PRODUCT ATTRIBUTES MODEL: A TOOL FOR EVALUATING BRAND POSITIONING

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A brand’s positioning is designed to develop a sustainable competitive advantage on product attribute(s) in the consumer’s mind. Perceptual maps are commonly used to evaluate a brand’s positioning. Another tool from the economics literature, the product attributes model (based on Lancaster 1966, 1979), utilizes three components: attribute ratings, budget constraint, and indifference curves. The key advantage of this analysis over perceptual maps is the ability to incorporate the impact of price into assessment of the brand’s positioning. This paper discusses how the product attributes model helps managers understand the strategic implications of positioning decisions and provides an example of its use.

INTRODUCTION

Positioning “refers to how customers think about proposed and/or present brands in a market (Perreault and McCarthy 1999).” Through a brand’s positioning, a company tries to build a sustainable competitive advantage on product attribute(s) – tangible or intangible – in the mind of the consumer. This advantage is designed to appeal to one or more segments in that product category. Developing a successful positioning strategy is not easy; in fact, Schneider (1996) states: “Positioning products in a complex market can be one of a company’s most difficult decisions.”

To effectively position (or reposition) a brand, the company must know how this brand is perceived in relationship to other brands in the product category. Several tools are available for evaluating a brand’s positioning: multidimensional scaling, factor analysis, discriminant analysis, and multiattribute compositional models are the most commonly used. These tools have relative advantages and disadvantages that make them more suitable to specific applications as summarized in this paper. Based on these tools, the marketer can evaluate whether:

- The brand has a positioning that is differentiated from other brands in the market.
- Potential opportunities exist for the introduction of new products or repositioning an existing brand.
- Certain segments are underserved by existing brands in the category.

One tool that has not achieved common use is Lancaster’s model of consumer demand (1966, 1979), referred to in this paper as the product attributes model. This model incorporates price and the consumer budget into the analysis of the competitive positioning for brands. As such, it has advantages over other methods when price or value is a key issue in brand positioning. This paper provides an overview of the theoretical
basis for the product attributes model. Our primary contribution is a discussion of how the product attributes model can be used to make strategic decisions in brand positioning or repositioning. We further show the results of an application to the automobile industry. This model allows the marketer to better understand the customer-perceived value for the attributes in light of the price of the brand. From a marketing strategy standpoint, this understanding has specific implications for product design/re-design and pricing.

THE IMPORTANCE OF POSITIONING

Urban and Hauser (1993) state, “Positioning is critical for a new product. Not only must a new product deliver the benefits the customer needs, but it must do so better than competition (p. 202).” In developing a positioning, the marketer must consider four things:

- The target market.
- How the product is different or better than competitors.
- The value of this difference to the target market.
- The ability to demonstrate or communicate this difference to the target market.

These elements roughly relate to the components of a brand position as described by Aaker (1996): target audience, subset of identity/value proposition, create advantage, and actively communicate. The brand identity and positioning are central to developing a strong customer base and brand equity.

The target market and the perceived differentiation from competitors are core concepts of positioning. Rao and Steckel (1998) define a brand’s positioning as “how it is perceived relative to its competitors by a relevant group of customers. Segmentation and positioning are too often treated as independent concepts in practice and in the literature. However, positioning has no value unless it is appropriate for a target segment (p. 36).”

The concept of value to the customer is central to an effective positioning. Further, the brand must be able to communicate this value effectively to at least one segment of customers to get customers to switch to the brand. Aaker (1998) states, “A differentiation strategy must add value for the customer, and the added value must be perceived by the customer (pp. 164-165).”

Differentiation for new and established products typically takes the form of attributes that can be built into the product design to deliver benefits to the customers. The differentiation can be in quality (higher or lower), additional features, packaging innovation, to name a few. Or if the firm has a cost advantage relative to competitors, the product may be positioned on value by offering a lower price.

One of the key tasks of a new product manager is to define a brand’s positioning, and managers of existing brands must continue to monitor the effectiveness of the brand positioning and reposition when needed. Several methods have been developed to help marketers evaluate a brand’s positioning. These methods are described in the next section.

Methods for Evaluating a Brand’s Positioning

Keon (1983) describes four primary methods for evaluating a brand’s current or potential positioning. The methods are: multidimensional scaling, factor analysis, discriminant analysis, and multiattribute compositional models. Table 1 provides a summary of the input data, analysis, advantages, limitations, and best use for each method as drawn from the literature. The summary is primarily based on Keon (1983) and Hauser and Koppelman (1979) with additions and updates from other papers as shown in the table. For each method, a paper or two using or discussing this method is provided as a reference.

According to DeSarbo, Young and Rangaswamy (1997), multidimensional scaling is the primary method used for positioning. For further information on specific analytical techniques for multidimensional scaling, refer to Bujmolt and Wedel (1999) and Carroll and Green (1997) for a detailed comparison.

Huber and Holbrook (1979) compare and contrast factor analysis and discriminant analysis with the conclusions presented in Table 1. According to this analysis, discriminant analysis is more likely to yield objective dimensions while factor analysis is more likely to yield affective dimensions. These findings lead to the conclusion about the best use for each method.

Conjoint analysis is the most common approach in terms of multiattribute compositional models and is described in the table. For a taxonomy of conjoint methods, refer to Carroll and Green (1995). Green and Kriger (1989) conclude that conjoint analysis provides practical advantages over multidimensional scaling in terms of measurement and data collection for evaluating brand positioning. These authors suggest that the combination of conjoint for analytical purposes and multidimensional scaling for display purposes offers an attractive combination for researchers.

Hauser and Koppelman (1979) conclude that attribute-based techniques such as factor analysis and discriminant analysis provide better measures of consumer perceptions than similarity techniques such as multidimensional scaling if the set of attributes is reasonably complete. In addition, Hauser and Koppelman (1979) show that factor analysis is typically better than discriminant analysis. In our table, we provide a description of the “best use” for each method, recognizing that no one approach is best in all circumstances. Each method has strengths and limitations that make it more or less appropriate in specific decision making situations.
One limitation across all of the methods (with the exception of the Lancaster model described later in this paper) is the failure to consider price in the analysis, except as an additional attribute or dimension. One exception is a study by Hauser and Gaskin (1984) that used price in developing perceptual maps with factor analysis. Hauser and Gaskin (1984) use attributes per dollar as variables. In this analysis, they find that using attributes per dollar provides a better prediction of share than traditional methods or than the use of price as an additional dimension. Urban and Hauser (1993) discuss value maps and show that these maps provide guidance to new product teams in setting an initial price for a new product.

In looking at choices across product categories, Hauser and Urban (1986, p. 448) conclude that price is appropriate as a dimension when "price itself carries utility, such as in conspicuous consumption or when perceptions of quality are based on price."

Otherwise, consumers prioritize choices based on the surplus of utility over price.

The purpose of this paper is to demonstrate the applicability, and advantages and limitations, of the Lancaster model (1966, 1971) in evaluating brand positioning. The Lancaster model would be categorized as a multiattribute compositional model in the methods described in the table. This model has been discussed and extended in the marketing literature (Taylor and Haines 1975; Hendler 1975; Ratchford 1975, 1979; Ladd and Zober 1977; Hauser and Simmie 1981). The key advantage of this method over other methods is that the model explicitly considers price in evaluating the positioning of brands. Our paper adds to previous research on the Lancaster model in the marketing and economics literature in two ways. First, we provide an overview of the model and discuss its usefulness to the strategic issues surrounding brand positioning. Second, we provide an example of the model and show how Lancaster's model can be applied to brand positioning or repositioning questions.

**OVERVIEW OF THE PRODUCT ATTRIBUTES MODEL**

The model in Lancaster (1966, 1979), which we refer to as the product attributes model, assumes that consumer choice is based on the characteristics (or attributes) of a brand. The consumer derives utility based on the level of these attributes existing in the brand that she/he chooses within a budget constraint.

In the model, the consumer maximizes utility (U) in her/his choice of a brand. This choice is subject to the consumer's budget constraint (k), which must be greater than or equal to price (p) in combination with the quantity of the brand purchased (x). The choice is based on the vector of product attributes (z) that maximizes the consumer's utility based on the perceived levels of the attributes in the brand and the quantity that can be purchased. B represents the matrix of products-to-attributes transformation coefficients b_{ij} showing the level of i-th attribute a_{i} attained from the consumption of one unit of j-th product x_{j}. A simple form of this model is shown below (Lancaster 1966):

Maximize $U(z)$ (1)

Subject to $px \leq k$ (2)

With $z = Bx$ (3)

$z, x \geq 0$. (4)

There are three key components to the analysis for the product attributes model: the perceived levels of the product attributes for a brand, the budget constraint (referred to as the efficiency frontier in this application), and the indifference curve of a consumer or segment of consumers. The following sections discuss each of these elements briefly in terms of explicating the concept and its importance to the model.

**Attributes of Products**

Lancaster (1966, 1971, 1979) shows that consumers have preferences for characteristics (or attributes) of products. Each product is a bundle of attributes. For example, automobiles and motorcycles differ in gas mileage, horsepower, styling, safety, and so on. Rather than comparing the products themselves (as in indifference curve and budget constraint analysis), the theory assumes individuals choose among the more basic attributes of the products. Understanding why a consumer chooses a product based upon its attributes helps us to understand why some consumers have preferences for specific brands. This allows an analysis of brand competition.

The product attributes model explains individual choice as a process of choosing bundles of product attributes inherent in goods and services. The model assumes that consumer choice is based on maximizing utility (or the level of satisfaction received) from the product attributes subject to a budget constraint. The model is particularly useful in analyzing differentiated product markets. These markets have brands that are substitutes for each other and are distinguished by their makeup of a specific set of characteristics. Understanding consumer preferences for attributes that distinguish among brands can help in defining the best positioning and marketing mix for a particular brand.

To illustrate the model, we will use a simple example with only two product attributes. In this case, a two-dimensional graph reveals the model's main features and links it to the traditional indifference curve and budget constraint analysis of individual choice.

Figure 1 shows three products (A, B, and C), each offering specific amounts of attribute X and attribute Y. Each product is depicted in attribute space as a ray from the origin. The slope of each ray is determined by the ratio of attribute Y to attribute X. The rays are linear if we assume each product...
<table>
<thead>
<tr>
<th>METHOD</th>
<th>INPUT</th>
<th>ANALYSIS</th>
<th>ADVANTAGES</th>
<th>LIMITATIONS</th>
<th>BEST USE</th>
</tr>
</thead>
</table>
| Multidimensional scaling                        | Similarity or preference ratings          | Based on proximity – more similar brands are  | 1. The resulting dimensions are based on consumer judgments or preferences of the brands. The results are not dependent on attributes asked. | 1. Dimensions are often difficult to interpret. 2. Repositionings and new products are hard to evaluate because the analysis only considers existing dimensions of existing brands. 3. Direct similarity judgments have been shown to have issues with reliability (Summers and MacKay 1976). 4. Data collection is difficult for the researcher and respondent. Respondents have to rate or rank order numerous pairs of objects in terms of similarity or dissimilarity. (Katahira 1990) 5. The analysis requires at least 7 or 8 brands to get a map with 2 or 3 dimensions. This is a problem if the evoked set is small. (Hauser and Koppelman 1979) | Established categories with numerous brands in the evoked set.  
* Existing brand and/or attributes. |
| (cf. Green, Wind, and Jain 1972; Green, Wind, and Claycamp 1975; Moinpour, McCullough, and MacLachlan 1976) |                                            |                                               |                                                                            |                                                                               |                                               |
| Factor Analysis                                  | Ratings of brands on attributes           | Determines key dimensions based on the explanation of variance in the total attribute set using correlation among the attributes. The factor scores are the input for the maps. | 1. The product dimensions are relatively easily determined from the factor loadings. 2. The analysis reduces many attributes to key dimensions. | The factors are a function of the data collected (i.e., the attributes asked) rather than the importance of the attributes to consumers. | Promotional and communications strategies because it yields more affective dimensions (Huber and Holbrook 1979).  
* Potential gaps or opportunities for new products. |
| (cf. Hauser and Urban 1977; Huber and Holbrook 1979) |                                            |                                               |                                                                            |                                                                               |                                               |
| Discriminant Analysis                            | Ratings of brands on attributes           | Determines the linear combinations of attributes that best discriminate among brands. | The dimensions are based on attributes that differentiate the brands.         | 1. The factors are a function of the data collected (i.e., the attributes asked) rather than the importance of the attributes to consumers. 2. Dimensions are not easily or intuitively interpretable into managerial actions. 3. Dimensions are based on attributes that are different across brands regardless of relevance to preference or choice. | Engineering or new product design because it yields more objective dimensions (Huber and Holbrook 1979). |
| (cf. Pessemier 1977; Katahira 1990)               |                                            |                                               |                                                                            |                                                                               |                                               |
| Multiatribute Compositional Models               | Tradeoffs for consumers between attributes and product configurations | Determines the utilities of combinations of attributes. | 1. The analysis provides insight about consumer preference among attributes and brands. 2. The analysis can provide simulations for determining the optimal combination of attributes for segments of consumers. | 1. It requires other analysis to show brand positioning in relation to competitors and segments. 2. The data collection for a large number of brands could be onerous for the respondent and costly to the researcher. | New product design  
* Product re-design or repositioning |
| (The most commonly used is conjoint analysis.) (cf. Wilkie and Pessemier 1973; Green and DeSarbo 1978; Green, Carroll, and Goldberg 1981) |                                            |                                               |                                                                            |                                                                               |                                               |

1 Keon (1983) and Hauser and Koppelman (1979) formed the primary basis of this table, as supplemented by other papers shown.
offers a constant ratio of attribute Y to attribute X as quantity consumed increases. The highest ratio is offered by product A, the lowest by product C.

The Budget Constraint and Efficiency Frontier

The quantity of a product that a consumer can afford to buy will depend on the price of the product and the budget of the consumer. For a given budget constraint and set of prices for the products, the end points A, B, and C represent the limits of consumption along each product ray. The end points (or total attainable attributes) are calculated by multiplying each attribute level for a single unit of the product by the quantity of the product that the consumer can afford to buy. The line segment ABC defines the budget (or efficiency) frontier for the consumer. The frontier is called efficient because a consumer maximizes utility by choosing combinations of attributes on this frontier.

The efficiency frontier shows the total amounts of attribute X and attribute Y that the consumer can afford to buy. Product A offers $X_A$ of attribute X and $Y_A$ of attribute Y. Similarly, products B and C offer the attribute bundles $(X_B, Y_B)$ and $(X_C, Y_C)$ respectively.

Indifference Curves

The consumer's choice is made by maximizing her/his utility, as defined by the consumer's set of indifference curves, subject to the budget constraint. In the product attributes model, we interpret the slope of the indifference curve at a particular point (also called the marginal rate of substitution) as the rate at which the consumer is willing to trade off units of attribute Y for an additional unit of attribute X to maintain the same level of utility. Thus, the consumer's choice is influenced by her/his preference pattern in attribute space.

**Consumer Equilibrium**

As shown in Figure 2, the consumer shows a strong preference for attribute Y and therefore chooses product A. The consumer's preference is represented by the relatively flat indifference curves (IC, IC*, IC†). The highest indifference curve that intersects the efficiency frontier is IC*. (We will always let IC* represent the optimal indifference curve throughout our discussion of the product attributes model.) This intersection is at the end point of the ray for product A. The consumer maximizes utility at this intersection and will choose Product A.

On the other hand, a strong preference for attribute X would lead her/him to choose product C. In this case, the indifference curves are relatively steep. The proliferation of differentiated products in a particular market can be explained as the result of the dispersion of tastes and preferences for various attributes among different segments of consumers.

**Mixing Products**

Note that the consumer will spend her/his entire budget on a single product A, B, or C if the highest indifference curve just touches the respective end point. If the highest indifference curve touches a point on the line segment between two product ray end points, then the consumer would choose to split consumption between the two adjacent products. In Figure 3, the highest indifference curve that intersects the efficiency frontier is IC*. The intersection is represented on the graph as point M. However, there is no product that satisfies the attributes in the ratio represented by the point M. The consumer may be able to maximize utility by mixing products B and C. The consumer buys product B some times and product C other times. This can lead to brand switching by consumers for specific uses or occasions or just for variety. An example of mixing products would be dining out at various restaurants.

**Product Indivisibility**

If the product's consumption is indivisible (as in the case of an automobile or house), then consumption (or the consumer's
choice) is determined by the highest indifference curve that touches an end point. This may occur if the price of the product is large relative to the consumer's income, and the consumer can only afford to purchase one of the products.

As shown in Figure 4, the consumer cannot attain the highest indifference curve IC* if she/he can only afford to buy one of the products. The consumer will choose to buy product B (where the lower indifference curve IC intersects the efficiency frontier), and then utility will be less than optimal.

**Lancaster’s Model in the Marketing Literature**

In the 1970s and early 80s, several papers looked at Lancaster’s model, its advantages and limitations, and the potential application to marketing. Ratchford (1975) provides an overview of the model and describes several contributions of Lancaster’s model to consumer behavior (p. 67):

- An explanation for the role of price in determining demand for differentiated products.
- A framework for estimating the sensitivity of demand to changes in the relative price of a brand.
- A theoretical perspective for brand share models.
- An economic explanation for brand loyalty.
- A method to understand how brand preferences are formed given preferences for characteristics and prices.

Ratchford (1975) cites two limitations of the model. First, the model is static and deterministic. As noted by Ratchford (1975), most of the models used for evaluating brand positioning possess these same characteristics so this is a limitation across many of the methods used, not just Lancaster’s model. Ratchford (1979) in fact provides an extension of the Lancaster model for stochastic choice. Second, the model does not address how preferences for the characteristics are formed. Again, most of the methods for evaluating brand positioning do not describe this relationship. To the extent that understanding the formation of preferences is important for a specific application, Hauser and Simmie (1981) extend Lancaster’s model to include a full information processing model (physical feature → perceptions → preferences).

Ladd and Zober (1977) claim the model makes three assumptions that limit its usefulness: (1) every characteristic has nonnegative marginal utility, (2) utility is independent of the distribution of characteristics among products, and (3) the model uses linear consumption technology. Ratchford (1979) refutes that these are necessary assumptions of the Lancaster model except in unusual circumstances (e.g., when a consumer buys all brands of the product).

For our proposed application to brand positioning as opposed to product choice, Lancaster’s model (1966, 1979) provides an effective method for incorporating price into positioning analysis without requiring more elaborate extensions to the model. The product attributes model is particularly effective for brand positioning decisions involving product design and repositioning, especially when price plays a critical role in the perception of value for the product. In this context, the product attributes model provides a superior way to look at the combination of attributes with price and consumer budget constraints to guide managers in decision making.

Ratchford (1975) concludes: “In defense of the work presented here [Lancaster’s model], it can only be said that no worthwhile model of consumer behavior could take account of all factors…. The judgment about whether the models discussed here are ‘good’ can only be made after their predictions have been tested empirically (p. 74).” To encourage this empirical testing, we propose several ways that the product attributes model can provide strategic guidance in marketing. We conclude with an example of an application in
the automobile industry. Our goal is to show the usefulness of
the model in a specific context—brand positioning—and make
the model tractable for academician and practitioner alike.

**STRATEGIC IMPLICATIONS FOR
BRAND POSITIONING**

The product attributes model can be used to analyze a brand's
positioning and its effect on consumer choice. The product
attributes model has important implications for the brand's
positioning and marketing mix.

**Market Segmentation/Target Market**

The product attributes model can help the firm understand the
market segment(s) for a product. It can then enable the firm to
identify the appropriate target market(s) for its specific brand.

For example, in Figure 5, the consumer with indifference
curve IC\(_Y\) has a relatively low marginal rate of substitution
(MRS) between attribute Y and attribute X. This consumer has
a relatively flat indifference curve and will tend to purchase
product A. Consumers with a low MRS can be called the
"Attribute Y segment."

The consumer with indifference curve IC\(_X\) has a relatively high
MRS between attribute Y and attribute X. This consumer has
a much steeper indifference curve and will tend to purchase
product C. She/he belongs to the "Attribute X segment."

**Positioning**

The product attributes model allows the firm to see how its
brand is perceived relative to the competition on critical
attributes. The firm can assess whether it operates from a
position of strength or if it is vulnerable to the competition. If
it is vulnerable, it can determine the appropriate action to take:
a new product, changes in the existing product, changes in
price, or a new promotional strategy.

**New Product**

A firm may introduce a new product positioned to take
advantage of an opportunity represented by a "gap" in the
attribute space between rays. This "gap" indicates that existing
products do not satisfy a specific ratio of attributes. If a
sufficient number of consumers want this ratio, a new product
may be developed with the appropriate ratio of attributes that
maximizes the utility of this market segment.

**Changes in Existing Product**

The product attributes model indicates on what attribute(s) the
existing product may be deficient. The firm can then make the
product improvements needed to shift the product to a more
favorable position in the market. The product attributes model
can also help predict increases in market share that will result
from these product improvements.

**Changes in Price**

If the product's price is reduced, the budget constraint will
shift outward along the product ray (the consumer can afford
more). If the product's price is increased, the budget constraint
will shift inward along the product ray (the consumer can afford
less).

Look again at Figure 4. What can the firm that sells product C
do to capture the consumer and make a sale? One option
would be to cut price. Cutting the price will shift the budget
constraint outward. A cut in price moves the end point for
Product C from C to C' as shown in Figure 6. The consumer
equilibrium will be at the intersection of IC* and the new
efficiency frontier. The consumer then will choose to buy
product C.

**Pricing a Product Out of the Market**

Based upon a consumer's perception of the attributes offered
by a product, there is a maximum price he or she will pay for
the product. In Figure 7, the consumer maximizes utility by
mixing between products A and C. The price of product B at
the point B on the product ray is too high for the consumer.
The price of product B must be decreased to the point
represented by B' in order to capture the consumer. An
alternative approach is to add value through product re-design
to move the product to the same position.
Price deals and coupons can be used to effectively lower the price for specific purchase occasions. These promotions adjust the efficiency frontier on the promoted product for those particular purchases.

**AN EXAMPLE**

We will start with a simple example based on two automobile attributes (gas mileage and horsepower) to analyze the choices faced by two market segments: environmentalists and racing enthusiasts. Table 2 summarizes gas mileage, horsepower, and price data for three automobiles (Focus SE, Taurus, and Mustang Mach 1), as reported by Edmund’s New Car Guide. Note that these models do not compete in the same subcategory. However, the analysis shows the positioning strategies used by one company (in this case, Ford) to appeal to multiple segments based on different combinations of attributes.

Figure 8 shows the product rays associated with each brand of automobile. The slope of each ray is equal to the ratio of gas mileage to horsepower.

**FIGURE 8**

**Promotion / Changes in Consumer Perceptions**

Advertising can change the perception of the product in terms of attribute content and proportion (distance from the origin to the end point and/or slope of the product ray). It can also influence a consumer’s tastes for attributes (shape of individual consumer’s indifference curve).

Advertising may make an attribute important to consumers that might not have been considered previously. In this case, a new attribute dimension must be considered in the product attributes model.

Table 3 shows the total attainable attributes for each brand of automobile given the consumer’s budget. Total attainable attributes are calculated as the attribute rating of the automobile multiplied by the quantity of that automobile which the consumer can afford to buy (in this case, automobiles per $30,000). Clearly, the Focus is positioned as an economy car based on its superior performance on gas mileage. Similarly, Mustang has a well-defined position as a muscle car based on its strength in terms of horsepower. The Taurus performs at a mid-level on each of these attributes.
TABLE 2
ATTRIBUTES AND PRICES OF THREE AUTOMOBILES
- GAS MILEAGE AND HORSEPOWER -

<table>
<thead>
<tr>
<th>Brand of Automobile</th>
<th>Price (MSRP)</th>
<th>Attribute Rating*</th>
<th>Ratio of Gas Mileage to Horsepower</th>
<th>Automobiles per $30,000**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus SE</td>
<td>$15,595</td>
<td>100 36</td>
<td>2.78</td>
<td>1.92</td>
</tr>
<tr>
<td>Taurus</td>
<td>$19,990</td>
<td>74 51</td>
<td>1.45</td>
<td>1.50</td>
</tr>
<tr>
<td>Mustang Mach 1</td>
<td>$28,995</td>
<td>63 100</td>
<td>0.63</td>
<td>1.03</td>
</tr>
</tbody>
</table>

TABLE 3
TOTAL ATTAINABLE ATTRIBUTES
- GAS MILEAGE AND HORSEPOWER -

<table>
<thead>
<tr>
<th>Brand of Automobile</th>
<th>Total Attainable Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gas Mileage</td>
</tr>
<tr>
<td>Focus SE</td>
<td>192</td>
</tr>
<tr>
<td>Taurus</td>
<td>111</td>
</tr>
<tr>
<td>Mustang Mach 1</td>
<td>65</td>
</tr>
</tbody>
</table>

Figure 9 builds on Figure 8. The total attainable attributes define the end point on each product ray. We then connect the outermost end points to define the efficiency frontier. Any end points inside the efficiency frontier are effectively priced out of the market. In this case, the end points are defined by the Focus and the Mustang. The Taurus falls inside of this efficiency frontier, and so it appears to be priced out of the market. We will discuss this more later in the example.

**FIGURE 9**

People who are concerned about the environment or economy would be expected to give up only a little gas mileage for increases in horsepower since this segment values fuel efficiency. As a result, this segment has a very low marginal rate of substitution, and its indifference curves are relatively flat. We call this segment the environmentalist segment with the highest attainable indifference curve ICp. Figure 10 shows a representation of this segment’s highest attainable indifference curve superimposed on the graph of Figure 9.

The environmentalist segment will choose to purchase the Focus SE since its highest indifference curve (ICp) intersects the efficiency frontier at the end point for the Focus SE. This segment’s willingness to trade off only a little bit of gas mileage for more horsepower is best satisfied by the Ford Focus SE.

On the other hand, the other segment (referred to as the racing enthusiasts) cares little about gas mileage and wants a lot of horsepower. As a result, this segment’s indifference curve (ICq) is relatively steep in the area of the efficiency frontier, and a member of this segment will choose the Mustang Mach 1.

Note that the Ford Taurus is “priced out of the market.” This result is driven by our assumption that consumers only care about two automobile attributes, gas mileage and horsepower. We know that there are consumers who buy a Ford Taurus (in fact, the Taurus is one of the best selling automobiles in the world). This must mean that there are attributes other than gas mileage and horsepower that are important to automobile consumers. This result points to a need to consider additional attributes in the product attributes model. The analysis can be extended to multiple attributes through additional maps or
FIGURE 10

As can be seen in Table 5, the Taurus has the greatest total attainable attributes for luggage capacity; however, the Focus SE is very close. This proximity is primarily driven by the difference in price since the luggage capacity for the Taurus is approximately 40% larger than that for the Focus SE. This finding demonstrates the importance of including price in the analysis.

Table 5

<table>
<thead>
<tr>
<th>Brand of Automobile</th>
<th>Total Attainable Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus SE</td>
<td>146</td>
</tr>
<tr>
<td>Taurus</td>
<td>150</td>
</tr>
<tr>
<td>Mustang Mach 1</td>
<td>66</td>
</tr>
</tbody>
</table>

Figure 11 shows the relative positioning of the Focus, Taurus, and Mustang with respect to luggage capacity and horsepower. For segments emphasizing luggage capacity or horsepower, the Focus does not provide the value offered by Taurus and Mustang. As a result, the Focus, despite its relatively modest price, is priced out of the market because it does not possess sufficient quantities of the attributes desired for the price. Of the two cars remaining, the Taurus clearly appeals to the segment that desires luggage capacity which we will call the family segment. The indifference curve for this segment is designated by $IC_F$. The racing enthusiasts who greatly value horsepower over luggage capacity will select the Mustang (as shown by $IC_R$).

For completeness, we also show the comparison of luggage capacity and gas mileage. In this case, the Mustang is priced out of the market since it does not offer greater value for either attribute. The family segment will select the Taurus for its greater luggage capacity (as shown by $IC_F$), and the environmentalists will choose the Focus (as shown by $IC_E$) for its greater fuel efficiency.

FIGURE 11

Table 4 builds on Table 2, presenting the ratings and ratios for luggage capacity. The total attainable attributes for luggage capacity are summarized in Table 5.

<table>
<thead>
<tr>
<th>Brand of Automobile</th>
<th>Attribute Ratings*</th>
<th>Ratio of Luggage Capacity to Horsepower</th>
<th>Ratio of Gas Mileage to Luggage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus SE</td>
<td>76</td>
<td>2.11</td>
<td>1.32</td>
</tr>
<tr>
<td>Taurus</td>
<td>100</td>
<td>1.96</td>
<td>0.74</td>
</tr>
<tr>
<td>Mustang Mach 1</td>
<td>64</td>
<td>0.64</td>
<td>0.98</td>
</tr>
</tbody>
</table>

*Attribute ratings have been scaled to 100 points to allow an equivalent comparison of the attributes. Actual luggage capacity: Focus SE 12.9 cubic feet, Taurus 17 cubic feet, and Mustang Mach 1 10.9 cubic feet.
Similarly, for expository purposes, we develop utilities for the family and racing enthusiast segments. The family segment \( U_f \) values luggage capacity over horsepower, and horsepower over gas mileage. The racing enthusiasts \( U_r \) just care about horsepower and are willing to pay for it.

\[
U_f = GM + 10HP + 20LC \\
U_r = GM + 20HP + LC
\]

(7)  
(8)

Based on these utility functions, Table 6 shows the total utility assigned to each car by each segment. These values are assigned by weighting the total attainable attributes for each car. The bold values show the car preferred by each segment.

<table>
<thead>
<tr>
<th></th>
<th>( U_f )</th>
<th>( U_e )</th>
<th>( U_r )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus SE</td>
<td>1375</td>
<td>3802</td>
<td>1718</td>
</tr>
<tr>
<td>Taurus</td>
<td>1337</td>
<td>3802</td>
<td>1801</td>
</tr>
<tr>
<td>Mustang Mach 1</td>
<td>819</td>
<td>2415</td>
<td>2191</td>
</tr>
</tbody>
</table>

(9)

As can be seen in these examples, the environmentalist segment has a strong preference for the Focus SE due to its superior gas mileage. The family segment prefers the Taurus for its greater luggage capacity, and the racing enthusiasts prefer the Mustang for its horsepower. Through this analysis, marketers can identify the key segments and their preferences in terms of attributes and brands to determine the best segment to target, opportunities for new products or the need for modifications to existing products, appropriate positioning and promotional strategies, and potential pricing adjustments.

**CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH**

The product attributes model provides a powerful tool for analyzing marketing strategy based on the positioning of a brand. It provides a framework for incorporating brand price, consumer preferences, and budget constraints into an analysis of the optimal combination of attributes that appeal to specific market segments. The model provides direction for marketing strategy with implications for pricing, product development, promotion, positioning, and segmentation.

The product attributes model offers many opportunities for a future research agenda, including:

- Empirically testing the application of the model to marketing strategy.
- Using empirical research to compare the results of the product attributes model to other positioning analysis tools to better understand the relative strengths and weaknesses of these methods.
- Developing measures to define indifference curves for consumers or consumer segments.
- Empirically evaluating the application of the multiattribute model and its implications for marketing strategy beyond two dimensions.
REFERENCES


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