

Consumer-Driven Innovative Product Development

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To achieve Total Quality Management (TQM), companies must be customer-driven. In other words, they must translate what their customers want and need into products and services that fit those customers' criteria for purchase and repurchase decisions. To do so, companies must be able to measure the product characteristics that affect customer perceptions and deliver them consistently.

This is no small task. Although companies are spending increasing amounts on efforts to understand consumer needs, an extraordinary 90 percent of all new consumer products fail. Furthermore, of the products that manage to gain some market share, many do not completely satisfy customer desires. Most could be significantly improved.

The key question is how to conduct product development to create precisely the product the customer wants to buy. A major part of the challenge is to understand the softer, difficult-to-quantify aspects of consumer requirements: style, comfort, aesthetics, flavor, and service. At Arthur D. Little, we have pioneered a way to translate these „soft“ customer requirements into product specifications. We call it Product Dimensions Analysis (PDA). Although we have applied it primarily to foods and beverages, PDA can be used successfully for a vast variety of products with significant „perceived quality“ characteristics. But before we explain how PDA works, it may be useful to review briefly some of the conventional market research techniques it replaces.

Problems With Conventional Market Research

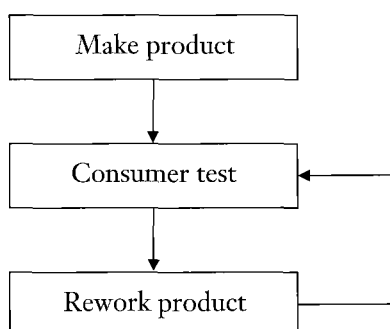
Most market research cannot provide precise measures of consumer preferences for the combination of characteristics that lead to purchase decisions. Typically, researchers measure consumer response as the preferred sample out of two or more choices. Consumer response from the product test is then used to modify the product. The „new“ product is again consumer-tested and, if necessary, modified further.

This „build it, test it, fix it“ approach to product development is expensive and time-consuming. Moreover, it often results in „wandering“ – a product development phenomenon in which changes in one product characteristic affect consumer response to other product characteristics. The final product of this iterative approach is unlikely to deliver what the consumer wants, for a number of reasons.

First, data are typically collected at a central location, where consumers are required to evaluate complex products in a short period of time. „On-the-spot“ product evaluations of this kind are difficult for consumers, especially if the product is a food or beverage with many sensory dimensions. The results of such consumer tests may produce misleading information. For example, the highly unsuccessful introduction of New Coke was based on extensive consumer testing of this kind.

Exhibit 1

Consumer Testing Used to Rework the Product



Second, different consumers want different sensory experiences from different types of products. For example, a person driving a luxury automobile may want a „smoother“ ride than a person driving a sports car. Their expectations differ further at various times of day and with various use occasions. Expectations are also affected by familiarity with the product based on previous usage and other factors. For example, consumers of diet colas have learned to like synthetic sweeteners; they also prefer a different flavor strength from that preferred by consumers of sugar-sweetened colas. To draw an „average“ between these two sets of preferences would miss

the target for both groups. Companies need to understand how their markets are segmented on the basis of consumer wants and needs before developing precise measures of the wanted characteristics.

A third problem is that conventional market research often asks the wrong questions. Although products vary in many ways, consumers focus on only a limited set of product attributes in differentiating among them. For example, there are many measures of automobile acceleration, but the one that matters most to consumers is the initial acceleration – i.e., the acceleration they feel in the first second or less. A general market research question about the importance of acceleration would miss this information entirely.

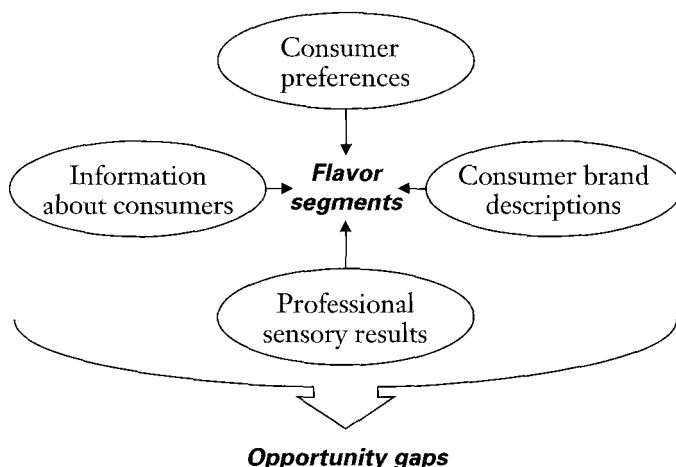
A fourth problem with conventional market research is that it lacks quantitative measures for consumer preferences. Without such measures, the chances that R&D can make the right product the first time are slight. For consumer research to provide really useful information, consumer responses must be translated into clearly understood measures. In some industries, this translation is referred to as the marketing/engineering interface. This is where Product Dimensions Analysis proves invaluable.

How Product Dimensions Analysis Works

Product Dimensions Analysis is a consumer-driven process for new product development (Exhibit 2). Properly applied, it can provide companies with the strategic information and product development tools they need to become innovative market leaders. PDA segments the market on the basis of consumer sensory preferences. For example, the market for soft drinks is segmented by flavor preferences and color preferences, while the market for snack foods is segmented by textural preferences (e.g., crunchiness, softness) as well as by appearance and flavor preferences. Consumer data (demographics, lifestyle, consumption behavior by time of day and use occasion, brand image, price sensitivity) are then used to develop a strategic understanding of the consumer segments. Next, consumer brand descriptions are calibrated to sensory preferences. Finally, consumer brand descriptions are translated into quantitative (sensory, physical, chemical, analytical) measures. The results identify market opportunities for existing and innovative new products, product optimization, brand positioning, and pricing.

Exhibit 2

Product Dimensions Analysis



A good example of how PDA works is a study undertaken in 1983 by Arthur D. Little and its subsidiary, Opinion Research Corporation, as an independent project to demonstrate the power of this method. The study focused on the carbonated soft drink market in Boston. It consisted of:

- Sensory measurements by a professional panel
- A consumer telephone survey
- Determination of consumer market segments
- Correlation of the consumer data and professional panel results

In the first step of PDA, a professional sensory panel developed a list of the sensory characteristics that differentiate soft drinks (using a proprietary Arthur D. Little method of sensory evaluation). These characteristics, together with marketing information, formed the basis of a questionnaire for a consumer survey. Consumers were asked one set of sensory questions in two ways: first, they were asked about their ideal soft drink; and then they were asked how well the same characteristics described the brand they most frequently consume.

Our analysis of consumers' responses to the ideal soft drink questions yielded 10 sensory concepts (Exhibit 3). In effect, these are the 10 ways consumers tell soft drinks apart and decide which to buy. We used consumers' responses to these 10 sensory concepts to segment the market into six groups of consumers that want similar sensory characteristics (Exhibit 4). These market segments can be displayed as „consumer ideal dimensions,“ and the various market segments can be located along these dimensions. For example, consumers in the upper-right quadrant of Exhibit 4 prefer a thirst-quenching, lower calorie soda with a sweeter, stronger flavor.

Next, trained panelists defined and numerically measured the attributes of frequently consumed soft drinks. We used our analysis to calibrate the consumer brand descriptions to consumer ideal dimensions. Then we used this analysis to translate consumer language into professional sensory descriptions.

The first consumer flavor dimension was translated into a professional measure of sour to sweet (although some of the other professional measurements were also used in the actual equation). This translation provided actual measurements of the levels of sweetness required by consumers, as shown in Exhibit 5. The translation of the second dimension was particularly useful because it developed a model for „thirst-quenching“ and „low-calorie“ attributes that involved a professional measurement of „mouthfeel.“ Mouthfeel was particularly important in describing the synthetic sweetener sensation of saccharin-flavored soft drinks. The translation of the second dimension also shed light on the consumer concept of „light-flavored,“ which was translated into an amplitude measure of the balance or blend of the flavor.

In the Boston market, Coca-Cola consumers preferred a sweeter product than Pepsi consumers. However, while the Coca-Cola product was actually less sweet than Pepsi, the level of sweetness of Coca-Cola came closer to matching the preferences of the Coca-Cola consumers than did Pepsi (which was viewed as too sweet). The study revealed that Boston consumers were very satisfied with the 1983 Coca-Cola formulation (pre-introduction of New Coke). Furthermore, the study identified opportunities for producers of diet soft drinks to improve their consumer satisfaction performance. (Follow-up research on subsequent diet soda formulations using NutraSweet® have shown a closing of the gap between consumer wants and product delivery on key attributes.)

The Benefits of Product Dimensions Analysis

By mapping the fit (or lack of fit) between what consumers want and what products deliver, PDA enables companies to optimize their products in a number of rather elegant ways.

Productive Correlations. Exhibit 6 maps the „consumer flavor world“ for another food product along two dimensions: mild-to-strong flavor (horizontal axis) and oxidized-to-“fresh“ flavor (vertical axis). In this study, brand image and price were also correlated to consumer perceptions of the product. Obviously, consumer expectation of satisfaction will increase with price. The brand image correlated strongly with the first – i.e., most significant – consumer dimension, while the second dimension was more negotiable in the consumer's purchase decision, involving a trade-off between quality and price. Overlaying brand image with other consumer information makes it possible to identify opportunities for improving the positioning of brands so that the brand image and price positioning support the sensory characteristics consumers want and the product delivers.

**Exhibit 3
Consumer Ratings of 10 Sensory Concepts**

<i>Concept Label</i>	<i>Sensory Attribute</i>	<i>Consumer Rating</i>
Thirst- quenching	<i>Refreshing, satisfying, thirst- quenching</i>	4.5
Citrus	<i>Citrusy, lemon taste, light- colored, not filling, not too sweet, orange taste</i>	1.3
Low-calorie	<i>Low-calorie, not orange taste</i>	0.6
Short aftertaste	<i>Blended, not heavily flavored, short aftertaste</i>	0.3
Tart/bitter	<i>Bitter, sour, spicy, tangy, tart</i>	-1.0
Sweet/syrupy	<i>Sweet, syrupy</i>	-1.7
Smooth/light	<i>Full-bodied, light-flavored, smooth</i>	2.4
Bubbly/strong	<i>Bubbly, cola taste, full- bodied, lasting taste, strong taste, tingly</i>	2.1
Mild	<i>Mild, not sharp</i>	1.5
Dark color	<i>Dark-colored</i>	1.5

Note: Consumers rated each factor's importance on a scale of -5 to +5.

Source: Arthur D. Little, Inc.

**Exhibit 4
Natural Flavor Segmentation**

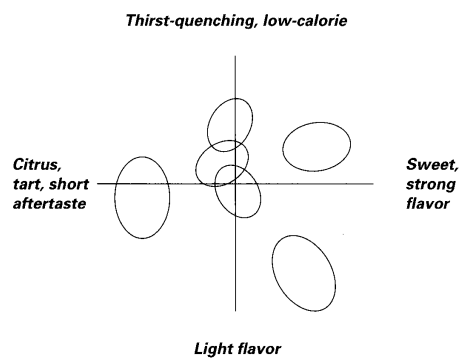


Exhibit 5

Translate Consumer Descriptions

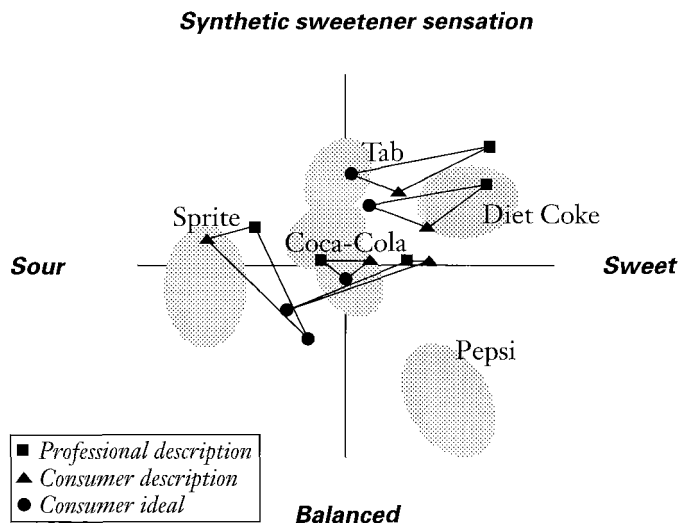
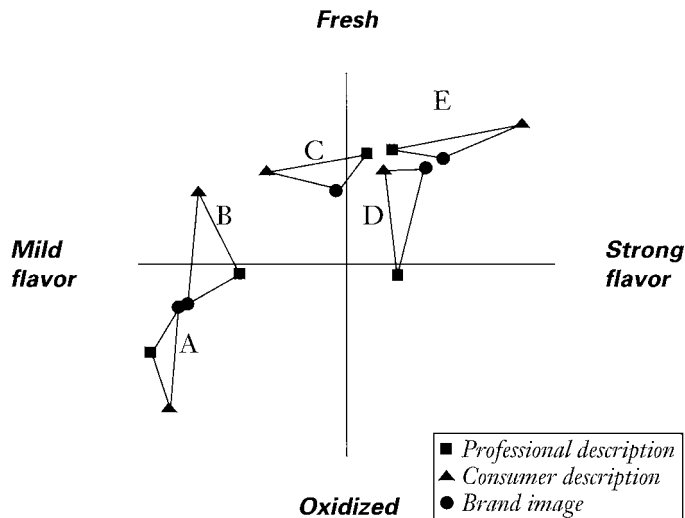


Exhibit 6

The Consumer Flavor World and Brand Image



Improving Product Characteristics. When the consumer ideal dimensions have been translated into quantitative measures (professional sensory measurements), these measures can be used to predict consumer response. The next step is to design an experiment in which key formulation/process factors are varied. The formulation combinations suggested by the experimental design are evaluated by the professional sensory panel. Analysis of the data shows what changes in formulation are likely to result in product changes desired by each consumer segment.

Targeted Testing. PDA permits market researchers to select from the set of new or potential products just the ones with the desired characteristics for consumer testing and to place them with precisely the consumers identified as representing the right market segment for that formulation. The response of these consumers is then analyzed to validate the new product formulations. Finally, product formulations can be selected for each market segment and

supported with the appropriate brand positioning and pricing strategy.

Precise, Quantitative Specifications. The translation of consumer perceptions and language into quantitative measurements is critical to the success of the product development process. By eliminating the ambiguity of language, the PDA approach provides R&D with the instrument to measure progress in meeting consumers' needs. The process of product development becomes far more efficient and cost-effective.

Linkages With Strategy. Information generated by PDA studies allows marketing and product development groups to work together in a powerful new way to develop coherent marketing strategies. They can both enhance and defend current brands and exploit the weaknesses of competitive brands. In some cases, PDA permits a company to reprocess and repackage a lackluster older product to serve a larger or faster-growing market. Conversely, information generated by PDA studies can reveal – as in the case of Coca-Cola in the Boston market – that customers are substantially satisfied with a product, and that reformulation would probably not be perceived as beneficial.

Conclusion

Progress in the quality of products and services – as perceived by customers – requires measurement of both the performance of the products and services and the satisfaction of customers. As customer requirements move beyond wanting the product not to fail, many apparently qualitative needs and preferences are surfacing. **PDA** is a powerful technique for understanding them and translating them into winning products and services.

Christine J. Jantz is practice leader for Product Dimensions Analysis activities in Arthur D. Little's Food Industries Section. She has extensive experience also in the areas of direct mail marketing and consumer product testing.

David Kendall retired in 1990 after 38 years with Arthur D. Little, most recently as a director of the firm's Technology and Product Development consulting practice. He continues to consult to the company, focusing on sensory measurement and its correlation with consumer response.