Case Studies:
Leveraging Predictive and Prescriptive Analytics

April 13, 2011

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IBM, Partner
Advanced Analytics Services Leader, N. America
What are the types of questions we try to solve with Advanced Analytics

Use Structured Data & Unstructured Data
- Numeric
- Text
- Image
- Audio
- Video

Simplified to be consumable and accessible to everyone, optimized for their specific purpose, at the point of impact, to deliver better decisions and actions through:

**Descriptive Analytics**
- What happened?
- How many, how often, where?
- What exactly is the problem?

**Predictive Analytics**
- What will happen next if?
- What actions are needed?
- What will happen if?

**Prescriptive Analytics**
- How can we achieve the best outcome and address variability?
- What trends will continue?
- How can we achieve the best outcome?

IBM Advanced Analytics Software

The anatomy of a decision.

Analytics Sophistication
- Numeric
- Text
- Image
- Audio
- Video
Three Areas of Benefit for Analytics

**Infrastructure Productivity**
Take-out cost and improve efficiency

**Analytics Simplification / BAO Foundation**

**Solutions**
Current State: “I have an offer – let me find a customer to sell to”

- They don’t really know me
- Customers are offered products that may feel irrelevant and disconnected vs. solutions

- “You do not know me & ask me multiple times about the same thing.”
- “I use Large US Bank for convenience but primarily use another bank.”
- “The Bank doesn’t understand me, my industry or my business.”
- The Bank’s associates can’t address all of my business needs

- The Bank’s offers have little context and relevance – we under utilize our e-channels
- Staff are not confident in acting on offers – our presentment rates are too low
- We don’t know what is working and can’t diagnose under-performance

Our data is siloed, latent, and oriented to products and channels
Our analytics are geared to propensities not relationships and behaviors
Every group, product and channel for itself – no customer optimization
Our offers have little context and relevance – we under utilize our e-channels
Staff are not confident in acting on offers – our presentment rates are too low
We don’t know what is working and can’t diagnose under-performance
Target Vision: “I have a customer – what do they need most?”

IBM Advanced Analytics Software

The anatomy of a decision.

A Large US Bank

Customer Needs & Segment Strategies
- Mass Market
- Mass Affluent
- Small Business
- Customer Experience & Treatment Strategies
- DEPOSITS
- CARD
- MORTGAGE
- INVESTMENTS

CIM Governance, Prioritization & Optimization

Customer Analytics

Integrated Data

“Inform” “Learn” “Target” “Present” “Engage” “Measure”

- Direct Mail
- Agent, IVR
- Online, Email
- ATM
- Mobile, SMS
- Chat

“Inform”
Data is highly integrated and recent – provides holistic, detailed customer view

“Learn”
We have recalibrated to the customer and have new test and learn abilities

“Target”
We optimize communication to maximize value to the bank and customer

“Present”
We deliver the right information to the right channel – we capture feedback

“Engage”
Staff and leaders understand our goals – have the skill & motivation to deliver

“Measure”
We understand the value levers and have instrumented CIM to “know”

“Brilliant!”
Data is highly integrated and recent – provides holistic, detailed customer view

The bank knows me and values my relationship

“They seem to know what I need and when I need it.”

“They always get me to the right place and never fail to follow up.”

“There is real value to me in getting all my needs met by one bank.”
Three Areas of Benefit for Analytics

**Business Productivity**
Improve control, bottom line and stop losses

**Solutions**
- Finance / Risk / Fraud Analytics
- Supply Chain / Operational Analytics

IBM Advanced Analytics Software

The anatomy of a decision.
IBM Advanced Analytics Software

The anatomy of a decision.

Real-time Pattern Recognition of Streaming Data in a Neo-Natal Unit (Toronto Hospital)
## Aetna – Medical Cost Trend Analysis

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<th><strong>Client</strong></th>
<th>Aetna</th>
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<td><strong>Industry</strong></td>
<td>Healthcare</td>
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**Challenge**
They wanted to develop analytical models and algorithms that would be able to identify and diagnose changes or patterns in medical cost trends in a more automated and timely basis.

**Solution**
For a pilot set of data, IBM built a multivariate regression model that can simultaneously evaluate the impact that all possible factors have on changes to overall medical costs.

Used optimization to determine the best fit regression model.

**Benefits**
While only in pilot, the results of the model were enough to convince Aetna to expand the scope of the model and pursue a path towards implementing the model as part of their ongoing cost trending analysis.
An Example of how this analysis works

Let’s say that:  \( \text{2008 Cost} = 100 \) and \( \text{2009 Cost} = 180 \)

*The model estimated: Factor 1 = 1.5 and Factor 2 = 1.2*
   
   where \( \text{2008 Cost} \times \text{Factor 1} \times \text{Factor 2} = \text{2009 Cost} \)
   
   \( 100 \times 1.5 \times 1.2 = 180 \)

\[ \text{Cost Impact of Factor 1} = \frac{\text{2009 Cost} \times (\text{Factor 1} - 1)}{\text{Factor 1}} = \frac{180 \times (1.5 - 1)}{1.5} = 60 \]

\[ \text{Cost Impact of Factor 2} = \frac{\text{2009 Cost} \times (\text{Factor 2} - 1)}{\text{Factor 2}} = \frac{180 \times (1.2 - 1)}{1.2} = 30 \]
An Example of how this analysis works

Let's say that: 2008 Cost = $100 and 2009 Cost = $180

The model estimated: Factor 1 = 1.5 and Factor 2 = 1.2
where
2008 Cost * Factor 1 * Factor 2 = 2009 Cost
$100 * 1.5 * 1.2 = $180

**Total Cost Impact of Factor 1 & Factor 2**

Factor 1
Individual Cost Impact = $60

Factor 1 remaining impact, with Factor 2 removed
$50

Factor 2
Individual Cost Impact = $30

Factor 2 remaining impact, with Factor 1 removed
$20

Combined Cost Impact
$10
Why do we need optimization for this?

- As the number of factors increase (think hundreds or thousands), a direct solution approach becomes difficult due to the size of the problem, and issues like interactions, noise and hierarchical effects.

  - To account for these concerns, we explored two approaches in estimating the factors:

    - **Optimization**: find the factors that maximize the explaining power of the model (i.e., minimize unexplained cost)

    - **Approximation**: iteratively estimate the factors in sequence
Overview of the Coca-Cola Freestyle Program
VMO Pilot High Level Process Flow

Plan Simulation

Perpetual Inventory

Store & Product Data

SAP B/W

B/W Extract For DIOS

Log File Processing For B/W

Dispenser Log Files

Ingredient Demand File

Replenishment Engine (Calculate SS, EOQ, Case Order)

Entry Into SAP Order System

Forecast Engine

Store Level Cartridge Forecast

Release Orders to Distribution

Store Level Cartridge

Cartridges Delivered to Customer

Wireless Wan

Dispenser Application

Accuracy: 0.102

Forecast Engine

Store Level Cartridge

Replenishment Orders

Release Orders to Distribution

Entry Into SAP Order System

Perpetual Inventory

Plan Simulation

VMO Pilot High Level Process Flow

IBM Advanced Analytics Software

The anatomy of a decision.
Network Modelling and Optimization at USPS

- Developed **optimization and simulation models** (NIA) used to design future network structure
- Developing a **transportation optimization and planning system** (TOPS) to improve utilization and reduce costs of the USPS's transportation network
- **Benefits to the Client**
  - Estimated operational savings of 10-20 percent
  - Better understanding of excess capacity

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(NIA)
- **Strategic**
  - Node Optimization
- **Tactical (TOPS)**
  - Route Plans & Schedules
  - Routing Decision Rules
- **Operational**
  - Dispatch & Routing Execution (SAMS)
  - Track & Trace Visibility (SASS)
USPS Highway Corridor Analytical Program

Client U.S. Postal Service (USPS)

Challenge Needed to identify quick-hit savings for the plant to plant transportation for a region of the country by increasing utilization on each truck.

Solution Built an optimization model using ILOG CPLEX to evaluate transportation between approximately 20 sorting centers. HCAP was designed as a transportation optimizer to identify opportunities to consolidate USPS highway transportation in order to save costs. Complex data mining and predictive analytics were required to estimate mail volume flows.

Benefits Within the first year of implementation, USPS realized transportation cost savings that resulted in a 400% return on investment.
Three Areas of Benefit for Analytics

- Infrastructure
- Productivity
- Take-out cost and improve efficiency

Solutions

- Finance / Risk / Fraud Analytics
- Supply Chain / Operational Analytics
- Business Productivity
- Improve control, bottom line and stop losses

Return to Growth
Intelligent profitable growth

- Marketing and Customer Analytics
- Human Capital Analytics
Best Buy Case Study: Segmentation Approach

- Start with 30-40 modeled variables – “Feature Vectors” – The customers response to the firm’s value proposition
- Each feature vector is like a gene strand, which describes a facet, or set of customer behavior traits
Customer Segmentation and Media Mix Optimization

Optimized the Holistic Marketing Budget while Driving Customer Tailored Direct Marketing

- Develop IBM’s Retail Industry Forecast for the industry/sector
- Develop media response models by Action Cluster for each media type
- Develop predictive and prescriptive marketing budget recommendations tailored for the Client

“[The IBM model] said, overall, the mix was off. It said if we shift dollars away from inserts to television, we would generate a pretty good lift in revenue and related profits. When you have big budgets like we do, a 5% to 10% improvement is a big deal.”

Drew Panayiotou
SVP Marketing, Best Buy
Results

Reactivated 101,008 of the Most Valuable Customers
*That is equivalent to all of the best customers in Chicago

Tripled the response rate (292%) with Super Premium Customers
Doubled the response rate (217%) with Best Customers
Real-time Analytics Matching Platform (RAMP)
Increases the probability of a unique rapport between a customer and an call center agent

Data Analysis

Customer Attributes
- Recurring Revenue
- Payment plan
- Billing History
- Credit and Balance scores / levels
- Demographics
- Value
- Segmentation

Affinity Match:
- Optimal Agent for that customer
- A desired customer decision
- Predicted Agent availability
- Customer’s “wait threshold”
- In “real time”
- Self Learning

Data Analysis

Agent Attributes
- Success Rates
- Persistency of success
- Revenue increase by customer
- Demographics (if available)
<table>
<thead>
<tr>
<th>What RAMP IS NOT…</th>
<th>What RAMP IS…</th>
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</thead>
<tbody>
<tr>
<td>• Prescriptive (Rules based)</td>
<td>• Predictive (Insights)</td>
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<tr>
<td>• Skills-Centric</td>
<td>• Performance-Centric</td>
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<tr>
<td>• Broadly Matched</td>
<td>• Individually Matched</td>
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<tr>
<td>• CTI / Routing Engine</td>
<td>• Optimal Routing Recommendation</td>
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<tr>
<td>• Invasive Infrastructure Replacement</td>
<td>• Leverages existing investments</td>
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<tr>
<td>• Multitude of Connection Points</td>
<td>• Easy Webservice integration</td>
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<tr>
<td>• Another point of failure</td>
<td>• Failsafe (through existing platform)</td>
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<tr>
<td>• Prioritization</td>
<td>• Optimization</td>
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<tr>
<td>• Offer engine</td>
<td>• Matching engine</td>
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<tr>
<td>• Workforce Management</td>
<td>• Revenue generator</td>
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<tr>
<td>• “Mess Fixer”</td>
<td>• Value maximizer</td>
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Inbound Call Results

**Within 1st Year Of Operation**

- **Saved Fees** increased by 119%
- **Saved Calls** increased by 49%

Saved Fees improved from 16.4% to 35.9%

Saved Calls improved from 15.7% to 23.4%
Outbound Call Results

Overall impact of using RAMP (12 Months)

- Lift in Fees Over Baseline: 37%
- Contact Conversion (Sales Yields): 29%

Customer Experience Impact
- Agent Attrition: -25%
- DNC Requests: -20%

Revenue Impact
Case Study: Customer Targeting and Sales Force Productivity

Client: IBM
Industry: Electronics

Challenge: IBM needed to identify potential new customers to achieve sustainable revenue growth. More specifically, they needed methods developed to rank new opportunities in terms of the propensity to purchase, as well as to predict future revenue opportunity to insure the allocation of sales resources against the IBM accounts with the greatest growth.

Solution: IBM developed predictive models to compute the probability of a company purchasing an IBM product and to estimate the realistic revenue at each IBM account for each major product brand.

Benefits: The solution has been deployed to over 7,000 IBM sales professionals, is used extensively within IBM to drive quantitative decisions on the re-deployment of sales resources, and has driven $2 billion in additional revenue.
What we did at IBM:

The **IBM Sales Model** provides an end-to-end process supported by data and tools to deliver business results.

- **Select Target Markets and Clients**
  - Enhance sales process by directing sellers to best sales leads
  - Estimate probability that a company will buy a specific IBM product brand

- **Identify Opportunity**
  - Develop forward-looking view of opportunity by client
  - Identify accounts where there is significant untapped revenue
  - *What if all clients looked like our best clients?*

- **Understand Performance**
  - Understand sales productivity and revenue performance by modeling relationship between sales capacity and revenue
  - Provide insights into how capacity, deployment and transactions translate into performance

- **Select Coverage, Deploy and Align Resources**
  - Align sellers to the best client opportunities and according to established guiding principles

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### OnTarget
- **Individual Sellers**

### Market Alignment Program (MAP)
- **Sales Managers and Executives**

### Growth and Performance (GAP)
- **CFO office, Brand CFOs, Sales Executives**

### Territory Optimization Program (TOP)
- **Sales Managers**
What we achieved so far at IBM:

- **OnTarget**
  - Delivered leads via web portal
  - Close-rate up 2%
  - Estimated annual revenue impact $468M (worldwide)

- **MAP**
  - Estimated future revenue opportunity for each client
  - Shifted 800 resources to different account segments
  - Estimated revenue impact $600M (worldwide)

- **GAP**
  - Decision-support tool delivered in web portal
  - Used by the CFO office and Brand CFOs worldwide to set and distribute revenue targets and conduct performance deep dives
  - $140M worldwide revenue in 2008-2009 from GAP driven performance deep dives in 3 business units

- **TOP**
  - Web tool for sales managers to design optimal territories
  - Currently supports 11K sales resources in key IBM brands, 20K by the end of 2010. Annual worldwide revenue benefits for 2010 are estimated at $600M for all brands

… and looked into some challenging technical problems

- Classification, probability estimation
- Quantile estimation
- Regression, time-series analysis, causal modeling
- Large scale mixed integer programming

Note: IBM Benefit measurements consistent with external benchmarks:
- ZS Associates: Sales territory alignment projects can improve revenue performance by 2-7%*
- BCG: Based on prior consulting engagements, programs like the IBM Sales Model can have 5-12% revenue impact**

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** Boston Consulting Group
Recommendation 1:
Focus on the biggest and highest value opportunities

Recommendation 2:
Within each opportunity, start with questions, not data

Recommendation 3:
Embed insights to drive actions and deliver value

Recommendation 4:
Keep existing capabilities while adding new ones

Recommendation 5:
Use an information agenda to plan for the future

How to get started

Pick your spot
Biggest and highest value opportunity

Prove the value
Start with questions Embed insights

Roll it out over time
Add capabilities Information agenda