Name: Sam K. Hui

Department: Marketing

Project Title:

Analysis of Path Data in Marketing with Application to Grocery Shopping Behavior

Advisors:

Eric T. Bradlow

Peter S. Fader

Descriptive Summary

This research studies how consumers interact with a spatial environment and make decisions about their movements and related behaviors (e.g., purchases). More specifically, we focus on studying consumers' grocery shopping patterns through an analysis of a novel dataset containing grocery shopping paths and purchases, collected using Radio Frequency Identification (RFID) technology by Sorensen Associates, an in-store research company.

Since the study of paths, a research topic by itself, is fairly new to marketing, there is no established framework or methodology to analyze path data. To develop the necessary methodology to analyze path data, the proposed dissertation research will be comprised of three essays, each of which studies paths from a different perspective. The detail of each essay is discussed below.

In the first essay, we identify the different dimensions and components of a path model and provide a unifying framework that allows us to apply tools developed in other disciplines (e.g., models of birds, pedestrians, and automobile traffic) to path data in marketing. We overview the different forms of path data in marketing, e.g., in-store shopping paths, page-to-page web browsing behavior, eye tracking movements, and Information Acceleration sessions, and categorize them under our new framework. In addition, we identify a variety of important operational issues that should be taken into account for researchers who wish to build models of path-related phenomena.

In the second essay, we develop an individual-level stochastic model for store shopping trips to capture the relationship between a consumer's shopping path through the store and her purchasing behavior. Using the "attractions" of different regions and product categories in the store, to the consumer, as fundamental latent constructs, our individual-level model jointly

captures three key aspects of a consumer's within-store behavior: which regions she visits and the region-to-region transitions, how long she stays in each region, and whether or not she makes a purchase in each region. Further, our model allows for shoppers to be forward-looking, i.e., they plan ahead when deciding their next steps, and we estimate their forward-looking propensities from the data. We calibrate our model using actual shopping path data, and discuss our empirical findings and managerial implications.

In the third essay, we study grocery shopping paths through the lens of the "Traveling Salesman Problem" (TSP), a classic problem in operations research. We define the optimal path for each shopper as the shortest path that connects all his purchases, and study the systematic deviations from optimality that grocery shoppers exhibit. This continues the tradition in marketing from Meyer and Assuncao (1990)[1] and Camerer et al. (2004)[2], where observed data are compared to a normative benchmark; in this case, observed shopping paths and TSP-optimal paths are compared. We decompose the length of each observed path into three components: the length of the optimal path, the additional length due to order inefficiency (i.e., following a suboptimal order of purchase), and the additional length due to travel inefficiency (e.g., following suboptimal point-to-point paths). We then explore the relationship between these inefficiencies and purchase behavior, and infer shoppers' number of look-ahead steps (forward-lookingness) based on their order of purchases.

[1] Meyer, Robert J., and Joan Assuncao (1990), "The Optimality of Consumer Stockpiling Strategies," Marketing Science, 9(1), 18-41.
[2] Camerer, Colin F., Teck-Hua Ho, and Juin-Kuan Chong (2004), "A Cognitive Hierarchy Model of Games," Quarterly Journal of Economics, 861-898.

Budget (<u>Total = $2500)</u>

(i) Travel Expense: $1500

I plan to present this research at the Marketing Science Conference in Singapore, June 2007. The expense above will cover the air ticket expense.

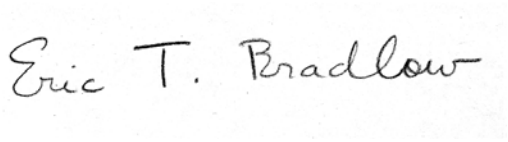
(ii) Computer Equipment: $1000

Since this research involves heavy computation, I need to purchase a new computer to perform the necessary simulation and estimation procedures.

Current Sources of Funding from Marketing Department

Currently, I do not receive any additional research funding on this project from the Marketing Department.

Advisors



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