

   Individual attribute ratings for each brand are compared with minimum criterial values for those attributes. If more than one brand meets or exceeds all criterial values, then these brands are classified as acceptable. Brands which fail to meet any one of these criterial values are classified as unacceptable.

   For brands in the acceptable set, criterial values are increased sequentially one unit at a time beginning with the most important attribute. After each attribute is increased, brands are compared with the new criterial values. This process continues until all acceptable alternatives are eliminated. The order of elimination is the basis for ranking the brands.

   For brands in the unacceptable set, the original criterial values are decreased sequentially one unit at a time. The process continues until all unacceptable brands meet the new criterial values. The order of entrance is the basis for ranking brands in this set.

   In addition to generating a complete rank ordering of brands, this procedure insures that every acceptable brand is ranked higher than every unacceptable brand. Brands which enter or exit consideration sets simultaneously are assigned tied ranks.

4. **Lexicographic Model**

   All brands are compared on the most important attribute. The brand with the highest rating on this attribute is ranked first, the brand with the second highest
rating is ranked second, and so forth. All brands with the same rating for the most important attribute are compared on the second most important attribute. This process continues until a complete rank order is achieved.

5. Lexicographic Semi-order Model

Again, all brands are compared initially on the most important attribute. However, brands need not have the same rating on this attribute to be considered equivalent. That is, brands with ratings two scale units or less apart, are considered tied. As in the lexicographic model, the second most important attribute is used to break the tie. This procedure continues until a complete rank order is obtained. For both the lexicographic and lexicographic semi-order models brands tied or equivalent on all attributes are assigned tied ranks.

These procedures reduce all product data to rank order output. The first ranked brand is assumed to be the individual's most preferred choice. Also, this type of output provides additional information about perceptions of preference among the remaining brands. Both types of data are used to test the evaluation models. Dependent Variables

Five dependent variables are used in this study. These variables include a) first choice accuracy: disguised brands; b) rank order accuracy: disguised brands; c) critical paired comparisons: disguised brands; d) decision description: disguised brands; and e) choice accuracy: actual brands. Measurement procedures for each of these variables are described in this section.

First choice accuracy: disguised brands (FCA) represents the degree to which the individual evaluation models correctly predict the highest ranked brand from
the set of disguised brands for each product. For each subject, a model is scored one if the predicted highest ranked brand matches the subject's actual highest ranked brand. Conversely, a model is scored zero if the predicted highest ranked brand does not match actual highest ranked brand.

Rank order accuracy: disguised brands (ROA) assesses the degree to which the entire rank order generated by each evaluation model is related to the actual rank order given by subjects. For each subject, Kendall Tau rank order correlations are calculated between each predicted rank order and actual rank order (Siegel, 1956). These individual correlation coefficients are then standardized to meet analysis of variance assumptions and treated as a measure of rank order accuracy among the evaluation models.

As previously mentioned, brand stimuli were constructed such that, to the greatest extent possible, the choice of different stimuli implied the use of different evaluation models. For each decisional environment, a set of five individual brand paired comparisons was selected. These comparisons were selected so that conjunctive and unweighted linear models were compared with probable lexicographic and weighted linear representations. For example, subjects were asked to compare a brand with moderate rankings on all attributes (conjunctive) with a brand possessing high rankings on
certain attributes and low rankings on others (lexicographic or linear-weighted). This set of five choices was termed critical paired comparisons: disguised brands (CPC).

Actual choice for each pair was compared with the predicted choice for each of the evaluation models. A model was scored one if predicted choice agreed with actual choice. If no agreement was observed, the model was scored zero. For each subject, these values were summed across the five paired comparisons.

FCA, ROA, and CPC are termed predictive ability measures for the disguised brand stimuli. Wright (1973b) suggests that descriptive ability should also be considered in this type of research. Accordingly, a descriptive ability measure was included. This measure is called decision description: disguised brands (DD).

Prose descriptions of each evaluation model were presented to subjects. Subjects were asked to check a description for each product. For each subject, an evaluation model was scored one if checked as the decision description. Since only one choice was possible, all other models were scored zero. These data provide a descriptive measure based upon the perceptions of the subjects. However, these data provide little insight about the validity of these perceptions. Therefore, a second measure was included. Only the model chosen as
most descriptive by each subject was considered. If this model correctly predicted first choice, it was scored one. All other models were scored zero.

To this point, this study has been concerned exclusively with disguised brands. External validity, therefore, is a significant issue. That is, to what extent do subjects behave in a similar manner when evaluating actual brands? Choice accuracy: actual brands (CA) represents the degree to which individual evaluation models predict actual choice from a set of national brands of deodorant, toothpaste, and toilet tissue. For each subject, a model is scored one if actual choice is correctly predicted. For all other results, a model receives a score of zero.

An operational summary of these dependent variables is shown in Figure 5. All data relating to these variables were collected through the application of the research instrument. The development of this instrument is detailed in the following section.

Instrument Development

Two principal questions were addressed in the development of the data collection instrument. These questions were:

1. What criterion or criteria should be established to insure that the task represented a routine brand choice situation for all subjects? and,
### Dependent Variables

<table>
<thead>
<tr>
<th><strong>First Choice Accuracy (FCA)</strong></th>
<th><strong>Operational Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An evaluation model is scored one if predicted first choice matches actual first choice for the disguised brands. The model is scored zero in all other situations.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rank Order Accuracy (ROA)</strong></th>
<th><strong>Operational Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The rank order correlation between the predicted rank order and the actual rank order is calculated for each evaluation model. These correlations are then standardized to meet ANOVA assumptions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Critical Paired Comparisons (CPC)</strong></th>
<th><strong>Operational Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An evaluation model is scored one if predicted choice in each paired comparison matches actual choice. The model is scored zero for all other situations. These values are then summed over the five paired comparisons.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Decision Description (DD)</strong></th>
<th><strong>Operational Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An evaluation model is scored one if checked as the appropriate description. All other models are scored zero. As an additional measure, if the chosen model correctly predicts first choice, it is scored one. All other chosen models are scored zero.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Choice Accuracy (CA)</strong></th>
<th><strong>Operational Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An evaluation model is scored one if predicted first choice matches actual first choice from a set of national brands. The model is scored zero in all other situations.</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5. An operational summary of the dependent variables.
2. How should evaluation model and brand choice data be collected?

The resolution of the questions is discussed in the following section.

Criterial Data

Two criteria were established to ascertain the degree to which these specific choice situations were routine for the experimental subjects. These criteria were purchase frequency and brand familiarity.

Purchase frequency measured the number of times subjects had personally purchased the experimental products during the previous year. Four purchases in the previous year was arbitrarily established as the cut-off value. Therefore, three purchases or less failed this criterion.

This criterion has a high degree of face validity. However, pretest results indicated some problem areas. First, the measure does not account for purchase quantities. Subjects who purchase ten units at a time are treated like subjects who purchase a single unit. More important, the requirement of personal purchase may be unnecessarily restrictive. Many students use parents or friends as purchasing agents for these types of products. Several subjects in the pretest indicated that buying in large quantities or shifting purchase responsibility is possible because the decision is routinized.
For these reasons, a brand familiarity criterion was established. Subjects were asked how familiar they were with national brands of deodorant, toothpaste, and toilet tissue. Subjects as least slightly familiar (knew three brands or more) were considered acceptable.

Subjects who passed either or both of these criteria for a single product were retained for the analysis of that product. Note, however, that it is entirely possible for a subject to qualify for certain products and not others.

Evaluation Model and Brand Choice Data

For each product category, subjects were presented with definitions of the evaluative attributes. Subjects were asked to rank these dimensions in terms of importance. In addition, subjects were told to allocate 100 points among these attributes, again reflecting the importance of these attributes to them. The ranking data were inputs for the lexicographic models, while the constant sum data were used as weights for the weighted linear model.

A 15 point scale was used to portray attribute data throughout the study. A sample scale was presented and five specific scale points defined. Pretest subjects were questioned intensively about their perceptions of the scale. These subjects seemed to understand the
meaning of specific positions on the scale and were sensitive to differences in ratings among brands. Therefore, the scale format was considered appropriate for this study.

Minimum criterial values were measured by asking subjects to indicate the minimum acceptable level a brand should have on a particular attribute for them to consider purchasing it. Pretest data showed that some subjects had difficulty in understanding this task. These subjects stated that an example would be helpful. Therefore, in the final instrument a specific example was included.

Construction procedures from the brand stimuli were then developed. Brand stimuli were printed on 5x8 cards. An example of a brand stimulus is shown in Figure 6.

Brands were designated A-D, A-G, or A-J depending upon the treatment condition. Attributes were listed on the left side of the card opposite 15 point scales. Bars were used to indicate the rating on each attribute. Attribute ratings were assigned in the following manner. Scale values were divided into five regions. These regions were (1) very low (1-3), (2) moderately low (4-6), (3) average (7-9), (4) moderately high (10-12), and (5) very high (13-15). Some simple decision rules
Brand B

- Softness
- Absorbency
- Color variety
- Size variety
- Dispensing ease
- Fragrance
- Strength

Figure 6. An example of a brand stimulus profile for toilet tissue.
were used. First, an average brand was always included. All attribute ratings for an average brand were taken from the average region. The choice of an average brand should imply a conjunctive strategy.

Second, several lexicographic and weighted linear brand descriptions were included. For these brands, one or two ratings were chosen from the very high region. However, an equal number of attributes were assigned ratings from the very low region. Lastly, the unweighted linear model is based on a simple summation of attribute ratings. Therefore, brands were constructed so that these summated values differed for each brand.

Brand stimuli were contained in a $7\frac{1}{2} \times 10\frac{1}{2}$ inch brown manila envelope. Directions on the envelope described the contents. Subjects were informed that the attribute ratings were developed from a recent national survey of college students. This cover story was included to add face validity and relevance to the task. Finally, subjects were told to assume all brands had the same selling price.

Paired comparison and ranking tasks followed. After completing these tasks, subjects returned the cards to the envelope, and the process was repeated for the remaining products. The order of presentation of products was randomly assigned.

Actual brand data were collected for the same number of attributes and brands. Subjects were then
asked to choose the one brand in each product category they would like to receive as a gift for participating in the study. These actual brand data were used to operationalize the evaluation models for actual choice. Descriptive data were collected by writing paragraph descriptions of each strategy. Pretest results showed that the strategy descriptions and actual choice tasks were understood by the subjects.

A different instrument was necessary for each attribute-brand condition. The three attribute-four brand instrument is shown in Appendix B.

**Hypothesis Testing**

Expectations concerning the outcomes of the research hypotheses are described in this section. In addition, procedures used to test these hypotheses are reviewed.

**Hypothesis 1:** The evaluation models will differ in predictive ability for each of the disguised set of brands.

As pointed out in Chapter II, very little published research has investigated the relative predictive ability of compensatory and noncompensatory evaluation models. Furthermore, studies that are available show considerable variation in experimental methodologies. Generally, lexicographic and linear weighted models have demonstrated greater predictive ability. Therefore, the expectation is that this hypothesis should be affirmed.
A three factor (attributes x brands x models) analysis of variance design with repeated measures on the models factor is used to test this hypothesis. A significant models main effect for FCA, CPC, and ROA data indicates that this hypothesis can be accepted.

Hypothesis 2: The predictive ability measures will not differ among the three product categories.

All previous research on compensatory and non-compensatory evaluation models has been limited to a single product category. While different products have been used in these studies, diverse methodologies preclude any product inferences. In the absence of any experimental data, therefore, it is expected that this null hypothesis will be accepted.

A four factor (attributes x brands x models x products) analysis of variance design with repeated measures on the models and products factors is used to test this hypothesis. A significant product main effect for FCA, CPC, and ROA data suggests that the null hypothesis cannot be accepted.

Hypothesis 3: Specific evaluation models will differ in predictive ability across decisional environments for each disguised set of brands.

This hypothesis examines the predictive efficacy of particular evaluation models across the decisional environments specified in this study. As the number of brands and attributes increase, the information processing demands of the various evaluation models
do not seem to be equivalent. The compensatory models imply that all brands must be evaluated on all attributes. Therefore, increasing the number of brands and/or attributes substantially increases the magnitude of the decision task. Similarly, a conjunctive formulation specifies that criterial values must be established for each alternative, and that each brand is compared against all these criterial values. Again, the magnitude of the decision task is increased. In each of these cases, there is reason to suspect that predictive ability should vary across these decisional environments.

Lexicographic models, however, should show greater consistency across decisional environments. While a larger number of brands may still increase decision complexity, this should not be the case for additional attributes. Lexicographic models do not assume that all brands are compared on each attribute. If a superior brand is identified with the first attribute, the process terminates. This is true regardless of the number of attributes available for consideration. Therefore, predictive ability of this model across these decisional environments should show little variation.

This issue of consistency across decisional environments is crucial in comparing evaluation models in applied situations. If the predictive ability of these models varies across decisional environments, then these situational variables must be controlled
before any predictive comparison is valid. To date, no research has been conducted on this issue. However, the conceptual arguments developed previously suggest differences. Therefore, it is expected that the data will support this hypothesis.

A two factor (attributes x brands) analysis of variance design is used to test this hypothesis. A significant attributes x brands interaction effect for FCA, CPC, and ROA data implies that the particular evaluation model being investigated does not predict equally in all decisional environments. When significant interaction terms are found, graphical presentation of these effects is included.

**Hypothesis 4:** The evaluation models will differ in descriptive ability for each of the disguised set of brands.

Researchers that have investigated noncompensatory evaluation models have contended that these models are more descriptive of consumer brand choice behavior. They argue that even if these models were just equivalent to compensatory models in terms of predictive ability, superior descriptive ability should be sufficient to justify the use of these models.

Empirical results are equivocal on this point. Russ (1971a) found that lexicographic models were superior to a weighted linear model, but Wright (1975) and Perreault and Russ (Note 1) report opposite
results. Descriptive differences have been reported in all available studies. Therefore, it is expected that this hypothesis will be accepted.

A three factor (attributes x brands x models) analysis of variance design with repeated measures on the models factor is employed to test this hypothesis. Two types of Decision Description (DD) data are available to test this hypothesis. The first data set consists of a subject's choice of a single model description for each product. The second data set relate that choice to the predictive ability of that model. A significant models main effect for the first data set implies that a certain model, or models, was chosen with greater frequency than would be expected by chance. A significant models main effect for the second data set suggests that at least one of the models chosen most descriptive predicts actual choice with greater frequency than would be expected by chance.

**Hypothesis 5:** The evaluation models will differ in predictive ability for each actual set of brands.

External validity is an important consideration in laboratory research. While this issue is not completely resolved in this study, some insights may be gained from actual choice data. If the findings for actual choice data support the disguised brand results, then some external validity is demonstrated. Since
consistent differences have been reported favoring weighted linear and/or the lexicographic models, it is expected that differences will be manifested for actual choice data.

A three factor (attributes x brands x models) analysis of variance design with repeated measures on the models factor is used. A significant models main effect for CA data implies that predictive ability differs among the evaluation models.

The conventional .05 significance level is used throughout this study. If significance differences are observed in any of the analyses of variance, the Newman-Kuels procedure is used to determine the nature of those differences (Winer, 1962).

Procedure

The study was conducted in a private room in the Ohio Union on the campus of The Ohio State University. The task facing the subjects dictated the arrangement of the experimental room. The study required that subjects make judgments about four, seven, or ten brand stimuli. Since these stimuli were printed on 5x8 cards, a reasonable amount of work space was necessary for each subject. Furthermore, if subjects could see the brand stimuli of other subjects, then the objective of the study might be obvious. Therefore, approximately 15 square feet of work space was provided for each subject. In addition, partitions were placed
so that visual access among subjects was completely restricted. A diagram of the experimental room is shown in Figure 7.

Results from the pretest indicated that the maximum completion time in the most strenuous condition (7 attributes-10 brands) was 49 minutes. Therefore, one hour was scheduled for each experimental group.

Subjects were randomly assigned to treatment conditions. Before subjects were brought into the room, experimental materials were placed in each workspace. Individual name tags were placed on each set of materials. Subjects were escorted into the room and asked to find their name tags and be seated.

The experimenter told the subjects that the study consisted of working through the printed materials in front of them. The following specific instructions were given to each group. First, subjects were told that all specific directions were contained in the materials. Subjects were asked to raise their hands for assistance any time the instructions were not clear. Second, pretest results showed that completion time varied substantially across treatment conditions. That is, instruments for treatments with few attributes and requiring few judgments took less time to finish. Therefore, subjects were informed that everyone was doing something different and were told not to be concerned if others finished while they were still
Figure 7. A diagram of the experimental room.
Finally, subjects were asked not to talk with anyone about the study until all subjects were tested.

At this point, subjects were asked to begin. When a subject completed the instrument, the experimenter quickly checked the materials for completeness. When omissions were discovered, the subject was asked to return to his seat to complete the instrument. If the instrument was complete, the experimenter noted the brand of toothpaste chosen by the subject. The subject was given a medium size tube of that brand of toothpaste and thanked for his participation. The subject was then escorted from the room. When the last subject in the group was finished, the room was readied for the next group.

Data were collected over a four day period. After this data collection period, 18 subjects were questioned individually about various aspects of the study. Specific questions concerned the task involvement of the subjects, perceived objectives of the study, and comprehension of the data collection instrument.

All subjects indicated that a high degree of task involvement had occurred. Additionally, none of these subjects had discerned the objectives of the study. Finally, while a high level of comprehension was evidenced for most items in the instrument,
it was clear that many of these subjects did not understand the description of the conjunctive model. This misinterpretation must be considered in the analysis of Hypothesis 4 in Chapter IV. When these individual interviews were completed, all experimental subjects were told about the objectives of the study during class sessions the following week.

Summary

In this chapter, elements of the research methodology were discussed. These elements included descriptions of subjects, research variables, and research procedures.

After data collection activities were completed, data were edited and analyzed in accordance with the procedures developed in this chapter. The results of these analyses are discussed in the following chapter.
CHAPTER IV
RESULTS

In this chapter, the results of this study are presented. Initially, subject data are discussed. The total number of subjects available for analysis are identified in this section. Then, the research hypotheses are analyzed. Each hypothesis is stated and then appropriate evidence is summarized. Based on these data, the hypothesis is either accepted or rejected.

Subject Data

One hundred sixty-seven subjects provided usable responses. Table 4 shows the number of subjects in each treatment condition. From these treatment totals, subjects failing to meet the purchase frequency and brand familiarity criteria for each product were eliminated. The number in each treatment condition failing these criteria for each product are also shown in Table 4. Therefore, 167, 165, and 153 subjects were available for the toothpaste, deodorant, and toilet tissue analyses respectively.

This final subject pool resulted in unequal cell sizes for each product analysis. In order, maximum and minimum cell sizes for deodorant, toothpaste, and toilet tissue were 20 and 17, 20 and 18, and 18 and 15.

78
Table 4

Number of Subjects in Each Treatment and Number Failing Both Qualification Criteria

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>Deodorant</th>
<th>Toothpaste</th>
<th>Toilet Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
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<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
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<td>0</td>
<td>2</td>
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<td>6</td>
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<td>1</td>
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<tr>
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<td>0</td>
<td>1</td>
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<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>18</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
Since analysis of variance is the primary research tool in this study, two alternative approaches were possible. The first approach is to use a nonorthogonal analysis of variance algorithm. This technique places no restrictions on cell sizes across treatment conditions. An alternative approach is to use traditional orthogonal analyses of variance procedures. This technique requires that equal cell sizes be achieved through randomly dropping subjects from cells with larger number of observations.

Both orthogonal and nonorthogonal analyses were performed. Since no major differences were found, orthogonal results are reported for Hypotheses 1-4. Hypothesis 5, however, required the use of a nonorthogonal solution.

Hypothesis Testing

The five research hypotheses are tested in this section. A similar procedure is followed for each hypothesis. The hypothesis is stated and the testing procedure is outlined. Then, appropriate data are discussed. Finally, these data are briefly summarized, and the hypothesis is accepted or rejected accordingly.

Throughout this discussion, abbreviations are used to denote specific evaluation models. These abbreviations include LU (unweighted linear), LW (weighted linear), C (conjunctive), LEX (lexicographic), and LS (lexicographic semi-order).
Hypothesis 1: The evaluation models will differ in predictive ability for each of disguised set of brands.

A three factor analysis of variance (attributes x brands x models) with repeated measures on the models factor was computed for each predictive measure and each product category. A significant models main effect in each of these analyses indicates the evaluation models differ on that predictive measure. The results of these analyses are summarized in Table 5.

When first choice accuracy was used as the dependent variable, a significant models main effect was observed for all three product categories. Investigation of these significant main effects indicated a moderate degree of similarity across product categories. Mean first choice accuracy values and model comparisons based on these values are reported in Table 6.

For disguised brands of toothpaste, the LS, LEX, and LW models were significantly higher in first choice accuracy than the C and LU models. No significant differences were observed among the LS, LEX, and LW models or the C and LU models.

For disguised brands of deodorant and toilet tissue, differences among the models were more pronounced. The LS and LW models had the highest first choice accuracy for deodorant. The LEX, C, and LU models ranked third, fourth, and fifth, respectively. The LW model was highest in first choice accuracy for toilet tissue, while the LS
Table 5
Summary of the Evaluation Model Main Effects for the Three Predictive Ability Measures

<table>
<thead>
<tr>
<th>Disguised Brands</th>
<th>$F^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Choice Accuracy</strong></td>
<td></td>
</tr>
<tr>
<td>Toothpaste</td>
<td>6.80**</td>
</tr>
<tr>
<td>Deodorant</td>
<td>19.84**</td>
</tr>
<tr>
<td>Toilet Tissue</td>
<td>15.75**</td>
</tr>
</tbody>
</table>

| **Critical Paired Comparisons** |         |
| Toothpaste              | 40.54** |
| Deodorant               | 51.85** |
| Toilet Tissue           | 29.92** |

| **Rank Order Accuracy** |         |
| Toothpaste              | 35.50** |
| Deodorant               | .03    |
| Toilet Tissue           | .10    |

$^a$ Degrees of freedom associated with toothpaste, deodorant, and toilet tissue were (4, 612), (4, 576), and (4, 504) respectively.

** $p < .01$. 
Table 6
Summary of Mean FCA Values and Model Comparisons for the Three Product Categories

<table>
<thead>
<tr>
<th>Rank</th>
<th>Evaluation Models</th>
<th>Mean FCA</th>
<th>Model Comparisons&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Toothpaste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LS</td>
<td>.51</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LEX</td>
<td>.51</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LW</td>
<td>.50</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>.35</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>LU</td>
<td>.34</td>
<td>-</td>
</tr>
</tbody>
</table>

|      | Deodorant         |          |                               |
| 1    | LS                | .56      | .01  .01  .01                |
| 2    | LW                | .55      | .01  .01  .01                |
| 3    | LEX               | .46      | .05  .01                      |
| 4    | C                 | .39      | .01                          |
| 5    | LU                | .18      | -                             |

|      | Toilet Tissue     |          |                               |
| 1    | LW                | .65      | .05  .01  .01  .01            |
| 2    | LS                | .59      | .01  .01  .01                |
| 3    | C                 | .41      | .05                          |
| 4    | LEX               | .37      | .05                          |
| 5    | LU                | .33      | -                             |

Note: Maximum FCA = 1.00

<sup>a</sup>The Newman-Keuls procedure was used for all model comparisons.

<sup>b</sup>The presence of a probability figure denotes that the mean FCA for the row evaluation model is significantly larger than the mean FCA for the column model at the indicated level. If no probability figure appears, the models are not significantly different.
model was ranked second. The C and LEX models were not significantly different, while the LU model was ranked last.

Significant models main effects were also observed for all product categories when critical paired comparisons data were analyzed. The nature of these differences was the same for all products. A significantly greater number of correct critical pairs predictions were indicated for the LEX, LS, and LW models. However, no differences were observed among these models. Additionally, the C model was superior to the LU model. These data are shown in Table 7.

Finally, when rank order accuracy data were considered, a significant models main effect was found for disguised brands of toothpaste only. As shown in Table 8, the LW model was superior in rank order accuracy when compared with the remaining models. No other differences among the models was observed.

Data in Appendix D (Tables 14, 15, and 16) show that in most cases, the five evaluation models predict significantly better than random choice models. However, data reported above indicate consistent predictive differences favoring the LW, LEX, and LS models.

Few differences were found among these models. In addition, the C model usually was superior in predictive ability to the LU model. These results were consistent across product categories.
Table 7
Summary of Mean CPC Values and Model Comparisons for the Three Product Categories

<table>
<thead>
<tr>
<th>Rank</th>
<th>Evaluation Models</th>
<th>Mean CPC</th>
<th>Model Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Toothpaste</td>
<td>LEX</td>
<td>LW</td>
</tr>
<tr>
<td>1</td>
<td>LEX</td>
<td>3.86</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LW</td>
<td>3.83</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LS</td>
<td>3.83</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>3.32</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>LU</td>
<td>2.59</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Deodorant</td>
<td>LS</td>
<td>LEX</td>
</tr>
<tr>
<td>1</td>
<td>LS</td>
<td>3.76</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LEX</td>
<td>3.73</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LW</td>
<td>3.67</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>3.42</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>LU</td>
<td>2.29</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Toilet Tissue</td>
<td>LS</td>
<td>LW</td>
</tr>
<tr>
<td>1</td>
<td>LS</td>
<td>3.87</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LW</td>
<td>3.83</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LEX</td>
<td>3.76</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>3.59</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>LU</td>
<td>2.79</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Maximum CPC = 5.00

The presence of a probability figure denotes that the mean CPC for the row evaluation model is significantly larger than the mean CPC for the column model at the indicated level. If no probability figure appears, the models are not significantly different.
Table 8
Mean ROA Values and Model Comparisons for Toothpaste

<table>
<thead>
<tr>
<th>Rank</th>
<th>Evaluation Models</th>
<th>Mean ROA</th>
<th>Model Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LW</td>
<td>1.18</td>
<td>- .01^b .01 .01</td>
</tr>
<tr>
<td>2</td>
<td>LS</td>
<td>.00</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LEX</td>
<td>-.01</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>-.01</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>LU</td>
<td>-.03</td>
<td>-</td>
</tr>
</tbody>
</table>

^a Each rank order correlation coefficient was converted to a standard score by subtracting the mean correlation coefficient and dividing the remainder by the standard error of the mean. The mean ROA value represents the average standardized rank order correlation coefficient for each evaluation model.

^b The presence of a probability figure denotes that the mean ROA for the row evaluation model is significantly larger than the mean ROA for the column model at the indicated level. If no probability figure appears, the models are not significantly different.
The rank order accuracy data were less clear. While differences were found for toothpaste, no differences were observed for deodorant and toilet tissue. Several potential explanations of these results are possible. One explanation is that the evaluation models do not differ in ability to predict rank order accuracy. This position implies that the significant finding for toothpaste is attributable to chance. A second explanation is that rank order accuracy among evaluation models is product specific. That is, the predictive ability of evaluation models differs for toothpaste, but not for deodorant or toilet tissue.

The unanimous differences among evaluation models for first choice accuracy and critical paired comparisons data across products militate against either of these explanations. Rather, these findings may reflect the greater information processing activity required by the rank order accuracy task. Ranking an entire set of brands is a more difficult task than selecting a most preferred brand or choosing among two brands. This increased information processing requirement may result in a substantial number of random assignments for moderate or large brand sets. This type of behavior is an explanation of the observed rank order accuracy results.

Overall, clear predictive differences among the five evaluation models are apparent. Therefore,
Hypothesis 1 is accepted. The evaluation models do differ on the predictive ability measures for each of the disguised sets of brands.

Hypothesis 2: The predictive ability measures do not differ across the three product categories.

A four factor analysis of variance (attributes x brands x models x products) with repeated measures on the products and models factors was performed for each predictive ability measure. A significant products main effect for each analysis indicates predictive ability differences among the products.

The $F$ values for first choice accuracy and critical paired comparisons data were $F(2,252) = 1.03$ and $F(2,252) = 1.91$, respectively. These values were not significant. However, the products main effect for rank order accuracy was significant, $F(2,252) = 4.52$, $p < .05$. An inspection of means showed that rank order accuracy for deodorant was higher than rank order accuracy values for toothpaste and toilet tissue. Absolute differences among these means were not significant, however.

Again, conflicting results were observed for the predictive ability measures. No differences among products were indicated for first choice accuracy and critical paired comparisons, while rank order accuracy data suggested higher predictive accuracy for more risky products (deodorant).
In the previous section, the information processing requirements of the ranking task were discussed. It was suggested that ranking a moderate or large number of brands may result in random choices among lower ranked brands. The extent of these random choices, however, may be product dependent. For more risky products, fewer random choices should be expected.

While ranking moderate or large sets of brands may result in product differences, no consistent predictive differences were observed among the products. Therefore, Hypothesis 2 is accepted. The predictive ability measures did not differ for the three product categories.

**Hypothesis 3**: Specific evaluation models will differ in predictive ability across decisional environments for each disguised set of brands.

A two factor analysis of variance (attributes x brands) was computed for each evaluation model and predictive ability measure. A significant attributes x brands interaction effect indicates that the particular evaluation model being investigated does not predict equally well in all decisional environments.

Nine separate analyses were conducted for each model. Main effects data are presented in Appendix D (Tables 12 and 13). Interaction data are summarized in Table 9. Only significant interaction effects are discussed for each evaluation model. A graphical analysis is included in Appendix C. The reader desiring specific
Table 9
Summary of the Attributes x Brands Interactions
Effects for the Three Predictive Ability Measures

<table>
<thead>
<tr>
<th>Disguised Brands Evaluation Models</th>
<th>Predictive Measures</th>
<th>FCA</th>
<th>ROA</th>
<th>CPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LU</td>
<td>6.40**</td>
<td>5.82**</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>LW</td>
<td>3.32*</td>
<td>5.82**</td>
<td>1.99</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1.40</td>
<td>2.43</td>
<td>2.76*</td>
<td></td>
</tr>
<tr>
<td>LEX</td>
<td>1.18</td>
<td>1.57</td>
<td>1.47</td>
<td></td>
</tr>
<tr>
<td>LS</td>
<td>1.90</td>
<td>3.37*</td>
<td>2.21</td>
<td></td>
</tr>
<tr>
<td>LU</td>
<td>1.87</td>
<td>3.16*</td>
<td>2.92*</td>
<td></td>
</tr>
<tr>
<td>LW</td>
<td>0.08</td>
<td>0.48</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.74</td>
<td>0.48</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>LEX</td>
<td>1.13</td>
<td>2.82*</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>LS</td>
<td>2.33</td>
<td>1.79</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>LU</td>
<td>10.54**</td>
<td>7.59**</td>
<td>8.46**</td>
<td></td>
</tr>
<tr>
<td>LW</td>
<td>2.03</td>
<td>1.68</td>
<td>2.79*</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.76</td>
<td>1.60</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>LEX</td>
<td>3.80**</td>
<td>3.68**</td>
<td>4.34**</td>
<td></td>
</tr>
<tr>
<td>LS</td>
<td>2.24</td>
<td>0.87</td>
<td>1.82</td>
<td></td>
</tr>
</tbody>
</table>

The data in this table are F ratios associated with the attributes x brands interaction for each analysis. Degrees of freedom appropriate for the toothpaste, deodorant, and toilet tissue analyses were (4,612), (4,676), and (4,504), respectively.

*  $p < .05$

**  $p < .01$
information concerning a particular interaction will be referred to the appropriate appendix exhibit.

Unweighted Linear Model. As discussed in Chapter III, it was expected that the LU model would show considerable variation in predictive ability across decisional environments. The reasoning behind this expectation was that as the number of brands and attributes increase, the information processing demands on an individual increase substantially. Seven significant interaction effects shown in Table 9 support this expectation. In the explanation that follows, only significant interaction effects are discussed.

Significant FCA interactions were observed for toothpaste and toilet tissue brands. The nature of these interactions were the same for both product categories (See Appendix C, Figures 8 and 9). When four alternatives were considered, FCA was significantly higher for seven attributes. For ten alternatives, three attributes resulted in the largest FCA. These data suggest that when a small number of alternatives (4) is considered, the use of a moderate (5) or large (7) number of attributes is not overly stressful. As the number of alternatives increase, however, the use of even a moderate number of attributes is not practical.

Significant ROA interactions were observed for all three product categories (See Appendix C, Figures 10, 11, and 12). Once again, toothpaste and toilet tissue
exhibit a high degree of similarity. When four alternat­ives were considered, a moderate (5) or large (7) number of attributes resulted in the highest ROA. As the number of alternatives was increased to ten, ROA was highest for a small (3) number of attributes. These results are consistent with the FCA data.

However, ROA for deodorant brands shows opposite results. That is, highest ROA for four alternatives was observed when three attributes were considered. For ten brands, no difference among the attribute conditions was observed, even though substantial variation in processing complexity is implied.

Finally, consistent results were observed when the two significant interactions for CPC data were analyzed (See Appendix C, Figures 13 and 14. For a small (4) number of toilet tissue brands, the highest CPC was recorded for a moderate (5) or large (7) number of attributes. When ten brands were considered, the highest CPC was observed for three attributes. The opposite findings were recorded for deodorant brands. In the four brand condition, three attributes resulted in the highest CPC. When ten alternatives were considered, the highest CPC value was found for seven attributes.

All predictive data for toilet tissue and toothpaste brands were consistent. Specifically, when a small number of alternatives is considered, a large amount of attribute information can be processed efficiently. Similarly,
for large sets of alternatives, only a small number of attributes can be processed effectively. These results are in agreement with original expectations.

For deodorant brands, however, ROA and CPC data reflect opposite results. That is, for a small number of brands (4), a small number of attributes (3) resulted in highest predictive ability. For a large number of brands (10), a large number of attributes (7) was most effective.

To some extent, these results may reflect confounding within the study. Specific attributes are confounded within treatment conditions. That is, attributes were assigned on a non-random basis to the three and five attribute conditions. The specific attributes assigned to the three attribute condition were all above average in importance. Therefore, a greater efficiency could have been achieved from a small amount of information. However, this confounding explanation cannot account for the finding that the use of seven attributes resulted in significantly higher predictive ability (CPC) or no difference (ROA). A plausible explanation of these findings is that as more risky decisions are entertained, a wider range of attribute salience is evidenced. That is, individuals consider a larger number of attributes in making a more risky decision. Therefore, more available information (not necessarily all information) is processed by individuals for more risky decisions.
The large number of significant interactions indicates that the LU model does not predict uniformly in all decisional environments. However, the nature of these differences vary across product categories.

**Weighted Linear Model.** The LW model requires that all attributes be considered for each alternative. Thus, there is a direct relationship between information processing complexity and the number of alternatives and attributes. However, the addition of the importance weighting parameter may moderate this effect. For example, a very low importance weight may indicate to the decision maker that this attribute can be ignored. To the extent that this occurs, processing complexity will not increase as rapidly across decisional environments. Therefore, while some differences in predictive ability should be expected, there should be fewer than for the LU model. The data support this explanation.

Significant FCA and ROA interaction effects were observed for disguised brands of toothpaste (See Appendix C, Figures 15 and 16. In each case, these effects were consistent with LU toothpaste data. That is, for a small (4) number of alternatives, a moderate (5) or large (7) number of attributes produced the highest predictive ability. Conversely, for a large (10) number of alternatives, a small (3) number of attributes result in the highest predictive ability.
Data are less clear for the CPC interaction for toilet tissue brands (See Appendix C, Figure 17. When ten alternatives were considered, three attributes resulted in the highest predictive ability. For four alternatives, a moderate (5) number of attributes produced the highest CPC value, but no differences were observed in the ten and three attribute conditions. This is not a serious departure from the LU data for these brands. That is, when a choice is required from a small set of alternatives, a relatively large number of attributes may be used. For large alternative sets, however, only a small number of attributes is used effectively.

In comparison with the LU model, fewer significant interactions were found for toothpaste and toilet tissue, and no significance was observed among deodorant brands. These findings highlight the ability of the LW model to lessen decision process complexity across decisional environments. If an individual can weight attributes to reflect personal salience, then even a small amount of information can be tailored to the situation. As more attributes are considered, low attribute salience implies that this specific attribute has little impact on choice. Therefore, that information can be effectively omitted and the decision process simplified greatly.
Since this ability to simplify the decision process depends upon a familiarity with a range of attributes, it is reasonable to expect that this ability is more developed in risky situations. The absence of significant interactions for deodorant brands supports this conclusion. However, this explanation also implies that the largest number of significant interactions should be observed for toilet tissue brands. This was not the case. However, in debriefing sessions, it was clear that most subjects considered softness, absorbency, and strength as the most salient attributes. Apparently, many subjects were assigning very high weights to these attributes and very low weights to the remaining attributes. Therefore, the complexity of the process was reduced. For toothpaste brands, a greater variety of salient attributes was observed. In this case, complexity was reduced, but to a lesser extent.

*Conjunctive Model.* Since the C model implies comparing all alternatives with criterial values on all attributes, it was expected that predictive ability would decline across decisional environments. However, only the CPC interaction for toothpaste brands was significant (See Appendix C, Figure 18). More specifically, for a small (4) number of alternatives, a small (3) number of attributes resulted in the highest CPC. For ten brands, seven attributes was most effective.
Therefore, the expectation concerning this model was not supported.

One potential explanation for this unconfirmed expectation concerns the application of the C model in decision situations. Alternatives are eliminated from consideration if even one criterial value is not met. Therefore, it is not necessary that all attributes be considered for all unacceptable alternatives. Rather, it should be expected that individuals, when confronted with a large number of alternatives and attributes, will develop heuristics to identify these unacceptable alternatives as quickly as possible. The implication of these findings is that the predictive ability of the C model may not be adversely affected by increasingly complex decision environments.

**Lexicographic Model.** The LEX model assumes that all alternatives are compared along the most important attribute. The process terminates when a single alternative remains or all attributes have been exhausted. Since this evaluation process does not require that all attributes be considered, predictive ability of this model should not be affected across diverse decisional environments. The data do not support this expectation.

Significant effects for all predictive ability measures were observed for brands of toilet tissue (See Appendix C, Figures 19, 20, and 21). In each case, the nature of the interaction was the same. That is, when
four alternatives were considered, five attributes resulted in the highest predictive ability. For ten brands, no significant differences were observed between three and five attributes.

Apparently, LEX is not a simple evaluation strategy for low risk products. It was stated previously that debriefing sessions indicated three salient attributes for toilet tissue. Within this set, however, there was no indication that a hierarchy of these attributes was well developed (that is, all weights were approximately equal). Therefore, the choice of a first comparison attribute may contain a random element. The implication of this explanation is that as a product risk increases, the hierarchical attribute structure should become better developed.

This explanation does not account for ROA interaction for deodorant brands (See Appendix C, Figure 22). Specifically, when four alternatives were considered, seven attributes resulted in the highest ROA. For ten brands, no significant differences in ROA were observed across attribute conditions. This finding suggests that for a ranking task, LEX model may require the use of a large number of attributes.

The LEX model exhibited greater variation in predictive ability across decision environments than was expected. Specifically, the greatest differences in predictive ability were observed for the low risk
product category. It is apparent from these data that the LEX model is not a simple evaluation strategy to apply in all situations.

**Lexicographic Semi Order Model.** The LS model differs from the LEX model in one important respect. Alternatives are eliminated only if they are rated lower on the attribute of interest by more than some prescribed amount. In comparison to the LEX model, this evaluation process implies that the consideration of more attributes may be necessary. Because of this increased information processing requirement, therefore, it was expected that the LS model would evidence at least moderate variation in predictive ability across decisional environments.

Again, the data do not support this expectation. Only the ROA interaction for brands of toothpaste was significant (See Appendix C, Figure 23). Specifically, when a small (4) number of alternatives was considered, a moderate (5) number of attributes resulted in the highest ROA. For a large (10) number of brands, a small (3) number of attributes was most effective.

This lack of significant differences indicates that the predictive ability of the LS model is not adversely affected in diverse environments. These results contrast sharply with LEX model results. One explanation for these differences relates to the
number of salient attributes considered. The debriefing sessions indicated that multiple attributes were considered of some importance by most individuals. Even though these attributes are hierarchically ordered, an alternative that is "close" on the most salient attribute and far superior on the next attribute is a desirable alternative. In this situation, LEX and LS make different predictions. The greater predictive stability exhibited in these data support the LS conceptualization.

Summary. Overall, these data support the hypothesis that the evaluation models differ in predictive ability across decisional environments. Therefore, Hypothesis 3 is accepted.

The data, nevertheless, revealed that expected performance differed among the models. As expected, the LU model differed substantially across decisional environments. However, performance of LW, C, and LS differed to a lesser extent, while the LEX model differed more than expected. These data seem to show that evaluation models are adaptable to the information processing demands of the decisional environments studied.
Hypothesis 4. The evaluation models will differ in descriptive ability for each of the disguised sets of brands.

A three-factor analysis of variance (attributes x brands x models) was calculated for data sets 1 and 2 for each disguised set of brands. Data set 1 consists of a subject's choice of a single model description for each product. Also, subjects were given the opportunity to indicate that none of these five evaluation strategies were used. The choice of one of these alternatives was scored one, and all other alternatives were scored zero. These data were then summed over all subjects. A significant models main effect for these data indicates that a particular evaluation model or models was chosen as most descriptive with greater frequency.

Data set 2 attempted to relate descriptive ability with predictive ability. More specifically, if the model chosen as most descriptive by each subject correctly predicted first choice, it was scored one. All other models were scored zero. These data were also summated across subjects. A significant models main effect for this data set suggests that at least one of the "most descriptive" evaluation models predicts actual choice with greater frequency than expected by chance.

As revealed in Table 10, evaluation model main effects for each of the product categories in data set 1 were significant. In each case, the nature of the significance is the same. These data are reported in Table 11.
Table 10
Summary of the Evaluation Model
Main Effects for DD Measure: Data Set 1a

<table>
<thead>
<tr>
<th>Disguised Brands</th>
<th>( F^b )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deodorant</td>
<td>20.99**</td>
</tr>
<tr>
<td>Toothpaste</td>
<td>23.24**</td>
</tr>
<tr>
<td>Toilet tissue</td>
<td>8.95**</td>
</tr>
</tbody>
</table>

aData Set 1 consists of a subject's choice of a single evaluation model description for each product.

bDegrees of freedom associated with each product category are (5,805).

** \( p < .01 \)
Table 11

Summary of Mean DD Values and Model Comparisons for Data Set 1

<table>
<thead>
<tr>
<th>Rank</th>
<th>Evaluation Models</th>
<th>Mean DD</th>
<th>Model Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LW</td>
<td>LS</td>
</tr>
<tr>
<td></td>
<td>Deodorant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LW</td>
<td>3.67</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LS</td>
<td>2.32</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LEX</td>
<td>1.65</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>LU</td>
<td>.57</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>None</td>
<td>.54</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>.26</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Toothpaste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LW</td>
<td>3.87</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LS</td>
<td>2.32</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LEX</td>
<td>1.47</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>LU</td>
<td>.52</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>None</td>
<td>.49</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>.32</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Toilet Tissue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LW</td>
<td>2.87</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>LS</td>
<td>2.11</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>LEX</td>
<td>1.37</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>LU</td>
<td>1.25</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>None</td>
<td>.98</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>.43</td>
<td>-</td>
</tr>
</tbody>
</table>
The LW model was perceived as most descriptive. While no significant comparisons were observed among the remaining models, the ordering in terms of descriptive ability was the same for each product. In order, the LS, LEX, LU, none, and C models were ranked second through sixth on this measure.

The relatively poor performance of the C model deserves mention. Eighteen subjects were questioned about all aspects of the study after data were collected. Data from these debriefing sessions indicated that eleven of these subjects did not understand fully the paragraph description for the C model. Therefore, it is possible that this poor performance is explained largely by faulty instrumentation rather than actual model differences.

Data set 2 related descriptive ability to predictive ability. More specifically, the predictive efficacy of the most descriptive model was ascertained. However, since 32% to 43% of the subjects selected the LW as most descriptive, then, the LW model should be higher on this measure by chance alone. However, when these effects are controlled for in data set 2, no significant differences were found.

Data set 1 was the primary descriptive ability measure. These data indicated that descriptive ability was highest for the LW model. In addition, consistent differences across products were observed among the remaining models.
Based on these findings, Hypothesis 4 should be accepted. The evaluation models are different on the decision description measure for disguised brands of toothpaste, deodorant, and toilet tissue.

**Hypothesis 5**: The evaluation models will differ in predictive ability for each actual set of brands.

A three factor analysis of variance (attributes x brands x models) with repeated measures on the models factor was computed for each product category. A significant models main effect for each product suggests that the evaluation models differ in ability to predict actual brand choice.

Experimental conditions for the actual choice situation were identical initially to the disguised choice situation. That is, subjects were presented with the same attributes and the same number of brands. However, some subjects were not familiar with all the actual brands presented to them. Therefore, the effective consideration set for these subjects differed from subjects who responded to all the brands. To maintain the original experimental conditions, subjects failing to respond to all the brands in the consideration set were omitted from these analyses.

Because of the high attrition rate in the ten brand condition for each product, an equalization of cells strategy was not feasible. Therefore, a non-orthogonal algorithm was employed. More specifically, an unweighted means analysis was performed on all data (Winer, 1962, pp. 374-378).
Conventional levels of significance were not observed for any of the models main effects. However, borderline results were found for actual brands of toothpaste and deodorant.

For brands of toothpaste, the analysis of variance indicated a marginally significant models effect, $F (4, 428) = 2.07, p < .09$. An investigation of model differences showed that the LW model had the highest predictive accuracy. The C, LS, LEX, and LU models were ranked second through fifth, respectively.

These results are not identical with disguised brand findings. For predictive ability measures, LW, LS, and LEX models performed at approximately the same level. These models were consistently superior to the C and LU models. For CA data, the performance of the LW, LS, and LEX models are, again, similar. However, the relative performance of the C model improves substantially.

The predictive efficacy of the evaluation models for actual and disguised brand data are more similar when brands of deodorant are considered. Again, a marginal models effect was observed, $F (4, 348) = 2.29, p < .06$. An analysis of absolute model predictive differences indicated that the LS model had the highest predictive accuracy. In order, the LEX, LW, C, and LU models were ranked second, third, fourth, and fifth.
For FCA data, the ranking of the LW and LEX models was reversed. Otherwise, the CA rank order is in agreement with the FCA and CPC rank order data.

The improved performance of the C model for toothpaste, but not for deodorant is difficult to explain. A potential explanation is that toothpaste brand advertising emphasizes a fairly broad range of benefits. For example, benefits such as decay prevention, whiteness, taste, and breath freshness are advertised regularly. Given this high degree of exposure, therefore, the probability that expectations or minimum criterial values will be developed on these attributes is relatively high. Most deodorant brand advertising stresses a more limited range of benefits (e.g., dryness). Therefore, since exposure is limited to a narrower range of attributes, the probability that minimum criterial values will be developed for all attributes is less.

These marginally significant results for toothpaste and deodorant provide some support for the disguised data findings. However, since conventional levels of significance were not reached, Hypothesis 5 cannot be accepted.

Summary

The five research hypotheses were tested in this chapter. Hypotheses 1, 2, 3, and 4 were accepted. Hypothesis 5 was not accepted. In addition to testing
each hypothesis in a statistical sense, explanations of observed differences were provided. In the following chapter, the conclusions and implications of this research are discussed.
CHAPTER V
SUMMARY AND CONCLUSIONS

In this concluding chapter, a summary of results, and conclusions based on these results, are presented. Then, managerial implications of these data are discussed. Finally, some future research areas are explored.

Summary of Results

The objective of this research was to ascertain the relative predictive and descriptive ability of five compensatory and noncompensatory evaluation models and to determine the effectiveness of each of these models in different decisional environments. A summary of the findings of this research relative to this objective is discussed below.

Both predictive and descriptive differences were observed among the evaluation models. When disguised brands were used, predictive measures were highest for the lexicographic semi-order, weighted linear, and lexicographic models. While few significant differences were observed among these models, the direction of differences consistently favored the lexicographic semi-order and weighted linear models. The conjunctive and unweighted linear models ranked fourth and fifth, respectively. The conjunctive model was usually significantly higher than the unweighted linear model.
in terms of predictive ability.

The prediction of actual choice yielded only marginally significant results for brands of deodorant and toothpaste. A pattern similar to the disguised brand results emerged. In both analyses, highest predictive accuracy was observed for the lexicographic semi-order, weighted linear, and lexicographic models. However, the predictive performance of the conjunctive model improved substantially for toothpaste brands, while the weighted linear model performed at approximately the same level for both products.

These predictive findings are in agreement with Russ (1971a), Perreault and Russ (Note 1), and Park (Note 2), but not Pras and Summers (1975). Pras and Summers investigated automobile brand choice behavior. Since the purchase of automobiles is not a routine brand choice for most people, differences should not be unexpected.

Descriptive differences among the models were less clear. Highest decision description values were observed for the weighted linear model. In addition, the lexicographic models were ranked second and third, respectively. These results are in agreement with the prose description approach used by Wright (1975) and Perreault and Russ (Note 1). However, different findings were achieved by Russ (1971a) using a protocol approach. Perhaps, prose descriptions and protocols
are not complimentary techniques.

Additionally, data from this study show that these five evaluation models are not equally effective in all decisional environments. As expected, the linear unweighted model differed substantially across decisional environments. However, the performance of the lexicographic semi-order, conjunctive, and linear weighted models differed to a lesser extent, while the lexicographic model differed more than expected. These data indicate that these four evaluation models may be adapted to information processing constraints imposed by a variety of decisional environments.

Lastly, no consistent product differences were found. That is, the evaluation models predicted equally well for deodorant, toothpaste, and toilet tissue brands. Conclusions from these findings are discussed in the following section.

Conclusions

Based on these results, the central research issue is not whether compensatory models are always superior to noncompensatory models or vice versa. Rather, an important consideration is which compensatory or noncompensatory model is best in a particular situation.

Criteria for model acceptance may include both descriptive and predictive considerations. Using these criteria, the weighted linear and the lexicographic semi-order are the best compensatory and noncompensatory models, respectively.
Second, the degree to which the decisional environment was related to evaluation model performance differed among the models. The unweighted linear model was most affected. Additionally, the lexicographic and weighted linear models were moderately affected, while the conjunctive and lexicographic semi-order models were only slightly affected. When predictive and descriptive ability and effects of decisional environments are considered, the lexicographic semi-order model is superior. That is, this model should provide the best results over a range of decisional environments.

Finally, the lack of significant predictive differences among products provides some evidence that these results may be generalized to routinely purchased, low unit value goods. These results imply that theories of consumer choice need not account for product differences, at least in the range of products studied.

**Managerial Implications**

Successful marketing planning must consider the decision process used by consumers in the target segment. Since this study has investigated a key element in this process, several managerial implications are relevant.

First, these results show that the assumption of the exclusive use of linear compensatory evaluation strategies by consumers is not warranted. Rather, the appropriate task is to determine which model is most
applicable in a particular marketing environment. This issue may be decided using predictive or descriptive criteria. For example, if a marketing manager is concerned strictly with predicting brand choice, then a predictive criterion is appropriate. If, however, that manager is concerned with adopting a marketing strategy aimed at changing evaluation processes used by consumers, then both predictive and descriptive criteria are appropriate. The choice among these criteria is dependent upon the objectives of the manager. Therefore, these objectives should be clearly articulated.

The importance of choosing the most appropriate evaluation model is underscored by the fact that different evaluation models suggest the use of different marketing mixes. More specifically, product and promotional decisions may be affected by consumer evaluation procedures.

Consider the marketing implications of the following example for weighted linear and lexicographic semi-order models. A manufacturer of personal care products is considering marketing a new whitener toothpaste. Market research has indicated that although ability to whiten teeth is the most important product attribute, the degree to which a toothpaste has a pleasant taste and freshens breath is also considered. If the consumers in this market segment use a weighted linear model, the importance weight for the whitens teeth dimension should
be considerably larger than the weights for the remaining attributes. This situation implies that market success for this new toothpaste depends largely on the degree to which it is perceived as being high on the whitens teeth attribute. More specifically, the new toothpaste must be rated at least as high on this attribute as the established competition. Therefore, product planning must be oriented to that objective.

Conversely, a lexicographic semi-order model suggests different product objectives. That is, competitive parity on the whitens teeth dimension is not required. Rather, this new product must only be "close" on this dimension for a second dimension to be considered. If this evaluation situation obtains, then a viable strategy would include developing a product close to the competition in terms of whiteness and superior in terms of taste and breath freshening ability.

The particular mix chosen depends upon the evaluation model actually used in the target segment. Again, as this research shows, there is not an an priori reason to expect a compensatory strategy.

**Future Research**

Future research in this area should be concerned with two general thrusts. These areas include the improvement of the experimental methodology and the extension of this research to other decision situations. These areas are briefly discussed below.
The results of this study suggest that the experimental methodology developed to study brand choice decision making is viable. That is, the choice among a set of disguised brand profiles in a laboratory setting is an effective way to study brand choice behavior. However, future research should consider collecting the information to operationalize the evaluation models and choice data at different times. More specifically, the model data should be collected first. Then, paired comparisons of brands could be constructed such that the choice of one brand implied the use of one evaluation model while the choice of the second brand suggested a different model. The development of these crucial tests would aid in the determination of the range of applicability of each model.

In addition, more research is required on descriptive ability. The method in which consumers actually make decisions is of critical management importance. Multiple indicators of descriptive ability should aid managers in their model choice decisions. Finally, this method of studying brand choice decision making should be extended to non-student samples.

A second research thrust should seek to extend this research to other decision situations. At present, these results apply specifically to routinized purchasing of low unit value consumer goods. Generalization of these results to other decision situations
is not warranted. Therefore, an appropriate area of further research is the investigation of other products in non-routine situations. In addition, industrial as well as consumer goods should be considered.
Product Opinion Questionnaire

Uncertainty, or risk is frequently associated with the purchase of products. This risk may take several forms:

1. You are not sure that the product will be able to perform the intended task. That is, it may not work. This is called performance risk.

2. You may be concerned that other people, especially your friends, will judge you unfavorably when you use the product. This is called social risk.

3. Finally, there is some chance that the product may not be safe. That is, it may be harmful to your well being. This is called physical risk.

In this questionnaire, you will be asked to indicate your perceived degree of performance, social, and physical risk for 10 products purchased and/or used by most college students.

For each type of risk, you will be asked to rate each product on a 9 point scale that varies from 1 (little or no risk) to 9 (very high risk).

Performance Risk

Please circle the number which best represents your feeling about the performance risk of each of these products.

<table>
<thead>
<tr>
<th>little or no performance risk</th>
<th>very high performance risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. vitamins</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>2. coffee</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>3. deodorant</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>4. stereo</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>5. aspirin</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>6. toothpaste</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>7. life insurance</td>
<td>2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>8. toilet tissue</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>9. beer</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>10. tennis racket</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
</tbody>
</table>
### Social Risk

Please circle the number which best represents your feeling about the social risk of each of these products.

<table>
<thead>
<tr>
<th>Product</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>vitamins</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>coffee</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>deodorant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>stereo</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>aspirin</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>toothpaste</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>life insurance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>toilet tissue</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>beer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>tennis racket</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

### Physical Risk

Please circle the number which best represents your feeling about the physical risk of each of these products.

<table>
<thead>
<tr>
<th>Product</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>vitamins</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>coffee</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>deodorant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>stereo</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>aspirin</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>toothpaste</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>life insurance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>toilet tissue</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>beer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>tennis racket</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>
The purpose of this study is to determine how college students decide which brand to buy out of the many brands of toothpaste, deodorant, and facial tissue available.

You will be asked to provide information about your perceptions of these products. In addition, you will be asked to provide purchase preference judgments for a set of disguised national brands. You will be furnished with all the information necessary to make these judgments. All information used in this study was taken from a recent national survey of two thousand college students.

Go through the pages of this instrument at a pace that is comfortable to you. When you have completed a page, turn to the next page. DO NOT RETURN TO PAGES THAT HAVE BEEN COMPLETED.

Please be as accurate as possible in making your responses. If you have any questions, please notify the experimenter.

Brand Familiarity

There are many national brands of toothpaste, toilet tissue, and deodorant available in retail stores. We want to know how familiar you are with the variety of national brands available in each of these product categories.

For any particular product category, you are:

a. not familiar at all if you know 2 brands or less
b. slightly familiar if you know 3 or 4 brands
c. fairly familiar if you know 5 or 6 brands
d. very familiar if you know 7 or more brands

Please check one of these responses for each product category.

<table>
<thead>
<tr>
<th>Brand</th>
<th>not familiar at all</th>
<th>slightly familiar</th>
<th>fairly familiar</th>
<th>very familiar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilet tissue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toothpaste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deodorant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Now, allocate 100 points to these three dimensions according to your feeling of their importance to you.

1. Give the largest number of points to the most important dimension, the second largest number of points to the second most important dimension, and so on.

2. Give the same number of points to dimensions of equal importance.

3. Make sure that the total number of points assigned to all dimensions is equal to 100.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Number of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dispensing ease</td>
<td>_____</td>
</tr>
<tr>
<td>2. Softness</td>
<td>_____</td>
</tr>
<tr>
<td>3. Color variety</td>
<td>_____</td>
</tr>
</tbody>
</table>

TOTAL 100 points
Throughout this study, a 15 point scale will be used. All information dimensions will be presented on this scale. The sample scale below describes verbally what five positions on this scale mean.

Familiarize yourself with these short descriptions. When you feel that you are sufficiently familiar with these descriptions, go to the next section.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
no moderately average moderately highest
amount low amount high amount possible
amount

1: absolutely no amount of that dimension is present in the brand
4: a moderate amount of that dimension is present in the brand
8: an average amount of that dimension is present in the brand
12: a moderately high amount of that dimension is present in the brand
15: the highest possible amount of that dimension is present in the brand

Minimum Levels

For each information dimension, circle the number which corresponds to the minimum acceptable level that a brand of toilet tissue should have on this dimension in order for you to consider purchasing it. For example, if you give a rating of 5 for a particular dimension, it means that you would not consider purchasing any brand rated 4 or less. You would, however, consider purchasing any brand rated 5 or above on that dimension.

1. Dispensing ease 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
2. Softness 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
3. Color variety 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Toilet Tissue Information Dimensions

The information derived from the national survey of college students indicated that a set of dimensions are used in the purchase decision for toilet tissue. These dimensions are:

A. Dispensing ease: the extent to which a brand of toilet tissue unrolls without tearing.

B. Softness: the extent to which a brand of toilet tissue feels soft.

C. Color variety: the extent to which a brand of toilet tissue is available in a variety of colors.

Once you are familiar with these dimensions, go to the next section.

Ranking of Toilet Tissue Information Dimensions

In choosing among brands of toilet tissue you may include other information dimensions. For this study, however, assume you will use only the three information dimensions presented above.

Please rank these dimensions in the spaces below in order of importance to you. Write the letter designation of the dimension you think is most important opposite number 1. Next, write the letter designation of the dimension you think is second most important, and so on.

MOST IMPORTANT  1. ___

2. ___

LEAST IMPORTANT  3. ___
Toilet Tissue Brand Rankings

Please rank these disguised brands according to the likelihood that you think you would purchase them.

Write the letter designation of the brand of toilet tissue you think you would most likely purchase opposite number 1. Next, write the letter designation of the brand of toilet tissue opposite number 2 that would be your second choice, and so on.

MOST LIKELY TO PURCHASE
1. Brand ___
2. Brand ___
3. Brand ___

LEAST LIKELY TO PURCHASE
4. Brand ___

When you have completed this page, please place the cards back in the envelope and turn to the next page.
Deodorant Information Dimensions

The information derived from the national survey of college students indicated that a set of dimensions are used in the purchase decision for deodorant. These dimensions are:

A. Fragrance: the extent to which a brand of deodorant has a pleasant fragrance.

B. Lasting protection: the extent to which a brand of deodorant provides lasting protection.

C. Mildness: the extent to which a brand of deodorant is mild to the skin.

Once you are familiar with these dimensions, go to the next section.

Ranking of Deodorant Information Dimensions

In choosing among brands of deodorant, you may include other information dimensions. For this study, however, assume you will use only the three information dimensions presented above.

Please rank these dimensions in the spaces below in order of importance to you. Write the letter designation of the dimension you think is most important opposite number 1. Next, write the letter designation of the dimension you think is second most important opposite number 2, and so on.

MOST IMPORTANT 1. 
2. 

LEAST IMPORTANT 3. 
Now, allocate 100 points to these three dimensions according to your feeling of their importance to you.

1. Give the largest number of points to the most important dimension, the second largest number of points to the second most important dimension, and so on.

2. Give the same number of points to dimensions of equal importance.

3. Make sure that the total number of points assigned to all dimensions is equal to 100.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Number of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fragrance</td>
<td></td>
</tr>
<tr>
<td>2. Lasting protection</td>
<td></td>
</tr>
<tr>
<td>3. Mildness</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 100 points
Throughout this study, a 15 point scale will be used. All information dimensions will be presented on this scale. The sample scale below describes verbally what five positions on this scale mean.

Familiarize yourself with these short descriptions. When you feel that you are sufficiently familiar with these descriptions, go to the next section.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
no moderately average moderately highest
amount low amount high possible
amount

1: absolutely no amount of that dimension is present in the brand
4: a moderate amount of that dimension is present in the brand
8: an average amount of that dimension is present in the brand
12: a moderately high amount of that dimension is present in the brand
15: the highest possible amount of that dimension is present in the brand

Minimum Levels

For each information dimension, circle the number which corresponds to the minimum acceptable level that a brand of deodorant should have on this dimension in order for you to consider purchasing it. For example, if you give a rating of 5 for a particular dimension, it means that you would not consider purchasing any brand rated 4 or less. You would, however, consider purchasing any brand rated 5 or above on that dimension.

1. Fragrance

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

2. Lasting protection

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

3. Mildness

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
Deodorant Brand Rankings

Please rank these disguised brands according to the likelihood that you think you would purchase them.

Write the letter designation of the brand of deodorant you think you would most likely purchase opposite number 1. Next, write the letter designation of the brand of deodorant opposite number 2 that would be your second choice, and so on.

MOST LIKELY TO PURCHASE
1. Brand ___
2. Brand ___
3. Brand ___

LEAST LIKELY TO PURCHASE
4. Brand ___

When you have completed this page, please place the cards back in the envelope and turn to the next page.
Toothpaste Information Dimensions

The information derived from the national survey of college students indicated that a set of dimensions are used in the purchase decision for toothpaste. These dimensions are:

A. Whitens teeth: the extent to which a brand of toothpaste whitens teeth.

B. Pleasant taste: the extent to which a brand of toothpaste has a pleasant taste.

C. Non-abrasiveness: the extent to which a brand of toothpaste is not abrasive to tooth enamel.

Once you are familiar with these dimensions, go to the next section.

Ranking of Toothpaste Information Dimensions

In choosing among brands of toothpaste, you may include other information dimensions. For this study, however, assume you will use only the three information dimensions presented above.

Please rank these dimensions in order of importance to you in the spaces below. Write the letter designation of the dimension you think is most important opposite number 1. Next, write the letter designation of the dimension you think is second most important, and so on.

MOST IMPORTANT

1. ___

2. ___

LEAST IMPORTANT

3. ___
Now, allocate 100 points to these three dimensions according to your feeling of their importance to you.

1. Give the largest number of points to the most important dimension, the second largest number of points to the second most important dimension, and so on.

2. Give the same number of points to dimensions of equal importance.

3. Make sure that the total number of points assigned to all dimensions is equal to 100.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Number of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Whitens teeth</td>
<td></td>
</tr>
<tr>
<td>2. Pleasant taste</td>
<td></td>
</tr>
<tr>
<td>3. Non-abrasiveness</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 100 points
Sample Rating Scale

Throughout this study, a 15 point scale will be used. All information dimensions will be presented on this scale. The sample scale below describes verbally what five positions on this scale mean.

Familiarize yourself with these short descriptions. When you feel that you are sufficiently familiar with these descriptions, go to the next section.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>no amount</td>
<td>moderately low amount</td>
<td>average amount</td>
<td>moderately high amount</td>
<td>highest possible amount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1: absolutely no amount of that dimension is present in the brand
4: a moderate amount of that dimension is present in the brand
8: an average amount of that dimension is present in the brand
12: a moderately high amount of that dimension is present in the brand
15: the highest possible amount of that dimension is present in the brand

Minimum Levels

For each information dimension, circle the number which corresponds to the minimum acceptable level that a brand of toothpaste should have on this dimension in order for you to consider purchasing it. For example, if you give a rating of 5 for a particular dimension, it means that you would not consider purchasing any brand rated 4 or less. You would, however, consider purchasing any brand rated 5 or above on that dimension.

1. Whitens teeth
   - 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

2. Pleasant taste
   - 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

3. Non-abrasiveness
   - 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Toothpaste Brand Rankings

Please rank these disguised brands according to the likelihood that you think you would purchase them.

Write the letter designation of the brand of toothpaste you think you would most likely purchase opposite number 1. Next, write the letter designation of the brand of toothpaste opposite number 2 that would be your second choice, and so on.

Most Likely to Purchase
1. Brand ____
2. Brand ____
3. Brand ____

Least Likely to Purchase
4. Brand ____

When you have completed this page, please place the cards back in the envelope and turn to the next page.
Information Dimension Ratings

Please rate each specific brand of toothpaste, deodorant, and toilet tissue on each information dimension. Circle the number which best represents your perceptions of the amount of that dimension in that particular brand.

Remember, only your perceptions are important. Therefore, even if you are unsure, please supply a rating for each dimension. However, skip any totally unfamiliar brand.

**Brands of Toothpaste**

**Crest**
- Whitens teeth: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Pleasant taste: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Non-abrasiveness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

**Closeup**
- Whitens teeth: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Pleasant taste: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Non-abrasiveness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

**Pepsodent**
- Whitens teeth: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Pleasant taste: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Non-abrasiveness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

**Gleem**
- Whitens teeth: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Pleasant taste: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Non-abrasiveness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

**Brands of Toilet Tissue**

**Charmin**
- Color variety: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Softness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Dispensing ease: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

**White Cloud**
- Color variety: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Softness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Dispensing ease: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

**Northern**
- Color variety: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Softness: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- Dispensing ease: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
<table>
<thead>
<tr>
<th>Lady Scott</th>
<th>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color variety</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Softness</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Dispensing ease</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

**Brands of Deodorant**

### Sure

<table>
<thead>
<tr>
<th>Fragrance</th>
<th>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasting protection</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Mildness</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

### Right Guard

<table>
<thead>
<tr>
<th>Fragrance</th>
<th>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasting protection</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Mildness</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

### Secret

<table>
<thead>
<tr>
<th>Fragrance</th>
<th>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasting protection</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Mildness</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

### Ban

<table>
<thead>
<tr>
<th>Fragrance</th>
<th>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasting protection</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Mildness</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

---
Background Information

1. Check the appropriate responses:
   a. female b. 21 years old or below c. single
   ___ male ___ 22 to 26 years old ___ married
   ___ 27 years old or above

2. Check your place of residence during the current school year.
   ___ at home with parents
   ___ sorority or fraternity house
   ___ dormitory
   ___ apartment
   ___ rooming house
   ___ other (specify)

Please indicate the approximate number of times that you personally purchased each of the following products in the last year. Check one response for each product.

<table>
<thead>
<tr>
<th>Product</th>
<th>3 times or less</th>
<th>4-6 times</th>
<th>7-11 times</th>
<th>12 times or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothpaste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deodorant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet Tissue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For participating in this study, you will be given your first choice of brands of toothpaste, toilet tissue, or deodorant. For each product, please check the one brand that you would most prefer to receive. Do not check any brands with which you are totally unfamiliar.

Toilet Tissue
___ Northern
___ White Cloud
___ Lady Scott
___ Charmin

Deodorant
___ Right Guard
___ Ban
___ Sure
___ Secret

Toothpaste
___ Gleem
___ Closeup
___ Pepsodent
___ Crest
Choice Descriptions

Listed below are six (6) different strategies people use to rank brands of products.

Check the statement which most accurately represents the strategy you followed in making your brand ranking decisions for each product category.

Deodorant Toilet tissue Toothpaste

1. I observed the ratings on each dimension for each brand. Then, I attempted to average these ratings into an overall evaluation for each brand. My brand rankings were based on this average value.

2. I paid most attention to ratings on dimensions which I thought important. My evaluation was done in such a way that the rating on the most important dimension was weighted most heavily, the rating on the second most important dimension was weighted second most heavily, etc. My brand rankings were based on these weighted values.

3. For each information dimension I considered most important. For brands rated highly on this dimension, I assigned a high ranking. For brands tied on this dimension, I considered my second most important dimension. This process continued until all brands were ranked.

4. I evaluated each brand on the information dimension I considered most important. For brands rated highly on this dimension, I assigned a high ranking. For brands rated low on this dimension, I assigned a low ranking. For brands tied on this dimension, I considered my second most important dimension. This process continued until all brands were ranked.
5. I proceeded much as described in statement 4. That is, I assigned high rankings to brands rated high on my most important dimension and low rankings to brands rated low on this dimension. However, brands did not have to be tied on this dimension to consider my second most important dimension. For brands that were rated close (2 scale units or less) on my most important dimension, I considered my second most important dimension to rank those brands. This process continued until all brands were ranked.

6. I scanned over the ratings on various dimensions without paying special attention to any single dimension. However, I really don't think I used any systematic evaluation procedure.

Thank you for your cooperation. Please return the packet of materials to the experimenter.
APPENDIX C
Figure 8. The attributes-brands interaction for FCA among toothpaste brands for the LU model.

Figure 9. The attributes-brands interaction for FCA among disguised toilet tissue brands for the LU model.
Figure 10. The attributes-brands interaction for ROA among disguised toothpaste brands for the LU model.

Figure 11. The attributes-brands interaction for ROA among disguised toilet tissue brands for the LU model.
Figure 12. The attributes-brands interaction for ROA among disguised deodorant brands for the LU model.

Figure 13. The attributes-brands interaction for CPC among disguised toilet tissue brands for the LU model.
Figure 14. The attributes-brands interaction for CPC among disguised deodorant brands for the LU model.

Figure 15. The attributes-brands interaction for FCA among disguised toothpaste brands for the LW model.
Figure 16. The attributes-brands interaction for ROA among disguised toothpaste brands for the LW model.

Figure 17. The attributes-brands interaction for CPC among disguised toilet tissue brands for the LW model.
Figure 18. The attributes-brands interaction for CPC among disguised toothpaste brands for the C model.

Figure 19. The attributes-brands interaction for CPC disguised toilet tissue brands for the LEX model.
Figure 20. The attributes-brands interaction for FCA among disguised toilet tissue brands for the LEX model.

Figure 21. The attributes-brands interaction for ROA among disguised toilet tissue brands for the LEX model.
Figure 22. The attributes-brands interaction for ROA among disguised deodorant brands for the LEX model.

Figure 23. The attributes-brands interaction for ROA among disguised toothpaste brands for the LS model.
Table 12
Summary of the Attributes Main Effects for the Three Predictive Ability Measures

<table>
<thead>
<tr>
<th>Disguised Brands</th>
<th>Evaluation Models</th>
<th>Predictive Measures$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LU</td>
<td>FCA</td>
</tr>
<tr>
<td>Toothpaste</td>
<td>LW</td>
<td>.69</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>2.46</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>2.73</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>.23</td>
</tr>
<tr>
<td>Deodorant</td>
<td>C</td>
<td>2.20</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>.11</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>.11</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>.83</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>.04</td>
</tr>
<tr>
<td>Toilet Tissue</td>
<td>C</td>
<td>10.43**</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>2.80</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>.98</td>
</tr>
</tbody>
</table>

$^a$Degrees of freedom associated with toothpaste, deodorant, and toilet tissue are (1,153), (1,144), and (1,126) respectively.

* $p < .05$
** $p < .01$
### Table 13
Summary of the Brands Main Effects for the Three Predictive Ability Measures

<table>
<thead>
<tr>
<th>Disguised Brands</th>
<th>Evaluation Models</th>
<th>Predictive Measures&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FCA</td>
</tr>
<tr>
<td><strong>Toothpaste</strong></td>
<td>LU</td>
<td>4.43*</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>.54</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>2.56</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>.71</td>
</tr>
<tr>
<td><strong>Deodorant</strong></td>
<td>LU</td>
<td>3.02</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>1.92</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>7.63**</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>4.96*</td>
</tr>
<tr>
<td><strong>Toilet Tissue</strong></td>
<td>LU</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>5.28*</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>1.70</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>4.90*</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>8.96**</td>
</tr>
</tbody>
</table>

<sup>a</sup> Degrees of freedom associated with toothpaste, deodorant, and toilet tissue are (1,153), (1,144), and (1,126) respectively.

*  \( p < .05 \)

**  \( p < .01 \)
Table 14
A Comparison of Mean FCA for the Five Evaluation Models with a Random Model

<table>
<thead>
<tr>
<th>Disguised Brands</th>
<th>Evaluation Models</th>
<th>Mean FCA</th>
<th>Random Model Comparison$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothpaste</td>
<td>LS</td>
<td>.51</td>
<td>.01$^b$</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>.50</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>.35</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>.34</td>
<td>.01</td>
</tr>
<tr>
<td>Deodorant</td>
<td>LS</td>
<td>.56</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>.55</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>.46</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>.39</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>.18</td>
<td>.01</td>
</tr>
<tr>
<td>Toilet Tissue</td>
<td>LW</td>
<td>.65</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>.59</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>.41</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LEX</td>
<td>.37</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>.33</td>
<td>.05</td>
</tr>
</tbody>
</table>

$^a$For each comparison, a random FCA value of .16 is used. This value is the mean of the chance probabilities associated with each of the three brand conditions. These values are .25, .17, and .10 for the 4, 7, and 10 brand conditions respectively.

$^b$The presence of a probability figure denotes that the mean FCA value for the appropriate evaluation model is significantly larger than the mean FCA for the random model at the indicated level. If no probability figure appears, then that evaluation model and the random model are not significantly different.
Table 15
A Comparison of Mean CPC for the Five Evaluation Models with a Random Model

<table>
<thead>
<tr>
<th>Disguised Brands</th>
<th>Evaluation Models</th>
<th>Mean CPC</th>
<th>Random Model Comparison^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothpaste</td>
<td>LEX</td>
<td>3.86</td>
<td>.01^b</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>3.83</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>3.83</td>
<td>.01</td>
</tr>
<tr>
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<td>C</td>
<td>3.32</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>2.59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LS</td>
<td>2.76</td>
<td>.01</td>
</tr>
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<td></td>
<td>LEX</td>
<td>3.73</td>
<td>.01</td>
</tr>
<tr>
<td>Deodorant</td>
<td>LW</td>
<td>(3.67)</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>3.42</td>
<td>.01</td>
</tr>
<tr>
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<td>LS</td>
<td>3.87</td>
<td>.01</td>
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<td>LW</td>
<td>3.83</td>
<td>.01</td>
</tr>
<tr>
<td>Toilet Tissue</td>
<td>LEX</td>
<td>3.76</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>3.59</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>LU</td>
<td>2.79</td>
<td>.05</td>
</tr>
</tbody>
</table>

^aFor each comparison, a random CPC value of 2.50 is used. This value reflects the chance probability associated with five dyadic choices.

^bThe presence of a probability figure denotes that the mean CPC value for the appropriate evaluation model is significantly larger than the mean CPC for the random model at the indicated level. If no probability figure appears, then that evaluation model and the random model are not significantly different.
Table 16
A Comparison of Mean ROA for the Five Evaluation Models with a Random Model: Toothpaste Only

<table>
<thead>
<tr>
<th>Evaluation Models</th>
<th>Mean ROA</th>
<th>Random Score</th>
<th>Random Model Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>LW</td>
<td>1.18</td>
<td>-1.459</td>
<td>.01</td>
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<tr>
<td>LS</td>
<td>.00</td>
<td>-1.463</td>
<td>.05</td>
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<tr>
<td>LEX</td>
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<td>-1.458</td>
<td>.05</td>
</tr>
<tr>
<td>C</td>
<td>-.01</td>
<td>-1.346</td>
<td>.05</td>
</tr>
<tr>
<td>LU</td>
<td>-.03</td>
<td>-.486</td>
<td></td>
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</tbody>
</table>

\(^a\)The random score for each evaluation model represents the standard score associated with a rank order correlation of zero.

\(^b\)The presence of a probability figure denotes that the mean ROA value for the appropriate evaluation model is significantly larger than the mean ROA for the random model at the indicated level. If no probability figure appears, then that evaluation model and the random model are not significantly different.


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