Business Forecasting and Analytics Forum
September 19-20 • Chicago, IL

Analytics as an Enabler in a Fast Changing World

Drive intelligent decision making by presenting data and insights in a simple and impactful manner

September 20, 9:45am

Rajeeve Kaul – G4S

Mr. Kaul has a proven track record of growing margin and unlocking value by focusing on pricing and analytics to gain insights and drive business decisions. Mr Kaul has extensive experience leading and creating organizations focused on deploying advanced analytics to business decisions. His past experience includes a role with OfficeMax where he was SVP of Strategy and Pricing and held full responsibility for developing go to market strategies to drive gross margin for the company. At Cardinal Health he was vice president of strategy and pricing and vice president of customer acquisition and profitability management.

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https://jpkgroupsummits.com/attendee5
Analytics as an Enabler in a fast changing world

June 2013

Rajeeve Kaul
Context and objectives

- The world is increasingly connected and complex
- Information is growing by leaps and bounds
- IOT and new devices, blurring of channels and lines
- What we learned 10 years ago is not as applicable today
- As we adapt to change we find answers and more questions
- Change in complex organizations is difficult
- What are the analytic frameworks that can help us through this transition?

Today’s objectives

- Cast the case in the context of some observations
- Provide some of the “why” and “how” for this journey
Background and Introductions

Career and Experiences

Business goals and decision making

Statistics, Business, Marketing, big data, machine learning....

Industries and nuances

What’s common for business leaders
Analytic approaches have been leveraged across many industries

Background and perspective

- Precision in decision making critical in a thin margin business with increasing competitive pressures as economy matures
- Advanced analytics can be used across multiple types of industries
- Differentiation and value creation is possible through use of analytics as is evidenced from numerous success stories and players and providers
- An analytical framework drives consistency of decision making when informed through a scientific process

Value created across diverse areas

Retail and Retail Web Web
- Plethora of data in a thin margin environment
- Aptitude to collect and want to use data
- Lot of buzz – keep up with the Jone’s

Financial Sector
- Accepted and mature user of analytics
- Big focus on differentiation through analytics
- Mature leadership accepting of data

Mature economies
- By definition have better data infrastructure
- Data and analytics one differentiator
- Faming more difficult with growth plateaus
Big data is an evolving construct

Genetics and statistics

Pre computer big data problems

Matrix inversions and big data

Convergence and computational estimation

Simple summarizations across tall and wide data

……...today's big data may not be tomorrows
Vast amount of sparse and complex relationship data in online transactions challenges traditional approaches

- Decision tree for online interactions is complex multi-step process with customers opting out at any stage
- Low conversion rates of 1% not unusual
- Go/No-go decision at each point
- Hundreds of variables and attributes to each decision
- Typical regression type approaches fail in this environment due to hierarchical decision and sparse data
- Model complexity multiplies when optimizing multi-channel strategies

** Regression model does not work well in the 2 scenarios on the right

Similar binary problems are common in all industries.....
Optimizing multi-channel strategy to differentiate and target customers across channels is very hard to implement.

A similar model applies across B2B businesses too......
Leverage a conceptual Model of Analytical Discovery to learn faster

An effective business strategy is built from a strong testing and modeling program
Schematic for generic DSS

Data Input
- CI
- Primary data
- Syndicated
- Activity-internal
- Tests
- Business Data Mart -other

DSS Engine
- Interactive What-If
- Financial Impact
- Response curves
- Market Definition
- Rules
- GTM Strategy
- Omni Channel roles
- Temporal constraint

External Source

DSS Integration

Execution

Web/POS Execution

User GUI

Interactive & Batch Connection to Engine
- OLAP functionality
- Integrated reporting/tracking
- Honor policy
- Validate execution

Optimal decisions through an integrated system
In a changing world, an analytics framework can provide stability of thought and action….

<table>
<thead>
<tr>
<th>Function/Area</th>
<th>Application of Analytics</th>
<th>Method</th>
<th>Sample Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>Sales force effectiveness</td>
<td>Integer optimization</td>
<td>What is the optimal size of territory?</td>
</tr>
<tr>
<td></td>
<td>Territory alignment and sizing</td>
<td>Clustering methods</td>
<td>How should I align sales and allocate resources?</td>
</tr>
<tr>
<td></td>
<td>Compensation and targets</td>
<td>Path and Var models</td>
<td>What is the right incentive plan?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delphi methods</td>
<td>How do I evaluate sales force effectiveness?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Response models</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>Customer and market segmentation</td>
<td>Clustering methods</td>
<td>Why do customers choose us?</td>
</tr>
<tr>
<td></td>
<td>Customer attitude and behavior research</td>
<td>Factor analysis</td>
<td>Are two customers the same?</td>
</tr>
<tr>
<td></td>
<td>Marketing ROI and program valuation</td>
<td>Markov Chain models</td>
<td>Will customers buy this new product?</td>
</tr>
<tr>
<td></td>
<td>Drivers of customer choice</td>
<td>Choice models</td>
<td>Should I introduce the new product?</td>
</tr>
<tr>
<td></td>
<td>Offer development</td>
<td>Conjoint study</td>
<td>How am I perceived by my customers?</td>
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<td></td>
<td></td>
<td>Perceptual maps</td>
<td>How satisfied and loyal are my customers?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multinomial models</td>
<td>Do I have the right portfolio?</td>
</tr>
<tr>
<td>Operations</td>
<td>Optimal network</td>
<td>Autoreg models</td>
<td>What is the right footprint?</td>
</tr>
<tr>
<td></td>
<td>Level and reorder point</td>
<td>Dynamic lag models</td>
<td>What should I expect the order to be?</td>
</tr>
<tr>
<td></td>
<td>Efficient transport routing</td>
<td>Non-linear optimization</td>
<td>How much should I order?</td>
</tr>
<tr>
<td></td>
<td>Warehouse configuration</td>
<td>Queuing and process models</td>
<td>Should I construct a new facility?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ARIMA, Brownian motion</td>
<td>How to I allocate my trucks and cage to service customers best?</td>
</tr>
</tbody>
</table>
... and have multiple applications in business

<table>
<thead>
<tr>
<th>Function/Area</th>
<th>Application of Analytics</th>
<th>Method</th>
<th>Sample Problems</th>
</tr>
</thead>
</table>
| B2C Retailing | • Assortment Optimization  
• Price Optimization  
• Markdown Optimization  
• Store locations  
• Micro segmentation  
• Customer level targeting and strategies | • Regression and econometric demand models  
• Mixture models  
• Dynamic optimization  
• Stochastic process  
• Discrete Choice models  
• Clustering models | • What is the right set of product inventory to carry in each store to optimize ROI  
• Which stores behave similarly to one another? What affects store success?  
• Should I increase price or decrease it?  
• How rapidly should I decrease price for seasonal merchandize to optimize profit  
• What is the optimal way to allocate my scarce media dollars |
| Online Model  | • Optimized search  
• Best presentation and placement  
• Price Optimization  
• Customer Loyalty and retention  
• Marketing and promotions | • Decision trees  
• Neural Networks  
• SEM and CFA models  
• AR and lag models  
• Econometric demand modeling  
• Markov chain process  
• MCMC approaches | • How do I convert a search to purchase?  
• How will price and pop-ups affect the each individual outcome differently?  
• What is the long term effect of an EDLP strategy on different customer types?  
• How do I optimize conversion – which customers are susceptible to what offer  
• How do I best attract higher value customers to my web-site? |
Test multiple scenarios and strategies at one time

How-

- Through DOE methodology
- Fractional Factorial Designs to select relevant strategies.
- Stratified Random Sampling adequately represent each segment.

Example
- Need a price test in 7 Competitor markets, 5 Regions, 2 Store Types, 3 Segments
- 25 Test and 25 Control Stores within each segment
- Total number of stores needed: $7 \times 5 \times 2 \times 3 \times 50 = 10,500$
- Store number increases rapidly as more segments are added

DOE provides a Cost effective way to test strategies
DOE core foundation for material business decisions in retail settings
# Continuum framework to measure progress across the journey

## Data and Facts
- Complete set of facts
- Limited external data
- Internal and external fact base for decision making
- Trustworthy and timely
- Easy and wide spread access
- Robust data collection mechanisms

## Basic Analysis
- Wide spread use of Excel, Access for analysis
- Standard reporting and metric tracking of KPI’s
- Analyst trusted source of insight
- Decisions grounded in facts
- Reporting of financials
- Analysis of sales trends

## Analytic Focus
- SPSS, SAS, CPLEX, R, MATLAB etc in use
- Analysts trained in Econometrics, OR, Mgt Science, Statistics
- Math/Stat models used for decision making
- Probabilistic frameworks - uncertainty
- Not used
- Lack of understanding of formal methods

## Strategic
- Fact based strategic frameworks drives business knowledge
- Analytics informs, drives, sustains business
- Skilled analysts as trusted advisors with clear career path
- More focus on gut feel
- Lack of in-house skill set
- Exposure at directors and above to analytic frameworks
- Is this a next logical step forward - begin to move
- Long term vs. short

<table>
<thead>
<tr>
<th>Assessment Area</th>
<th>Data and Facts</th>
<th>Basic Analysis</th>
<th>Analytic Focus</th>
<th>Strategic</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D</td>
<td>Limited external data</td>
<td>Widely spread use of Excel, Access for analysis</td>
<td>SPSS, SAS, CPLEX, R, MATLAB etc in use</td>
<td>Not in place today</td>
</tr>
<tr>
<td>Operations</td>
<td>Rich internal transactional data for analysis</td>
<td>Reporting of financials, Analysis of sales trends</td>
<td>Not used</td>
<td>More focus on gut feel</td>
</tr>
<tr>
<td>Strategy</td>
<td>Gate keep analytic data</td>
<td>Extensive use of KPI, reporting, analysis</td>
<td>Trained staff over a dozen analysts, managers, directors</td>
<td>Is this a next logical step forward - begin to move</td>
</tr>
</tbody>
</table>

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Approach to big data analytics is often about change

- Decision Making Culture
  - Theories & Methods
  - Values & Beliefs

- Comprehensive Approach
  (broader focus than tools & capabilities)

- Better Decisions

- Improved Outcomes

Scientific Process
(creative destruction)

- Start with the business problem or question
- Define hypothesis and operationalize models to test competing theories
- Gather facts, conduct trials, analyze
- Test and prove to generate new insights
- Accept / reject based on decision making process
Optimization can generate 2 to 5% lift in market

<table>
<thead>
<tr>
<th>Category Name</th>
<th>Changed</th>
<th>Decreased</th>
<th>Gross Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC HEATING</td>
<td>549,910</td>
<td>252648</td>
<td>$ (829,589)</td>
</tr>
<tr>
<td>BATTERY AND ACCS</td>
<td>68,389</td>
<td>61376</td>
<td>$ 7,043,212</td>
</tr>
<tr>
<td>COOLING SYSTEMS</td>
<td>2,111,784</td>
<td>1044275</td>
<td>$ (4,576,670)</td>
</tr>
<tr>
<td>ENGINE POWERTRAIN</td>
<td>745,040</td>
<td>317695</td>
<td>$ (696,183)</td>
</tr>
<tr>
<td>INTERNAL ENG</td>
<td>1,903,297</td>
<td>784083</td>
<td>$ (2,140,948)</td>
</tr>
<tr>
<td>WINDOW WIPER REPAIR</td>
<td>84,317</td>
<td>53262</td>
<td>$ 221,940</td>
</tr>
<tr>
<td>ENGINE MANAGEMENT</td>
<td>776,635</td>
<td>379098</td>
<td>$ 1,321,722</td>
</tr>
<tr>
<td>FUEL SYSTEMS</td>
<td>543,610</td>
<td>299365</td>
<td>$ 3,602,430</td>
</tr>
<tr>
<td>IGNITION</td>
<td>2,424,686</td>
<td>1348406</td>
<td>$ 3,936,880</td>
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<tr>
<td>SPARK PLUGS</td>
<td>652,017</td>
<td>608168</td>
<td>$ 13,196,201</td>
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<tr>
<td>STARTERTS ALTERNATORS</td>
<td>266,128</td>
<td>135242</td>
<td>$ 1,589,177</td>
</tr>
<tr>
<td>BRAKES - FRICTION</td>
<td>802,250</td>
<td>566745</td>
<td>$ 5,060,455</td>
</tr>
<tr>
<td>BRAKES - HYDRAULICS</td>
<td>1,357,210</td>
<td>646394</td>
<td>$ (280,218)</td>
</tr>
<tr>
<td>CHASSIS</td>
<td>419,451</td>
<td>186918</td>
<td>$ (230,785)</td>
</tr>
<tr>
<td>DRIVE TRAIN</td>
<td>461,484</td>
<td>283429</td>
<td>$ 1,606,938</td>
</tr>
<tr>
<td>EXHAUST SYSTEM</td>
<td>168,822</td>
<td>108597</td>
<td>$ 645,838</td>
</tr>
<tr>
<td>RIDE CONTROL SHOCKS</td>
<td>255,359</td>
<td>181903</td>
<td>$ 1,593,632</td>
</tr>
<tr>
<td>STEERING</td>
<td>358,499</td>
<td>168482</td>
<td>$ (115,961)</td>
</tr>
</tbody>
</table>

TOTAL 13,948,888 7426086 $ 30,948,672

Challenge to optimally manage fast moving skus in a real time environment across web and retail interactions
Combination of channel, assortment and markdown and markup strategy resulted in 13 million price changes to optimize market basket
3% gross margin lift to revenue
Keys to understanding how to make this all work

• Keep it simple

• Challenge the status quo aggressively

• Models accepted years ago may not work today

• Align business objectives with approach

• Gain alignment on how to solve

• Don’t deploy a more complex model than you need to

• Be willing to dispense with technical jargon

• Use your analysis to empower the decision maker

• Focus on change management