Marketers tools exist to help managers understand and manage their pricing decisions.

"You can't take market share to the bank." - George Cressman

"No other element of the marketing mix can have a more rapid or dramatic impact on business profitability than improved price management. Price is the most powerful profit lever in the business. For the typical S&P 1000 company, a 1% price increase translates to a 12% increase in profitability if volume remains the same.

Of course the willingness of customers to pay a higher price is based on the value they receive. Higher value, higher willingness to pay. The better a firm's ability to identify and measure the value of an offering and its components, the better our chances of developing an offering to command a higher price.

A 1998 audit of pricing practices that we conducted at 11 large firms revealed that in most cases:

• Firms are internally focused, rather than market focused, in their price-related information gathering and performance measurement.
• Managers generally work hard to make good pricing decisions, but they are not employing the information, tools, and techniques to work smart.

If this sampling is indicative of the behavior of many firms, and we believe it is, then many firms are missing the boat on building value, higher prices, and greater profitability.

Our purpose in this article is to discuss marketing engineering tools that managers can employ to become more market-oriented when making pricing decisions and to be more productive in their analyses. Specifically, our focus will be on the marketing engineering tools and techniques for measuring the customer’s price-value relationship and for assessing how changes in price influence demand.

Here are six questions we will address:

• How can we measure the actual value of our offering to a customer?
• What is our offering’s perceived value relative to competitive offerings?
• How might the marketplace respond to a price change in our offering?
• Which attributes of our offering have the highest value to the customer?
• Which segments will value an offering highly?
• When faced with multiple alternatives, how do customers choose between alternative offerings or offerings with different combinations of features?

To address these questions, we will discuss four essential tools for the marketer’s tool kit:

• Value-in-use analysis.
• Value mapping.
• Conjoint analysis.
• Discrete choice modeling.
In a future article, we will discuss yield management, a marketing engineering technique for proactively managing the price-value relationship when timing of purchase is a primary determinant of value.

Value in Use Analysis

Value in use (VIU) analysis is a process for inferring the economic value of a product to a given customer relative to the next best competitive offering. VIU answers the customer’s question: “What’s in it for me?”

VIU is used primarily in making pricing decisions for offerings targeted to business customers. These customers look for measurable, functional or performance value, relative to alternatives, in order to justify a purchase. These customers often wield significant power in the relationship, and their purchasing agents are expected to be tough negotiators with suppliers on price. From the supplier’s perspective, it is critical to understand the value of their offering to the customer in order to hold the line against discounting. VIU is tailor-made for considering the price-value relationship in these situations.

VIU is particularly useful in new product pricing. Pricing decisions made at launch define the economics of the market for years or even decades to come. VIU is a flexible, analytical approach that can be used to assess the value of a new product or service relative to:

- An incumbent process.
- An incumbent product or service.
- An in-kind competitor.
- A not in-kind competitor.

Exhibit 1 demonstrates the calculation of VIU in which a newly developed industrial product (o-ring) has higher corrosive resistance than an incumbent product. The analysis reveals the new product has seven times the value of the incumbent to the customer ($35 vs. $5). This new o-ring may, therefore, be priced at a level up to seven times that of the incumbent. In other words, at any price less than $35 the customer is better off using the new product. VIU reveals the upper price limit based on economic value.

The marketer’s challenge, then, is set a price that provides the customer with an incentive to switch to the new product while adequately rewarding the supplying firm for its creation of the value. In the example, the economic value of the o-ring is $35. Let’s say that the product cost is $10 and the price set is $25. Then the firm makes $15 on each o-ring as a reward for creating value. The purchasing firm is $10 better off with each o-ring purchased than it would have been using the old product and therefore has an incentive to switch.

In our experience with this type of situation, managers who do not employ VIU are likely to underestimate a new product’s value and set price too low. Managers who employ VIU are likely to obtain higher prices, pay back the new product investment more quickly, have higher marketing budgets, and better hold the line against discounting.

Another advantage of VIU is that it can be used to estimate overall market potential. Often VIU will vary based on the operating characteristics of the buyer. Different segments of buyers will have different values in use. By setting price at a certain level, certain buyers will find the offering attractive, and others will not. The available market potential is then defined by the set of potential customers who find the offering attractive at a given price point.

A major disadvantage of VIU analysis is that it does not consider customer perceptions, which may be at variance with the economic value created. For example, compact fluorescent light bulbs have been on the market for at least a decade. These bulbs use only a fraction of the energy of typical incandescent bulbs and last 10 times to 20 times longer. Manufacturers have been quite successful in selling these bulbs to business and industrial customers where the economic value is significant and measurable. In the consumer market, however, sales have been perennially disappointing. Though the bulbs provide a measurably better economic value relative to incandescents, most consumers are simply unwilling to pay $15–$30 for a light bulb. To measure perceptions, we must use other analytical approaches that evaluate perceived value as well as economic value.

Value Mapping

Value mapping is an easy-to-use
process for understanding how customers perceive competing offerings. Value maps measure the relative perceived quality of competing offerings as compared to their relative price. Value mapping is most useful in established product categories in which a number of competing alternatives are available to customers. The technique may be used in establishing price for a new offering or in evaluating the perceived value and price of an existing offering.

Exhibit 2 is a value map for laptop computers. The diagonal line across the map is the fair value line. Along this line, the price-value relationship is constant. Products plotted on or near the line are perceived as delivering fair value for the price. Products plotted to the right of this line offer high perceived quality relative to price. Products plotted to the left are perceived to be high priced relative to the perceived quality they deliver.

To produce the map, customers are asked to weight and rate attributes offered by several competitors. In the case of laptops, for example, customers might assign weights to the attributes of screen size, weight, flexibility in use, and service. Customers then rate competitors relative to one another on these attributes. Finally, customers are asked to weight the importance of price in their decision relative to nonprice attributes and to provide the prices of competing offerings. The map is produced by plotting the positions of competitors on the two axes: relative perceived quality and relative price. The slope of the fair value line is the ratio of price to nonprice weights. The steeper the slope, the less weight price has in the overall decision.

Value maps have several advantages. First, they are relatively easy to use and inexpensive to employ. As a first cut in looking at price, value maps can be very useful. For example, if a firm is considering a response to a competitor’s price move, producing a value map might be a good starting point. Value maps provide a strategic overview of the competitive situation. Product strategies can be visually analyzed both for their impact and anticipated competitor response. The slope of the value line suggests the degree to which price is a factor in the decision. A steep slope suggests price plays only a minor role in the decision. A gradual slope suggests customers are highly responsive to price. Position on the map might suggest price-performance-based segmentation. The data underlying value maps is also useful in that it points to those attributes that are the basis for the perception of superior performance and therefore provide indicators for change. Because the maps are based on customer perceptions, they can also be used to assess dissonance between perceptual and actual performance. In sum, value maps can be useful in:

- Visualizing the competitive situation.
- Understanding customers’ definition of value.
- Assessing a “fair” price and the role of price in the decision.
- Determining a path forward to improve your position.

For all its advantages, value mapping also has its limitations. Value mapping is often a feature-based comparison. Using the map requires an understanding of how those features translate into benefits underlying the purchase decision. Further, value maps do not measure price sensitivity (a change in volume given a change in price) very well. While the mapping process does indicate what percentage of the decision is based on price (the slope of the fair value line) that measure of price sensitivity is not a very good one. Can a customer really say with certainty that x% of their decision is based on price? What if that customer is presented with two virtually identical offerings, wouldn’t 100% of the decision then be based on price? In a commoditized market, where the prices are identical, is 0% of the decision based on price? To truly get a handle on price sensitivity, we need to move on to other models.

**Trade-off Approaches**

How do customers choose among alternatives when making a purchase? What role does price play in the decision? How will demand for a product change if we change price? How will our demand change if a competitor changes price? Can we develop a model for what-if analyses to evaluate alternative competitive scenarios? These are the kinds of questions routinely answered by trade-off analyses.

Trade-off works like this. Suppose you were shopping for a sport utility vehicle (imagine you are the only remaining person in America who does not currently own one). After visiting several dealers, you find that the primary differences between the Ford Explorer, Dodge Dakota, and Jeep Cherokee are price, sound system, and ride. Each vehicle has advantages and disadvantages in the three categories. Your decision is then made by trading off those attributes of least value to you in favor of those of more value to you. If you are wealthy, for example, you might trade off low price in favor of the best sound system and ride. If you had a bad back, you might trade off the sound system for a good ride and an acceptable price. Your goal as a consumer is to maximize your utility (the value you get from the product) given the constraints of the options you are presented with and your value hierarchy.

The trade-off approach is distinctly different from the value mapping approach. Value mapping is a survey approach that directly measures buyer attitudes. Trade-off analysis is an experimental approach in which buyers are presented with a set of options and asked to express their preferences or make a choice. By using this approach, as opposed to asking customers directly what they think, we present them with a
real-world decision situation and observe their response. What they do is usually a better indicator of real-world behavior than what they say.

The value of the trade-off approach is readily apparent. If you ask customers whether they want a lower price, they will routinely respond in the affirmative. If you present them with a set of options with alternative value price combinations, you may find they choose the higher priced option because of greater perceived value.

In the early 1980s, Marriott was running out of good sites for typical full-sized hotels. In addition, they were missing the low-end business traveler segment making six or more trips per year and looking for a “good value.” Marriott management asked two questions:

- What are the optimal hotel design features that will best position us to penetrate this segment?

- What does this segment’s demand curve look like given different product/pricing options?

Marriott used trade-off analysis to answer the questions and used the findings to develop a new concept: “Courtyard by Marriott.” By 1994, Marriott operated 300 courtyard hotels generating over one billion dollars in sales and created a new product category in the process.

Trade-off analysis encompasses several analytical approaches. Here we will focus on two of them: conjoint analysis and discrete choice modeling, also known as choice-based conjoint. In many respects, the two models are similar. The decision to use one or the other is largely based on the market situation being analyzed, the critical questions to be answered, and the relative strengths and weaknesses of each model given the situation and questions.

**Conjoint Analysis**

Conjoint analysis is theoretically a product design technique, but many conjoint studies are motivated by pricing issues. Exhibit 3 illustrates a simple conjoint analysis of an individual’s preferences for a hotel room. In the example, the respondent evaluates three options for two product attributes: room type and price. The respondent is asked to assign points to alternative “products” constructed from available attribute options. In this case, the respondent chooses from among nine products, each constructed from the room type and price attributes. The respondent then assigns nine points to his most preferred option and one point to his least preferred option. In this case, he most prefers a room/office at the $129 price and least prefers the small suite at $169.

In this simple example, the points in each column and row are summed and divided by the number of options. The resulting number for each row and column are the utility calculations, where higher numbers indicate greater utility. Utility itself is simply a measure of the relative preference for the option. Room/office has the highest utility (preference) overall and small suite the least. Now we have created a uniform measure of utility across the product attributes of room type and price, giving us the opportunity to trade off units of one in exchange for units of another. In a sense, this measurement approach allows us to compare apples (room type) with oranges (price) using the same underlying utility scale.

Now let’s consider the question: If we offer a room/office instead of a large room, will the customer be willing to spend an additional $20 for this option? In other words, would the customer trade off an additional $20 for the better room? Here is the analysis:

Yes, the customer would likely spend $20 more. In fact, the room/office is worth over $30 to this customer based on their preferences! In reality, if we were evaluating these room options, we would look at cost and volume implications as well to determine the product alternatives that maximize profitability.

In practice, conjoint analysis almost always deals with more than two product attributes. A typical study would consist of five or six attributes, each with three to four options, although some studies have used a substantially higher number of attributes. Exhibit 4 (see page 52) lists some of the other attributes that were evaluated in the Marriott study. The data collection procedures and utility calculations with more than two attributes are complex and require specialized software and a skilled analyst. Having said that, the actual outputs of conjoint are surprisingly simple. Conjoint

**Exhibit 3**

**Simple conjoint analysis**

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Price 129</th>
<th>Price 149</th>
<th>Price 169</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small suite</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Large room</td>
<td>7</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Room/Office</td>
<td>9</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

Utility:

- 6.7 = Most preferred
- ... = Intermediate
- 3.3 = Least preferred

20/3 15/3 10/3

Utility:
Sample Marriott case attributes

- Room size & décor
- Food related services
- Lounge facilities
- Transport to airport to airport
- Registration/checkout
- Secretarial services
- Leisure facilities
- Security factors

provides estimates of:

Utilities of each feature/attribute and its value to customers at the individual customer level, permitting better targeting and value-based segmentation.

- Market shares for existing competitors.
- Market shares for new product concepts.
- Demand curve showing price sensitivity at the aggregate or market segment level.

The actual output of conjoint analysis is a trade-off model in which the marketer can experiment with alternative price-feature scenarios to understand price sensitivity and to predict market share and profitability under various pricing options.

In practice, conjoint has several advantages over other value assessment techniques. As mentioned, conjoint analysis permits a more realistic assessment of customer preferences than more direct approaches like value mapping. Further price sensitivity can be directly measured indicating how volume would change given a change in price. Conjunct can be used to understand the price sensitivity of different segments of customers. And the value to the customer of specific product features can be quantified. Conjunct also permits segmentation analyses and modeling of alternative product concepts after the research is complete. Finally, conjunct can be implemented with a relatively small sample size. Not surprisingly, conjoint analysis is one of the most successful marketing modeling techniques.

On the other hand, conjoint has significant disadvantages as well. Conjoint is unquestionably difficult to explain to managers. Also, because of experimental design considerations, the per survey cost of conjoint is high. As a result, there is often pressure to study more product attributes and levels. Left unchecked, this translates into a cumbersome data collection and high error rates. With more attribute levels, price effects also tend to be underestimated. Finally, because conjoint defines products as sets of attributes, all attributes and options must make sense for all products. This can be problematic in markets where brands have strong identities, where not-in-kind competition is predominant or where the price range is particularly wide. In these cases, another approach called discrete choice modeling might be useful.

**Discrete Choice Modeling**

Discrete choice modeling (DCM) was initially applied to pricing in order to address some of the shortcomings of conjoint. Unlike the conjoint analysis approach in which respondents express preferences for a product assemblage of attribute combinations. DCM presents customers with actual product alternatives or concepts and asks them to choose which they would buy. Some choice models, in fact, have been developed to focus directly on the pricing question. Marriott employed a price elasticity choice model to firm up its pricing in the Courtyard case.

As compared to conjoint, DCM is a better choice in situations where price is a determinant attribute in the purchase decision and where the purchase decision is not highly evaluative. That is, DCM works best in situations where customers can quickly assess the value of alternative offerings and make a choice amongst the options. DCM may also be preferable to conjoint in the following situations:

- Target customers are relatively homogenous in their behavior (particularly price sensitivity).
- Competing products have unique features not shared by competitors (e.g., strong brand identity).
- Products have a wide array of price options or ranges.

Exhibit 5 illustrates a typical question format including a set of hotel choices. In this case, the respondent is asked to make a choice for purchase. In some studies, customers would be asked to indicate their first, second, and third choice alternatives to gather more data. DCM is arguably the most realistic approach to measurement of price sensitivity.

As with conjoint, the method allows calculation of the relative value of individual features of the offering. DCM also permits estimation of market shares for product alternatives and permits development of demand curves. Exhibit 6 illustrates demand curves for a set of hotels at different base price levels. Finally, we can raise hypothetical questions. For example:

- How will market share redistribute if Marriott raises its prices by 15%, from $129 to $148, and Westin raises its price 5% from $149 to $156?
- If Westin dropped its price by $20, which hotel, if any, would lose the most share?

As with conjoint, such analysis requires specialized software and a skilled analyst. Having said that, the actual outputs of this model are surprisingly simple. DCM produces a trade-off model in which the marketer can experiment with alternative pricing scenarios to measure price sensitivity. A discrete choice model provides estimates of:

- Utilities of each feature/attribute to customers.
- Market shares for existing competitors and product concepts.
- A demand curve for each brand showing price sensitivity.
**Exhibit 5**

**Choice model input sheet**

At which hotel would you stay?

<table>
<thead>
<tr>
<th>Marriott</th>
<th>Westin</th>
<th>Sheraton</th>
<th>Hilton</th>
<th>Any Other Hotel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price per night</td>
<td>$529</td>
<td>$519</td>
<td>$519</td>
<td>$519</td>
</tr>
<tr>
<td>Business services</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Minutes to meeting</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Health club</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Check one and only one

*Note: The respondent would be shown several sets of choices like this.*

**Exhibit 6**

**Example hotel demand curves**

![Graph showing hotel demand curves](image)

Relative to conjoint, its greatest advantage is its flexibility in pricing applications. For example, it is easier to use DCM to measure price sensitivity of specific brands. DCM can also be used for measuring cross-price elasticities (e.g., influence of a price change by Marriott on the demand for Hilton).

The list of disadvantages of DCM must begin with the cost. DCM is an expensive technique to implement. Not only is there extensive development work on the front end, but the technique also requires relatively large sample sizes. And, as with conjoint, the mechanics of DCM can be difficult to explain to managers.

Another drawback of DCM is that it does not readily permit segmentation. In general, the technique will not tell you if there are groups of customers with differing price sensitivities. In applying the technique, therefore, an assumption is that the target segment members have similar price sensitivities. Having said that, there is some current research that promises to overcome this limitation by incorporating customer heterogeneity.

**The Right Approach for You?**

In this article, we have summarized the advantages and disadvantages of four marketing engineering tools useful in better understanding and managing the price-value relationship. Each can be of tremendous value to the marketer in the right circumstances. In this context, when we speak of value we mean ability to impact the profitability of the enterprise. As we said earlier, price is the most powerful profit lever in the business. The following is a Cliff Notes summary of the four models.

Business to business marketers cannot live without value-in-use. VIU gets to the heart of business to business purchasing. As a business buyer, I want to know why I will be economically better off making a purchase. In consumer product pricing, VIU has limited application.

Value mapping is an inexpensive, easy-to-use and potentially powerful first step in understanding customer perceptions of competing offerings in either consumer or business markets. Value mapping provides a bird’s eye view of the marketplace, can identify price/quality segments and value-for-price anomalies, reveals factors underlying differences in perceived value, and permits visual modeling of alternative product strategies and competitive responses.

Conjoint analysis is most useful for measuring price sensitivity within a product category when the purchase process involves careful consideration of the available alternatives. Conjoint reveals how customers would trade off additional price for feature enhancements. That information is collected indirectly, so respondent bias on price is less likely. Conjoint outputs can be used for simulating pricing options to estimate impact on market demand and competitor market shares, especially in new product contexts.

Conjoint also permits segmentation of customers based on price sensitivities.

Discrete choice modeling is most applicable in modeling a marketplace that contains a diverse set of competitors, each with unique strengths and weaknesses. In addition, DCM is best used when the customers’ choice task is straightforward and clear. In such contexts, a DCM study places respondents in the most realistic situation for measuring price sensitivity. It literally asks customers to make a choice similar to what they would do in an actual purchase. DCM outputs also enable managers to simulate what would happen in the market under various pricing options that they are considering.

**About the Authors**

Gary L. Lilien is Distinguished Research Professor of Management Science at Penn State University. University Park, and co-founder and Research Director of the university’s Institute for Study of Business Markets, a research institute dedicated to advancing the theory and practice of business-to-business marketing. Gary consults with a variety of companies such as Allied Signal, American Cyanamid, AT&T, Hewlett-Packard, and IBM. He has authored nine books and more than 80 professional articles on topics such as business marketing, new product development, marketing models, and bargaining theory.

Arvind Rangaswamy is an Associate Professor of Marketing at Penn State University. He has consulted with such companies as Peapod, Unilever, Pfizer, and Paragon Research. Arvind’s research interests include computer-based concepts, methods, and models for enhancing marketing decision making and the impact of the Internet and other emerging computer and information technologies on the marketing function. He has been published in several professional journals.

Timothy Matanovich is president of Market Leaders Group. Golden, Colo. MLG produces executive workshops, provides businesses with marketing decision-making tools, and consults with businesses on marketing and leadership challenges. Tim has worked with companies such as GE, DuPont, and Xerox, to enhance profitability through improved marketing decision making.