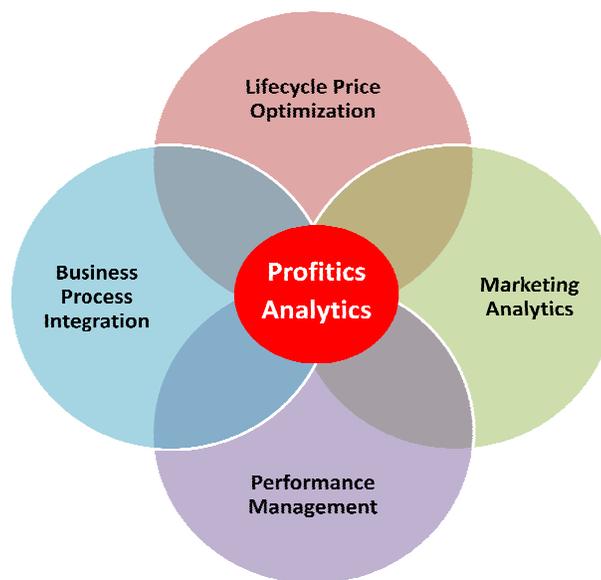




1821 Walden Office Square, Suite 400
Schaumburg, IL 60173
877.379.6466
www.profitics.com

Stochastic Optimization: Promotions & Assortments in Retail



Profitics Science Team

Date: Oct 2007

Contents

Introduction	2
Problem Statement:	3
Previous Options	3
Profitics Solution	3
Implementation	4
Summary	4

Introduction

The complex problem of optimizing for revenue and profit in retail needs to take a wide variety of factors into consideration including:

- Customer Behavior and Choices
 - Customer Needs Profile
 - Customer Life Cycle behavior
 - Customer Shopping Baskets
- Store Dynamics
 - Local Market Dynamics
 - Competitive Landscape
- Merchandise Category Properties
 - Visual Merchandising
 - Space Planning
 - Procurement, Inventory and Supply Constraints
 - Product/Seasonal life cycles
- Assortment Dynamics
 - Inter category interactions
 - Basket Shopping
 - Price comparison across category
- Competitive Environment
 - Choice availability perceptions
 - Price and Promotions Perception
 - Basket Shopping trade-offs
 - Key product pull dynamics
- Planning philosophy
 - Pull vs. Push Inventory Planning
 - Local vs. Central Planning
 - Standardization vs. Supply complexity
 - Periodic planning vs. continuous re-planning
- KPIs tracked
 - Category profitability
 - Space revenue/profit yield
 - Display revenue/profit yield
 - Market Share
 - Same store sales
 - Marketing/Promotions cost per incremental dollar

- Average ticket
- Returns Performance
- Conversion rates

These complexities create a need for flexible scientific software systems that reduce complexity without leaving money on the table.

Problem Statement:

Optimizing: assortments, category planning, promotions, marketing planning

For: revenue and profit

Under: stochastic demand scenarios with un-certain competitive product pricing positions and uncertain basket shopping behaviors

With: incomplete/insufficient data

Subject to: inventory, supply chain and operational constraints.

Mathematically Speaking:

$$\max_{p_{xj}, n_{xj}} \hat{\pi}_{xj} = \left(p_{xj} + \sum_{k \neq j} p_{xk} a_{jk} \right) \sum_{t | j \in B_t} \lambda_t s_{xt}(\mathbf{A}_{x'}, \mathbf{A}_y) - \tilde{C}_{xj}(A_{xj})$$

Where managers chose the optimal promotion plan and assortment combinations with analysis of customer choices in a basket shopping environment.

Previous Options

Prior to the latest advances in retail analytics, black box solutions that optimized one product life cycle at a time, did not take stochastic nature of forecasts, ignored customer responses to choice availability and customer responses to promotions/marketing. These systems were analyst un-friendly and produced un-intuitive solutions without simulation capabilities.

In short, they were un-usable, complicated the problem of decision making and left money on the table.

Profitics Solution

Our solution is a combination of cutting edge science, and well designed decision support systems with sensitivity analysis (what-if simulations when the recommendations of the models are overwritten).

Our solution includes core scientific advances such as: Bayesian techniques and heuristic enhanced stochastic optimization techniques to deal with data issues, volatility in forecasts and sensitivity analysis requirements.

Our design of decision support systems, and our iterative model/technology development, tuning and deployment processes deliver dramatic measurable value.

In our solutions, science serves process and guides process re-engineering where necessary. Our systems are designed to be embedded into the existing planning and operational processes of an organization. We analyze an existing business operation, identify opportunities to add game changing value for our customers and then deploy our technology as a nicely integrated support system that helps to scientifically answer some business questions in context such as:

- Identifying high profit or high potential customer segments and stores
- Combine customer behavior and market basket analysis to predict customer action and preference with products, categories, promotions and marketing efforts

- Combine transaction-level data and scientific modeling technique to segment types of customers by value
- Optimize marketing efforts: Items and categories are evaluated to provide a set of market basket analytics to identify which categories, brand and items will grow your market baskets.
- Identify market basket composition trends to drive basket growth.
- Develop insights using market basket affinities and co-purchasing behavior to predict follow on sales
- Combine volumetric measures and price elasticities to understand which items drive price image

These analysis modules are integrated into planning, execution and performance measurement to enhance existing business management processes seamlessly.

Implementation

Our implementation process is designed to add science at critical parts of your existing business

processes and integrate the science in your existing technology infrastructure.

The implementation methodology is iterative both in the scientific models and the software.

Our Software architecture is open, extensible both on data and logic dimensions, uses the latest flexible collaboration technologies to fit seamlessly into existing infrastructure.

We seek to generate value by empowering your front line analysts to delve into past and real time demand analytics using analyst friendly decision support systems designed to link decisions to key drivers and constraints.

Summary

Our unique blend of expertise in operations research, computer science, statistical data analysis, OLAP-BI-data warehousing is integrated into our product. We combined our science and technology with our mature and value focused business consulting, project management processes to guarantee the delivery of game changing value. A custom enterprise software system solution that is focused on the unique value opportunities of your organization and deploys seamlessly into your existing infrastructure will help you define the game and transform the competitive industry in your favor.

