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ACTUAL AND PERCEIVED REDUNDANCY IN CONSUMER INFORMATION ENVIRONMENTS

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ABSTRACT

Attribute level redundancy is identified as an important aspect of consumer information environments that may help explain limited information use by consumers. Two studies are reported which examine actual attribute redundancy as well as subjects' perceptions of attribute redundancy. Across sixty-five product categories, actual redundancy varied widely from category to category. Perceptually, within a subset of these categories, subjects were not able to identify particularly redundant attribute-pairs, attributes, or categories. The results also suggest that both the level of perceived redundancy and perceptual accuracy are systematically related to consumer knowledge and experience, and that knowledge and experience are conceptually distinct.

INTRODUCTION

Consumer decisions and decision strategies depend largely on the information environment within which decisions are made. Decision researchers have long emphasized the importance of the information environment (Brunswik 1956; Simon 1969; Einhorn and Hogarth 1981) and, for their part, consumer researchers have discussed and examined several environmental or context effects on consumer judgment and choice processes (cf. Bettman and Kakkar 1977; Bettman and Zins 1979; Russo 1977, 1981; Johnson 1980). One potentially important aspect of consumer information environments is the redundancy of product attribute information, or the correlation of values across product attributes. Theoretically, both decision and consumer researchers argue that an increase in attribute redundancy decreases the marginal value of gathering and processing information (Einhorn, Kleinmuntz, and Kleinmuntz 1979; Einhorn and Hogarth 1981; Hagerty and Aaker 1984).

Consumer research on redundancy has focused primarily on consumers' use of price as a means of judging or explaining overall product quality (Monroe

1973; Riesz 1978, 1979; Geistfeld 1982; Gerstner 1985). Generally these studies find little to no systematic correlation between prices and quality rankings. This does not, however, imply that product information environments are not redundant. Overall quality rankings, such as those taken from Consumer Reports, are subjective in nature and imply particular rules for combining multi-attribute information (Rao and Hughes 1971). Any observed relationship between price and an overall quality ranking, or lack thereof, is problematic at best. Moreover, price/quality studies do not address the redundancy among specific, nonprice attributes. As a result, focusing on overall quality rankings may obscure the true level at which redundancy operates. It may be at the attribute level where redundancy exists, is perceived, and has an effect on consumer information use. This attribute level redundancy has been relatively ignored by consumer researchers, and has only recently been studied empirically (Bettman, John, and Scott 1984).

This study examines two important initial questions regarding attribute redundancy and consumers. First, to what degree are consumer information environments redundant? Second, do consumers accurately perceive the redundant, or nonredundant, nature of attribute information? The first question explores an important factor affecting the actual marginal value of information. The second question explores perceptions that may affect the perceived value of information. The answers to these questions have important marketing and public policy implications. If, for example, attribute information is redundant and consumers perceive this, then more information may not be better. If, however, consumers perceive information as redundant when in fact it is not, the marginal value of gathering and processing may be underestimated. We begin by discussing the consumers' information environment and why redundancy, in particular, deserves research attention.

CONSUMER INFORMATION ENVIRONMENTS

Debates in public policy and marketing often center on how much information is enough. Are we providing consumers too little, enough, or too much information? Although a plethora of information is available to consumers (Miller 1978), a consistent and sometimes surprising finding is that relatively little of this information is ever gathered and used (Newman and Staelin 1972; Miller 1978; Olson and Jacoby 1972; Payne 1976; Sheluga, Jaccord and Jacoby 1979). To understand why consumers may use relatively little information, we must first understand the goals that motivate information use.

One general view is that consumers gather and use information as long as the perceived benefit of using the information exceeds the perceived cost (Johnson 1980, 1986; Ratchford 1980; Russo 1981; Shugan 1980; Thaler 1980). According to this view, consumers use relatively little information simply because the perceived cost of gathering and processing information exceeds the perceived benefit. Unfortunately, our understanding of the benefits of processing information, both real and perceived, is extremely limited (cf. Einhorn, Kleinmuntz, and Kleinmuntz 1979; Klein 1983; Ratchford 1980). This contrasts with a growing body of literature highlighting information processing costs (cf. Huber 1980; Johnson and Payne 1985; Johnson 1980, 1986; Russo 1977, 1981; Russo and Dosher 1983; Shugan 1980).

The perceived redundancy of the information available to consumers may have a very direct impact on the perceived benefit of that information and resulting information use. Very early in the study of decision making, Brunswik (1943, 1956) underscored the importance of studying attribute redundancy, or the interrelationships among the goal paths in an organism's environment (see also Postman and Tolman 1959; Einhorn, Kleinmuntz and Kleinmuntz 1979). The impact of redundancy on the objective benefits of

processing information is straightforward. As attribute redundancy increases, the marginal value of gathering and processing information decreases (Einhorn et al. 1979; Einhorn and Hogarth 1981; Hagerty and Aacker 1984). In a redundant environment, information search for a choice involving even complex, expensive products may be quite limited and still yield extremely satisfactory results. As Einhorn and Hogarth surmise, "cue (information) redundancy in the natural ecology reduces the need for attending to and evaluating large numbers of cues" (p.66). It is also possible, however, that the value of objectively nonredundant information is vastly underestimated. Consumers may perceive relationships between attributes when none, in fact, exist (Einhorn and Hogarth 1978).

Thus two quite different scenarios may either individually, or in combination, help explain the relatively sparse use of available information by consumers. First, consumers may perceive correlations among objectively unrelated attributes and, as a result, may severely underestimate the benefit of gathering and using more information when making decisions. Second, although it may be relatively easy to gather and use more information there may be very little value in doing so. Attribute information may, in fact, be very redundant and consumers may accurately perceive its low marginal value. It is important, therefore, for marketers and public policy makers to explore the extent of both actual and perceived redundancy in consumer information environments. In our first study, we look at the degree of information redundancy that exists in various product categories. We then discuss in more detail whether or not consumers are indeed able to accurately perceive attribute redundancy, and why redundancy may be overestimated. Our second study then looks directly at whether or not consumers accurately perceive redundancy both within and across a number of product categories.

STUDY ONE: ENVIRONMENTAL REDUNDANCY

Method

The goal of this first study is to examine attribute level redundancy across several consumer information environments. The data for the study were sixty-five useable brand by attribute matrices taken from the Consumer Reports 1985 Buying Guide. Usable matrices included those with more than one product attribute. Not included as attributes were overall ratings or rankings, general comments, and attributes that were a direct function of (i.e. calculated from) two or more other attributes already included (e.g. cost per roll of toilet paper is a direct function of price and number of rolls). While the attribute information in such reports is not unquestionably "true," it is the best and most objective available. (See Morris and Bronson [1969] for a discussion of the shortcomings of such data.) The use of this data is also consistent with past methodological practice (Riesz 1978, 1979; Gerstner 1985; see also Yomada and Ackerman [1984] for analysis of data from a similar source in Japan).

Although Consumer Reports may be our most objective source of attribute information, it is possible that a downward bias may exist with respect to redundancy. Inasmuch as Consumers' Union is a consumer service organization, product categories may be selected based on perceived information need. In highly redundant environments such need is minimal. Also, certain attributes presented by Consumers' Union (e.g. "comfort") may actually represent combinations of several redundant attributes. An attribute may also be so redundant that it is simply mentioned in the discussion and not included in the brand/attribute matrix. For these reasons, the redundancy measures derived below are felt to be objective albeit conservative. At the same time, there is no reason to believe that this bias is not relatively constant across product categories.

Two general types of attributes were included in the study, purely objective, quantitative attributes (e.g. size, weight, capacity) and product ratings (e.g. convenience, energy efficiency). Objective attributes were coded verbatim. Product ratings, reported on a qualitative five point scale from better to worse, were given corresponding quantitative scores from one to five. Where available, the number of advantages and disadvantages listed in the matrices were independently summed to provide additional attributes.

Analysis and Results

Attribute correlation matrices were obtained for all sixty-five product categories. Attribute pairs were chosen as the unit of analysis because they are the most basic level at which redundancy can be measured and perceived. (Other, more general measures of redundancy can be derived from attribute pairs.) The correlation between each attribute pair was squared to provide a measure of redundancy (R^2). There are two reasons for using R^2 to measure redundancy. First, whereas R^2 indicates proportional redunction in the variation of one attribute provided by the information in a second attribute, a simple correlation coefficient has no such clear-cut interpretation (Neter and Wasserman 1974, p. 90). Second, all the redundancy measures become unidirectional. Table 1 reports the number of attributes in each matrix, the high and low R^2, their standard deviation, and mean R^2 across attribute pairs. The mean R^2, which is equivalent to the average amount of information contained in any one attribute regarding all other attributes in the category, is the overall redundancy index on which the product categories are compared. To facilitate comparison, the categories have been ranked on this index from high to low.

Table 1 reveals both significant levels and ranges of redundancy across categories. On average, each attribute explains 22 percent of the variance

in every other attribute across the sixty-five categories. The average variance explained within categories ranges from a low of .Ø35 for Long Nose Pliers to a high of .826 for Type C Batteries. Except for the three categories at the extreme high end of the index, redundancy changes gradually from category to category. Also, there is no significant amount of clustering by category type (e.g. durables v. nondurables) at particular levels of redundancy. Another important obervation is the variance in redundancy across attribute pairs within many of the categories. The attribute pair R^2 measures for Juice Extractors, for example, which had a standard deviation of .33, ranged from a high of .86 between "ability to make good tasting juice" and "pulp capacity" to a low of .ØØ between "pulp capacity" and "ease of cleaning."

The basic finding of this first study is simply that a considerable range of redundancy exists across consumer product categories. Even within categories there is often considerable variance in redundancy across attribute pairs. The complex nature of this aspect of the consumer's environment suggests that consumers are faced with a nontrivial task. The next question is whether consumers accurately perceive the redundancy in their environment. We look first at existing studies and perspectives that address this question.

PERCEIVING REDUNDANCY

Previous Studies

Early studies of our ability to perceive redundancy were far from encouraging. Smedslund (1963), for example, found that subjects (nurses) without training in statistics had little to no concept of the correlation among patients' symptoms. Subjects with training in statistics, moreover, consistently overestimated these correlations (see also Jenkins and Ward 1965). In an early review of this literature, Peterson and Beach (1967)

note that the often observed result of studies that use binary attributes or cues as stimuli (e.g. a 2 X 2 matrix) is overconfidence in the judging of relationships. Subjects often focus on a biased subset of information, either only on the cell in which two favorable outcomes occur or only at the diagonal, where two favorable outcomes occur and two negative outcomes occur. One conclusion is that people do not generally appreciate negative evidence and, therefore, overestimate relationships. Other studies, however, reveal that perceptions of correlation are much improved when continuous variables, with more than two values, are used (Erlick 1966; Erlick and Mills 1967; Beach and Scopp 1966). Peterson and Beach conclude that "statistical man" may do much better when placed in a more natural, complex environment.

In a provocative paper, Einhorn and Hogarth (1978) describe situations in which we may perceive strong relationships when only weak or no relationships exist, resulting in an overconfidence in our own judgmental ability. They point out that we are often only exposed to a subset of cases relevant to assessing relationships (e.g. only witnessing the performance of applicants we admit to graduate school). Moreover, among these available cases, people may only focus on information that confirms rather than disconfirms their hypotheses (e.g. focusing only on graduate students that do well; see also Wason and Johnson-Laird 1972). Our bias toward the use of confirmatory information is also evidenced in studies of illusory correlations, where people's expectations endure despite being presented with data to the contrary (Chapman and Chapman 1967, 1969; Golding and Rorer 1972), and in studies on the "Pollyana Principle," where pleasant or positively valued information is processed more accurately or effectively (Matlin and Stang 1978; Fornell and Westbrook 1984).

More recently, Crocker (1981) outlined possible steps in the process of assessing covariation or correlation which may affect the accuracy of perceptions. Crocker suggests a five point covariation assessment process in which we first decide on the relevant data, then sample instances of the data to use as evidence, classify the instances as confirming or disconfirming, recall these instances and estimate the frequency of confirming and disconfirming cases, and finally combine the data into a judgment. The important point is that biases may exist at any one of these stages which result in overconfidence in the perception of environmental relationships. Similarly, Alloy and Tabachnik (1984) discuss the role of expectations on the perception of covariation. They argue that our ability to judge and learn covariation can be explained by looking jointly at the information currently available in our environment and our expectations regarding that information. People may perceive true (environmental) relationships or correlations when there are no prior expectations. When expectations exist, however, they discount currently available information. Alloy and Tabachnik use this framework to explain many of the empirical inconsistencies across covariation studies.

The only study of perceived attribute redundancy in a consumer products context is encouraging. A recent study by Bettman, John, and Scott (1984) suggests that individuals can distinguish between high and low levels of product attribute correlation when no prior expectations exist in a laboratory situation. This is consistent with the framework described above by Alloy and Tabachnik. Consumer perceptions do not, however, take place in a vacuum. And to date, consumers' ability to perceive actual attribute redundancy has not been studied.

To summarize, it appears consumers may or may not perceive correlations in their environment, and may be biased to perceive correlations when none

exist. Research from psychology would suggest that redundancy is often overestimated, which may help explain why consumers use relatively little information when making decisions.

The Role of Experience

It seems natural that accurate (or inaccurate) perceptions of redundancy may depend on consumers' experience with and knowledge of the products in question. The consumer, upon entering an environment (e.g. considering an initial purchase in a product category) without knowing whether or not attribute values are correlated, may have very inaccurate perceptions. Once consumers learn about a product attribute environment, one aspect of this knowledge may be an understanding of the relatively redundant or nonredundant nature of the information. More knowledgable consumers should have more attribute information in memory on which to distinguish redundant and nonredundant attributes. Additionally, or alternatively, this "knowledge" may result in an overestimation of the absolute level of redundancy across product attributes. Given the biases that affect the coding, recall, and weighting of stored information (Einhorn and Hogarth 1978; Crocker 1981), overestimation may result.

Perceptual accuracy, as well as the level of perceived redundancy, may not, however, increase monotonically with experience. Previous consumer research, particularly the mixed results regarding the effects of knowledge and experience on memory and information search (Bettman and Park 1980; Johnson and Russo 1984; Brucks 1985), suggests that knowledge and experience should be treated separately. As Brucks argues, knowledge and experience are conceptually distinct. Experience reflects a consumer's interaction with a product, while knowledge may or may not result from this interaction. Following Howard (1977), as experience begins to grow, attribute knowledge

grows. As experience continues to grow, more overall evaluations are stored in memory while it becomes unnecessary to process and remember more specific attribute information (Bettman and Park 1980). Howard refers to these evaluations as brand concepts. As consumers move through stages of experience, a brand concept or overall evaluation is eventually stored in memory and recalled when needed. Concurrently, the need to store and recall specific attribute information decreases.

This suggests that perceptual accuracy may be maximized at higher levels of attribute knowledge and at an intermediate level of product experience. Given processing biases and expectations, knowledge and experience may similarly result in inflated perceptions of redundancy; consumers may perceive greater redundancy at higher levels of knowledge and at an intermediate level of experience.

Hypotheses

We should emphasize the exploratory nature of the present study, especially inasfar as perceptions of actual product redundancy are concerned. However, many of the arguments and resulting hypotheses follow from existing theoretical arguments and empirical findings (e.g. overestimating redundancy, knowledge, and experience effects). The null hypothesis is that consumers accurately perceive both differences in attribute redundancy and the degree of attribute redundancy within and across product categories. The information and processing biases described above suggest two alternative hypotheses:

> H1: Consumers do not accurately perceive differences in attribute redundancy within or across product categories.
>
> H2: Consumers systematically overestimate the degree of attribute redundancy that exists within and across product categories.

Two further hypotheses distinguish between experience and resulting attribute knowledge. As attribute knowledge may be maximized at an intermediate

level of experience, knowledge and experience measures may differentially affect both the accuracy of perceived differences in redundancy and the absolute level of redundancy perceived. Attribute knowledge should result in both greater accuracy, or ability to distinguish redundant and nonredundant attribute, as well as greater perceived levels of redundancy given information processing biases:

> H3: The relative accuracy of perceived redundancy (H1) is greatest at higher levels of knowledge and at an intermediate level of experience.
>
> H4: Absolute levels of perceived redundancy are maximized at higher levels of knowledge and at an intermediate level of experience.

If, alternatively, knowledge and experience both measure the same underlying construct, both accuracy and level of perceived redundancy may be maximized at higher levels of both knowledge and experience.

STUDY TWO: PERCEPTIONS OF REDUNDANCY

Stimuli

Consumer perceptions of redundancy were examined within six of the original sixty-five product categories from Study One. Categories were chosen that : 1) represent the range of average redundancies in Table 1; 2) consumers were likely to vary in their knowledge of and experience with; 3) involved a minimum of three and a maximum of eight attributes (to keep the task reasonable); and 4) were likely to be at least minimally interesting to consumers (e.g. no long nosed pliers). Naturally, some of the categories chosen meet these criteria better than others. The categories chosen were (with average R^2 measures and number of attributes in parentheses) exercise bicycles (.417, n=9), juice extractors (.351, n=5), disk cameras (.262, n=7), blow dryers (.219, n=3), microwave ovens (.130, n=9), and telephones (.098, n=10). Three of these categories, exercise bicycles, microwave

ovens, and telephones, initially included number of advantages and number of disadvantages as attributes (see Study One above for a description of these attributes). Given their ambiguity when taken out of context, these attributes were not included here. This resulted in average R^2 measures of .39Ø (n=7) for exercise bicycles, .134 (n=7) for microwave ovens, and .Ø94 (n=8) for telephones in Study Two.

Method

Using a questionnaire format, three types of information were collected from each subject within each of the six categories: 1) Judgments of the redundancy between each pair of attributes; 2) category level attribute knowledge ratings; and 3) three measures of the consumer experience within each category. The questionnaire contained two sections. Section one contained the ninety-eight attribute-by-attribute redundancy questions organized by category. The response scale ranged from a perfect negative relationship between the attributes (-5) to no relationship (Ø) to a perfect positive relationship (5). The end points of the scale correspond to R^2=1 while the midpoint of the scale corresponds to R^2=Ø. The instructions included descriptions of the two endpoints, denoting perfect negative or positive relationships, and the zero point, denoting no relationship. The resulting scale measures both the perceived direction of the relationship and the perceived R^2 between each pair of attributes. (This "perceived R^2" is well calibrated at the mid- and endpoints of the scale.) Here is a sample question used in the instructions for the study:

If you know that an electric range is high priced, how likely is it to have either a large or small oven?

Certain to have a small oven									Certain to have a large oven
-5	-4	-3	-2	-1	Ø	1	2	3	4	5

The design of the question format was borrowed from implicit personality theory. The justification is quite simple. Implicit personality theory focuses on the same question of interest here albeit in a different context. Implicit personality theory focuses on peoples' beliefs about the attributes of people while our interest is on peoples' beliefs about the attributes of products. Schneider (1973) discusses several methods for assessing personality trait redundancy. According to Manis and Platt (1975), the most common technique for assessing redundancy of this sort is to have respondents assess the likelihood of co-occurrence for various trait pairs (e.g. if someone is honest, how likely is s/he also to be friendly?). The question format used here follows this basic format. (John, Scott, and Bettman [1986] use a similar format for measuring perceptions of price/quality relationships.) Pilot testing of the questions showed that consumers had a good understanding of the questions. The only problems occurred when attributes were included that were not very intuitive or well understood by many subjects (e.g. camera "flare"). To correct for this, a brief, one sentence layman's definition of each problematic attribute was developed and included in the first question containing the attribute. The test subjects had no apparent trouble understanding the resulting test questions.

A total of four questionnaires were used to counterbalance both the way in which each question was stated and the order of the questions and categories. Two versions of the questionnaire contained questions using the same attribute within each pair of attributes as the focus, or subject, of the question (i.e. the attribute on which the consumer knows the product is high or low). Consumers rated their perceived level of the other attribute in each pair on the rating scale below each question. Within each question, the wording of the attribute levels as high or low was randomly assigned.

In the other two versions of the questionnaire, the "given" attribute and the "to be rated" attribute were switched. The random wording of the attribute levels in the first two versions (e.g. high v. low) was also reversed in the second two versions of the questionnaire. Finally, within each pair of questionnaires containing the exact same questions, the order of the questions was also counterbalanced. All questions were presented by category. In one version, the categories and questions within the categories appeared in one random order. In the other version, the order of both the categories and the questions within the categories was reversed.

Section two of the questionnaire used a knowledge scale developed by Johnson (1984) to assess the consumers own perceived level of attribute knowledge within each category. Given the number of categories studied, lengthier albeit more objective knowledge "tests" (Sujan 1985) were ruled out in order to keep the task managable. Responses ranged from Ø (complete ignorance of the products attributes and functions) to 2Ø (expert knowledge of the products attributes and functions; see Johnson [1984] for details). In order to delineate knowledge from experience, and test hypotheses H3 and H4 , three objective measures of experience within each category were also collected. These included the number of times the consumer had bought a product in each category (a five point categorical scale ranging from "None" to "Four or more"), when the consumer's last purchase in the category occurred (a five-point categorical scale ranging from "Never" to "In the last month"), and how frequently the consumer uses each product (a five point categorical scale ranging from "Never" to "At least once a day"). As each of these three measures captures a different aspect of consumer experience, the five point scales were equally weighted and combined to create a single, twelve point experience measure. (The three individual experience measures were all significantly [$p<.ØØ1$]

positively correlated across consumers.)

Procedure

The four versions of the questionnaire were randomly administered to small groups of subjects (approximately twenty to a group). The subjects included an approximately equal number of graduate and undergraduate business administration students at The University of _____ (total n=114) who were paid for their participation. These subjects were chosen because they were likely to understand and to be able to answer the questions as well as to vary in their knowledge of and experience with the products in question. The questionnaire took anywhere from one-half hour to fifty minutes to finish. Subjects were instructed to answer every question in the questionnaire (so that the analyses that followed could be performed). Of the 114 subjects, 9 failed to complete the entire questionnaire and were excluded from subsequent analysis. The data from the remaining 105 subjects were used to test the six hypotheses.

Analysis

Central to the analysis was the consideration that accurate or inaccurate perceptions of redundancy differences may exist at any one of three levels. First, redundancy may be perceived at the attribute-pair level. That is, knowing the level of a product on one particular attribute may suggest to consumers that the product is likely to have a particular value on a second attribute. Alternatively, redundancy may be perceived at a more general attribute level. Consumers may not effectively distinquish one attribute-pair from another yet they may have some idea of the information contained within a particular attribute regarding other attribute values. Knowing one attribute value may give consumers some general idea of the values of all the other attributes of the product. Finally, consumers may

accurately perceive the general level of redundancy across attributes within a particular category. In other words, a consumer's average ratings of redundancy across attribute pairs may accurately reflect the average objective redundancies reported in Table 1, even though they may be inaccurate in distinguishing which attributes are more or less redundant.

A multi-stage analysis was required to measure accuracy at the attribute-pair, attribute, and category levels. Recall that the responses to the questions in section one of the questionnaire correspond to directional, perceived R^2's for each attribute pair (at least at the mid- and endpoints of the scales). Perceptual accuracy at the attribute-pair level must, therefore, take into account both the magnitude and direction of the perceived relationship. To measure attribute-pair accuracy, the actual R^2 measures from study one were signed to indicate the direction of each relationship and correspond to the subjects' responses. The subjects' responses were then correlated against the signed, actual R^2 measures for each subject within each product category. In essense, the magnitude and direction of each attribute-pair relationship was regressed against each subject's corresponding perceptions across all possible attribute pairs in each product category. The resulting correlations represent a measure of perceptual accuracy for each subject at the attribute-pair level.

A second stage of analysis measured attribute level accuracy, or each subject's ability to recognize attributes that are, on average, highly correlated with all the other attributes that describe a product. The values of each subject's responses to the redundancy questions involving a particular attribute were averaged to provide a measure of perceived redundancy for that attribute. Only absolute values of the responses were averaged. A corresponding measure of the actual redundancy of each attribute was calculated using the original R^2 measures from Study One. The

average actual redundancies were regressed against the average perceived redundancies across the thirty-six attributes for each subject. This provides a second, attribute level measure of perceptual accuracy across categories. (Given that sample sizes are smaller here than at the attribute-pair level, only the results across all thirty-six attributes are reported below.) Unlike the more specific attribute-pair accuracy, this measure does not consider the direction of perceived attribute relations. It concentrates only on actual versus perceived information contained.

Finally, the subjects' ability to accurately distinguish redundant and nonredundant categories was mesured. Category level redundancy measures, corresponding to those in Study One, were computed for each category. The absolute values of each subject's responses to all the redundancy questions in each category were similarly averaged to provide a measure of perceived category level redundancy (n=630). The actual category redundancies were then regressed against the percieved category redundancies to measure category level accuracy. (As this accuracy measure must be computed across the six product categories, the only accuracy computed was across the 105 subjects (n=630) rather than across categories for each subject [n=6].)

The three accuracy measures test hypothesis one. The subjects' average, absolute levels of perceived redundancy were compared with the level or magnitude of the actual redundancies obtained in Study One in order to test hypothesis two. In order to test hypotheses three and four, subjects' responses to both the knowledge and experience scales were categorized into three levels - low, medium, and high. Each level represented one-third of the available scale responses. Separate analysis of variance models were then used to test for significant differences in the dependent measures, perceptual accuracy (hypothesis three) and level of perceived

redundancy (hypothesis four), with changes in the independent variables, consumer knowledge (three levels), and consumer experience (three levels). Separate analyses were performed because the knowledge and experience measures were not orthogonal (see below). Hypothesis three predicts that accuracy in perception is greatest at higher levels of knowledge and an intermediate level of experience while hypothesis four predicts that perceived redundancy is greater at higher levels of knowledge and an intermediate level of experience.

Manipulation Check on Questionnaire Effects

Prior to discussing any particular hypothesis, given the length and difficulty of the questionnaire task it is important to determine whether or not consumers understood and answered the questions or simply responded randomly. Support for nonrandom responses is provided by the consistency in the responses to the redundancy questions across consumers. Because the order and form of the questions (including the response scale) were counterbalanced across the four versions of the questionnaire, subjects showing consistency in their perceptions would indicate both that they understood and that they answered the questions sincerely. Subjects' perceptions were, in fact, remarkably similar. After coding all the subjects' responses to the same directional scale values (i.e. reverse coding the original counterbalances), each judge's responses were intercorrelated. Out of the 5460 possible interjudge correlations, 3205, or 59 percent, were significantly positive ($p<.05$). Moreover, only 245 of these correlations, or 4.5 percent, were negative, only 5 of which were significant. Therefore, in the analyses that follow, the results cannot easily be attributed to the questionnaire instrument used to measure perceptions.

Hypothesis One: Perceptual Accuracy

Although the subjects were quite consistent in their perceptions, these perceptions were not very accurate at the attribute-pair, attribute, or category level. Looking first at attribute-pair accuracy, very few correlations between the perceived and actual redundancy of attribute pairs were significant. Across the pairs in all six categories (n=98), only 12 of the 105 subjects' judgments correlated significantly ($p<.05$) with actual redundancy levels, and only 9 of these 12 were positive correlations. This finding is relatively consistent within product categories as well. Only 8 correlations were significant for telephones (5 positive), 2 for microwaves (1 positive), 8 for juice extractors (0 positive), 1 for blow dryers (0 positive), 1 for exercise bikes (1 positive), and 1 for cameras (1 positive). (Sample sizes were, however, necessarily smaller for blow dryers [n=3] than for any of the other categories.) These results are particularly important because perceptions at the attribute-pair level incorporate both the magnitude and the direction of the perceived relationships. Perceptions at this level were not only inaccurate, but in the wrong direction for many consumers, particularly for juice extractors. The correlation matrix of actual attribute values for juice extractors from Study One helps explain this result. Intuitively, more expensive juice extractors might be expected to make better juice, have a larger pulp capacity, and be easier to use. Counter to intuition, the objective correlation between price and these three attributes was significantly negative.

Perceived accuracy at the attribute level (perceived redundancy per attribute v. actual redundancy across the n=36 attributes) was very similar. Only 17 of the 105 subjects' perceived attribute level redundancies correlated significantly ($p<.05$) with actual redundancies, and only 5 of these were positive. The existence of significant, negative correlations here

suggests that some subjects systematically confused redundant and nonredundant attributes. Perceptions at the category level were no better. The correlation between each subject's average perception of redundancy within each category (n=630) and the actual category averages was only r=.02 (nonsignificant).

Overall, consumers in this study appear unable to perceive differences in redundancy across actual attribute values from the six product categories sampled. This result, while supporting hypothesis one, is in contrast to the laboratory results of Bettman, John, and Scott (1984). Important differences between the two studies may help explain the difference in results. First, as argued previously, individuals are subject to a number of biases and expectations that may affect perceptions of the actual product attribute redundancies studied here. In the laboratory study of Bettman et al., subjects were provided objective attribute value information regarding attributes labeled simply X and Y in order to eliminate the effects of prior expectations. Second, the Bettman et al. study involved relatively few attributes. As revealed in Study One here, the consumer's perceptual task is actually quite complicated. Both categories and attribute pairs within categories vary widely in actual levels of redundancy making for a very nontrivial learning task. As will be explored in more detail under hypotheses two, three, and four, overestimation as well as consumer knowledge and experience differences may also help explain the support for hypothesis one.

Hypothesis Two: Overestimation of Redundancy

Hypothesis two suggests that consumers often overestimate attribute redundancy. In order to compare the results, the absolute values of the subjects' responses to the -5 to 5 response scales, reflecting perceived R^2,

were converted to a Ø to 1 scale to be more comparable to actual R^2 measures. (Keep in mind that the consumers' reponses are only well calibrated to actual R^2's at the mid- and endpoints of the response scales.) On average, subjects' estimated redundancies across the six categories were greater than actual redundancies (.318 v. .224). This difference was not, however, significant. Overestimation was present within four of the six product categories, although none of the category level results were significant. The perceived and actual levels of redundancy by category were .294 and .Ø94 for Telephones, .34Ø and .134 for Microwaves, .252 and .352 for Juice Extractors, .318 and .22Ø for Blow Dryers, .374 and .39Ø for Exercise Bikes, and .312 and .2Ø4 for Disk Cameras.

Although these results do not support hypothesis two, the direction of the results is consistent with previous findings in psychology and the theoretical arguments of Einhorn and Hogarth (1978), Crocker (1981), and Alloy and Tabachnik (1984). What is particularly interesting is the pattern of results. Subjects underestimated redundancy for the two categories with large actual redundancies and overestimated redundancy for the other four categories with lower actual redundancies. There was, in fact, a very significant relationship ($p<.ØØ1$) between the degree to which subjects over or underestimated redundancy and actual redundancy.

One explanation of this result is that consumers have a general expectation regarding attribute redundancy that exists across categories. As a result, actual redundancy is systematically under- or overestimated for categories whose actual attribute redundancy is high or low. An alternative explanation is that many subjects simply minimized effort and gave similar, random responses to the questionnaire. This is possible and, in fact, likely for at least some subjects. However, as noted at the beginning of the results, the consistency of the subjects' perceptions across question-

naires (counterbalanced for question phrasing, response scales, and order) suggests that questionnaire effects cannot explain the results. It is more likely that over-or underestimation is a function of consumer knowledge and experience. As it turned out, the four categories in which the consumers overestimated redundancy were the same categories in which consumers were higher, on average, in self-rated knowledge and were more likely to have had some experience. The particular effects of knowledge and experience are explored by testing hypotheses three and four.

Knowledge and Experience Measures

As described above, the subjects' responses to the knowledge and experience questions were collapsed into three levels of knowledge and experience to test hypotheses three and four. The 630 subject by category knowledge ratings were well distributed, with 136, 272, and 222 observations at low, intermediate, and high levels of knowledge. These subjects were, however, lower on the experience scale. There were 414, 147, and 69 observations respectively at low, intermediate, and high levels of experience. Although the sample sizes are adequate for analysis, they do indicate that perceptual accuracy may be low because of relatively inexperienced subjects. The fact that subjects were relatively high on self-rated knowledge and lower, on average, in experience is not inconsistent. Although the experience measure is very objective, it was relatively difficult for subjects to score high in experience across all three of the independent dimensions of experience surveyed. Experience on any one of the three experience measures, or minimal experience on two or more, may also result in a significant level of knowledge.

A comparison of the 630 (category by subject) knowledge and experience measures (on their original scales) reveals a significant positive relation-

ship (r=.60, P<.0001) between these variables. The relationship was, however, nonlinear. The mean levels of knowledge (on the original twenty point scale) were 8.92, 12.69, and 14.72 for low, medium, and high categories of experience. Although the observed relationship does not support a decrease in knowledge from moderate to high levels of experience, it does suggest that different constructs may be involved. It is also important to note that self-rated attribute knowledge, while necessary in this case, is more subjective than the experience measures used in this study. It is likely that many consumers with very high levels of experience overestimate their own attribute knowledge (Sujan 1985). As noted earlier, separate analyses compared the independent variables of knowledge and experience and the dependent variables - perceptual accuracy (H3) and perceived level of redundancy (H4).

Hypotheses Three: Perceptual Accuracy v. Knowledge and Experience

All of the following comparisons are across categories. Because knowledge and experience were measured rather than overtly manipulated, sample sizes were too small in several cases to perform analyses within categories for the attribute-pair and attribute level accuracies. Examination of the available data within categories did, however, reveal consistency across the categories regarding the pattern of results that are reported under both hypotheses three and four. Combining knowledge and experience measures across categories was also considered problematic and, as a result, prohibited any analyses involving category level accuracy versus knowledge or experience.

Hypothesis three relates the accuracies studied under hypothesis one to the knowledge and experience measures. These results are presented in Figure A. The dependent variables used included the attribute-pair and attribute level accuracies for each category for each subject (n=630). At

the attribute-pair level, the results reveal a significant positive relationship between knowledge and perceptual accuracy ($p<.05$). A contrast of means shows low knowledge subjects as significantly less accurate than intermediate and high knowledge subjects with no difference between the intermediate and high subject groups. Interestingly, the average correlation between actual and perceived attribute-pair redundancies was negative for low knowledge subjects (mean=-.15) and closer to zero for intermediate and high knowledge subjects (means of -.06 and -.07 respectively). In other words, higher knowledge subjects, while not accurate, were significantly "not as bad" as low knowledge subjects. Knowledge was not, however, significantly related to attribute level accuracy. The average correlations between actual and perceived attribute level redundancy were -.07, -.06, and -.11 for subjects low, medium, and high on self-rated knowledge.

Hypothesis three also states that accuracy is maximized at an intermediate level of experience. The results reveal no significant relationship between experience and accuracy at the attribute-pair level (average correlations of -.08, -.06, -.13 for low, medium, and high experience). Accuracy was, however, significantly related to experience at the attribute level ($p<.001$). Moreover, experience resulted in decreased accuracy. The average correlations between actual and perceived attribute level redundancy was significantly lower at a high level of experience than at either low or intermediate levels of experience (average correlations for low, medium and high experience subjects were -.05, -.09, and -.22 respectively). The difference between subjects low and intermediate in experience was nonsignificant.

Although only two of the four main effects were significant, the pattern of results provides limited support for hypothesis three and the

conceptual distinction between knowledge and experience. Figure A suggests that, overall, accuracy is greatest at an intermediate level of knowledge/experience, while high experience subjects are not as accurate as high knowledge subjects and low knowledge subjects are not as accurate as low experience subjects. It is curious, however, that the two main effects were for different accuracy measures and that subjects were most inaccurate at a high level of experience. That high experience subjects' attribute level accuracies were more negative suggests that these subjects often confused high and low redundant attributes. That low knowledge subjects' attribute-pair accuracies were more negative suggests that these subjects often identified correlated attribute pairs but misjudged the directions of the relationships. This result is consistent with those under hypothesis one. Recall that juice extractors, for example, contained counter-intuitive objective attribute relationships.

Hypothesis Four: Perceived Redundancy v. Knowledge and Experience

Hypothesis four predicts that perceived redundancy is greater at higher levels of knowledge and an intermediate level of experience (i.e. where attribute knowledge is maximized). The results, presented in Figure B, support hypothesis four. Perceived redundancy increased significantly with self-rated product attribute knowledge ($p<.05$). Although the differences between low and medium and low and high knowledge levels were significant ($p<.05$; average redundancies of .282, .320, and .330 from low to high), there was no significant difference between intermediate and high knowledge subjects. Consistent with the hypothesis, perceived redundancy was also maximized at an intermediate level of experience. The average perceived redundancies here were .308, .344, and .294 respectively for subjects low, intermediate, and high in experience. Although the main effect for experience was not as significant as for knowledge ($p=.06$), a contrast of

the factor level means shows significant ($p<.05$) differences between both low and intermediate and intermediate and high levels of experience in the predicted directions.

The support for hypothesis four helps explain the systematic under- and overestimation of redundancy observed under hypothesis two. Higher knowledge subjects, including those with moderate experience, perceive systematically greater levels of redundancy within product information environments. The results of hypothesis three and hypothesis four, taken together, suggest two additional results. First, perceptual accuracy is not "as bad" at higher knowledge levels. Second, experience and resulting knowledge should be treated separately regarding their effects on perceptions. Naturally, these conclusions may be limited to the categories and subjects studied.

SUMMARY AND DISCUSSION

This study set out to address two important questions regarding attribute redundancy in consumer information environments. First, how redundant is the information in these environments? Second, do consumers accurately perceive this redundancy? A related question arose, suggested by previous psychological studies, as to whether consumers systematically overestimate redundancy. The results of the two studies reported here provide some insignts into each of these questions.

Study One looked at the average redundancy of attribute values within each of sixty-five product categories. The results suggest that consumer information environments contain significant levels of attribute redundancy and that attribute redundancy varies widely both across categories and across attribute-pairs within categories. Redundancy in consumer information environments appears very complex, and the result is a very nontrivial

perceptual task for consumers.

Study Two measured subjects' perceptions of redundancy for attribute pairs within six of the sixty-five categories in Study One. The six categories were chosen to represent a range of objectively redundant to nonredundant information environments. The subjects in the study were very inaccurate in their perceptions of redundancy at all three levels explored (attribute-pair, attribute, and category). This result is in contrast to the laboratory results of Bettman, Roedder, and Scott (1984). Relying only on their own knowledge and experience, our subjects were relatively unable to perceive the relationships between pairs of attributes, identify particularly redundant attributes, or identify particularly redundant product categories.

Study Two also revealed subjects directionally, though not significantly, overestimating attribute redundancy. More importantly, both inflated perceptions of redundancy and the observed inaccuracy in perceptions were significantly related to knowledge and experience differences across consumers. Our subjects more accurately perceived redundancy at an intermediate level of both knowledge and experience. Low knowledge subjects often inaccurately judged the direction of the relationships among objectively redundant attributes. High experience subjects, who may have less product attribute knowledge than moderately experienced subjects, more often confused redundant and nonredundant attributes. Knowledge and experience also affected average perceived redundancy. Subjects who rated themselves moderate to high on knowledge perceived more redundancy than low knowledge subjects, while subjects who were intermediate in experience perceived more redundancy than subjects who were either low or high in experience.

The support for hypothesis four, combined with the limited support for

hypothesis three, indirectly supports the assumed relationship between experience and attribute knowledge. Subjects intermediate in experience may have had more attribute knowledge on which to make their judgments, resulting in the relatively more accurate and, at the same time, inflated perceptions of redundancy. The observed inflated perceptions of redundancy are consistent with both theoretical discussions and empirical observations in the psychological literature (see Einhorn and Hogarth 1978, Crocker 1981, and Alloy and Tabachnik 1984).

The observed monotonic, nonlinear relationship between self-rated knowledge and consumer experience does suggest an alternative interpretation of these results. Even though high experience subjects may upwardly bias their knowledge ratings, these subject may have at least as much attribute knowledge as moderately experienced subjects. However, compared to moderately experienced subjects, high experience subjects may be subject to more salient biases and expectations and, as a result, are more innacurate in their perceptions. Unfortunately, this interpretation does not explain the fact that high experience subjects were more accurate than high knowledge subjects in their perception of the absolute level of attribute redundancy. Naturally, a third interpretation is possible which combines the two possible effects. High experience subjects may have less information on which to base their judgments and, at the same time, be subject to more biases and expectations than are moderately experienced subjects. While the knowledge differences may drive perceived levels of redundancy, more salient biases or expectations may result in high experience consumers being unable to distinguish redundant from nonredundant attributes. At minimum, the results support a conceptual distinction between knowledge and experience that deserves further research attention.

The exploratory results reported here should be interpreted with caution. Other consumers' perceptions, or perceptions in other product categories, may be quite different. In particular, consumer perceptions of more nondurable products, for which repeat purchases are more common and frequent, may be quite different from those found here. It may also be difficult to generalize beyond the student sample used in the study. If, however, our relatively sophisticated subjects had poor perceptions of redundancy, it would be difficult to argue that other subjects with the same knowledge and experience levels for similar products would do any better. Another limitation is that the test of hypothesis two assumes that the judgments obtained from consumers are equivalent to "perceived R^2's." This translation is strong at the mid- and endpoints of the scale, but tentative at other levels.

The major unanswered question is how perceptions of redundancy affect information use. The results reported here suggest that knowledgeable consumers may underestimate the value of information and inappropriately restrict their information search. Future research should explore the effects of perceived redundancy on information search and use. A recent study by John, Scott, and Bettman (1986) provides some insight in this regard. John et al. demonstrate how perceptions of price/quality relationships may affect information use. In their study, consumers who had prior beliefs regarding a positive relationship between price and quality were more likely to sample only high priced products in a particular category. Following Einhorn and Hogarth (1978), limited search strategies of this type do not expose consumers to all the information necessary to dispute their beliefs and, as a result, can create or reinforce inaccurate perceptions.

TABLE 1

ATTRIBUTE TO ATTRIBUTE VARIANCE EXPLAINED BY PRODUCT CATEGORY
(N = Number of Attributes in the Category)

Product Category	N	Min.	Max.	SD	Mean
Type C Batteries	7	.539	.990	.115	.826
Dish Liquids	2	.813	.813	.000	.813
Type AA Batteries	7	.441	.964	.143	.790
Exercise Bicycles	9	.130	.762	.144	.417
Freezer Thermometers	3	.217	.510	.163	.405
Slide Projectors	7	.011	.874	.284	.380
Juice Extractors	5	.000	.857	.328	.351
Standing Mixers	4	.001	.716	.357	.342
Manual Pasta Makers	3	.000	1.000	.577	.333
Razors and Blades	6	.018	.723	.212	.331
Pasta Makers (Auto.)	5	.001	.572	.233	.307
Electric Woks	5	.028	1.000	.348	.289
Water Filters	6	.000	.806	.214	.282
Toaster Ovens	2	.273	.273	.000	.273
Shaving Creams	2	.265	.265	.000	.265
Knife Sets	5	.073	.527	.127	.265
Disk Cameras	7	.002	.734	.271	.262
Aerosol Paints	4	.008	.557	.219	.248
Picnic Jugs	5	.001	.782	.256	.234
Sleeping Bags	13	.001	.716	.174	.225
Cameras (35mm)	9	.000	.763	.182	.221
Blow Dryers	3	.026	.484	.238	.219
Compact Stereos	8	.004	.819	.225	.215
Broiler Ovens	2	.214	.214	.000	.214
Interior Alarms	8	.000	.669	.205	.209
Gas Ranges	5	.000	.684	.190	.206
Console Humidifiers	12	.000	.929	.224	.204
Saber Saws	11	.000	.731	.208	.202
Dehumidifiers	10	.000	.895	.101	.199
Portable Mixers	4	.068	.531	.177	.197
Electric Ranges	6	.001	.672	.218	.196
Slip Joint Pliers	4	.060	.367	.114	.193
Cylinder Locks	6	.014	.549	.166	.190
Stuffing Mixes	5	.001	.651	.212	.190
Lawn Mowers	12	.001	.658	.173	.188
Toothpaste	5	.001	.472	.150	.181
Steam Irons	11	.000	.783	.186	.176
Elec Clothes Dryers	12	.000	.769	.175	.167
Toilet Paper	8	.002	.712	.175	.166
Washing Machines	19	.000	.845	.182	.160
Blenders	5	.022	.340	.118	.156
Attache Cases	6	.052	.334	.083	.148
Camera Flash Units	14	.000	.757	.161	.142
Smoke Detectors	5	.000	.359	.122	.140
Dishwashers	8	.000	.835	.182	.138
Electric Fry Pans	7	.000	.476	.153	.137
Kitchen Scales	5	.003	.570	.208	.133
Perimeter Alarms	7	.000	.426	.131	.131
Gas Clothes Dryers	12	.000	.674	.165	.131
Microwave Ovens	9	.003	.379	.101	.130
Dead Bolt Locks	7	.000	.384	.134	.126
Macoroni and Cheese	8	.002	.679	.159	.123
Thermos Bottles	6	.012	.389	.136	.116
Color TV's (19")	12	.000	.797	.147	.099
Telephones	10	.000	.486	.105	.098
Cassette Decks	10	.000	.382	.105	.096
Kitchen Timers	5	.001	.358	.221	.093
Gas BBQ Grills	10	.000	.402	.097	.089
Wood Stains	8	.000	.480	.105	.086
Walkaround Stereos	10	.000	.441	.098	.077
Clock Radios	17	.000	.440	.098	.069
Stereo Receivers	15	.000	.228	.057	.048
Shampoos	2	.044	.044	.000	.044
Drip Coffee Makers	4	.001	.104	.038	.039
Long Nose Pliers	4	.002	.069	.026	.035
AVERAGES	7	.052	.592	.163	.218

FIGURE A

PERCEPTUAL ACCURACY V. KNOWLEDGE AND EXPERIENCE

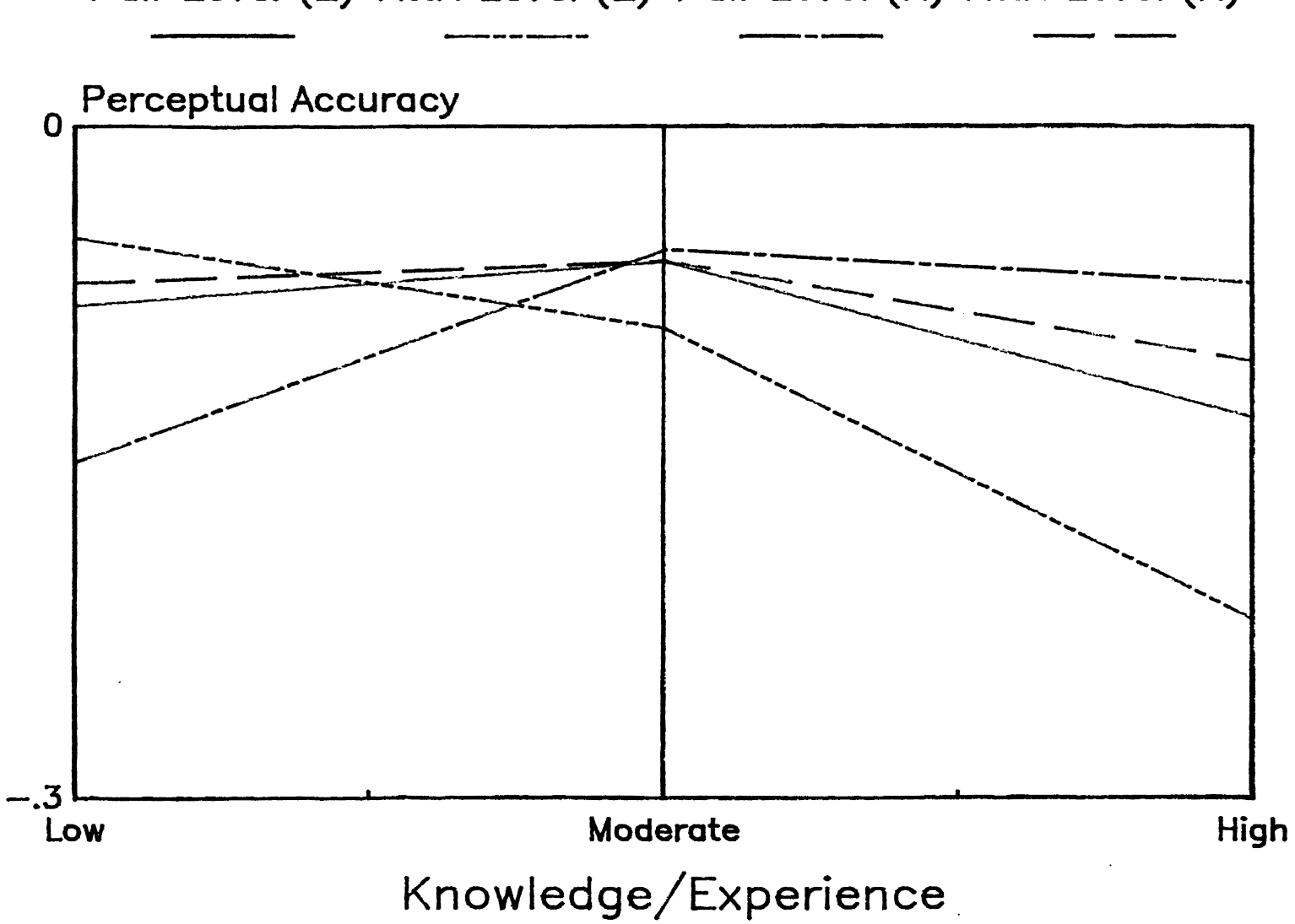
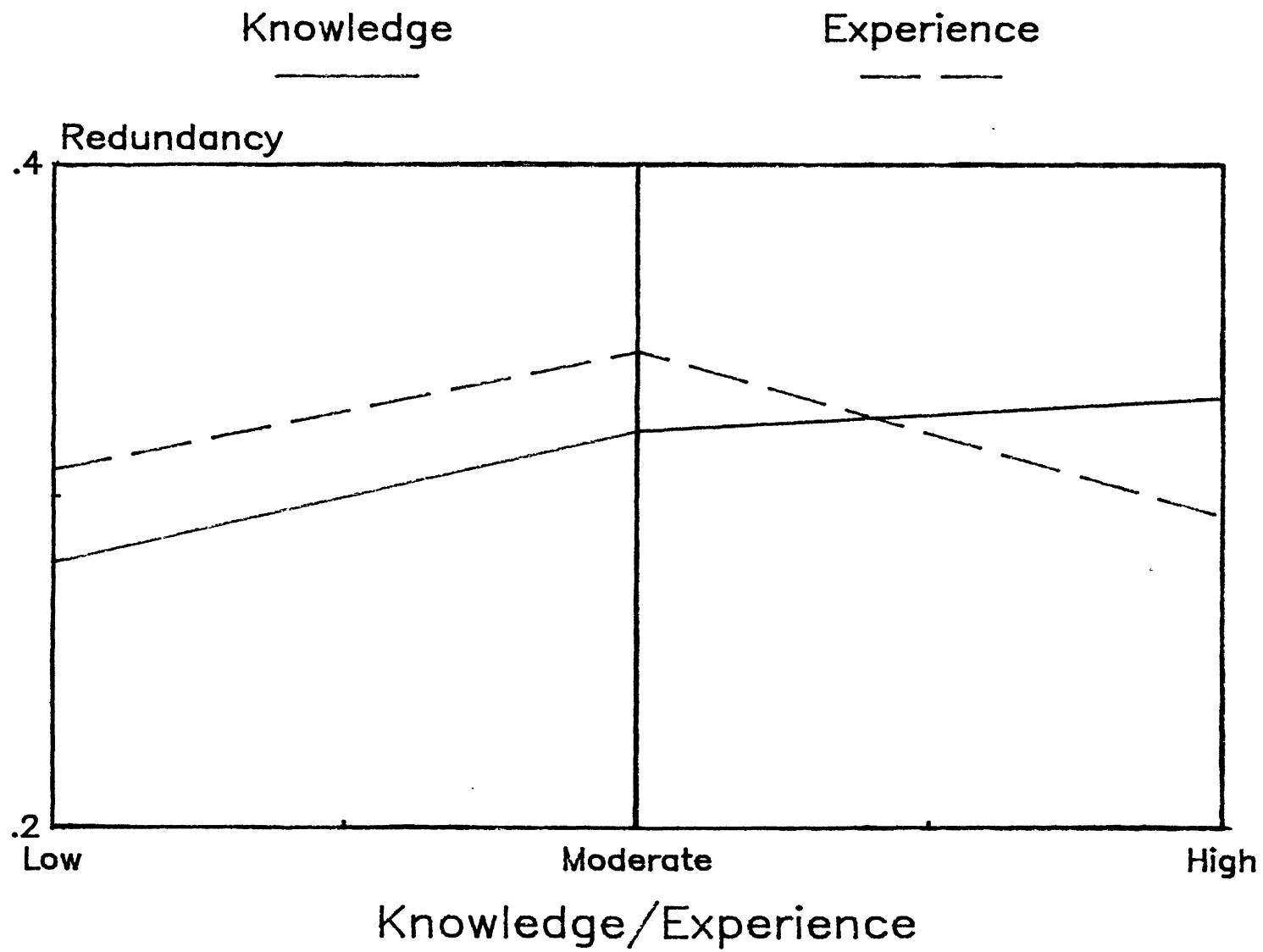


FIGURE B

AVERAGE PERCEIVED REDUNDANCY V. KNOWLEDGE AND EXPERIENCE



REFERENCES

Alloy, Lauren B. and Naomi Tabachnik (1984), "Assessment of Covariation by Humans and Animals: The Joint Influence of Prior Expectations and Current Situational Information," Psychological Review, 91 (1), 112-149.

Beach, Lee Roy and T. S. Scopp (1966), "Inferences About Correlations," Psychonomic Science, 6 (6), 253-254.

Bettman, James R. and Pradeep Kakkar (1977), "Effects of Information Presentation Format on Consumer Information acquisition Strategies," Journal of Consumer Research, 3 (March), 233-240.

Bettman, James R. and C. Whan Park (1980), "Effects of Prior Knowledge and Experience and Phase of the Choice Process on Consumer Decision Processes," Journal of Consumer Research, 7 (December), 234-248.

Bettman, James R., Deborah Roedder John, and Carol A. Scott (1984), "Consumers Assessment of Covariation," in T. Kinnear (ed.), Advances in Consumer Research, 11, 466-471.

Bettman, James R. and Michel Zins (1979), "Information Format and Choice Task Effects in Decision Making," Journal of Consumer Research, 6 (September), 141-153.

Brucks, Merrie (1985), "The Effects of Product Class Knowledge on Information Search Behavior," Journal of Consumer Research, 12 (June), 1-16.

Brunswik, Egon (1943), "Organismic Achievement and Environmental Probability," Psychological Review, 50, 255-272.

_____ (1956), Perception and the Representative Design of Experiments, Berkeley, CA: University of California Press.

Chapman, Loren J. and Jean P. Chapman (1967), "Genesis of Popular but Erroneous Psychodiagnostic Predictions," Journal of Abnormal Psychology, 72 (3), 193-204.

_____ (1969), "Illusory Correlation as an Obstacle to the Use of Valid Psychodiagnostic Signs," Journal of Abnormal Psychology, 74 (3), 271-280.

Crocker, Jennifer (1981), "Judgments of Covariation by Social Perceivers," Psychological Bulletin, 90 (September), 272-292.

Einhorn, Hillel J. and Robin M. Hogarth (1978), "Confidence in Judgment: Persistence of the Illusion of Validity," Psychological Review, 85 (5), 395-416.

_____ (1981), "Behavioral Decision Theory: Processes of Judgment and Choice," Annual Review of Psychology, 32, 53-88.

Einhorn, Hillel J., Don N. Kleinmuntz, and Benjeman Kleinmuntz (1979),

"Linear Regression and Process-Tracing Models of Judgment," Psychological Review, 86 (5), 465-485.

Erlick, D. E. (1966), "Human Estimates of Statistical Relatedness," Psychonomic Science, 5 (10), 365-366.

Erlick, D. E. and R. G. Mills (1967), "Perceptual Quantifications of Conditional Dependency," Journal of Experimental Psychology, 73 (1), 9-14.

Fornell, Claes and Robert A. Westbrook (1984), "The Vicious Circle of Consumer Complaints," Journal of Marketing, 48 (Summer), 68-78.

Geistfeld, Loren V. (1982), "The Price-Quality Relationship - Revisited," Journal of Consumer Affairs, 16 (Winter), 334-335.

Gerstner, Eitan (1985), "Do Higher Prices Signal Higher Quality?," Journal of Marketing Research, 22 (May), 209-215.

Golding, Stephen L. and Leonard G. Rorer (1972), "Illusory Correlation and Subjective Judgment," Journal of Abnormal Psychology, 80 (3), 249-260.

Hagerty, Michael R. and David A. Aaker (1984), "A Normative Model of Consumer Information Processing," Marketing Science, 3 (3), 227-246.

Howard, John (1977), Consumer Behavior: Application of Theory, New York, NY: McGraw-Hill.

Huber, Oswald (1980), "The Influence of Some Task Variables on Cognitive Operations in an Information-Processing Decision Model," Acta Psychologica, 45, 187-196.

Jenkins, H. M. and W. C. Ward (1965), "Judgment of Contingency Between Responses and Outcomes," Psychological Monographs, 79 (1).

John, Deborah Roedder, Carol A. Scott, and James R. Bettman (1986), "Sampling Data for Covariation Assessment: The Effects of Prior Beliefs on Search Patterns," Journal of Consumer Research, 13 (June), 38-47.

Johnson, Eric J. and John W. Payne (1986), "Effort and Accuracy in Choice," Management Science, 31 (4), 395-414.

Johnson, Eric J. and J. Edward Russo (1984), "Product Familiarity and Learning New Information," Journal of Consumer Research, 11 (June), 542-550.

Johnson, Michael D. (1980), "An Information Processing Analysis of Product Labels," in Jerry Olson (ed.), Advances in Consumer Research, 7, 724-728.

_____ (1984), "Consumer Choice Strategies for Comparing Noncomparable Alternatives," Journal of Consumer Research, 11 (December), 741-753.

_____ (1986), "Modeling Choice Strategies for Noncomparable Alternatives," Marketing Science, 5 (1), 37-54.

Klein, Noreen M. (1983), "Utility and Decision Strategies: A Second Look at the Rational Decision Maker," Organizational Behavior and Human Performance, 31 (February), 1-25.

Manis, Melvin, and Marjorie B. Platt (1975), "Integrating Verbal Information: The Referential Communication Paradigm," in Martin Kaplan, and Steven Schwartz (eds.), Human Judgement and Decision Processes, New York: Academic Press, 173-200.

Matlin, Margaret W. and David J. Stang (1978), The Pollyana Principle: Selectivity in Language, Memory, and Thought, Cambridge, MA: Schenkman.

Miller, John A. (1978), Labeling Research - The State of the Art, Marketing Science Institute report number 78-115 (November), Marketing Science Institute: Cambridge, MA.

Monroe, Kent B. (1973), "Buyers Subjective Perceptions of Price," Journal of Marketing Research, 10 (1), 70-80.

Morris, Ruby T., and Claire S. Bronson (1969), "The Chaos in Competition Indicated by Consumer Reports," Journal of Marketing, 33 (July), 26-43.

Neter, John and William Wasserman (1974), Applied Linear Statistical Models, Homewood, Illinois: Richard D. Irwin, Inc.

Newman, Joseph W., and Richard Staelin (1972), "Prepurchase Information Seeking for New Cars and Major Household Appliances," Journal of Marketing Research, 9 (August), 249-257.

Olson, Jerry C. and Jacob Jacoby (1972), "Que Utilization in the Quality Perception Process," in M. Venkatesan (ed.), Proceedings of the Third Annual Conference of the Association for Consumer Research, 167-174.

Payne, John (1976), "Task Complexity and Contingent Processing in Decision Making: An Information Search and Protocol Analysis," Organizational Behavior and Human Performance, 16 (August), 366-387.

Peterson, Cameron and Lee Roy Beach (1967), "Man as an Intuitive Statistician," Psychological Bulletin, 68 (1), 29-46.

Postman, L. and Edward C. Tolman (1959), "Brunswik's Probabilistic Functionalism," in S. Koch (ed.), Psychology: A Study of Science, Vol. 1, New York, NY: McGraw-Hill.

Ratchford, Brian T. (1980), "The Value of Information for Selected Appliances," Journal of Marketing Research, 17 (February), 14-25.

Rao, Vithala R. and G. David Hughes (1971), "A Search for Models of Consumers Unions' Brand Evaluation: A Multidimensional Approach," Proceedings of American Marketing Associations' Educators Conference, 164-174.

Riesz, Peter C. (1978), "Price Versus Quality in the Marketplace, 1961-1975," Journal of Retailing, 54 (Winter), 15-28.

_____ (1979), "Price-Quality Correlations for Packaged Food Products," Journal of Consumer Affairs, 13 (Winter), 236-247.

Russo, J. Edward (1977), "The Value of Unit Price Information," Journal of Marketing Research, 14 (May), 192-201.

_____ (1981), "The Decision to Use Product Information at the Point of Purchase," in Ronald W. Stampfl and Elizabeth C. Hirshman (eds.), Theory in Retailing: Traditional and Nontraditional Sources, Chicago: American Marketing Association, 155-167.

_____, and Barbara A. Dosher (1983), "Strategies for Multialternative Binary Choice," Journal of Experimental Psychology: Learning, Memory and Cognition, 9 (4), 676-696.

Schneider, David J. (1973), "Implicit Personality Theory: A Review," Psychological Bulletin, 79 (5), 294-309.

Sheluga, David, James Jaccord, and Jacob Jacoby (1979), "Preference, Search, and Choice: An Integrative Approach," Journal of Consumer Research, 6 (September), 166-176.

Shugan, Steven (1980), "The Cost of Thinking," Journal of Consumer Research, 7 (September), 99-111.

Simon, Herbert (1969), Sciences of the Artificial, Cambridge, MA: MIT Press.

Smedslund, Jan (1963), "The Concept of Correlation in Adults," Scandinavian Journal of Psychology, 4 (3), 165-173.

Sujan, Mita (1985), "Consumer Knowledge: Effects on Evaluation Strategies Mediating Consumer Judgments," Journal of Consumer Research, 12 (June), 31-46.

Thaler, Richard (1980), "Toward a Positive Theory of Consumer Choice," Journal of Economic Behavior and Oranization, 1 (1), 39-60.

Wason, P. C. and P. N. Johnson-Laird (1972), Psychology of Reasoning: Structure and Content, London: D. T. Batsford.

Yomado, Yoshiko and Noreen Ackerman (1984), "Price-Quality Correlations in the Japanese Market," Journal of Consumer Affairs, 18 (Winter), 251-265.