Harvard Business School

9-590-121

July 5, 1990

# Perceptual Mapping: A Manager's Guide

## I. Introduction

Pictures are often more effective than words, e.g., basketball coaches map out plays on mini-blackboards during time-outs; a company's annual reports set out sales figures in a bar graph; and executives study maps of sales regions to identify account concentration and territory development. Similar pictures often play a role in new product development as evidenced by the common usage of terms like "product positioning" and "market structure." These terms seem to indicate that the manager is visualizing a map of the marketplace in which brands are positioned against one another vying for the spot which consumers most desire. In strategic planning sessions, it is not unusual for a participant to pick up a marker and make his vision explicit on a flip chart. For example, a V.P. of marketing for a men's tailored clothing company might think of the dimensions of competition as mainly two: price and youthfulness of appeal and thus sketch out the "map" in **Figure A**.

Products range from the very expensive Hickey Freeman for the mature person to Austin Reed as branded low-price alternative for the younger set, to private label clothing. The strategic planners use this map as the focal point of a discussion on where the firm's new suit line should be placed.

Implicitly, the group makes two assumptions in using the map in this way: (i) potential customers use these same two dimensions in differentiating brands, i.e., price and youthfulness of appeal are key to customers and (ii) the placement of a brand on the two dimensions reflects the beliefs of customers. If it is a reliable representation of the views of customers in the marketplace, this type of map can illuminate discussions on target market selection, product design and product communications strategy.

Since the perceptions of customers are key, a set of market research tools has been developed to produce maps based on hard consumer perception data. These data replace perhaps informed, but somewhat subjective, judgment of managers. This note discusses these "Perceptual Mapping" tools. Having given some rationale for the construction of maps, Section II discusses construction procedures and Section III presents some illustrative applications and details the uses of the maps.

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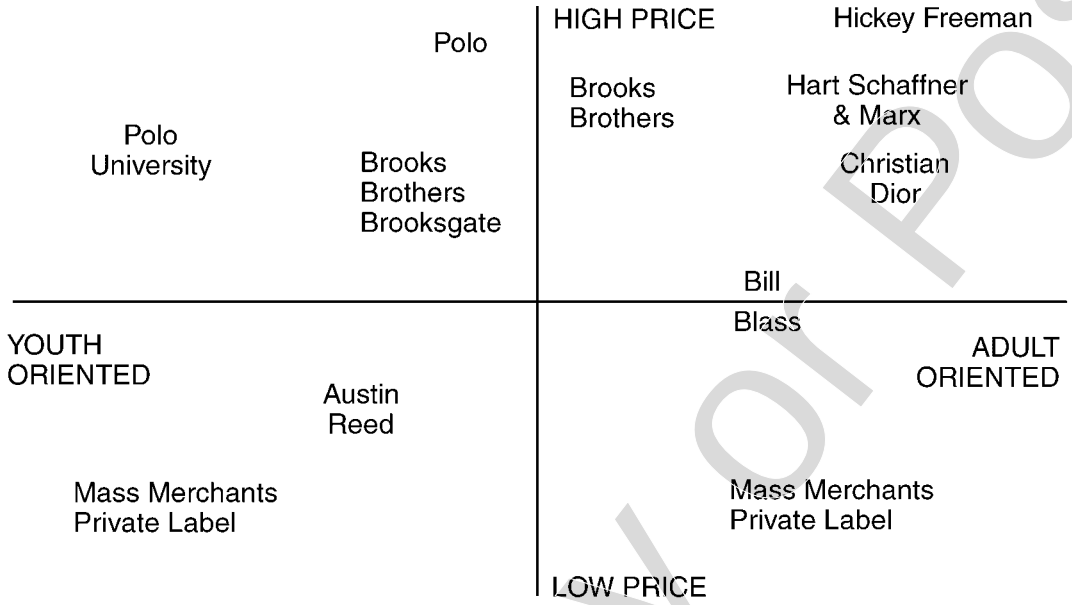
*Professor Robert J. Dolan prepared this note as the basis for class discussion.*

**Figure A** Map of Competitors in Suit Business




## II. Developing the Map

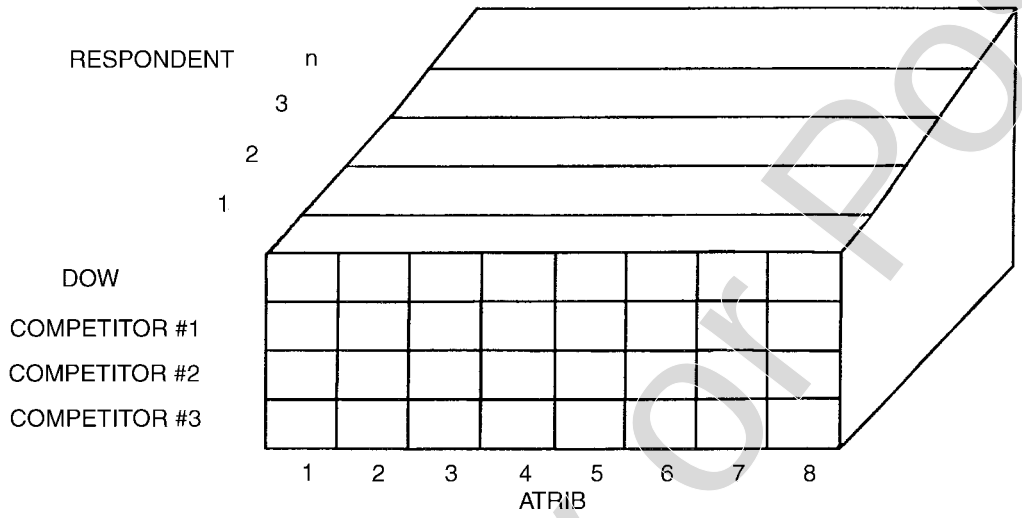
One obvious way to develop the map of a product category is to ask a consumer to name the two most important differentiating characteristics and then rate each product on these characteristics. This might work reasonably well in some situations. However, in general, it places too great a burden on respondents to result in reliable maps.

There are two major alternatives for constructing maps, differing in what is asked of consumers: (i) attribute rating method (AR) and (ii) overall similarity method (OS). The AR method is similar to one proposed above except consumers are presented a full list of possible relevant attributes and rate each item on each attribute. For example, Siemer (1989) uses the AR method to map the competition among vendors of specialty plastics. Potential customers rated Dow Chemical and three competitors on the eight attributes which Dow believed important:

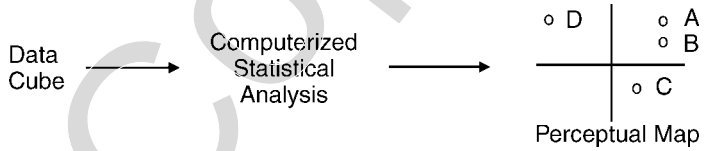
1. meets scheduled delivery dates
2. practices innovation and development
3. has fair pricing
4. has consistent product
5. provides support in solving processing problems
6. has custom color capability
7. provides adequate technical literature
8. withstands high heat distortion temperatures

The data collection phase of the AR approach results in a "data cube" as shown in **Figure B**.

**Figure B** The "Data Cube" of the AR Method




Each respondent provides 32 numbers, i.e., the ratings of each vendor on each of eight attributes. As shown in **Figure B**, for N respondents, one can think of the data from each being stacked up together in the data cube of 32 x N numbers. Now the question is how to extract some information from these data. This is the role of statistical analysis. The process is:

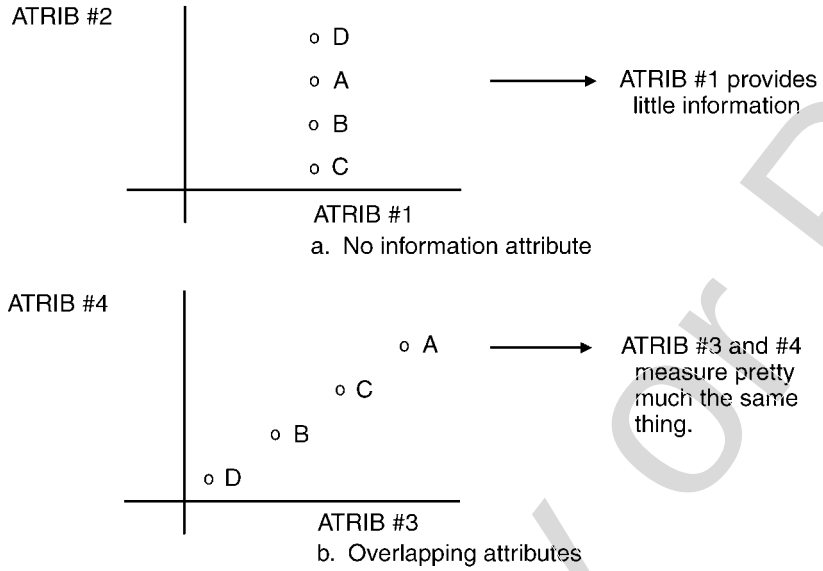



The statistical analysis (either "factor analysis" or "multiple discriminant analysis") essentially works on one set of vendor attribute ratings. This one set can be obtained by averaging the ratings across all respondents to obtain an aggregate market view or the analysis can be done sequentially for smaller groups of respondents to examine whether segments exist which vary in their perceptions of products. The philosophy behind the analysis is to find the two axes for the perceptual map which will convey the most information in the data cube.

The statistical analysis defines the axes by including the original attributes with different weights.[1] Intuitively, what the procedures do is "look" at situations such as shown in **Figure C**. In **Figure Ca**, we see all vendors are rated identically for attribute #1, so that is not a very interesting product feature. Once the statistical analysis reveals this, it does not give attribute #1 much importance in portraying the situation. Attribute #2 on the other hand varies across products and would have a place in the final map. **Figure Cb** is a situation in what attributes #3 and #4 are highly correlated, i.e., the vendors rated high on #3 are also rated high on #4. The statistical analysis would thus treat #3 and #4 as measurements of the same underlying construct.

[1]For details and a comparison of the statistical methods, see Hauser and Koppelman (1979).

**Figure C** Attribute Analysis




The analysis collapses down from the original set of attributes to a two-dimensional map with the four vendors positioned on the axes. Since the original data are in eight dimensions (attributes) and the perceptual map is reduced down to two, the map cannot capture all the variation among the vendors given in the data matrix. However, essentially it does the best it can, i.e., retains the most important information from the full data matrix and reports it in two dimensions to provide visual impact. For some representative maps using the AR method, see:

Siemer (1989) - p. 112 - Vendors of Specialty Plastics
Johnson (1987) - p. 144 - Presidential Candidates
Block (1989) - p. 122 - Channels of Distribution Alternatives
Stannard (1989) - p. 133 - Automobiles

The AR method has a key limitation for some product types, i.e., it requires the researcher to articulate and the respondent to think in terms of attributes. Apparently, this was not a problem for specialty plastics at Dow. However, imagine executing the AR approach in the soft drink or perfume market. In categories with competition driven by tastes, odors, or aesthetics—i.e., things we do not verbalize very well—the AR method breaks down. In such situations, the overall similarity (OS) method is preferred.

The OS method produces a map similar to that of AR. However, the input data are quite different. In OS, we do not specify any attributes of the products. We simply ask the respondent to make judgments about the overall similarity of pairs of items. Specifically, for n items, we require the respondent to rank the $[(n)(n-1)]\div 2$ possible pairs of items from most similar to least similar. For example, mapping the movie market we might consider 6 items: *Henry V, Fish Called Wanda, Nuns on the Run, Little Mermaid, Field of Dreams,* and *Teenage Mutant Ninja Turtles.* (Note: we limit this to six for simplicity in showing how the procedure works. Ordinarily, one would want to consider all relevant competition.) With 6 items, there are 15 pairs. A convenient way to represent the required input is in matrix form with a 1 = most similar pair and a 15 = least similar pair. Suppose one respondent gave the judgments as shown in **Table A**:

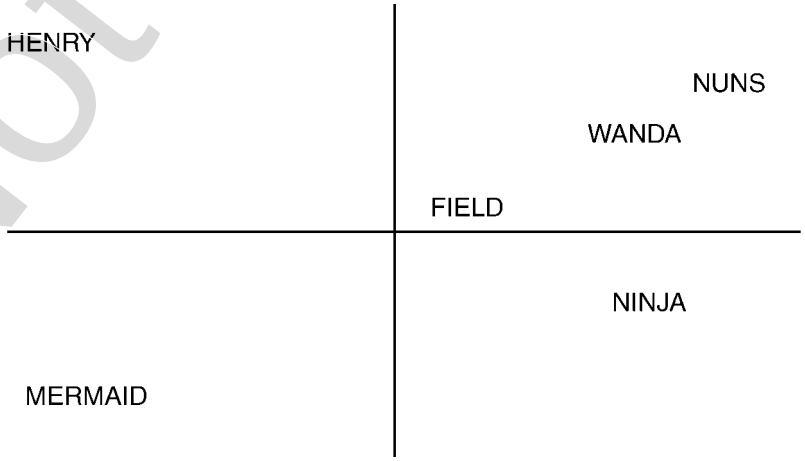
**Exhibit Table A** Respondent Ranking of Similarity of Six Movies

| | WANDA | NUNS | MERMAID | FIELD | NINJA |
|---|---|---|---|---|---|
| HENRY | 11 | 12 | 10 | 6 | 13 |
| WANDA | - | 1 | 14 | 2 | 5 |
| NUNS | | - | 15 | 3 | 6 |
| MERMAID | | | - | 8 | 9 |
| FIELD | | | | - | 4 |
| NINJA | | | | | - |

"Eyeballing" the data, we might notice a couple of things. First, Field of Dreams is seen as pretty similar to all the movies (obviously this hypothetical respondent never threw a baseball with his hypothetical father). Also, the Mermaid-Ninja pair is rated ninth—less similar than the average pair. This might seem odd as they are two children's movies in the set. In order to sort these things out, we submit the data to a statistical procedure (Multidimensional Scaling), to develop a map to permit us to "see" the data and get the information from it.

The statistical analysis attempts to find a map such that the distance between the movies as shown on the map match up (i.e., be in the same order) as the rank numbers in the input data matrix of **Table A**. The map in **Figure D** fits this bill. The output of multidimensional scaling is a plot like **Figure D** and a statistic which tells how closely the distances on the map match up with the original input data. Note that we do not know what the axes are—but our knowledge of the category can help us to name them. On the vertical axis, it's *Henry V, Fish Called Wanda,* and *Nuns on the Run* on one end versus *Teenage Mutant Ninja Turtles* and *Little Mermaid* on the other. This strongly suggests an adult versus kids audience vertical dimension. Second, the horizontal axis has *Henry V* and *Little Mermaid* versus *Nuns on the Run, Fish Called Wanda* and *Teenage Mutant Ninja Turtles*—strongly suggesting a humor dimension. *Field of Dreams* is the middle position—with broad audience appeal and a mix of serious and humorous. The map helps explain what might seem odd to us from "eyeballing" the data. While *Little Mermaid* and *Teenage Mutant Turtles* are seen as similar in their target audience, this respondent differentiates them on the basis of their relative use of humor.

**Figure D** Perceptual Map of Movie Market



The OS method thus allows us not only to map products but also infer the attributes used by the respondent in making distinctions. Note, however, that these inferences were somewhat subjective (e.g., one might say the horizontal axis is quality of the musical score) and required knowledge of the objects by the analyst. The OS procedure has been used in the mapping of:

- Retail stores by Arora (1982), Singson (1975)
- Desserts by Jain (1978)
- Food Products by Lautman, Percy and Kordish (1978)
- Ethical Drugs by Neidell (1969)
- Cigarette Brands by Smith and Lusch (1976)

**Table B** summarizes the major differences between the AR and OS methods.

**Table B** Comparison of AR and OS Methods

| AR | OS |
|---|---|
| Input Data | |
| • brand ratings on attributes<br>• attributes prespecified by analyst | • overall similarity ranking<br>• definition of similarity left to respondent |
| Statistical Technique | |
| • factor analysis<br>or<br>multiple discriminant analysis<br>(software generally available) | • multidimensional scaling (special-purpose software required; however, efficient packages available at low cost) |
| Output | |
| • product positions on axes defined as combination of original variables | • relative product positions; axes must be interpreted by analyst |
| Best Suited For | |
| • applications with hard attributes which can be verbalized | • categories dominated by not easily articulated attributes |

The major difference is in the input data required. While OS does require specialized software, a number of packages are available at no great cost. However, because of issues relating to statistical power, OS is inappropriate for applications with less than 8 brands to be mapped. Because the nature of the different product category determines which method is more appropriate, AR and OS should be viewed as complements to one another, rather than substitutes.

## III. Applying the Maps in New Product Development

There are three major ways in which perceptual maps are used in the new product development process:

(i) to obtain a better understanding of market structure
(ii) to test where a new product being considered for introduction would be perceived
(iii) to provide direction to R&D efforts to satisfy the wants of consumers better.

In many studies, perceptual maps are used for all three of these purposes simultaneously. The third is somewhat different from the others in that it requires representation of consumers'

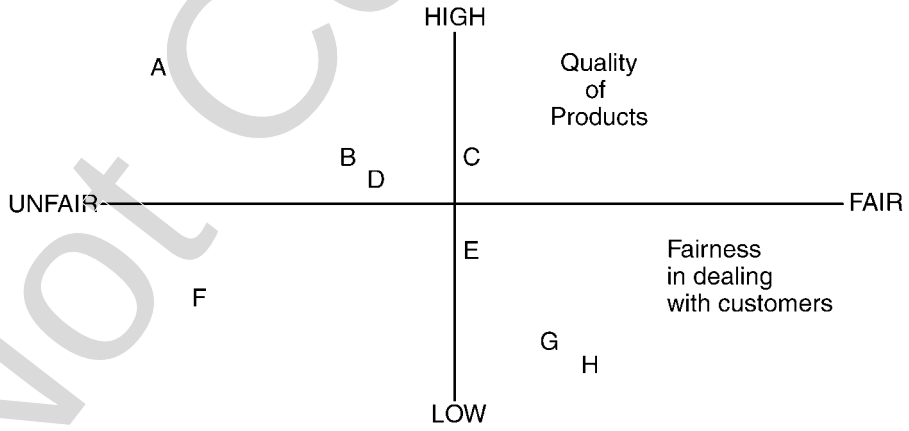
preferred positions (their "ideal points") as well as competitors' positions on the map. The procedure for achieving this will be discussed below. We will now cover each of the three purposes in turn.

## Purpose #1: Understanding Market Structure

At the idea generation stage of the new product development process, perceptual maps can be a useful stimulus to opportunity identification. Our vice president of marketing for the suit manufacturer was putting maps to this use in the example above. Specifically, the map of **Figure A** can indicate "holes" in the product space which might be exploited. These "holes" may represent niches of the market which current competitors have overlooked and could be developed. Second, the maps indicate the vulnerability of competitors by showing how consumers perceive them. For example, there are cases where a dominant share brand seems impossible to attack. However, a deeper understanding of customers' attitudes and perceptions can show the means of attacking this seemingly impregnable incumbent. Consider **Figure E**, a hypothetical map of eight vendors. Suppose using the AR or OS method generated the map with the axes interpreted as shown in the figure. Market shares in the category are:

| | | | |
|---|---|---|---|
| A. | 58% | E. | 8% |
| B. | 8% | F. | 1% |
| C. | 9% | G. | 5% |
| D. | 7% | H. | 4% |

**Figure E** Map of Competitive Positions of Eight Firms




These market shares are compatible with the map positions and the notion that a large proportion of the customers in the category are quite quality sensitive and hence buy from firm A even though it is perceived as "unfair."

The market share numbers suggest a difficult job in attacking A. However, the map indicates A's vulnerability. A's differentiation on quality, i.e., even firms B, C, D, and E are significantly lower in quality, grants it some power which it has exercised to the point of being negatively perceived by customers. If A were positioned in the map in the upper right hand quadrant, (say at A's quality and H's fairness), there would be no basis for attacking A. However, its poor position on fairness indicates A's market share can be taken away if a firm is able to produce product near A's quality level and treat customers well simultaneously.

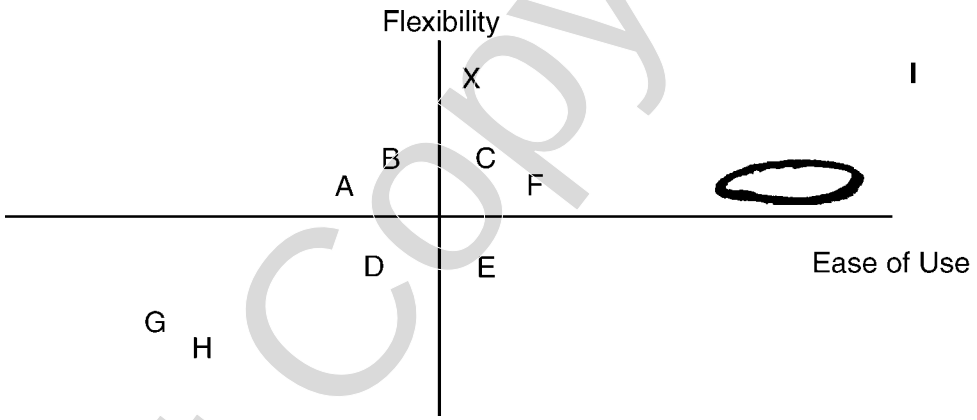
## Purpose #2: Perceptions of a Product Concept

Once a general opportunity has been identified, (either with or without perceptual maps) the process usually moves forward to concept development and testing and, in consumer packaged goods, some form of product use test or laboratory test market. In either of these phases, perceptual maps can be used to test if the concept or product would be perceived as the firm intended by consumers. The ASSESSOR pretest market system (see Silk and Urban (1978) for details) regularly uses perceptual mapping (an AR version) to provide diagnostic information to complement its prediction of the market share a proposed new product would attain.

For this use, respondents must be informed about the new concept or product, either through a concept statement or, if possible, product use. Once they are able to form their own image and judgments about the brand, the method proceeds as usual.

For example, suppose a firm in the computer business already participates in the market and the key attributes are ease of use, flexibility, and price. A Perceptual Map of the market is shown in **Figure F**.

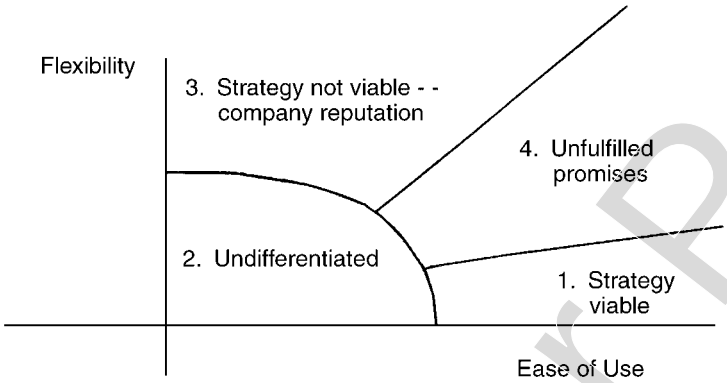
**Figure F** Perceptual Map of Personal Computer Market




The map shows a group of competitors in the middle of the map; firms G and H offer less flexibility and convenience (presumably at lower prices). Our Firm X has been able to differentiate itself from the group via innovation on flexibility, taking point X on the map. Although not depicted on the map, this is at a slight price premium over the offerings of A, B, C, D, E, and F. Firm I has been able to differentiate itself by offering both greater flexibility and greater ease of use, but its offering is at a significant price premium.

Our firm is considering expanding its product line to bring out a machine which is very easy to use, but with average flexibility, i.e., a product in the area of the circle drawn on the map. Such a product would sell at the same price level as X, but would (it was hoped) not cannibalize X but rather appeal to a market segment now buying F or I. The question is whether the product could take on this position in customers' eyes even if, in a technical performance sense, it provided average flexibility but was quite easy to use. Perceptual mapping can provide an answer to the advisability of the strategy. Once consumers understand the proposed product, a mapping study could be done to see where the new product falls. **Figure G** shows the four zones.

**Figure G**




If the new product takes on a position in consumer's eyes in Zone 1, the basic positioning is viable. The product is positioned strongly on the ease-of-use dimension and the trade-off for ease-of-use for flexibility is communicated. All other zones are problematic. Zone 2 puts the firm "in the bunch" with firms A, B, C, D, E, and F—not differentiated enough to make a product line extension worthwhile. Zone 3 is a basic failure to capture the desired position. The firm's reputation for flexibility overwhelms the new product features and the new product is seen to have the same basic strengths and weaknesses as the firm's current offering. Finally, Zone 4 may initially look like a good place to be—offering both improved ease-of-use and flexibility over the "bunch," but the product cannot deliver against those expectations and hence in the long term this would be a disaster.

Similarly, a map can be used after a product introduction to track the positioning. For example, suppose the study at this stage showed the new product to be on the border between Zones 1 and 4. One might then argue that the respondents had limited communication about the new product and that an actual introduction would be accompanied by extensive company-managed communication and trade press reviews which would be sufficient to place the product squarely in Zone 1, the "strategy viable" zone. Perceptual maps could be constructed after the introduction to test this hypothesis and aid in the determination of whether remedial action was necessary. Smith and Lusch (1976) used this approach to examine the effectiveness of a Liggett and Myers repositioning effort.

## Purpose #3: Direction to R&D Efforts to Satisfy Customers Better

This purpose is similar to #2, except here we require formal representation of the "ideal point" of a customer, i.e., what point on the map represents the ideal combination of attributes for different customer groups. Our example in #2 was chosen to sidestep this issue by choosing two attributes which almost everybody would like as much of as he could get for a given price. Consequently, we could think of the "ideal" being as far to the northeast as possible.

When we have attributes for which more is not necessarily better, we will want to represent explicitly these ideals. There are two methods for doing this, both of which are applicable in either the AR or OS procedure. The first method is to alter the input data collection phase to include the respondents "ideal" in the set of things to be rated on each attribute (AR method) or to be considered in forming all possible pairs for similarity ranking (OS method). The second method is to augment the data collection on perceptions with a preference phase. Statistical analysis, called preference mapping or "unfolding," is then used to position a respondent "ideal point" un the map following the principle that the ideal should be "close to" the brands at the top of the preference ranking and "far from" those at the bottom of the preference ranking (see Jain (1971) for example).

The examples in the literature point out the value of doing this because the ideal points of individuals while usually clustered, are spread out across the map of brands. For example, Johnson's work (1987) on presidential candidates identified eight clusters with significantly varied ideals on the two key dimensions of candidate differentiation:

- liberal versus conservative
- reduce government involvement versus increase government involvement.

## Summary

Often the intent is to use perceptual maps to serve each of these three purposes. The potential for managerial utility is hopefully clear from the description of the technique; however, added testimony comes from the number of firms regularly using the method and the reaction of some of those users. For example, in discussing Dow Chemical's application in the specialty plastics market, Siemer (1989) notes the following contributions of the perceptual mapping study:

> Some of the facts we learned from this study shocked us. . . . We had focused on physical product benefits as a basis for competitive advantage. Instead, we found a market more interested in service issues. [The study provided] greater understanding of the market structure . . . an understanding of the unique needs of industry segments [and] . . . competitors' vulnerabilities from the point of view of our customers.

The impact of this improved understanding was a change in Dow's basic approach to the market and spending plans, viz. "We were able to develop a strategic positioning for Dow that focused and prioritized our resources where they would have the greatest competitive advantage, and then were able to abandon issues and priorities that had low potential return because of customer indifference."

## IV. Summary

Perceptual mapping has proven a useful tool. It does have a number of limitations, however, which should be noted. First, it presents a static view, i.e., it is a snapshot of consumers' current perceptions. If a series of studies of the same market is done over time, some trends can be monitored. Second, while it may help a firm determine what it would like to do vis-à-vis the market, it provides no indication of the cost or likelihood of being able to achieve the desired positioning.

In short, it in no way substitutes for management judgment but often provides valuable input and serves as a very useful focal point in strategic planning discussions.

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