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IMPACT OF PRIOR FAMILIARITY AND COGNITIVE COMPLEXITY ON INFORMATION PROCESSING RULES

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Most of the research on human information processing has utilized a common view of man. Man is seen as possessing some systematic mechanism with which he acquires, processes, manipulates and ultimately utilizes information about his environment to achieve his goals. This has led to the search for the systematic mechanism or mechanisms resulting in diverse viewpoints, schools of thought and even theories of human information processing. Examples of the divergent views about how man processes information must include the problem solving approach of Newell, et.al., (1958, 1972), information integration theory of Anderson (1971), attribution and balance theories of Heider (1958) which led to the cognitive consistency school of thought in social psychology (Abelson, et.al., 1968), information processing approach (Schroeder, et.al., 1967) probability and Bayesian statistical ideas of Edwards (1954, 1960) the multidimensional criteria with consequent trade-off ideas of Dawes (1964a, 1964b) and Einhorn (1970, 1971) based on Coombsian theory of data (1964), and the popular expectancy-value models of attitudes (Atkinson (1964), Rosenberg (1956), and Fishbein 1967).

A closer look at these divergent viewpoints of man as information processor and especially their applications in consumer behavior (Cyert, et.al., 1962; Howard and Moore 1963; Howard and Morgenroth 1968; Howard

1963; Howard and Sheth 1969; Alexis, et.al., 1968; Haines 1969; Kernan 1969; Bettman 1970; Wright 1973; Sheth and Raju 1973; Park 1974; Sheth 1971, 1974; Hansen 1972; Sheth and Talarzyk 1972; Cohen and Ahtola 1971; Cohen, et.al, 1972; Wilkie and Pessemier 1973; Bass and Talarzyk 1972; Bass and Wilkie 1973) indicates that there are two main streams of thought. One is concerned with the structural and sequential aspects of information processing or the paths by which a consumer as a problem solver or decision maker goes about performing that task. The other is concerned with the functional aspects of strategically combining information about various alternatives by some learned judgmental rules in order to evaluate and make a choice among alternatives. While there is a good deal of consensus among the researchers in the structural stream of thought, there is almost a turmoil in the functional stream of thought in the human information processing area. The bulk of the debate centers around the question as to which one of a number of judgmental rules available to the individual is actually utilized by him in evaluating and choosing among alternatives. Specifically, the following four judgmental rules have been suggested as alternative strategies of evaluation:

1. Unweighted linear-compensatory (ULC) rule: $E = \sum_{i=1}^{n} x_i$
2. Weighted linear-compensatory (WLC) rule: $E = \sum_{i=1}^{n} w_i x_i$
3. Conjunctive (C) rule : $E = \sum_{i=1}^{n} (\text{Min } x_i)$
4. Disjunctive (D) rule: $E = \underset{i=1...n}{\text{Max}} (x_i)$

where E = individual's evaluation of an alternative based on its profile of information related to choice criteria,

x_i = ith element of that profile of information,

w_i = Subjective importance of the ith element of choice criterion to the individual,

Min x_i = minimum acceptable level of an alternative on x_ith criterion

Max x_i = maximum level of an alternative on x_ith criterion.

HYPOTHESES OF STUDY

The purpose of the experimental study reported in this paper was to test the hypothesis that the use of a specific judgmental rule in evaluating alternatives is a function of individual and task-related determinants rather than the prevalence of an universal rule across individuals and across situations implied by the proponents of a specific judgment rule. This view is consistent with the recent dynamic theory of information processing proposed by Sheth and Raju (1973). Based on past research and thinking especially of Bruner (1962), Miller (1959), Atkinson (1964), McGuire (1968) and of Howard (1963), Howard and Sheth (1969), and Sheth and Venkatesan (1968) in consumer behavior, prior familiarity with the task was chosen as an important factor to represent the task-related determinant. Similarly, following Festinger (1957), Bruner, et.al., (1962), Berlyne (1960), and Ostrom and Brock (1969), cognitive complexity was chosen as an important factor to represent the individual related determinant likely to influence the choice of an evaluative judgment rule.

Based on extensive reasoning,[1] the following hypotheses was formulated for experimental testing in this study.

1. In general, the respondent's evaluations will tend to correlate more with linear rules (weighted linear compensatory or unweighted

linear compensatory) than with nonlinear rules (conjunctive or disjunctive).

2. The respondent's evaluations will be more strongly correlated with the unweighted linear compensatory model when he is less familiar with the task and/or the task is more complex to perform.

3. The respondent's evaluations will tend to correlate more strongly with the weighted linear compensatory rule when he is more familiar with the task and/or when the task is more complex.

4. The correlations between the respondent's evaluations and the conjunctive rule will be significantly higher in situations of moderate familiarity and/or lower complexity.

5. The correlations between the respondent's evaluations and the disjunctive rule will be significantly higher in situations of moderate familiarity and/or lower complexity.

STUDY DESIGN

The experimental design entailed either controlling or manipulating the effects of various levels of two factors - prior familiarity and cognitive complexity - on the respondent's evaluations. Three levels of prior familiarity - low, medium and high - were created based on respondent's direct answering of his familiarity with a randomly assigned product out of a list of seven consumer durable and nondurable products. The three levels were operationalized following the definitions of extensive - limited - routinized learning phases discussed by Howard and Sheth (1969). The list of seven products (automobile, toothpaste, suntan preparation, hamburger, exterior trim paints, tires and stereo casette tape decks were developed

based on a prior pilot study of many products on a continuum of familiarity in the population chosen for the study. The cognitive complexity was determined by asking the respondent to rate the degree of importance of eight evaluative criteria for each randomly assigned product. Two levels of cognitive complexity (Hi and Lo) were created based on whether a respondent rated five or more criteria as important to him. The choice of the eight evaluative criteria, the cut-off points on the importance scales, and the determination of Hi and Lo level of cognitive complexity were all based on a prior pilot study. Somewhat surprisingly, the seven products chosen in the study divided themselves nicely into two groups: automobile, tires, stereo tape decks and exterior paints were products with high cognitive complexity to most respondents, and hamburgers, toothpaste and suntan preparations with low cognitive complexity.

Even though there was a 2x3 two-factorial experimental design, this study is not an experiment in the sense of some manipulation of a controllable factor and measuring its impact on a test group. The actual study was a cross-sectional survey of a total of 294 respondents who were asked to evaluate on a seven point "poor to excellent" scale each of eight fictitious (alphabetically labeled) brands based on each brand's profile of information on eight preselected criteria. As stated before, while the study was carried out over seven different product categories, any one respondent was asked to evaluate eight brands of only a single product category randomly assigned to him. The usual precautions for order bias, positive ratings bias, and providing for positive and negative information about a brand were incorporated in the study to ensure good data. In addition to prior familiarity with the

product category, cognitive complexity, and evaluations of each of the eight brands, a number of additional questions were asked related to the minimum acceptance level on each criterion, verbalization of the mental thought process for each evaluation (direct protocol) and response to structured statements which verbally described each of the four judgment rules (structured protocol). The direct and structured protocols were collected as external validating data for the main study and, therefore, they will not be reported here.

RESULTS AND DISCUSSION

Each respondent provided data on eight brand evaluations, his prior familiarity with the product category, and the cognitive complexity with which he was committed to the product class. Two separate statistical analyses were performed on this data, the one at the individual respondent level and the other at the aggregate level within the framework of the 2x3 two-factorial experimental design.

The individual respondent analysis consisted of building statistical models for each of the four judgmental rules and predicting the evaluation score based on profile of brand information, subjective importances of choice criteria, and minimum acceptance levels of these criteria. The predicted statistical scores for each judgmental rule across eight brands were then correlated with the actual brand evaluations made by the respondent in response to the profile of information provided to him. The judgmental rule which produced the highest correlation with the actual evaluation was deemed as the most appropriate for that respondent.[2] The respondent was then classified into one of the six experimental design cells based on his prior familiarity and cognitive complexity. A contingency analysis was

performed for each experimental factor and it is summarized in Table 1.

Insert Table . about here

These results in general tend to support most of the hypotheses related to the linkage of a judgmental rule and level of prior familiarity. In the case of Lo familiarity, the unweighted linear compensatory rule was utilized better than expected by chance and vice versa was true for the weighted linear compensatory model. While both the conjunctive and the disjunctive rules were less frequently correlated (highest) with the actual evaluations, they were evoked more in the Moderate prior familiarity than either Lo or Hi prior familiarity. Unfortunately, due to extreme small cell sample sizes, it is difficult to make any generalizations about the hypotheses related to the disjunctive and the conjunctive rules in different situations of prior familiarity.

The evidence in regard to the impact of cognitive complexity is not as clear. The hypotheses related to the unweighted and the weighted linear compensatory rules are at best supported in their directionality but not the magnitude. On the other hand, the hypothesis related to the greater utilization of conjunctive rule in less complex tasks is contradicted by the data at least in its directionality. Finally, the bulk of the significant chi-squared relationship between the cognitive complexity and the judgmental rules comes from the clear support of the hypothesis related to the disjunctive rule.

The second and statistically more elegant analysis consisted of the aggregate analysis of the correlations between the respondent's actual evaluations across eight brands and the four judgmental rules. Rather than assigning a specific rule to a respondent based on the highest correlation

across the four rules, the respondents were first classified into the six cells of the experimental design. Then the average correlations for each judgmental rule within each cell were calculated along with within-cell variances providing for the opportunity to perform both a multivariate analysis of variance on all the four judgmental rules utilizing the MANOVA procedures (Bock and Haggard, 1968). In order to more fully meet the inferential requirements of MANOVA procedures, the correlations were first transformed into Fisher's Z-scores which were then actually utilized as within-cell observation scores. Table 2 summarizes the means, the mean squares, and both the univariate and multivariate ANOVA tests for each of the two factors (prior familiarity and cognitive complexity). The overall MANOVA test clearly indicated highly significant main effects for both the factors ($p < .0004$ and $< .0001$ respectively) and a lack of interaction effect between the two factors ($p < .1471$). The univariate ANOVA, however, suggests lack of significant effect of prior familiarity on the strength of

Insert Table 2 about here

correlations between the actual evaluations and the unweighted linear compensatory rule. Similarly, it also indicates a lack of significant impact of cognitive complexity on the strength of correlations between the actual evaluations and the disjunctive rule. All other relationships are highly significant and generally in the directions of the hypotheses, except in the case of the conjunctive rule and the cognitive complexity where it is contrary to the hypothesis.

While this study has demonstrated that (a) respondents generally utilize linear compensatory rules much more often than other rules, and (b) there are significant differences in the choice of a specific rule

across individuals and tasks, it is only the beginning. More research especially experimental type in naturalistic setting is required before any definitive statements can be made about the prevalence of a specific judgmental rule in human information processing.

NOTES

1. The reader is urged to read Park (1974) for a fuller documentation of the reasoning as well as description of the study. For a more global view see Sheth and Raju (1973).

2. The measure of highest correlation with a particular judgment rule has some problems. For example, it may be the highest but the correlation with the next rule may not be that far. We considered utilizing a test for significant difference between the highest and the next highest but it created some other problems. While the highest correlation is not the best measure, it seems at least a satisfactory measure to perform the statistical analyses reported in the first part of the results.

TABLE 1

CONTINGENCY ANALYSIS OF PRIOR FAMILIARITY, COGNITIVE COMPLEXITY AND JUDGMENTAL RULES

a. Actual vs. expected frequency

	Judgmental Rules				
	Unweighted Compensatory	Weighted Compensatory	Disjunctive	Conjunctive	n
Prior Familiarity[1]					
Lo	36(26)	27(35)	9(7)	4(8)	76
Medium	43(50)	72(67)	13(13)	16(14)	144
Hi	17(19)	28(25)	2(5)	7(5)	54
n	96	127	24	27	274
Cognitive Complexity					
Lo	31(33)	49(51)	15(8)	7(9)	102
Hi	65(63)	98(96)	9(16)	20(17)	192
n	96	147	24	27	294

b. Contribution of each cell to overall chi-squared

					Chi-Squared
Prior Familiarity					
Lo	3.80	1.80	0.57	2.00	8.17
Medium	0.98	0.37	0.00	0.28	1.63
Hi	0.21	0.36	1.80	0.80	3.17
Chi-squared	4.99	2.53	2.37	3.08	12.97 ($p<.001$)
Cognitive Complexity					
Lo	0.12	0.07	6.12	0.40	6.71
Hi	0.06	0.04	3.06	0.50	3.66
Chi-squared	0.18	0.11	9.18	0.90	10.37 ($p<.001$)

1. A total of 13 respondents did not answer the prior familiarity question satisfactorily and they are excluded. Additional seven respondents had highest correlations with two rules and are eliminated from analysis.

TABLE 2

EFFECTS OF PRIOR FAMILIARITY AND COGNITIVE COMPLEXITY ON JUDGMENTAL RULES[1]

a. Univariate Analysis (ANOVA)

	Prior Familiarity					
Judgmental Rule	Lo	Moderate	Hi	Mean Square	Univariate F (2,275)	p
Unweighted	.665	.517	.670	8.513	2.015	.135
Weighted	.525	.731	.784	1.461	4.102	.017
Disjunctive	.099	.288	.237	0.906	4.413	.013
Conjunctive	.085	.298	.198	1.232	6.424	.001

	Cognitive Complexity				
Judgmental Rule	Lo	Hi	Mean Square	Univariate F (1,275)	p
Unweighted	.407	.694	4.860	19.03	.000
Weighted	.590	.741	1.580	4.45	.035
Disjunctive	.229	.225	0.004	0.02	.720
Conjunctive	.128	.278	1.800	9.40	.002

b. Multivariate Analysis (MANOVA)

Source of Variation	F-Ratio	p	df
Prior Familiarity	3.691	.0004	(8,544)
Cognitive Complexity	6.464	.0001	(4,272)
Interaction	1.520	.1471	(8,544)

1. A total of 13 respondents did not answer the prior familiarity question satisfactorily and they are excluded. Additional seven respondents had highest correlations with two rules and are eliminated from analysis.

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