A Virtual Prototyping Application (Let Customers Reveal Their "True" Preference)

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Abstract

In a brief and creative online survey, customers identify new product opportunities. This leads to an integrated market structure/market segmentation analysis. A clickstream-based analytical CRM case study is presented.

1. Introduction

We developed an interactive product configuration tool that allows customers to configure their preferred products based on a finite set of product attributes/features. From the perspective of statistical modeling, our application is similar to the conjoint technique. Conjoint is a research tool that marketers frequently use to determine what features a product should have. However, our virtual prototyping (VP) application eliminates the tedious ranking or paircomparing tasks on numerous pre-specified product Customers only need to rank their configurations. preferred products after they configure these products. Building their preferred products also enables customers to simultaneously consider all product attributes/features, therefore allowing us to measure product attributes/features interaction.

2. Research Applications

Our parallel test on a digital camera survey shows that although both conjoint and VP rank product attributes similarly, cross classification on four preferred product profiles yields only a 50% classification rate (hit ratio). On the attribute ranking, functional features (resolution, storage, image capacity) are the most important attributes, followed by brand (Sony, Kodak, Canon, Olympus, Nikon), and physical attributes (body type and lens) are the least important ones. On the cross classification, each respondent configures and ranks four preferred products, and conjoint attribute utilities are applied to these profiles. If two approaches produce a similar result, we would expect a nearly perfect classification. However, we only observe a 50% classification rate. Another survey on a different category also shows a similar finding. We will show a live demo of both approaches and let audiences

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judge which approach more reliably captures the true preferences.

Potential use of our application includes new product forecasting and integrated market structure/market segmentation analysis. Because we let respondents freely configure their preferred products based on all product attributes, it enables us to estimate any new product share potential. New product share is further adjusted to reflect the difference in distribution, pricing, and awareness – nonlinear forms are adopted to make the share adjustment. For example, the new Kodak flash card reaches a 30% share of Kodak professional digital camera, and most of the share gain is incremental (mainly drawing from Canon brand).

The above product-focused market structure reveals brands in competition, while customer-focused market segmentation identifies individuals with similar preferences. Latent class segmentation approach is adopted, and preference towards different attributes is assumed to follow a Dirichlet distribution where Dirichlet distribution parameters are estimated using EM algorithm (see appendix). Profiling the Dirichlet segments based on configured products reveals a mix of brand and type segments - Kodak and Canon forms one of the brandprimary segments. Posterior probability analysis enables us to profile segment beyond products. For examples, one can perform media scheduling based on demographics and media usage, and one can also perform advertising copy development based on psychographics and benefit attributes.

3. An Analytical CRM Case Study

Our presentation is concluded with an analytical CRM case study that shows how our VP application, in conjunction with clickstream data, is used to develop an online relationship with e-customers.

A global e-commerce jewelry manufacturer offers a variety of jewelry items to those Web shoppers who register at the participating jewelry stores through an instore kiosk (A more limited choice of jewelry items is offered to non-registrants). Since the company

The Second International Conference on Electronic Business Taipei, Taiwan, December 10-13, 2002 guarantees a two-day delivery to their registered customers, unfulfilled orders frequently lead to orders cancellation. To be able to anticipate customers' needs and preferences, we invite their core customers to take VP survey on a regular basis. Core customers are identified based on their online surfing patterns. A separate study based on customers' clickstream data classifies customers into one of the four segments (entertainment/fun, information seeker, technology savvy, and surfer – see the table below). The entertainment/fun segment accounts for about 25% of total customers, but generates over 60% of company revenues. This segment is also more receptive to VP survey than the other three segments. An entertaining and fun Website (jewelry auction, game-like promotion, sweepstakes, design your own jewelry, etc.,) is thus customized for their core customers. Website is further personalized based on customers' preference captured during the VP jewelrydesigning phase.



4. Future Development

Telecom and financial services are two areas that we believe can benefit greatly from the user-design application. Significant R&D efforts are currently underway to develop VP application in the service industry.

5. Appendix

 $P_{ns}{}^{i}$ – probability of observation n belongs to segment s in iteration i

 $\Pi_{\rm S}$ – segment s size

 θ_S – distribution parameter estimates in segment s

 $f(y_n|\Phi) = \Sigma_S \prod_S f_S(y_n|\theta_S)$ where $\Phi = (\prod_S, \theta_S), \theta_S = (B_S)$ or $\theta_S = (B_S, \lambda_S)$

 $B_{\rm S}$ - explanatory variables parameter estimates in segment s

the expectation of dependent variable (μ_S) is modeled as a link function of explanatory variables (X_p) ,

 $g(\mu_s) = \Sigma_p X_p B_{sp}$

 λ_S – dispersion parameter that characterizes the variance of observations in s

1. At the first iteration i=1, fix the number of segment s and generate starting probability P_{ns}^{1} randomly.

2. Given $P_{ns}i$, estimate Π_s by using $\Pi_s = \Sigma_n P_{ns}i/N$ and estimate θ_s by using either closed-form expressions (e.g., mean and standard deviation of normal distribution) or a numerical optimization procedure.

3. Stop if the change in the log-likelihood between iteration i-1 and i is sufficiently small where

 $\operatorname{Ln} L(\Phi) = \Sigma_n \Sigma_s [P_{ns} \ln f_s(y_n | \theta_s) + P_{ns} \ln \Pi_s]$

4. Increment iteration from i to i+1, and calculate new estimates P_{ns}^{i+1} by using $P_{ns} = \Pi_s f_s(y_n | \theta_s) / \Sigma_s \Pi_s f_s(y_n | \theta_s)$.

5. Repeat step 2 through 4.