Customer Choice Modeling in Hospitality Services: A Review of Past Research and Discussion of Some New Applications

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Abstract

Customer choice modeling techniques have grown in sophistication and applicability, so that this methodology can be useful for assessing the services and amenities that are market drivers for customers of hospitality businesses. In essence, customer choice modeling is an experimental process that seeks to identify the key market drivers by comparing respondents' choices among packages of products and services, known as choice sets. By comparing the ratings of various choice set packages, one can assess which features of a product or service are most critical to the purchase decision. Also helpful in customer choice modeling is analysis of existing purchase patterns, which can be collected from point-of-sale devices and web activity. However, valuable though it is, collected data are backward looking—telling what customers did, but not what they will do. In contrast, customer choice modeling can look forward to see what customers might like, provided the experiment is designed correctly.

Keywords

customer choice modeling; discrete choice analysis

While the business environment for the hospitality industry continues be in flux, the rapid proliferation of new products and services makes it ever more difficult for firms to understand what customers desire and are willing to pay for. Making things even more challenging, potential market offerings in the hospitality industry have grown increasingly complex due in large measure to advances in information technology that allow customers to compare and strategically assess the relative costs and benefits of different alternatives. For example, hotel customers can easily compare competitive offerings at online reservation channels such as Expedia, Orbitz, Kayak, and Travelocity. They can also read comments and recommendations from past customers at social media sites such as Tripadvisor.com, in addition to ratings provided by professional organizations such as AAA and *Forbes Travel Guide* (see Verma and Smith 2010). This increased market transparency creates both opportunities and risks for the service companies that must operate within this business environment. Therefore, as service providers face knowledgeable and sophisticated consumers, there is an increasing urgency to gain an understanding of the trade-offs associated with consumers' choices so that appropriate managerial decisions can be made.

The underlying problem in predicting customer choices resides in the fact that purchasing decisions are made on the basis of simultaneous consideration of (potentially) many different criteria, including brand, quality, performance, price, features, and channel (Verma 2007; McFadden 1986). This problem is further compounded in the purchase of service applications such as those in the hospitality industry where customers may consider nontangible features and characteristics of the market offerings (e.g., service quality, safety and trust, interactions between service provides and customers). Just to point out the many variables that could be studied in a customer choice experiment, for example, customers might choose a restaurant based on one or more of such factors as cost, service quality, food quality, food variety, cuisine, and ambience. Similarly, customers might choose a hotel based on its location (say, close to airport, tourist location, or downtown), brand name, various facilities (including swimming pool, golf course, and spa and fitness center), service quality, price, loyalty program, and quality ratings by past guests. Any or all of these would enter into the customer choice mix.

Within the hospitality services, many determinants of customer choice (e.g., waiting time, product variety) bear heavily on operating decisions, such as labor schedule, capacity planning, operating difficulties, and task priority policies. Given that many hospitality services are "coproduced," some drivers of customer choices are directly affected by the actions of customers (e.g., waiting time is a function of employee productivity and customer arrival rate, compounded by any special customer requests). The complex nature of

customer choice makes it crucial for marketers and managers to understand the relative importance to customers of various service components. For hospitality firms, this matter is made even more complicated by the structure of the business, given its multiple decision makers, including property owners, managers, and the corporate brand—each of which has its own particular decision-making criteria and constraints. In such a business environment, sometimes an objective assessment of customer choices is the only appropriate way to reconcile any differences in managerial priorities and practices.

During the past few years, research has defined a sophisticated toolbox, known as discrete choice analysis (DCA), for understanding the drivers of customer choices (e.g., Verma 2007). The DCA tools and methodologies allow the prediction of market performance of new or existing service offerings with remarkable precision, even for seemingly complex and erratic market conditions. Over the past several years, *Cornell Hospitality Quarterly* and the *Cornell Hospitality Report* series have published several articles on DCA-based customer choice modeling techniques. Appendix A list articles published in the *Cornell Quarterly* based on customer choice modeling. The purpose of this article is to briefly summarize the science of customer choice modeling, highlight recent advances, and present examples of new applications from the hospitality industry.

Discrete Choice Analysis: Scientific Background

DCA provides a systematic way to identify the implied relative weights and attribute trade-offs revealed by the choices of decision makers (e.g., a customer or a manager). DCA has been used to model choice behavior in many business and social science fields. In addition to the hospitality industry examples in the appendixes, introductions to and extensions of DCA can be found in sources such as Ben-Akiva and Lerman (1991); Hensher and Johnson (1980); Louviere (1988); Louviere, Hensher, and Swait (2001); Louviere and Woodworth (1983); and McFadden (1986). In this article I summarize the main ideas behind DCA, but it should be noted that the approach can be adapted to fit many specific research situations and applications.

Developing Choice Models from Revealed Preference Data

To estimate choice models based on revealed preference or transactional data (e.g., actual reservations data captured in a hotel's reservation system), a researcher needs to obtain a data matrix, which represents actual choices made by the decision makers. Examples of such databases include page views and hotel reservations made at online travel agent websites (e.g., Expedia, Travelocity, Orbitz, or Priceline); actual purchases of different cruise, golf, adventure, or dining packages; and sales for various products at a restaurant. Furthermore, some additional characteristics of the decision criteria should also be captured such that the estimated choice models can link explanatory variables with observed choices. For example, based on observed hotel reservations, competitive product offerings, and information about unsuccessful bids at Priceline.com, Anderson (2009) has developed a model for pricing hotels on opaque channels. In another paper, Dixon and Verma (2009b) explore the impact on future customer choices resulting from the sequence of "pleasure and pain" in a service encounter. They use long-term ticket sales data (more than one million individual transactions over a period of six years) from a large performing arts venue to calculate the probability of repeated purchase of subscription tickets. They use the resulting choice model to optimize the mix of scheduled events offered by the organization.

Other examples similar to those of Anderson (2009) and Dixon and Verma (2009b) demonstrate the use of revealed preference models in hospitality and related services—particularly in the area of pricing and revenue management. The mathematical economics literature also includes many examples of revealed preference models.

Developing Choice Models from Stated Preference Data

It is possible to develop a choice model without actual transaction data. If the researcher does not have access to appropriate revealed preference data, or if the available data set lacks appropriate statistical properties, then choice models can be estimated from stated preference methods, also known as experimental discrete choice analysis. The experimental choice modeling approach requires that decision makers (e.g., customers, managers) make choices in simulated situations derived from realistic variations of expected market offerings. The process typically comprises three broad steps (e.g., Verma, Plaschka, and Louviere 2002).

First, using qualitative assessment (e.g., customer interviews, case studies, industry data, focus groups) and other information sources, the researcher compiles a list of variables believed to influence customers' buying decisions. For example, a real estate developer might identify choice variables for a condominium development as follows: unit size (one bedroom, two bedrooms, three bedrooms), kitchen layouts (l-shape, u-shaped, galley style, open with island), appliances (standard, designer, or professional), amenities (exercise facility, roof terraces, theatre or entertainment suites, concierge, doorman), car parking (number of parking places, valet or self-parking, washing or cleaning services), and price (including base price per unit, built-out price, and any premiums for location or amenities).

Next, the researcher constructs choice experiments that compile several combinations of those various options into choice sets and ask respondents to select one package from

among two or more of those sets. For example, Victorino et al. (2005) presented her respondents with descriptions of three hotels (economy, midrange, upscale) based on a series of sixteen choice sets; Verma, Pullman, and Goodale (1999) presented customers with choice sets containing twelve experimental descriptions of four restaurants (a burger shop, a deli, a hotdog stand, and an Italian shop); and Verma and Thompson (1996) presented respondents with sixteen choice sets, each including two descriptions of pizza delivery establishments. In each study, respondents were asked to choose one package from those presented, but they could also choose none.

In the final phase, econometric models based on responses from these representative samples of customers (or potential future customers) are used to identify key empirical patterns in the survey responses, providing relative weighting for each explanatory variable (e.g., price, brand name, service features). Managers can then select the optimal combination of variables to develop a profitable and sustainable value proposition that, under normal competitive constraints, will make the best use of their available resources.

Recent Methodological Advances in Customer Choice Modeling

Like any science, customer choice modeling continues to evolve as researchers in various academic and professional disciplines pursue projects with varied focus and emphasis. I briefly describe four important advances below.

Multimedia Stated Preference Choice Experiments

Even a few years ago, a typical implementation of a stated preference choice model involved developing lengthy paper-and-pencil surveys in which a respondent was subjected to a series of preconfigured choice sets. Those choice sets were presented as static tables with little room for customization and adaptability for individual respondents. Recent advances in IT, including increased connection speed and computer power, plus digital imaging and video technologies, allow researchers to develop realistic and highly customizable choice experiments specific to each respondent's decision scenario. In recent work across a wide range of industries (e.g., consumer durables, retail and shopping areas, hospitality and leisure destinations, financial services, industrial automation, medical solutions and systems, and telecommunication) I have extensively used web-based technologies (e.g., hyperlinked pictures, brand logos, and audio and video files) to realistically illustrate choice scenarios.

Best-Worst Stated Preference Experiments

The examples of stated discrete choice preferences that I just gave assume that the respondents are selecting one bundle of product or service offerings from among several bundles, each containing different features. However, in many applications, the respondents need to prioritize the alternatives rather than select a single option. They might be asked to give satisfaction ratings, rank order operational priorities, or state their relative preferences for innovations). For such research problems, rating scales are commonly used to assess the relative importance of various decision variables (e.g., rate customer satisfaction on a scale from 1 to 7). However, we also know that respondents are notorious for rating items rapidly and without much thought, often using simplification heuristics to speed through the task (e.g., Cohen and Orme 2004). Studies also show that respondents use only a limited range of the scale points, resulting in many ties across items. Additionally, some respondents use just the top few boxes of a rating scale, some refuse to register a top score for any item, and others conscientiously spread their ratings across the entire range.

To combat the problems with rating scales, Louviere and coworkers developed a novel choice-based approach known as best-worst or maximum-difference choice analysis. This approach provides unbiased estimates of the relative preference ranking for a set of alternatives (Finn and Louviere 1992). The best-worst choice approach requires subjects to identify the best alternative on some dimension (e.g., attractiveness, satisfaction) and also to identify the worst alternative (Finn and Louviere 1992). I have found this approach to be particularly useful in service sector applications since often the decision makers have to assess the relative attractiveness of diverse alternatives. An example of a best-worst experiment within the hospitality context can be found in Dixon, Kimes, and Verma (2009), where we assess relative preferences for various restaurant technology innovations.

Advanced Data Analysis Procedures

While information technology's role in designing realistic experiments is impressive, even more impressive is the behind-the-scenes hard work of statisticians and management science researchers who have been developing advanced procedures for estimating and fine-tuning econometric models based on choice modeling. Advances in Bayesian statistics allow us to estimate choice models for each individual respondent and to fine-tune market-segment memberships. Several such statistical advances are described in a recent book by Train (2003). While I do not have room to describe them here, I want to mention such innovative optimization procedures as chaos theory, neural networks, simulated annealing, genetic algorithm, and simulation modeling, which are being used in various applications to identify optimal product-service design configurations and to link choice modeling outcomes with other managerial decision problems (e.g., Bonabeau 2002). Other advances in choice experiment design include developing hierarchical choice experiments and partial profile designs.

While use of such procedures increases the complexity in designing DCA studies, data analysis, and econometric model estimation, they also allow researchers to reduce the choice-task complexity for respondents by only showing a few potential product or service features (that is, market drivers) within each choice set at one time.

Fusion of Revealed and Stated Preference Data

During the past few years, firms have invested heavily in customer relationship management (CRM) systems and information technology that capture a huge amount of data on many different transactions. These include airline or hotel check-in records, reservation patterns, use of various facilities, credit card usage patterns, frequent user or loyalty card records, and wireless voice and data records—all of which can be used to monitor customer preferences over a long period of time. Effective use of such transactional data can allow organizations to customize product-service offerings to various customers' usage patterns, thereby increasing satisfaction, retention, and loyalty (Loveman 2003). As mentioned earlier, Anderson (2009) describes an excellent example of use of transactional data for pricing hotel rooms on Priceline.

While the use of transactional and data-mining techniques can be extremely helpful in isolating trends based on past choices, such approaches can only have limited use when making predictions about novel or unusual product and service features. Hence, experimental choice modeling results combined with econometric models developed from existing transactional databases can realistically estimate the impact of innovations within a specific business context. The reader should note, however, that such data-merging analysis requires extreme care, particularly to isolate any statistical differences due to use of multiple methods. Otherwise the resulting models might be confounded with random errors.

Within the hospitality context, I have seen relatively little use of choice models based on both transactional and stated preference data sets. In a recent paper MacDonald, Anderson, and Verma (2009) describe the strengths and benefits of combining two types of data sources when developing hotel pricing models. The study that Michael Dixon and I conducted for the performing arts venue used this approach (Dixon and Verma 2009a).

New Applications of Customer Choice Modeling in the Hospitality Industry

The science of customer choice modeling continues to evolve. At the same time, we are witnessing many new applications of customer choice modeling within the hospitality context. In this section, I describe some of the projects that are currently in progress at the Center for Hospitality Research related to customer choice modeling. Results based on these studies will be published in *Cornell Hospitality Quarterly* and as *Cornell Hospitality Reports*.

Understanding customer willingness to pay for real estate developments. Given the real estate development industry's recent turbulence, several questions remain unanswered with respect to customer willingness to pay for specific features within a development. For example, are customers more willing to pay for amenities within the unit itself (either a hotel room or a condominium) or for common facilities (e.g., spa, fitness center, golf course, conference facilities)? If so, then how much more would they pay? Using a large database of customer choice data from residential development projects in North America and Europe, we are exploring the intricacies of customer choices for real estate developments.

Customer choices for hospitality services in health care facilities. Even though the overwhelming reason to visit a health care facility is to receive professional advice and medical care, other aspects of a hospital stay are also important. One can also argue, for instance, that a person's health and well-being depend on care above and beyond clinical procedures. Furthermore, health care facilities also need to cater to the needs of a patient's family and loved ones. This project explores how customers' choices of a health care facility are influenced by the overall quality of care provided, including nonclinical components (e.g., convenience, food and beverage, service, and other supporting facilities and amenities).

The relative impact of social media and professional ratings on hotel and restaurant choices. Earlier this year, during a joint industry roundtable sponsored by the Center for Hospitality Research and the Cornell Nanyang Institute for Hospitality Management, participants discussed the need to further explore the relative impact on customer choices of ratings and rankings developed by professional organizations (notably, *Forbes Travel Guide* and AAA) and social media sites (e.g., Trip Advisor). As part of that discussion, the roundtable participants emphasized the inconsistency in hospitality ratings across various countries. Therefore the purpose of this project is to understand the relative impact of social media and professional ratings on choices of hotels in different parts of the world.

The impact of technology-based innovations on customer choices. Hotel and restaurant customers are increasingly being served by a variety of technology-based innovations, such as mobile check-in kiosks, keyless entry systems for hotel rooms, mobile phone applications for concierge and room service, and high-end television and music systems. Certain customer segments want to be able to use new technologies and applications as soon as they are available. On the other hand, another segment of population would like to see less use of technology and more personal service provided by employees. In this project, we are exploring how customer choices for hotels and restaurants are influenced by guests' general perceptions for and against technological innovations.

The effect on future choice of pleasure and pain in a service-encounter sequence. The choice of hospitality services is different from the choice of tangible goods because even after the purchase is made (that is, after the room is booked or the meal ordered), the customer continues to interact with the provider while the consumption is in progress. After the service is complete (after the guest checks out or pays the bill), the customer's overall experience is a combination of the relative pleasure (say, enjoying the facilities) and pain (e.g., paying the bill) experienced at different stages of the service delivery. In this research, we are exploring how the assessment of each encounter and the sequence in which they occur affect the overall evaluation of the service, leading to a future purchase.

Concluding Remarks

The purpose of this article was to summarize the use of customer choice modeling within the context of the hospitality industry and discuss some new developments. For a hospitality firm to be successful, I believe that it is necessary to employ a sophisticated customer choice approach, such as discrete choice modeling, an essential component of the managerial decision-making framework.

I hope that both practitioners and researchers interested in hospitality and related services will find customer choice modeling useful in their future research and applied projects and that the examples presented in this article are helpful. In closing, I would like to note that similar to other modeling processes, choice modeling is subject to the garbage in, garbage out principle. It generates useful information only if the assumptions behind the selection of market drivers, the experimental design, and the data-collection methods are sound.

Appendix A

Articles Based on Customer Choice Modeling Published in the Cornell Quarterly

Verma, R., and G. Thompson, "Basing Service Management on Customer Determinants: The Importance of Hot Pizza," *Cornell Hotel and Restaurant Administration Quarterly* 37 (1995): 18-23.

This article explains the basics of discrete choice analysis through a study of how customers chose a pizza-delivery company by trading off among several attributes (price, discount, promised delivery time, late-delivery time, variety, temperature, and money-back guarantee). The article further describes how the results of such a discrete choice analysis can be incorporated into a decision support system via a computer spreadsheet.

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Appendix A (continued)

Verma, R., M. Pullman, and J. Goodale, "Designing and Positioning Food Services for Multicultural Markets," *Cornell Hotel and Restaurant Administration Quarterly* 40 (1999): 76-87.

A discrete choice analysis–based study compares the food-service preferences of individuals from three different language groups (English, Japanese, and Spanish). All three groups of respondents were relatively price-insensitive for the four different types of restaurants studied and often were willing to wait either to order or to be served, depending on the food-service concept (e.g., waiting for pizza made sense to them, but waiting for burgers did not). Many respondents liked the idea of pictures of the food on menus to help identify unfamiliar items, but virtually no one wanted menus translated into their native languages. Based on the study, one food-service outlet adopted a new marketing strategy that not only increased its market share but attracted more patrons to the food court.

Verma, R., G. Plaschka, and J. J. Louviere, "Understanding Customer Choices: A Key to Successful Management of Hospitality Services," *Cornell Hotel and Restaurant Administration Quarterly* 43 (2002): 15-24.

This article describes in considerable detail how many different managerial decisions can be derived more effectively by using customer choice modeling techniques. The article describes how the results can be used to identify the preferences of customers in different market segments, calculate market share, identify order winners and qualifiers, calculate brand equity, calculate switching barriers, and develop implementation guidelines.

Goodale, J., R. Verma, and M. Pullman, "A Market-Utility Approach to Scheduling Employees," *Cornell Hotel and Restaurant Administration Quarterly* 44 (2003): 61-69.

This article describes how the results of a carefully planned choice experiment can be used to develop effective labor schedules. The article first discusses the components that make up this approach, which includes methods from customer-preferences modeling, service-capacity planning, and the four tasks of labor scheduling. Next, it shows how the model applies to balancing queue lengths and operating costs for an airport food-court vendor.

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Appendix A (continued)

Verma, R., and G. Plaschka, "Customer-Choice Modeling: Reflections, Advances, and Managerial Implications," *Cornell Hotel and Restaurant Administration Quarterly* 44 (2003): 156-65.

> This essay attempts to highlight some of the valuable managerial and methodological insights on customer choice modeling (CCM) observed over the course of the past ten years. To make this essay useful to both managers and academic researchers, it discusses thoughts on CCM in the context of methodological advances and managerial applications in service-driven markets. 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.

Appendix B

Background Research Articles and Books Related to Customer Choice Modeling

Adamowicz, W., P. Boxall, M. Williams, and J. J. Louviere, "Stated Preference Approaches for Measuring Passive Use Values: Choice Experiments and Contingent Valuation," *American Journal of Agricultural Economics* 80, no. 1 (1998): 64-75.

- An example of the use of choice modeling in environmental economics, including a comparison with contingent valuation (another technique widely used in economics).

Bonabeau, E., "Predicting the Unpredictable," *Harvard Business Review* 80, no. 3 (2002): 5-11.

- Describes the use of "agent-based modeling" in predicting the collective behavior of people in crowds, markets and organizations.

Ben-Akiva, M., and S. R. Lerman, *Discrete Choice Analysis* (Cambridge, MA: MIT Press, 1991).

- A classic textbook on theory and mathematics of discrete choice modeling.

Cohen, S., and B. Orme, "What's Your Preference," *Marketing Research* 16 (Summer 2004): 32-37.

Appendix B (continued)

- This article summarizes the deficiencies of using standard rating scale questions for eliciting customer preferences.

Finn, A., and J. J. Louviere, "Determining the Appropriate Response to Evidence of Public Concern: The Case of Food Safety," *Journal of Public Policy and Marketing* 11, no. 1 (1992): 12-25.

- This paper introduced the "best-worst" choice analysis technique, which can be used to assess customer satisfaction, to identify market preferences for really new product and service features, and for market segmentation analysis.

Goodale, J., R. Verma, and M. Pullman, "A Market Utility Based Model for Capacity Scheduling in Mass Services," *Production and Operations Management* 12, no. 2 (2003): 165-85.

- This paper describes how customer choice modeling results can be used to more effectively schedule capacity in production processes.

Hall, J., R. Viney, M. Haas, and J. J. Louviere, "Using Stated Preference Discrete Choice Modeling to Evaluate Health Care Programs," *Journal of Business Research* 57, no. 9 (2004): 1026-32.

- An example of choice modeling in the health care delivery industry.

Heinrich, C. J., and J. B. Wenger, "The Economic Contributions of James J. Heckman and Daniel L. McFadden," *Review of Political Economy* 14, no. 1 (2002): 69-89.

- This paper reviews and compares contributions of Dr. Heckman and Dr. McFadden—cowinners of the Nobel Prize in Economics in 2000.

Hensher, D. A., J. J. Louviere, and J. Swait, "Combining Sources of Preference Data," *Journal of Econometrics* 89, no. 1/2 (1999): 197-221.

- Reviews and compares the theoretical aspects of choice models derived from experimental analysis and from information based on actual past behavior (e.g., past purchase data).

Appendix B (continued)

Karniouchina, E., W. L. Moore, B. Rhee, and R. Verma, "Issues in the Use of Ratings-Based versus Choice-Based Conjoint Analysis in Operations Management Research," *European Journal of Operational Research* 197 (2009): 340-48.

- This article presents the results of studies conducted to evaluate different variations of basic customer choice modeling experimental formats and analysis approaches.

Li, S., A. Madhok, G. Plaschka, and R. Verma, "Switching Inertia and Competitive Asymmetry: A Demand Side Perspective," *Decision Sciences* 37, no. 4 (2006): 547-76.

- Explains how carefully designed choice experiments can be used to measure customer switching inertia.

Louviere, J. J., and G. Woodworth, "Design and Analysis of Simulated Consumer Choice or Allocation Experiments: An Approach Based on Aggregate Data," *Journal of Marketing Research* 20, no. 4 (1983): 350-67.

- THE "classic" reference in experimental choice analysis.

Louviere, J. J., D. A. Hensher, and J. Swait, *Stated Choice Methods: Analysis and Application* (Cambridge, UK: Cambridge University Press, 2001).

- A comprehensive textbook on theory, mathematics, and various applications of choice modeling.

Louviere, J. J., "What If Consumer Experiments Impact Variances as Well as Means: Response Variability as a Behavioral Phenomenon," *Journal of Consumer Research* 28, no. 3 (2001): 506-11.

- Highlights the problems associated with the distribution of data when multiple samples are combined.

Loveman, G., "Diamonds in the Datamine," *Harvard Business Review* 81, no. 5 (2003): 109-13.

- Presents an excellent example of a large-scale use of past purchase/preferences in offering customized offerings to customers.

Appendix B (continued)

Manski, C. F., "Danial McFadden and the Econometric Analysis of Discrete Choice," *Scandinavian Journal of Economics* 103, no. 2 (2001): 217-29.

- Describes the theoretical contributions of Dr. McFadden.

McFadden, D., "The Choice Theory Approach to Market Research," *Marketing Science* 5, no. 4 (1986): 275-97.

- A classic reference on how choice theory can be used in marketing research applications.

Pullman, M., R. Verma, and J. Goodale, "Service Design and Operations Strategy Formulation in Multicultural Markets," *Journal of Operations Management* 19, no. 2 (2000): 1-16.

- This article demonstrates how customer choice modeling can be used to identify similarities and differences in preferences between customers from different cultural backgrounds.

Rhee, B., R. Verma, and G. Plaschka, "Understanding Trade-offs in the Supplier Selection Process: The Role of Flexibility, Delivery, and Value-Added Services/Support," *International Journal of Production Economics* 120 (2009): 30-41.

- This article describes how choice-making criteria vary across different countries in a business-to-business busy-supplier selection.

Schwartz, B., *The Paradox of Choices: Why More Is Less* (New York, NY: HarperCollins, 2004).

- A recent best-seller argues that even day-to-day decisions are becoming complex because of abundance of choices available in the marketplace.

Train, K. E., *Discrete Choice Methods with Simulation* (Cambridge, UK: Cambridge University Press, 2003).

- This textbook describes state-of-the-art theoretical development in choice modeling research.

Verma, R., Z. Iqbal, and G. Plaschka, "Understanding Customer Choices in e-Financial Services," *California Management Review* 46, no. 4 (2004): 43-67.

- Describes an example of choice modeling in the online financial services industry.

Appendix B (continued)

Verma, R., J. Louviere, and P. Burke, "Using Market-Utility-Based Approach to Designing Government and Public Services: Case Illustration from United States Forest Service," *Journal of Operations Management* 24, no. 4 (2006): 407-16.

- This article presents a comprehensive example of using customer choice modeling in design of recreational services.

Verma, R., G. Thompson, W. Moore, and J. Louviere, "Effective Design of Products/Services: An Approach Based on Integration of Marketing and Operations Management Decisions," *Decision Sciences* 32, no. 1 (2001): 1-29.

- This article presents an optimization model and demonstrates how customer choice modeling results can be used to effectively develop new products and services.

Victorino, L., R. Verma, G. Plaschka, and C. Dev, "Service Innovation and Customer Choices in Hospitality Industry," *Managing Service Quality* 15, no. 6 (2005): 555-76.

- This article describes the results of a national customer choice modeling study to assess relative preferences for different types of innovations in a hotel. It presents comparisons between business and leisure customers.

Swait, J., and R. L. Andrews, "Enriching Scanner Panel Models with Choice Experiments," *Marketing Science* 22, no. 4 (2003): 442-60.

- This article examines the methods, viability, and benefits of pooling scanner panel data with compatible preference data from designed choice experiments.

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Cohen, S., and B. Orme. 2004. What's your preference. *Marketing Research* 16 (Summer): 32-37.

Dixon, M., S. Kimes, and R. Verma. 2009. Customer preferences and use of technology-based service innovations in restaurants. *Cornell Hospitality Report* 9 (7).

Dixon, M., and R. Verma. 2009a. Planning and scheduling large events based on revealed and stated preference analysis of customer choices. Working Paper.

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MacDonald, L., C. Anderson, and R. Verma. 2009. Using reveled and stated preference customer choice models for making pricing decisions in services: An illustration from the hospitality industry. Working Paper.

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