Dr. Diego Klabjan

Diego Klabjan is an associate professor at the University of Illinois at Urbana-Champaign, Department of Mechanical and Industrial Engineering. After obtaining his doctorate from the School of Industrial and Systems Engineering of the Georgia Institute of Technology in 1999, in the same year he joined the Department of Mechanical and Industrial Engineering at the University of Illinois. He is the recipient of the first prize of the 2000 Transportation Science Dissertation Award and jointly with a graduate student he has received the Anna Valicek award from the Airline Group of the International Federation of Operational Research Societies. He is serving as the president of the Institute of Operations Research and the Management Sciences Aviation Applications Section. His research is focused on airline management, supply chain and operations management, integer programming, and high performance computing. He is currently on a sabbatical leave of absence at the Massachusetts Institute of Technology in the Department of Civil and Environmental Engineering.

In-store One-to-One Marketing with RFID

Radio frequency identification (RFID) offers numerous benefits in various areas of supply chain management: warehousing operations, asset tracking, marketing, etc. In marketing, the importance of one-to-one marketing has long been acknowledged by retailers. RFID brings a new perspective with the immense possibility of direct one-to-marketing during a shopping experience, i.e. while the consumer is shopping.

We develop models for in-store one-to-one marketing. Based on the consumer's shopping list or the content of her shopping cart, we consider routing the consumer in the store and offering coupons based on the current items in the shopping cart during the shopping experience. RFID technology enables instant reading capability of the items in the shopping card and therefore the proposed models are technologically doable. While most likely not in the short term, in the longer term it is likely that each individual item will have an RFID tag and shelves will be equipped with RFID readers (so-called smart shelves).

Several cases are considered based on several characteristics and scenarios: the presence of a loyalty card, capability of tracking the shopping cart in the store, and the ability to share the shopping list with the store information system. For all the cases we develop a framework, whose solution routes the consumer through the store in order to maximize the potential additional profit. This profit arises from offering coupons to the consumer and, in the context of a grocery store, visiting tasting booths. The route is constrained with respect to the additional shopping time and possible preference constraints, such as, in the case of a grocery store, buying frozen food towards the end of a shopping trip.

The resulting model is a selective traveling salesman problem with time windows. The profit is calculated based on the estimated probability of a consumer buying a brand name in a category, which is promoted. This probability either depends on the entire shopping list in the case that this one is known in advance, or based on what is currently

in the shopping cart, which is obtained by the RFID reader. The underlying models for estimating this probability are discrete choice models, where we build on the existing models in the literature.

The validity of our models and potential additional profits by one-to-one marketing are evaluated by means of computational experiments. We compare our models with the baseline model, which assumes that a consumer shops up and down the aisles and visits only required aisles. We use real world data from a major grocery store, including the store layout and consumers' buying habits and shopping lists.