

The Art and Science of Customer-choice Modeling

Reflections, Advances, and Managerial Implications

Customer-choice models continue to improve, allowing hospitality companies to do an ever-improving job of dialing-in customer benefits for more profitable and sustainable operation.

BY ROHIT VERMA AND GERHARD PLASCHKA

We consider it an honor to be invited to reflect on our experiences with “customer-choice modeling” (CCM) for this special issue of *Cornell Quarterly*. We are indebted to our colleagues, co-researchers, teachers, and students, as well as to the many corporations and grant-making agencies for giving us the opportunity to explore the rich art and science of choice modeling within a wide range of industries, products, and service applications. Our attempt in this essay is to highlight some of the valuable managerial and methodological insights we have observed over the course of the past ten years. To make this essay useful to both man-

agers and academic researchers, we will discuss our thoughts on CCM in the context of methodological advances and managerial applications in service-driven markets.

Experiencing the Corporate “ARC”

Irrespective of up or down economic cycles, today’s business environment is even more competitive than during any other time in recent history. To a certain extent, companies can re-engineer, restructure, and cut costs, but at the end of the day any firm must identify a sustainable and profitable business

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model which will nurture growth. Creating a sustainable and profitable business model can prove to be as ruthless as reality-based television shows or political campaigns orchestrated by movie stars. "ARC" (ambiguity, risk, conformity) is the mnemonic framework for the three key questions that support creation of a profitable and sustainable business model, as we discuss below.

In such a business environment, managers must have a clear understanding of customer needs and their firm's own capabilities to grow revenue within the constraints of sustainability and profitability. While evaluating various possible market alternatives, managers typically refrain from implementing revolutionary changes in their product or service offering and instead engage in evolutionary market moves. This is understandable, since it is always easier to modify the "core engine" of a product or service offering by adding one or many "engine variants" rather than introducing a "new core engine" that might capture new markets or maintain customers with the current "core engine" until such engine is considered unprofitable.

On the other hand, it is probably unrealistic to expect that any one firm would excel on all product-service drivers simultaneously and still be competitive (i.e., provide the highest quality, fastest delivery, and greatest variety at the lowest price). In addition, companies often try to offer everything and anything that a market might conceivably demand—thus seriously limiting their firms' potential to make the described business model work. Therefore, it is imperative that managers understand the complexities of product or service drivers that truly reflect evolving customer needs and competitive actions, so that the managers can turn their limited resources into growth options that return most "bang for the buck."

In other words, to create, capture, and maintain demand for their product and service offerings, businesses have to perform a balancing act between changing customer demands and a firm's given operational challenges to maximize their growth opportunities. Consequently, management needs to address simultaneously the following three "ARC" challenges.

Ambiguity—

What do our customers really want?

Despite the best efforts of senior managers to ascertain customer needs, too many product and service offerings frequently miss the targeted target audience and its intended ROI. Thus, it is understandable that firms still engage in a "spray and pray" game with their product and service offerings, in the hope that at least one will stick! As a result, markets often are flooded with products and services that have relatively little added value or significance for customers. At best, such products contribute to revenue growth without improving the current margin, and they may even damage the business's bottom line. For example, what is the real customer value of a minibar, business center, or other in-room service in a hotel facility if only a few customers actually use any of the services provided?

Risk—

Will our new offerings be successful?

Managers face complex problems when deciding which product-and-service bundles to offer in the marketplace. Potential product-service drivers (e.g., price or specific product-and-service features) can have many variants. A manager may use experience, benchmarking analysis, or simply gut feel to decide which of those variants might be of interest to the customers. On the one hand, such "informed guessing" might lead to new and innovative ideas, but, on the other hand, it might also lead to only "managerial pet projects," which can cause depleted profits and heartaches.

Conformity—

Can we deliver what we promised?

While it is important to understand market-value drivers, companies must also meet customer preferences with effective operations. Even if firms succeed in identifying and delivering particularly attractive product-and-service packages, efforts to do so may prove futile unless managers can efficiently design, produce, and deliver on promises under resource constraints. For example, it might be a brilliant service solution to create a global wireless network via a satellite system for

EXHIBIT 1

Sample multimedia-supported ChoiceLab set to assess product-service alternatives

Which of the two hotels below will you choose during your next business trip?
 If you would not choose either of the two hotels described, please select "neither."

HOTEL A	FEATURES	HOTEL B
	Appearance	
 Matches current lifestyles & designs	Room Interior	Exhibits designs & lifestyles from 10-15 years ago 
<u>Contemporary and casual</u>	Ambiance	<u>Old World Charm</u>
Multiple Dining Facilities & formal dining room	Dining	Formal dining facilities only
 Personalized on-demand	Room Services	Standard 
1 hour from your meeting location	Accessibility	15 min. from your meeting location
US \$ 150 - 175	Room Price/ Night	US \$ 225 - 250
WHICH HOTEL WOULD YOU CHOOSE?		
HOTEL A <input type="checkbox"/>	NEITHER <input type="checkbox"/>	HOTEL B <input type="checkbox"/>

business users, but if someone can receive wireless signals only in the open sea or desert, then this innovation becomes irrelevant for such users, given that they need operate most of the time within steel-framed skyscrapers where signal reception is poor.

Assessing Customer Choices

Many concepts have been introduced to evaluate typical managerial ambiguity-risk-conformity challenges for customer-focused product and service solutions or innovations. One of the most successful solutions was introduced by the Nobel laureate Daniel McFadden, who used the framework of choice modeling. By combining McFadden's framework with experimental choice analyses methods developed by Jordan Louviere

and his research associates we can offer managers today a robust and rigid way to assess customers' choices to optimize return on capital-investment decisions.¹

Throughout the years we have built on and successfully adapted McFadden's framework and

¹ See: Rohit Verma, Gerhard Plaschka, and Jordan J. Louviere, "Understanding Customer Choices: A Key to Successful Management Hospitality Services," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 43, No. 6 (December 2002), pp. 15-24; Rohit Verma and Gary M. Thompson, "Basing Service Management on Customer Determinants: The Importance of Hot Pizza," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 37, No. 3 (June 1996), pp. 18-23; and Rohit Verma, Madeleine E. Pullman, and John C. Goodale, "Designing and Positioning Food Services for Multicultural Markets," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 40, No. 6 (December 1999), pp. 76-87.

Louviere's choice analysis in numerous projects within the hospitality and leisure industry; telecommunications, financial, B2B, and industrial services; real estate; and retail services. Our customer-choice modeling approach typically uses a three-phase approach.

MetaChoice

MetaChoice² is a service mark for the process used to assess and challenge management's preconceptions about current and future product-and-service offering(s) and to uncover (or deconstruct) customers' decision-making processes. By using qualitative market-assessment approaches, such as expert interviews, customer focus groups, case studies, macro- and micro-economic industry data, and other data-rich information sources, we can develop a list of core market-choice drivers (purchase attributes) that are believed to influence various value-extensions (purchase levels) of a customer's buying decisions. For example, a hotel manager might identify the following choice drivers and value levels: hotel type (e.g., motel, B&B, boutique hotel, convention hotel), loyalty program (e.g., hotel points, merchant points, airline frequent-flier miles), amenities (e.g., in-room business center, central business kiosk, anytime check-in and check-out), eating options (e.g., full-service restaurant, breakfast-only restaurant, in-room kitchenette), and price (e.g., weekday rate, weekend rate, all-inclusive pricing options). When developing a list of market-choice drivers it is important to critically assess whether they really have relevance in the purchase decision, since any future choice model will be only as good as its input variables will be. Finally, significant expertise is needed to find a balance between the realism of the situation and the capability of a customer to truly assess the presented alternative market choices.

ChoiceLab³

After identifying the relevant market-choice drivers we scientifically "reconstruct" customer-choice configurations using experiments that sat-

isfy necessary statistical and mathematical considerations.⁴ The number of potential choice configurations can multiply quickly; ten market drivers with four value extensions each, for instance, can generate more than a million alternatives. Consequently, we employ techniques (such as fractional factorial design and blocking) to estimate the effects of major market drivers and their value extensions.

In the customer-choice experiments, respondents are asked to choose among alternatives presented in choice sets (see Exhibit 1). For example, for a hospitality-industry customer-choice assessment in the hospitality industry, we might describe two hotels in a choice set, each with a number of market drivers and specific value extensions. Depending on the objective of the study, we can ask respondents any of a variety of choice questions—for instance: If these two hotels were your only alternatives, which one would you choose, Hotel ABC, Hotel XYZ, or neither one?; If Hotel ABC were your only option, would you go there during your next trip or stay at your previous hotel?; or What do you consider the most and least attractive features of each hotel?

ValueBridge⁵

During the final phase, econometric models are developed to identify key patterns in the customer responses, providing relative customer utility for each market driver and for each value extension. Managers can then select the optimal combination of market drivers to develop a profitable and sustainable value proposition that, under normal competitive constraints, will provide the best return on investment from their available resources.

After developing a suitable econometric model (e.g., multinomial logit, nested logit models) the results can be easily implemented in a decision-support program which can be used to perform various managerial what-if analyses.⁶

⁴ See: Verma, Plaschka, and Louviere, *op. cit.*

⁵ ValueBridge is a service mark.

⁶ For simple examples of managerial what-if analyses based on choice-modeling results, see: Verma and Thompson, *op. cit.*; and Verma, Pullman, and Goodale, *op. cit.*

² We have registered MetaChoice as a service mark.

³ ChoiceLab is a service mark.

Methodological Advances

Like any management tool, customer-choice modeling continues to evolve as researchers in various academic disciplines pursue additional research projects. At the same time, the “art” of choice modeling is also evolving rapidly as information technology makes it possible to develop more realistic choice experiments.

Emergence of Multi-media-driven Choice Experiments

Even a few years ago a typical choice-modeling study involved developing paper-and-pencil surveys in which respondents were subjected to a series of pre-configured, table-like choice scenarios. Choice sets were presented as static tables with little room for customization that would allow researchers to zero in on the respondent’s most salient purchase drivers. However, recent advances in information technology—including broadband internet connections, digital imaging and streaming-video technologies, and almost unlimited computing resources and sophisticated programming languages—allow researchers to develop realistic, customized choice experiments specific to each respondent and resulting in visually appealing and easy-to-use formats that trigger a high level of respondent involvement.

In our recent studies we have extensively used web-based technologies (with hyperlinked pictures or written illustrations, brand logos, and audio and video files) to realistically illustrate choice scenarios. When choice experiments require transferring huge data sets, we either mail respondents high-capacity portable storage devices (e.g., USB storage keys that can contain dozens of megabits of data) or conduct the interview at a mutually convenient site on a wired or wireless laptop computer. Although such options have been available for a while, only recently have they become relatively cost effective and easy to implement. In fact we are anxiously anticipating the day when 3-D virtual-reality technologies will become cheaply available to create “information accelerated” choice experiments (allowing us, among other things, to incorporate seamless product or service innovations not available in today’s market).

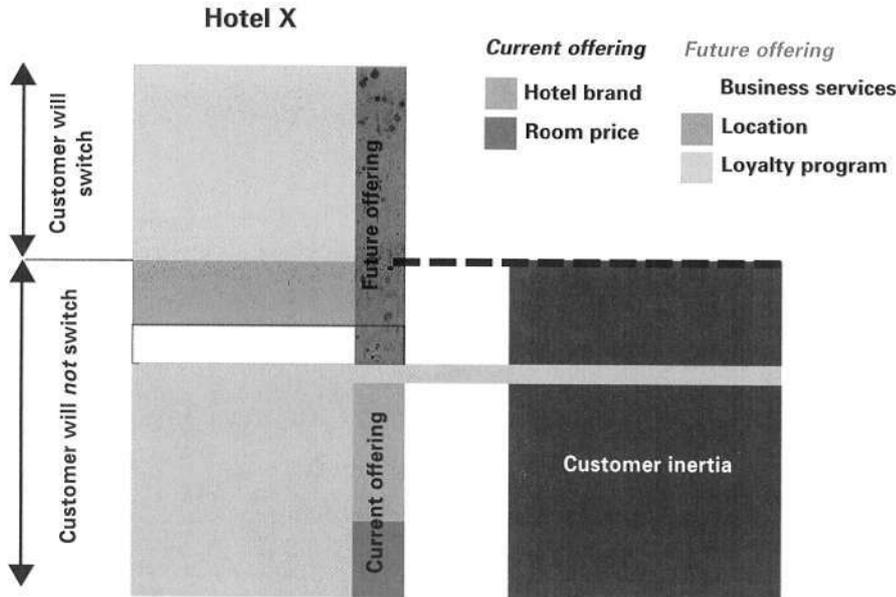
Advances in Experimental design and Estimation Processes

While information technology’s role in designing realistic experiments is impressive, even more impressive is the “behind the scenes” hard work of statisticians, mathematicians, and management-science researchers who have been developing advanced procedures for estimating and fine-tuning econometric models to assess the plethora of customer-choice situations. For example, recent advances in Bayesian statistics allow us to estimate choice models for each individual respondent and therefore enable us to fine-tune market-segment memberships. Innovative optimization procedures such as chaos theory, neural networks, simulated annealing, genetic algorithms, and simulation modeling are being used in various applications to identify optimal product-service design configurations and to link choice-modeling results with other managerial decisions (e.g., labor scheduling, capital-based resource constraints).

During the early days of choice modeling, researchers often debated how many market drivers would constitute too much information for the respondents to consider in a choice exercise. Researchers also debated how many choice scenarios should be shown to each respondent to develop robust choice models. While there is still no agreement on many such theoretical and methodological issues, advanced experiment-design procedures and relative ease of data collection from large numbers of respondents will relieve some of these academic tensions. For example, we used partially or completely random experimental designs in combination with statistical blocking and partial-experimental profiles to allow respondents to assess a highly complex choice situation in a consumer-oriented service environment. Other advances in choice-experiment design include developing sophisticated hierarchical-choice experiments combined with nested and partial profile designs. While use of such procedures increases complexity in designing choice studies, data analysis, and econometric-model estimation, those procedures also allow researchers to reduce the choice-task complexity and time requirement for respondents by showing only a few market drivers within each choice set at one time.

EXHIBIT 2

Customer-switching inertia compared to Hotel X's core offering



Integration with Other Customer-data-driven Processes

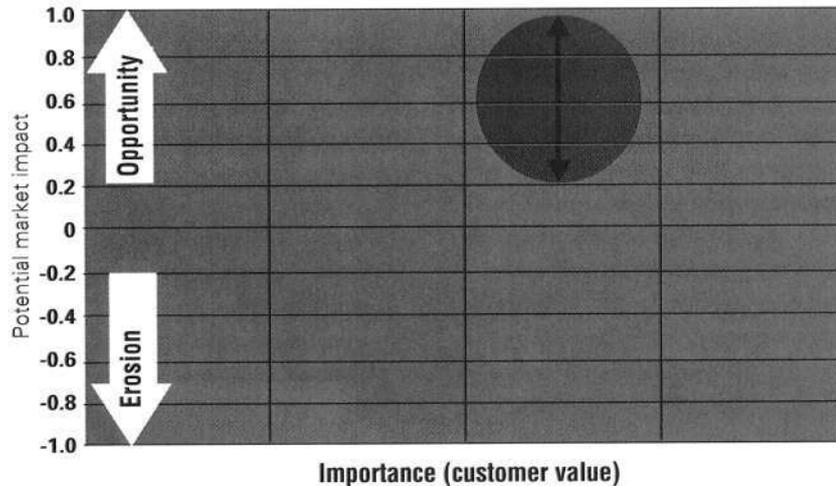
During the last few years, firms have invested heavily in customer-relationship management (CRM) systems and information technology in general. Such implementation generates considerable customer-transaction data (e.g., hotel check-in records; guests' use of various facilities; reservation and credit-card-use patterns; frequent-user and loyalty-card records) that can be used to monitor customer preferences over time. Effective use of CRM data can allow organizations to customize product and service offerings to individual customers' usage patterns, thereby increasing satisfaction, retention, and

loyalty. At the same time, such data mining cannot assess customers' preferences for any new product or service features that the firm might be considering. While the use of CRM and data-mining techniques can be extremely helpful in isolating trends based on past choices, such approaches can have only limited use when making predictions about the effects of future market drivers (e.g., introduction of a new brand).

Consequently, we believe that organizations can gain valuable insights on the effects of new market drivers by combining existing CRM databases with customer responses to carefully constructed choice experiments. As a matter of fact, within the domain of choice experiments, new

EXHIBIT 3

Single-item value structure map



The size of the "bubble" indicates the magnitude of market effects related to a specific market driver. A small bubble, for instance, means a minimal effect of varying the degree or extent of that particular market driver. A large bubble, on the other hand, implies substantial effects from altering the extent or level of that driver. A relatively high position of the bubble on the y-axis indicates a high-value growth opportunity. A relatively low position indicates the possibility of erosion in value and increasing risk. The bubble's position on the x-axis is based on the relative importance of the market driver on customer choice.

market drivers can be varied and their relative utilities estimated. In this way, choice-modeling results combined with econometric models developed from CRM databases can realistically estimate the effects of any new product-service offering within a particular business context. We believe that such analysis will lead to development of robust predictive models. The reader, however, should note that extreme caution is needed for such data-merging techniques to isolate any statistical differences due to use of multiple methods. Otherwise the resulting models might be confounded with random errors. For example, it is possible that mean or variance estimates (and, therefore, the scale parameter) for

models based on CRM and choice experiments would differ from each other simply because of differences in data-collection and estimation techniques. Therefore, the researcher needs to make appropriate corrections within the model estimation procedures to isolate the impact of such errors.

New Managerial Insights

In another *Cornell Quarterly* article we described a number of managerial insights that emerge from customer-choice-modeling studies.⁷ Rather than repeat what has already been well docu-

⁷ Verma, Plaschka, and Louviere, *op. cit.*

mented, here we highlight some other valuable managerial implications that we have observed in our recent studies.

Customer-switching Inertia

Generally speaking, the switching barrier or inertia is the tendency for customers to stay with their current product or service provider, despite the availability of other, "better" offerings. This might be caused by any number of factors, such as customer habit or preference for the *status quo* ("don't like to switch"); satisfaction with current products and service offerings; lack of real or perceived alternatives; or the perception that alternative offers lack credibility. Although in free markets we always assume that customers can choose their preferred vendor, we often observe in service-oriented markets that customers do not switch providers even if they freely can choose to do so—the result of switching inertia; bank customers, for instance, rarely transfer accounts because of one bad experience or a marginal increase in fees! Consequently, a new service provider has to overcome existing customer inertia, and must offer a substantially stronger service bundle simultaneously to win a customer's business or must offer a highly customizable service bundle to gain dominance in a market. This is especially true for markets where customers do not shop for marginally better or cheaper product and service solutions due to their preference for the *status quo* (e.g., offering better terms for loyalty programs, or offering 24-hour hotel check-in and check-out instead of traditional check-in and check-out processes).

We believe that robust and reliable estimates of switching inertia can be easily derived by designing customer-choice experiments when respondents have to choose between current and new product-and-service providers. Such choice experiments can be customized for each individual by first asking respondents to describe the value levels for each market driver of their current service providers (e.g., the travel service they used for their most recent business trip). Subsequently, we pair the currently used service with experimentally designed profiles of alternative service providers to generate a series of choice experiments.

Since we know the value levels for each market driver of each respondent's current provider, choice experiments allow us to isolate any effects triggered by, for instance, brand equity, price, or service offerings. Therefore, the estimate of inertia or switching barriers in the market (or within a customer segment, if needed) can be calculated removing any effects triggered by such things as brand loyalty, better prices or deals, or customer satisfaction leading to the market's "pure" inertia. On the one hand, the inertia can be positive, indicating that customers do not want to switch unless their barrier is overcome with a substantially better bundle of service offerings. On the other hand, the switching barrier can be negative, meaning that customers in this segment are willing to switch if they receive at least the same (identical) offering from a new supplier due to overall service dissatisfaction.

An illustration of customer inertia is presented in Exhibit 2 (see page 161). The vertical bar on the right side of the exhibit represents customer inertia in comparison with relative customer utilities of the various market drivers shown in the left-hand bar for Firm X's offerings.

Value-structure Mapping

A customer value-structure map can be a useful managerial tool based on choice-modeling results and assist senior managers in developing a market share based action portfolio based on customer needs. A value-structure map displays the relationship between three components of choice-model results (see Exhibit 3). The horizontal axis represents the relative importance of the customers' utilities for a particular product or service; the vertical axis represents relative utilities and their effect on the market (a positive sign indicates a market opportunity, while a negative sign indicates a market erosion); the size of the "bubble" within the value-structure map indicates the magnitude of market effect related to a specific market driver (i.e., difference between "least" attractive and "most" attractive level of an attribute level). A small bubble means that there will be little effect from varying the degree of offering for a particular market driver. A larger bubble, though, implies a substantial market effect of altering the value level of a market driver.

EXHIBIT 4

Market-share-based value structure map

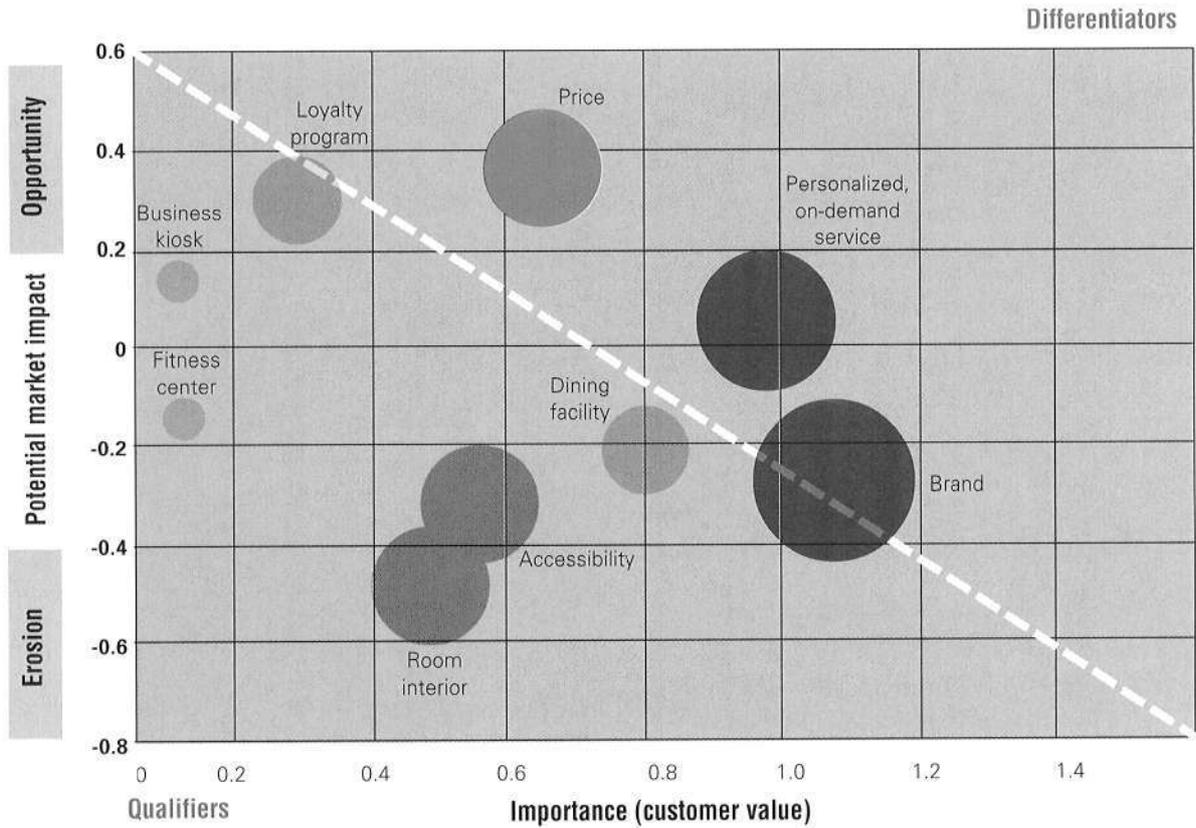


Exhibit 4 depicts an example of a value-structure map derived from choice-modeling results for a hospitality operator. The value-structure map captures the complex interrelationships among various market drivers and presents them in an easily comprehensible tool. By just looking at the value-structure maps managers can easily identify the market space with product-and-service bundles where they can “shape” or “adapt” to market conditions and also assess the “room to play” within the value levels of each market driver. Finally, it is possible to simulate with value-structure maps the natural market-share erosion, and thus determine the optimum and minimum-required product-service bundles for each product-service feature to compete effectively in the marketplace.

Outlook

We believe that choice modeling can yield valuable insights for market-driven strategy development by revealing customer clusters, suggesting the potential effects of changing the levels of value drivers, assessing overall brand equity, and identifying customers’ switching barriers. The stream of research on customer-choice modeling published over the last few years in the *Cornell Quarterly* has provided readers with the potential knowledge and ability to implement these techniques to better develop and implement such strategies throughout the hospitality industry. Moreover, choice modeling can reveal any salient differences between managers’ beliefs about customers’ needs and their actual needs. For senior managers eager for reliable feedback on how cus-

tomers view a business's offerings, we strongly recommend the use of customer-choice modeling, which provides a rigorous way to turn any realistic customer-value proposition into profitable and sustainable strategies for retaining or capturing market share and profitability. At the same time, even if the authors use choice models to estimate growth or erosion of market share, only corporate decision makers have the ability

to transform the insights gained from this approach when they start to trust the "art and science" of the choice modeling process. At the end only the understanding of customers' value propositions and structures will enable corporations to offer more sophisticated product-and-service bundles and overcome barriers to market-share growth. What company does not face such a challenge? ■



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