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THE EFFECT OF ECOLOGICAL CONCERN ON BRAND PERCEPTIONS: AN APPLICATION OF INDSCAL

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ABSTRACT

The purpose of this research was to examine the relationship between scores on an index of ecological concern and buyers' perceptions of detergent brands. Results indicated that the level of ecological concern among buyers of soap had a marked effect on their brand perceptions.

BACKGROUND

This paper is based on dissertation research conducted by Thomas C. Kinnear under the direction of Associate Professor James R. Taylor. References, tables, and figures contained herein conform to the style of the Journal of Marketing Research, in which this paper will appear.

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INTRODUCTION

Personal consumption has important ecological implications. Individuals in North America create as much solid waste as does manufacturing [17, p. 109]. Automobile exhaust accounts for a significant proportion of air pollution. Phosphate in laundry detergents has been identified as a significant source of water pollution in the Great Lakes [17, p. 110; 12]. Glass bottles and aluminum cans present special disposal problems because they do not deteriorate under normal disposal methods. Pesticides for home use and fertilizers also contribute to the problem of pollution of water resources. The wisdom buyers exercise in their purchase decisions with regard to these types of products can either help maintain the environment or contribute to its deterioration.

Concern about the pollution aspects of products has led some firms to introduce nonphosphate detergents and nonlead gasolines [23, 15]. Advertising campaigns emphasize the recycling aspects of glass containers [1] and inform the public about the antipollution efforts of firms [9]. A number of books and articles have attempted to teach consumers ecologically-constructive purchasing patterns [19, 22, 10, 18]. In several communities laws have been passed restricting the sale of products deemed harmful to the environment [2, 3, 21, 20, 8]. As a result, the ecological implications of personal consumption behavior have become a significant influence in the marketing environment.

The Concept of Ecological Concern

One of the objectives of this study was to differentiate buyers in the extent to which they are concerned about ecology. For our purposes the concept of ecological concern is composed of two dimensions. First, a buyer's attitudes must express concern for the ecology. Second,

he must indicate purchasing behavior that is consistent with maintenance of the ecology. Both of these dimensions are important in the accurate assessment of a buyer's concern for the ecology. Obviously, verbal expressions of concern are not enough. Likewise, it is possible for a consumer to purchase in an ecologically-concerned manner without being aware that he is doing so. Thus the level of ecological concern a person demonstrates will be a function of both his attitude and his behavior.

The more specific purpose of this research was to examine the relationship between scores on an index of ecological concern and buyers' perceptions of detergent brands. An index of ecological concern was developed that incorporates both attitudinal and behavioral measures, and scores on this index are considered measures of ecological concern.

HYPOTHESES

Hypotheses to be tested which relate to the effect of ecological concern on brand perception follow:

H_1: An ecological dimension will be used by buyers in the perception of brands.

H_2: The higher a buyer's ecological concern, the more important will be the ecological dimension in the buyer's perception of alternative brands.

H_3: The higher a buyer's ecological concern, the greater will be the perceived similarity of brands that are ecologically nondestructive.

METHOD OF ANALYSIS

INDSCAL Model

In testing these hypotheses, we intend to identify differences in perception of detergent brands among respondents who have different

scores on the ecological concern index. Since a procedure that allows for individual differences in multidimensional scaling is desirable for this purpose, a procedure developed by Carroll and Chang which is called INDSCAL (Individual Differences Scaling) will be used [4, 5, 6, 7] .

Inputs to INDSCAL are provided by the individual similarities judgments of every individual being examined; the similarities are then simultaneously manipulated by the program. The INDSCAL model, like other multidimensional scaling models, assumes that similarities judgments are related to distance in a perceptual space. It further assumes that all subjects use the same set of dimensions in making similarity judgments but differ with respect to the weight that they assign to these dimensions. INDSCAL allows for the possibility that some dimensions will have zero weight for some subjects and, therefore, will be unimportant for them.

The INDSCAL program yields the following output [24] :

(1) A group stimulus space: This space contains a point which represents each object on which similarities judgments are made. It is a space that takes all individual inputs into consideration. It is very much like a standard multidimensional scaling space where the average similarities judgments of individuals serve as input.

(2) A subject space: This space contains the weight for each individual on each dimension of the group stimulus space.

(3) A private space: This space maps the stimuli under consideration for a particular individual. It is obtained for any individual by applying the square root of his weights on dimensions to the associated dimensions in the group stimulus space.

INDSCAL has a distinct advantage over standard multidimensional scaling procedures because it yields a unique orientation or rotation of the axes [24, p. 4] . Within the INDSCAL program itself, the axes are rotated in order to account for the maximum amount of total variance in the similarities data of all subjects. Therefore, no further rotation is necessary in order to interpret the dimensions of the INDSCAL stimuli configuration. Wish and Carroll state:

> The unrotated axes, or dimensions, have a special status in INDSCAL, and might be assumed to correspond to fundamental psychological processes that have different saliences for different individuals. The remarkable fact is that in most cases the dimensions can be interpreted without rotation, as is necessary for solutions obtained from earlier multidimensional scaling procedure or from factor analysis. INDSCAL is therefore particularly valuable when the dimensions are not known in advance. [24]

A mathematical statement of the INDSCAL model follows [5, pp. 284-85] : given n stimuli, r dimensions common to all individuals are assumed; x_{ij} is designated to represent the value of the j^{th} stimulus on the t^{th} dimension, so that

(1) $$1 \leq j \leq n \quad \text{and} \quad 1 \leq t \leq r \ .$$

Similarities judgments and spatial distance are related by assuming that:

(2) $$s_{jk}^{(i)} = L(d_{jk}^{(i)}) \ ,$$

where

$s_{jk}^{(i)}$ is the similarity of the j^{th} and k^{th} stimuli for the i^{th} individual.

L is a linear function. This linearity assumption led to the requirement that the input data to INDSCAL be at an interval level.

$d_{jk}^{(i)}$ is a modified Euclidean distance for the i^{th} subject of the following form:

$$(3) \qquad d_{jk}^{(i)} = \left[\sum_{t=1}^{r} w_{it} (x_{jt} - x_{kt})^2 \right]^{\frac{1}{2}} .$$

This distance designation is the standard Euclidean, with the addition of the weights, w_{it}. These weights represent the saliences associated with particular dimensions. Weight of the i^{th} person is represented by w_{it} on the t^{th} dimension. The distance represented in (3) above is transformed to ordinary Euclidean by computing the distances in a space whose coordinates are:

$$(4) \qquad y_{it}^{(i)} = w_{it}^{\frac{1}{2}} x_{jt} .$$

This is a space like the x space except that the configuration has been expanded or contracted depending on the value of w_{it}.

This model is analyzed by utilizing the iterative least squares procedure to solve for the weights and stimuli coordinates [5, pp. 285-88] . The details of this procedure are beyond the scope of this paper.

The Data

The data utilized in this paper were collected by means of a mail questionnaire sent to 698 members of the Canadian Family Opinion-University of Western Ontario Consumer Panel. Useable questionnaires were returned by 500 panel members, a figure which constitutes 72 per cent of the panel. Comparison of the socioeconomic characteristics of panel members who answered the questionnaire with those who did not indicated no significant differences.

Similarities judgments and behavioral data were obtained in the questionnaire before any attitude questions relating to the environment were asked. These latter questions were contained in a separate envelope;

therefore, the dimension of ecological concern was not communicated to respondents before similarities judgments and behavioral data were collected.

Index of Ecological Concern

The purpose of any index is to summarize in one measure the power of a number of other measures of a construct. For our purposes, behavioral and attitudinal measures of ecological concern are combined in an index of ecological concern.

Figure 1 shows the measures that were used as components of the index of ecological concern. Figure 2 shows the matrix of interrelationships among these measures. The gammas range from .265 to 1.000, with the majority over .500. The measures were therefore judged to be highly interrelated and taken as evidence of the validity of the concept of ecological concern.

Originally a number of other measures were considered as possible components of the index of ecological concern. These measures were eliminated because they were not highly interrelated -- either among themselves or to other measures.

Points were assigned to the selected measures, as shown in Figure 1. The possible range of points on the index is 0 - 25. As a result of these point assignments, the interrelationships among response categories shown in Figure 2 have been replaced by interrelationships among points assigned to categories, and gammas were calculated on the basis of assigned points. Figure 3 presents the resulting matrix of interrelationships. Visual examination reveals that the level of relationships is very similar to those levels obtained for categories. In addition, when both matrices were clustered using a hierarchical routine [13] , the configurations were identical. Therefore, the points are a good representation of the actual categorical responses.

Figure 1

DEFINITION OF THE INDEX OF
ECOLOGICAL CONCERN

I. Behavioral Questions (Range of points is 0-8)

1. What brand of laundry product do you usually buy for washing clothes?

   a. 4 points if she purchases a phosphate-free laundry detergent

   b. 3 points if she purchases a detergent with less than 10 phosphate units per washload

   c. 2 points if she purchases a detergent with less than 20 phosphate units per washload

   d. 0 points otherwise

2. Have you ever done anything that differed from your usual shopping pattern in order to purchase a product that was low in pollutants or had no pollutants?

   If yes, please describe what you did.

   a. 4 points if the description of the shopping pattern was an acceptable change

   b. 0 points otherwise

II. Attitudinal Questions (Range of points is 0-17)

1. How important a problem do you consider pollution to be in Canada today?

Response	Points
Not at all important	0
A little important	1
Moderately important	2
Extremely important	3
The most important problem	4

2. Would you be willing to have your laundry less white or bright in order to be sure that you were using a nonpolluting laundry product?

   If yes, how much less white or bright would you be willing to have your laundry?

Fig. 1 (Cont.)

Response	Points
A very little less white or bright	1
A little less white or bright	2
Moderately less white or bright	3
A great deal less white or bright	4
A very great deal less white or bright	5

3. The government should force all products that pollute off the market.

Response	Points
Strongly agree	2
Agree	1
Other	0

4. I think that a person should urge her friends not to use products that pollute.

Response	Points
Strongly agree	2
Agree	1
Other	0

5. Do you think that all consumers should be interested in the pollution aspects of products that they purchase?

Response	Points
Yes	2
Other	0

6. To what extent would you describe yourself as being interested in the pollution aspects of products which you purchase?

Response	Points
Extremely interested	2
Interested	1
Other	0

Total range of points is 0-25.

Figure 2

INTERRELATIONSHIPS AMONG COMPONENTS OF
THE ECOLOGICAL CONCERN INDEX
(GAMMAS)

	Laundry Product	Pollution Importance	Less White	Shopping Pattern	Force Products Off	Urge Friends	Interest of Others	Self-Interest
Pollution Importance	.414							
Less White	.403	.311						
Shopping Pattern	.581	.488	.598					
Force Products Off	.265	.534	.265	.482				
Urge Friends	.502	.523	.416	.592	.469			
Interest of Others	.714	.447	.759	1.000	.329	.705		
Self-Interest	.688	.650	.544	.742	.460	.735	.847	

Figure 3

INTERRELATIONSHIPS AMONG THE POINTS ASSIGNED TO THE COMPONENTS OF THE ECOLOGICAL CONCERN INDEX (GAMMAS)

	Laundry Product	Pollution Importance	Less White	Shopping Pattern	Force Products Off	Urge Friends	Interest of Others	Self-Interest
Pollution Importance	.419							
Less White	.407	.311						
Shopping Pattern	.580	.483	.596					
Force Products Off	.282	.567	.273	.487				
Urge Friends	.541	.562	.443	.611	.519			
Interest of Others	.721	.456	.766	1.000	.350	.838		
Self-Interest	.671	.657	.544	.743	.509	.816	.878	

Table 1 shows the realized distribution of scores on the ecological concern index. Respondents are spread across the entire range of possible scores. The mean of the distribution is 11.31, the median is 11, the mode is 8, and the standard deviation is 5.06. It appears that this index has successfully differentiated among respondents.

Preparation for INDSCAL

The data to be input to INDSCAL were prepared as follows:

(1) Respondents were divided into five groups on the basis of their scores on the ecological concern index. We attempted to form groups which would be approximately equal in size. Table 2 shows the boundaries of the five groups based on their scores on the ecological concern index, and it also shows the number of respondents in each group. The nature of the distribution of scores made it impossible to form groups exactly equal in size.

(2) Average similarities judgments on the laundry products were calculated within each of the five groups.

(3) The INDSCAL program has no built-in procedure to determine the best dimensionality for a solution of inputs. In running the program, the user must specify the number of dimensions that he wants the model to solve for. Therefore it was necessary to determine the dimensionality of the solution before using INDSCAL. Nonmetric Multidimensional Scaling was used to find the best dimensionality. The average similarities matrix of laundry product brands for each group was input individually into the Guttman-Lingoes SSA-I multidimensional scaling algorithm [11, 16]. The Kruskal stress level associated with each dimensionality for the groups was examined to determine the needed dimensionality for each group [14]. Kruskal's designation of the quality of the goodness of fit is as follows [14, p. 3]:

Table 1

DISTRIBUTION OF SCORES ON THE ECOLOGICAL CONCERN INDEX

Score	Number of Respondents	Percentage
1	3	.6
2	11	2.2
3	9	1.8
4	14	2.8
5	23	4.6
6	24	4.8
7	28	5.6
8	52	10.4
9	34	6.8
10	39	7.8
11	44	8.8
12	30	6.0
13	23	4.6
14	30	6.0
15	30	6.0
16	32	6.4
17	10	2.0
18	18	3.6
19	9	1.8
20	9	1.8
21	7	1.4
22	6	1.2
23	5	1.0
24	5	1.0
25	3	.6
Total	498[a]	100.0

[a] Missing data = 2 cases

Table 2

THE DEFINITION OF GROUPS BASED ON RESPONDENTS' SCORES ON THE ECOLOGICAL CONCERN INDEX

Group	Index Score	Number of Respondents
1	17-25	66
2	13-16	93
3	10-12	91
4	7-9	89
5	0-6	66
Total		405[a]

[a] Only respondents who made all 28 similarities judgments were considered in this part of the analysis.

Stress	Goodness of Fit
.200	Poor
.100	Fair
.050	Good
.025	Excellent
.000	Perfect

Table 3 presents the stress levels of up to three dimensions for each of the five groups. The coefficient of alienation, which is another measure of fit, is also presented.[1] The selection of proper dimensionality for each group was predicated on a goodness of fit of at least excellent (stress $\leq$.025). Table 4 indicates that Groups 1 and 2, the highest scorers on the ecological concern index, required only one dimension to fit their similarities judgments excellently, while all other groups required three dimensions.

Since INDSCAL's dimensionality should be set equal to the maximum number of dimensions required by any of the groups, the decision was made to have the INDSCAL model solve the similarities judgments in three dimensions.

(4) The average similarities judgments for each group were then simultaneously input into INDSCAL.

RESULTS

Model-Data Fit

The three-dimensional INDSCAL stimuli configuration and associated axes rotation explains at least 90 per cent of the variance in the similarities judgments for all five input groups. Table 4 shows that explained variance ranges from a high of 98 per cent for Group 2 to a low of 90 per cent for Group 5. The INDSCAL model fits the input data extremely well.

Table 3

GOODNESS OF FIT OF SSA-I SOLUTIONS FOR EACH ECOLOGICAL CONCERN LEVEL GROUP

Group	Dimensionality					
	1		2		3	
	Stress	Alienation	Stress	Alienation	Stress	Alienation
1	.001	.001	...	...	...	...
2	.001	.001	...	...	...	...
3	.101	.169	.069	.113	.001	.002
4	.122	.181	.071	.102	.005	.009
5	.197	.143	.096	.124	.009	.016
All subjects	.082	.131	.054	.072	.005	.009

Table 4

CORRELATION BETWEEN COMPUTED SCORES
AND ORIGINAL DATA FOR GROUPS

Group	Correlation (R)	Variance Explained (R^2)
1	.98	.96
2	.99	.98
3	.98	.96
4	.98	.96
5	.95	.90

Dimensional Interpretation

The intent of this section is to determine the salience that different groups of consumers attach to particular dimensions in their perceptions of laundry products. Therefore it is necessary to interpret dimensions in the INDSCAL solution.

To facilitate this interpretation, attribute data were collected on the laundry brands in question. The rank order of laundry brands on each of the three dimensions in the group space was then correlated with the rank order of brands on each of the five attributes on which data were collected. These attributes were: sudsing level, harshness, phosphate content, enzymes, and cleaning power.

Table 5 shows the resulting correlation matrix. Dimension 1 is most highly related to the degree of perceived phosphate content (Rho = .82). It is also highly related to the degree of perceived enzymes content (Rho = .80). In personal interviews conducted as part of a pretest to the questionnaire used in this paper, it was noted that to a great extent respondents considered both phosphate content and enzymes to be related to pollution. Because phosphate content was most highly related to Dimension 1 and because enzymes, the next highest related attribute, also have perceived pollution-generating qualities, Dimension 1 is interpreted as "concern for ecology." Further, Table 6 indicates that Dimension 1 was utilized by all five groups.

Hypothesis One states:

> An ecological dimension will be used by buyers in the perception of brands.

The results presented in Tables 5 and 6 support this hypothesis.

Both the second and third dimensions are most likely correlated with cleaning power (Rho = .90 and .85 respectively). It is possible

Table 5

RANK ORDER CORRELATIONS (RHO) BETWEEN ATTRIBUTE RATINGS OF LAUNDRY BRANDS AND THE RANK ORDER OF THESE BRANDS ON THE INDSCAL DIMENSIONS

Attributes	INDSCAL Dimensions		
	1	2	3
Sudsing level	.63	.43	.50
Harshness	.67	.67	.30
Phosphate content	.82	.48	.52
Enzymes	.80	.75	.53
Cleaning power	.50	.90	.85

Table 6

THE WEIGHTS ASSIGNED BY INDSCAL TO THE DIMENSIONS FOR EACH GROUP

Dimension	Group				
	1	2	3	4	5
Dimension 1 (concern for ecology)	.972	.905	.799	.642	.554
Dimension 2 (cleaning power A)	.052	.191	.237	.371	.444
Dimension 3 (cleaning power B)	.007	.131	.278	.408	.399

that the simple attribute cleaning power does not accurately describe the way in which respondents perceive the cleaning action of laundry products on their clothes. Whiteness, brightness, stain and scum removal could all be part of a multidimensional attribute called cleaning power. Since attribute data were not collected on all the possible aspects that make up cleaning power, it is impossible to draw a definitive conclusion on this issue. Therefore both Dimensions 2 and 3 are interpreted as being related to some aspects of cleaning power.

In actuality, the testing of the hypotheses related to perception does not require that any dimension other than the ecological dimension be interpreted. However, the labeling of the other dimensions does aid in the understanding of respondents' perceptions.

Dimensional Salience

Table 6 shows the dimensional weights assigned by INDSCAL for each of the five groups. The weights assigned to Dimension 1, concern for ecology, increase consistently across groups as the score on the ecological concern index increases.

Hypothesis Two states:

> The higher a buyer's ecological concern, the more important will be the ecological dimension in the buyer's perception of alternative brands.

The results presented in Table 6 support this hypothesis.

The weights assigned to the first cleaning-related dimension are the opposite of those assigned to Dimension 1; that is, the lower the score on the ecological concern index, the higher the weight attached to cleaning aspects. Essentially the same result holds for Dimension 3, the other cleaning-related dimension. In this dimension Groups 4 and 5 are not completely consistent with the trend of increasing

weight attached to cleaning aspects and decreasing weight to ecological concern. However, the difference is slight and the trend across all five groups is still evident.

Stimuli Configurations

Table 7 shows the coordinates of the group stimulus space for the laundry products under consideration. Tables 8 through 12 show the private space coordinates for Groups 1 through 5 respectively. These latter spaces were obtained by applying the appropriate group and dimensional weight in Table 6 to the group space coordinates. Stimuli mappings are not shown because maps are not necessary to test the perceptual hypotheses in this paper.

Hypothesis Three states:

> The higher a buyer's ecological concern, the greater will be the perceived similarity of brands that are ecologically nondestructive.

Maple Leaf and Sunlight are the phosphate-free brands. The perceptual similarity of these two brands can be represented by the Euclidean distance between them taken in psychological space. Such a distance measure was calculated in the stimulus space of each of the five groups. Table 13, which shows the results, lends support to Hypothesis Three. The Euclidean distance between Maple Leaf and Sunlight gets smaller across groups as the score on the ecological concern index increases.

Technically, in terms of the INDSCAL model, the testing of Hypothesis Three by calculating Euclidean distance in a private space has a special meaning. A private space is obtained by applying the INDSCAL dimension weights to the group space. The weights are related to the amount of variance in similarities judgments which a particular

Table 7

STIMULUS SPACE COORDINATES FOR ALL GROUPS TOGETHER[a]

Stimulus	Dimension 1	2	3
Ideal	-.352	.282	.424
Cheer	.263	-.185	.251
Bold	.291	.130	.132
Sunlight	-.384	.006	-.574
Fab	.271	-.401	.053
Ajax	.275	.299	-.235
Maple Leaf	-.606	-.618	-.445
Tide XK	.242	.487	.395

[a] In the technical terms of INDSCAL write-ups this space is called a group stimulus space.

Table 8

STIMULUS SPACE[a] COORDINATES FOR GROUP 1[b]

Stimulus	Dimension 1	2	3
Ideal	-.347	.064	.035
Cheer	.259	-.042	.021
Bold	.287	.030	.011
Sunlight	-.379	.001	-.048
Fab	.267	.091	.004
Ajax	.271	.068	-.020
Maple Leaf	-.598	-.141	-.037
Tide XK	.239	.111	.033
Range on Dimension	.885	.252	.083

[a] In the technical terms of INDSCAL write-ups this space is called a private space. However, the results shown here are for a group. It is difficult to conceive of a group having a truly private space. Therefore, the term private is not used.

[b] Index: 17-25; highest ecological concern group.

Table 9

STIMULUS SPACE COORDINATES FOR GROUP 2[a]

Stimulus	Dimension		
	1	2	3
Ideal	-.335	.123	.153
Cheer	.250	-.081	.091
Bold	.277	.057	.048
Sunlight	-.365	.002	-.208
Fab	.258	-.175	.019
Ajax	.262	.131	-.085
Maple Leaf	-.576	-.270	-.161
Tide XK	.230	.213	.143
Range on Dimension	.838	.483	.361

[a] Index: 13-16; second highest ecological concern group.

Table 10

STIMULUS SPACE COORDINATES FOR GROUP 3[a]

Stimulus	Dimension		
	1	2	3
Ideal	-.351	.137	.223
Cheer	.235	-.090	.132
Bold	.260	.063	.070
Sunlight	-.343	.003	-.302
Fab	.242	-.195	.028
Ajax	.246	.146	-.124
Maple Leaf	-.542	-.301	-.235
Tide XK	.216	.237	.208
Range on Dimension	.802	.538	.525

[a] Index: 10-12; middle ecological concern group.

Table 11

STIMULUS SPACE COORDINATES FOR GROUP 4[a]

Stimulus	Dimension		
	1	2	3
Ideal	-.282	.172	.271
Cheer	.211	-.123	.160
Bold	.233	.079	.084
Sunlight	-.308	.004	-.367
Fab	.217	-.244	.033
Ajax	.220	.182	-.150
Maple Leaf	-.485	-.376	-.284
Tide XK	.194	.297	.252
Range on Dimension	.705	.673	.638

[a] Index: 7-9; second lowest ecological concern group.

Table 12

STIMULUS SPACE COORDINATES FOR GROUP 5[a]

Stimulus	Dimension		
	1	2	3
Ideal	-.262	.188	.268
Cheer	.196	-.123	.159
Bold	.217	.087	.083
Sunlight	-.286	.004	-.363
Fab	.202	-.267	.033
Ajax	.205	.199	-.148
Maple Leaf	-.451	-.412	-.281
Tide XK	.180	.324	.250
Range on Dimension	.668	.736	.631

[a] Index: 0-6; lowest ecological concern group.

dimension explains for a particular group. The more weight that is placed on a dimension, the more spreading of the stimuli from the group space will occur on that dimension and the greater will be the distance between two stimuli. Private space configurations are then a function of the dimensional weights, and so are any distances calculated in a private space. The greater the weights, the greater are the distances. The Euclidean distances between Maple Leaf and Sunlight in private spaces are directly related to the distribution of weights on the dimension for each group.

The correct interpretation of the distances between Maple Leaf and Sunlight, as presented in Table 13, becomes clear. The weights on dimensions are distributed in such a way that the least spreading of stimuli has taken place in Group 1. In reality, the testing of Hypothesis Three using Euclidean distances between Maple Leaf and Sunlight is just a subset of a broader hypothesis that:

> The higher a buyer's ecological concern, the less total spreading of stimuli will take place in the private space.

The location of the ideal brand in the five private space configurations is also significant. Table 8 shows that for the highest ecological concern group the ideal brand is located in close proximity to the two nonphosphate brands. Tables 9 through 12 show that for those groups lower in ecological concern the ideal brand moves consistently away from the nonphosphate brands to a position closer to Tide XK.

DISCUSSION

The nonmetric multidimensional scaling results shown in Table 3 indicate that Groups 1 and 2 fit a one-dimensional solution, while the other three groups require three dimensions. The INDSCAL results shown

Table 13

EUCLIDEAN DISTANCE BETWEEN
SUNLIGHT AND MAPLE LEAF

Group	Distance
1	.261
2	.347
3	.369
4	.429
5	.455

in Table 6 are consistent with these dimensionalities. Groups 1 and 2 are essentially placing weight on one dimension in their perceptions. The range of stimuli points on each dimension shown in Tables 8 and 9 further supports this point. Groups 3, 4, and 5 place substantial weight on all three dimensions, thus spreading the laundry brands. The range of dimensions shown in Tables 10, 11, and 12 illustrates this point. All groups utilized the ecological dimension, thus supporting Hypothesis One.

The results shown in Table 6 demonstrate that consumers who display different levels of ecological concern attach different salience to particular perceptual dimensions. As predicted in Hypothesis Two, the more a buyer is concerned with ecology, the more important the ecological dimension is in perception of different brands. This result holds even in the middle range of ecological concern.

It is also interesting to note the salience attached to cleaning aspects of laundry products. The more one is concerned about ecology, the less importance one places on cleaning aspects. The construct of ecological concern appears to have a marked effect on the dimensions a consumer uses in the perception of alternative brands.

These results add strength to the argument that the construct of ecological concern does exist. By measuring it one is able to predict and identify major differences in perception of brands.

Table 13 supported Hypothesis Three by showing that the higher a consumer's ecological concern, the more similar are perceptions of nonpolluting brands. This finding is related to the findings on dimensional salience. As concern for ecology and the weight attached to ecological characteristics increases, the perception of nonecological differences in nonphosphate brands becomes less important.

So distinctions among brands are made increasingly on the basis of their ecological aspects only. Since Sunlight and Maple Leaf are both nondestructive, the distinction between them becomes less as concern for ecological aspects increases.

SUMMARY

This research has demonstrated that the construct of ecological concern can be operationally defined and validated by relating it to buyers' perceptions of detergent brands. The INDSCAL model successfully identified systematic perceptual differences in the five levels of the ecological concern index. This index may be a useful explanatory variable for future research studies dealing with the ecological aspects of personal consumption behavior.

FOOTNOTES

*Thomas C. Kinnear is Assistant Professor of Business Administration, University of Western Ontario. James R. Taylor is Associate Professor of Marketing, University of Michigan. They acknowledge the assistance of Dr. Brent Ritchie, Laval University.

[1] The coefficient of alienation is equal to: $(1-r^2)^{\frac{1}{2}}$ where r is the correlation between correct distance and the plotted distance across all pairs.

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