INTRODUCING A NEW CUSTOMER SEGMENTATION IN THE AUTOMOTIVE MARKET : A MEANS-END PERSPECTIVE

Pierre VALETTE-FLORENCE*, Jean-Marc FERRANDI**, Dwight MERUNKA*** and Daniel BACHELET****

* Professor, ESA, University Pierre Mendes-France, BP 47, 38040 Grenoble Cedex 9, France
Tel: 33.4.76.82.56.11
Fax: 33.4.76.82.59.99
Email: Pierre.Valette-Florence@esa.upmf-grenoble.fr

** Associate Professor, CERMAB, University of Dijon, 4 Route des Plaines de l'Yonne, 89000 Auxerre, France.
Tel: 33.3.86.42.03.50
Fax: 33.3.86.46.88.72
Email: ferrandi@iut-dijon.u-bourgogne.fr

*** Professor, CEROG, University of Aix-en-Provence, Clos Guiot, Boulevard des Camus, 13540 Puyricard, France.
Tel: 33.4.42.28.08.08
Fax: 33.4.42.48.08.00
Email: dwight.merunka@iae-aix.com

****Former Marketing Director, Groupe PSA - Peugeot-Citroën - Paris - France

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Abstract

The study of cognitive structures has recently received increasing attention. Within that field, means-end chain analysis and the laddering method proposed by Reynolds and Gutman (1988) seem to be of prime importance. Their methodology, which is qualitative, belongs to the micro perspective and hence differentiates much more from the macro approach, quantitative in essence, aimed to segment individuals into groups defined by a priori specified value orientations. New developments relying on the optimal scaling features of non linear generalized canonical analysis (NGCA) have been recently proposed (Valette-Florence, 1998). These improvements not only allow the researcher to identify consumer's segments with specific means-end orientations, but also give the probability of the associations between the means-end solutions and any prespecified criterion, such as the cars owned by the respondents.
Key words: Means-end chain, segmentation, non linear generalized canonical analysis

Résumé : L'étude des structures cognitives et notamment l'analyse des chaînages cognitifs ont récemment reçu une attention croissante. La méthodologie qualitative proposée par Reynolds et Gutman (1988) appartient à la perspective micro et permet de mieux différencier les consommateurs que l'approche macro, quantitative par essence. De nouveaux développements basés sur l'analyse canonique généralisée non linéaire (NGCA) ont été récemment proposés par Valette-Florence (1998). Ils permettent non seulement au chercheur d'identifier les segments de consommateurs présentant des chaînes moyens-fins spécifiques, mais donnent également la probabilité des associations entre les chaînes moyens-fins solutions et n'importe quel critère préspécifié, comme les voitures possédées par les répondants.
Mots clés : Chaînages cognitifs, segmentation, analyse canonique généralisée non linéaire.

Introduction

Recently, the new applications of value theory to marketing problems have taken two fundamentally distinct tracks (Reynolds, 1985):

- The *"macro"* perspective is based upon developing a classification system or taxonomy used to segment individuals into qualitative groups defined by value orientations. The main *explicit* assumption of this approach is that respondents can deal with a priori value orientations and the statements that reflect such highly personal meanings. However, this implies two *implicit* assumptions which are worth noting:
  - respondents are in touch with these personal motivations,
  - they choose to respond accurately.
- The *"micro"* approach stems from psychological theory and uses in-depth *qualitative* methods to understand consumer motivations which circumvent the use of pre-established list of values. Recent applications have been grounded in means-end theory (Gutman, 1982) and new objective analytical methods (Gutman, 1984).

Thus, the *"micro"* approach especially focuses on the linkages between the attributes that exist in products, the consequences for the consumer provided by the attributes, and the personal values the consequences reinforce. According to the means-end chain theory of cognitive structures, consumer behavior is driven by benefits sought which cause the desire or preference for certain attributes. Means-end chain theory has been proposed as ideally suitable for the development of segments (Reynolds and Gutman 1988; Aurifeille and Valette-Florence 1992). However, conventional methods to analyze means-end chain data like the graphical presentation in hierarchical value maps (Gengler et al 1995) only display respondents' cognitive structures on an aggregated level and are not suitable for segmentation purposes.

The purpose of this article is to propose a new methodology for developing and understanding perceptual orientations and related product positioning. First, presentations on Means-End Chain Theory will be provided. Then, the new statistical approach will be presented, followed by a detailed illustration.

Means-End Chain Theory and Laddering Method

Means-End Theory (Gutman 1982; Olson and Reynolds 1983) offers one practical metaphor to assess consumers' product, service or behavior knowledge and meaning structures. The representation of cognitive structures in memory advocated by the theory is based on the ac-

knowledgement that a product may be linked to self (Gutman 1991). The central tenet of the theory is that product meaning structures stored in memory consist of a chain of hierarchically related elements. The chain starts with the product attributes and establishes a sequence of links with the self concept – the personal values - through the perceived consequences or benefits produced by certain attributes of the product. This forms a "means-end chain" in that attributes are the means by which the product provides the desired consequences or values, i.e., the ends. Values are considered as the ultimate source of choice criteria that drive buying behavior (Claeys et al., 1995). This exemplifies a basic assumption of the means-end chain approach and of the marketing concept in general, that products are bought for what they do for the consumer.

A means-end chain model (Gutman, 1982) is defined as the connection between product attributes, consumer consequences, and personal values. Attributes are features or aspects of products or services. Consequences accrue to people from consuming products or services. They may be undesirable or desirable (benefits). The central aspect of the model is that consumers choose actions that produce desired consequences and minimize undesired consequences. Values, or end states, are important beliefs people hold about themselves and about their feelings concerning other's beliefs about them (Rokeach, 1968).

Overall, it is the attribute-consequence-value sequence which is the focus of the model. Values provide the overall direction, consequences select specific behaviors in specific situations, and attributes are what is in the actual product that produces consequences. As consumers have different values, they will have, of course, different means-end chains. It is the knowledge of this structure that allows the structure underlying consumer decision processes to be examined.

The methodology designed specifically for uncovering the levels of abstraction is an in-depth interviewing technique called *laddering*. Laddering consists of a series of directed probes based on distinctions mentioned by the individual with respect to the competitive products or service classes. The purpose of the laddering is to elicit distinctions at higher levels of abstractions, thus uncovering the structural aspects of consumer knowledge as modeled by the means-end chain. In practice, a sequence of in-depth probes then traces the network of connections or associations in memory that eventually leads to personal values. The final goal is to determine sets of linkages between the key perceptual elements across the range of attributes(A), consequences (C), and values (V). These associations of ladders ($A \rightarrow C \rightarrow V$) represent combinations of elements that serve as the basis for distinguishing between and among products in a given product class. Thus, the final objective of the laddering method is to con-

struct a hierarchical value map which represents the associations across levels of abstraction mentioned by all respondents.

The Means-End Chain Theory was therefore successfully applied to a better understanding of the consumption of numerous products like beverage (Gutman, 1997), services (Botschen et al., 1999), ecological products (Kreziak, 1998) or in an retail environment (Thompson et al., 1998) and to identify intercultural segments of consumers (Dibley and Baker, 2001; Sukhdial et al., 1995; Vriens and Ter Hofstede, 2000).

Moreover, recent research has already shown the superiority of the means-end perspective on a more traditional macro orientation, if one wants to predict brand- choice behavior (Aurifeille and Valette-Florence, 1992). Lastly, recent methodological developments enable the researcher to identify segments with specific means-end hierarchies (Valette-Florence and Roehrich, 1995; Valette-Florence, 1998), while explicitly taking into account the hierarchical nature of the stimuli (e.g., the A/C/V elements).

Methodological Section

By means of a CAPI methodology, conducted in France by the SOFRES company, a full representative sample of 979 persons belonging to the B segment within the automotive market have been interviewed. All in all, 3917 individual ladders were obtained. Notice that due to the specificity of the CAPI methodology that has been retained, each individual ladder was solely composed of one element per hierarchical level (i.e.: one attribute, one consequence and one value).

All these individual ladders, which correspond to specific attribute - consequence - value orientations, were then coded into a succession of numbers (see exhibit 1) used as input for a non-linear generalized canonical analysis (NGCA). Among the different methods available to obtain a multidimensional perceptual space (Valette-Florence and Rapacchi, 1991) this non-linear generalized canonical analysis is selected (Valette-Florence, 1998) since it offers five advantages over other optimal scaling procedures (Valette-Florence, Sirieix, Grunert, and Nielsen, 1998):

- First, contrary to usual canonical analysis, the analysis is no longer restricted to two sets of variables. Therefore, the procedure allows the researcher to explicitly model any number of sets of variables (i.e., the attribute / consequence / values sets). The analysis then does exhibit a more formal causal character.

- Second, due to the optimal scaling properties of the method, the researcher can perform an usual cluster analysis on the stimuli (A/C/V) coordinates and then allocate the individual ladders to the identified cluster centroïds.
- Third, once a perceptual space has been obtained, any distance discriminant analysis can be easily performed, allowing to allocate any number of individual ladders.
- Fourth, the analysis provides several fit indices that help the researcher to evaluate the overall quality of his/her study.
- Fifth, the method is readily available, due to the SPSS package for Windows.

More specifically, the method can best be seen as a special kind of constrained multiple correspondence analysis (Gifi, 1990, pp. 204-207); Van der Burg et al., 1988). While usual multiple correspondence analysis tries to find the overall representation that best explains the total inertia, non-linear generalized canonical analysis seeks to explain to a maximum extent all interactions among the variables. To perform a non-linear generalized canonical analysis, one needs to transform all ladders - a sequence of categories determined in the traditional way - into a number of dichotomous variables equaling the number of items – attributes, consequences and values - present in the sample. Each item not present in a ladder is coded 0 and each item present in the ladder is coded 1. Hence one ends up with a n x m matrix where n is the number of items identified in the respondents' means-end chains and m is the number of ladders in the sample. In a next step the categories are grouped into sets that in contrast to usual canonical analysis are not limited to two. Therefore the researcher can explicitly model the nature of means-end chains into the data set and define one set of attributes, one set of consequences and one set of values (or break down these sets even further, e.g. into functional and psycho-social consequences or functional and terminal values). By using an optimal scaling procedure the data matrix can now be translated into a multidimensional space where the optimal number of dimensions can be assessed by comparing the fit indices one receives for each of the sets. Assuming we have only three levels of abstraction with two elements each (i.e., A_1A_2 / C_1C_2 / V_1V_2) usual multiple correspondence analysis will try to find the overall representation that best explains the total inertia, whereas NGCA seeks to explain as much as possible all the interactions among the original variables. Implicitly, the program makes use of interactive variables (i.e., $A_1C_1V_1$ / $A_1C_1V_2$ / $A_1C_2V_1$ / $A_1C_2V_2$ / $A_2C_1V_1$ / $A_2C_1V_2$ / $A_2C_2V_1$ / $A_2C_2V_2$) that indeed correspond exactly to the laddering data collection procedure and representation. Hence, the NGCA seems to match perfectly the laddering data to be analyzed.

In our case, we have four sets: the first three are related to the elements belonging to the attributes, consequences or values hierarchy. The fourth set is related to the type and the characteristics of the car owned by the respondents. Hence, the method seeks to find the best quantification of the original variables (i.e., their coordinates within a multidimensional space) that best differentiate the cars owned by the respondents. In that sense, the analysis can be seen as a kind of categorical discriminant analysis, since all the variables within each set are by nature categorical. Again, we do stress the fact that we shift to a kind of causal analysis, since we define a priori the very nature of each set.

Table 1 shows the results with dimensionality set to 5. The R^2 coefficient represents the square multiple correlation between linear combination from each set and the object scores. It can be seen as a measure of association between sets and the object scores. The result of this step is a certain position for each item in the multidimensional space given by the respective coordinates on each dimension. The positions are determined through an algorithm that puts items the nearer to each other the more often they are mentioned in the same ladder. The strength of the relationship between items can therefore be evaluated by calculating the Euclidean distances between them. Overall, the results are excellent, showing the ability of the proposed methodology to recover the essence of the associations between all the elements (A/C/V) evoked by the respondents.

TABLE 1

Non-linear Canonical analysis Results

R^2 per set	Full Space
Set 1: Attributes	0.90
Set 2: Consequences	0.96
Set 3: Values	0.89
Set 4: Types and characteristics of cars owned	0.92
Mean	0.91

Once we have obtained the stimuli coordinates, we can perform a rather usual cluster analysis on them. The number of groups can be evaluated by means of the usual fusion index, carefully taking into account the meaning of the solution we get. For each solution (cf. Table 2), the coherence index is computed simply as the mean distance between all the elements A/C/V/ belonging to the same mean-end solution and its corresponding centroïd. Moreover, a simple procedure enables identification of a prototypical chain, i.e., the one that minimizes

the mean distance defined above. Lastly, a distance discriminant affectation gives the probability of the associations among all the elements and each of the means-end solutions.

TABLE 2: Means-End Solution

Prototypical Chains and Related Coherence Indices C_{DP}	**Main Orientation**	**Attributes (1-27)**	**Consequences (28-60)**	**Values (61-72)**	**Coherence Index**
9-10-41-42-43-44-62 $C_{DP} = 0.222$	Space and Pragmatism	9-10-27	41-42-43-44-60	62	0.326
25-26-28-57-61 $C_{DP} = 0.342$	Trust and Prudence	21-25-26	28-52-57	61	0.481
18-47-48-71 $C_{DP} = 0.554$	Convenience and Freedom	18	38-47-48-49	71	0.605
17-39-45-66 $C_{DP} = 0.439$	Comfort and Auto-Expression	8-13-14-17	30-39-40-45-46	64-66	0.617
23-24-53-54-55-56-59-65 $C_{DP} =0.195$	Economy	1-23-24	31-53-54-55-56-58-59	65-67-72	0.430
4-12-69 $C_{DP} = 0.282$	Funny and Timely	4-12		69	0.282
2-6-29-32-36-63 $C_{DP} = 0.771$	Sign Value and Hedonism	2-3-5-6-15	9-32-33-34-35-36	63-68	0.880
19-20-37-51-70 $C_{DP} =0.566$	Security and Responsibility	7-16-19-20-22	37-50-51	70	0.729

Once a global solution has been obtained, the same procedure can be easily applied with regard to each of the initial individual ladders. The only thing we have to compute is their corresponding centroids within the aforementioned (semantic) multidimensional space. Again the same kind of distance discriminant affectation gives for each individual ladder its probability of belonging to each of the means-end solutions. Usually, two cases deserve attention:

1. either one individual chain is nested (or very close) within the elements that define a given means-end solution: its corresponding probability will then be very close (or equal) to one;
2. or, one individual chain is rather split between several means-end solutions: consequently, we get a kind of fuzzy affectation, the original chain being linked to several means-end solutions.

This specificity of the analysis allows the researcher to explicitly take into account the intrinsic fuzziness of the consumer. Lastly, the procedure not only gives for each means-end solution an indicator of its coherence, but also the number of respondents it matches (Table 3). For instance, the two main final means-end segments are means-end solutions 4 and 8, whereas means-end solutions 3 and 7 seem to be the less important.

TABLE 3

Final Segmentation

Means-end[1] solutions	Number of Individual Ladders	
1	494	12,6%
2	390	10,0%
3	360	9,2%
4	792	20,2%
5	746	19,0%
7	350	8,9%
8	785	20,0%
	3917	100%

Lastly, one advantage of the methodology lies in its capacity to display the means-end solutions within a multidimensional space. Indeed, distances between means-end solutions can be easily computed. For instance (see table 4), means-end solutions 1 and 3 are the closest (d=0.96), whereas means-end solutions 6 and 7 are the farthest (d=7.48). Notice that these results are fairly in accordance with the overall general orientations displayed by these means-end orientations (see table 2).

[1] Means-end solution 6 has been dispatched to the other means-end solutions due to the very few respondents it matched

TABLE 4

Distances Between Means-End Solutions

1	1							
2	1.08	2						
3	0.96	1.04	3					
4	2.80	2.45	2.03	4				
5	3.33	2.30	3.06	2.95	5			
6	7.39	7.26	7.23	7.30	7.46	6		
7	3.84	3.44	3.47	3.59	3.94	7.48	7	
8	3.65	2.44	2.26	2.68	3.09	7.38	3.41	8

Discussion and Conclusions

Although the associations of each means-end solution with the types of cars have not been given for confidential reason, our results already show the usefulness of the proposed methodology:

- Different types of psychosocial motives, each specific to a given means-end solution, are easily identified.
- Moreover, each means-end solution can be easily evaluated, not only in terms of its overall coherence, but also with regard to the number of consumers it matches; the tandem use of nonlinear generalized canonical analysis and cluster analysis has proved to be very useful for determining specific means-end solutions.
- In turn, managerial implications for product positioning, new product launching, consumer's segmentation and development of related advertising strategies are straightforward.

One fascinating output of the methodology is the probabilistic association given for each car and the means-end solutions (unfortunately not currently available for confidential reasons). One interesting property of our methodology also lies in its reproductibility: once data have been obtained on a full representative sample and hence calibrated, the same survey can be reproduced any times one wants without the necessity to reconduct all the statistical analyses. In that sense, our analysis resembles very much traditional discriminant analysis.

Our analysis also resembles latent class analysis. Whereas the later analysis deals with latent categorical variables, our distance analysis deals with latent continuous variables. A full comparison between these two different paradigmatic approaches has still to be undertaken.

Fascinating studies have still to be undertaken, as we have no yet taken into account any demographic or socioeconomic variables. Also, longitudinal studies could prove to be very useful, par-

ticularly when special events occur (e.g.: surveys before and after the Mercedes A-Class re-launching…).

Finally, as most of the attributes or consequences used in this survey lead to terminal or instrumental values, more specific attention should be given to their systematic identification, mainly because all of the recent studies undertaken in France or Europe have proven the core importance of social values for studying specific or/and symbolic consumption patterns (Roehrich et al., 1989)

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EXHIBIT 1

LIST OF CONTENT CODES

N°	ATTRIBUTES
1	(a car with) classic lines
2	(a car with) sports lines
3	(a car with) modern lines
4	(a car with) cute and funny lines
5	(a car with) innovative lines
6	(a car with) elegant lines
7	Does not look like a small car
8	Roomy interior
9	Large trunk
10	Convenient and modular interior
11	Interior made of high quality materials
12	Fancy interior
13	Luminous interior
14	Comfort features
15	"Sports" features
16	Security features
17	Comfortable seats and suspension
18	Handy
19	Pick-up
20	Road-holding qualities, braking
21	Reliability
22	Quality of the body
23	Low price
24	Low fuel consumption
25	Proximity to a local dealer of the brand
26	Trust in a well-known dealer
27	Numerous dealers of the brand

N°	CONSEQUENCES
28	Easy to resell
29	Having a beautiful car
30	Not attracting attention with one's car
31	Keeping the car for a long time
32	Having a rather sports car
33	Having a rather original car
34	Not having a cheap car
35	Having the latest model
36	Having an innovative car, ahead of its time
37	Improved security
38	Having room for adult passenger
39	Not feeling confined
40	Making children at ease
41	Having enough room for luggage
42	Transporting bulky objects
43	Having a modular passenger compartment
44	Having a modular trunk
45	Feeling at ease, like at home
46	Driving long distances
47	Nipping in and out traffic
48	Parking easily
49	Having a car requiring little maintenance
50	Allowing to drive fast
51	Passing easily
52	Knowing that the engine will start every morning
53	Not spending much money on one's car
54	Respecting one's budget
55	Getting the best price / features ratio
56	Restricting one's budget
57	Avoiding a bad deal
58	Limiting pollution
59	Getting a good mileage
60	Not having any maintenance problems

N°	VALUES
61	One should be careful when choosing, prefer trust worthy values
62	One should consider the practical facets of things, not bother about the rest
63	One should not hesitate to treat oneself to something one likes
64	One should not hesitate to choose the best
65	One should not live beyond one's means
66	The most important thing is to be in harmony with oneself
67	The most important thing is to spend money appropriately
68	One should not always do what the others do
69	One should move with the times
70	One should be responsible, not jeopardize oneself and others
71	The most important thing is to feel free
72	We all are responsible for our environment