Using Optimization for Distribution & Network Planning
Speakers

Wang Lei
VP, Asia Pacific

Tang Shouwei
Senior Optimization Specialist
About Us

Founded in 1989

Developer of **AIMMS**: modeling system for optimization-based applications

Offices in
- The Netherlands
- USA
- Singapore
- China

Franz Edelman Award Winner Users Choice
- 2011 with MidwestISO and Alstom
- 2012: with TNT Express/ORTEC
- 2013: with Dutch Delta Program Commissioner

$10 billion in investment savings

$275 million savings
280 million kg CO2

$137 million savings

$3 billion savings
Business Analytics Wave

- *Analytics at Work* (2010): Smarter Decisions, Better Results
- *The Optimization Edge* (2011)
Business Analytics Wave

[Diagram showing the evolution of data-driven decision-making from today to 24 months ahead, with categories like Historic trend analysis and forecasting, Standardized reporting, Data visualization, Analytics applied within business processes, Simulations and scenario development, Clustering and segmentation, and Regression analysis, discrete choice modeling, and mathematical optimization.]

Respondents were asked to identify the top three analytic techniques creating value for the organization, and predict which three would be creating the most value in 24 months.

SOURCE: MIT SLOAN Management Review
Analytics Landscape

<table>
<thead>
<tr>
<th>Competitive Advantage</th>
<th>Degree of Complexity</th>
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</thead>
<tbody>
<tr>
<td>Stochastic Optimization</td>
<td>How can we achieve the best outcome including the effects of variability?</td>
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<tr>
<td>Optimization</td>
<td>How can we achieve the best outcome?</td>
</tr>
<tr>
<td>Predictive modeling</td>
<td>What will happen next if?</td>
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<tr>
<td>Forecasting</td>
<td>What if these trends continue?</td>
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<td>Simulation</td>
<td>What could happen....?</td>
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<tr>
<td>Alerts</td>
<td>What actions are needed?</td>
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<td>Query/drill down</td>
<td>What exactly is the problem?</td>
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<td>Ad hoc reporting</td>
<td>How many, how often, where?</td>
</tr>
<tr>
<td>Standard Reporting</td>
<td>What happened?</td>
</tr>
</tbody>
</table>

Based on: Competing on Analytics, Davenport and Harris, 2007
Big Data, AI & Mathematical Optimization

Figure 1. Hype Cycle for Chief Supply Chain Officers, 2016

Source: Gartner (July 2016)
Optimization finds you the “Best Set of Actions”

An eye-opening experience for game changing leaders
Using Data for Distribution Network Planning

SANOFI

Distribution Service & Project
The need of customers

Challenges Post Shandong Regulations

- No. of customers dramatically increase
- Short response time required (fighting for fridge space)
- Temperature and humidity monitoring becomes critical
Distribution Network Planning

- New Distribution Model to leverage existing experience, expertise

**Current Distribution Network**
- 6 DCs
- 4 LSPs

**Future Distribution Network**
- New DC network optimization redesign
  - # DCs?
  - Location?
  - Product allocation strategy?
  - Rationalization #LSPs

China Distribution Network Planning
Distribution Network Planning

• A New Approach

Modeling: Supply chain cost
Delivery lead time
Service level

Qualitative: Provincial FDA regulations
Qualified distribution resource

Scenario Generation: AIMMS modelling with multiple scenario results
Sensitivity Analysis

Scenario Comparison: Total supply chain cost
Overall service level
Qualitative strategy

China Distribution Network Scenario Selection & Implementation

Aug 2017
Distribution Network Planning

• **Modeling Methodology**
  A Linear Programming model developed to identify optimal no. of DC & locations, to balance:
  - delivery lead time (1 day, 2 days, 3 days)
  - service level
  - total supply chain cost

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**Input**
- Sales forecast by volume, value and customer city
- Freight cost (cost model to simulate)
- Master data (Plant, SKU, customer...)

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**Total SC Cost Calculation**
- Transportation cost
- Stock Transfer
- Deliver to customer
- Warehousing cost
- Fixed cost
- Management cost
- Handling cost
- Inventory Cost

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**Output**
- Optimal # of DC and locations
- Estimated handling volume & stock level
- Estimated cost breakdown

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**Evaluation**
- Qualitative factors
- Sensitivity analysis
- Scenario comparison
Quantitative Modeling Output

- Cold Chain Product by Delivery Lead Time

Theoretical SC Cost vs # of DC

- Result of Sanofi model similar with theoretical one
- Theoretically, with the no. of DC increase, warehousing and inventory holding cost increase, while transportation cost decrease, similarly in our model, it reaches optimal cost at * DCs
- Minimum 5 DC needed, otherwise services level target cannot be achieved
Qualitative Input & Scenario Comparison

Implementation Constraints

- Provincial FDA regulations
- Qualified distribution resource
- DC management & synergies
Why Companies use Prescriptive Analytics;

> Are you frustrated by not being able to smoothly deal with complex recurring planning issues?
- Limited ability to handle complexity
- Spreadsheets become error-prone and difficult to maintain and update
- Difficult to share and collaborate

> Are you limiting your growth and service by technology not fully fitting your ideal process?
- Doesn’t fully address all of your questions
- Does not fully reflect your process
- Lack agility - don’t support rapid development of new, experimental, models

> Are you feeling stuck because IT slows down the process improvements you envision?
- Time consuming
- High maintenance costs
- Can’t easily update & adapt

"What used to take 10 hours now takes 5 seconds"
Indian Manufacturing Company

AIMMS fits perfectly to our business requirements. You get exactly what you want without paying for unnecessary features you will never use."
Global Shipping Company

“With the adoption of AIMMS PRO, Papyrus will rapidly make the transition from a locally oriented organization to a European Supply Chain concept.”
European Paper Merchant
Supply Chain Analytics Applications

- **Planning Teams**: Supply Chain Planning, Capital Proj. Planning, Supply Planning, Portfolio Optimization
  - Lower Costs, Increased Revenue, Improved Efficiency: 68% of Applications

- **Manufacturing & Production Teams**: Production Planning, Production Scheduling, Inventory Mgmt., Warehouse Mgmt.
  - Minimize Lost Sales, Increased Customer Satisfaction, Maximize Profit: 5% of Applications

- **Pricing Teams**: SKU Pricing, Market Pricing, Promotional Planning, Shelf Optimization
  - Increased Market Share, Increased Revenue, Maximize Profit: 5% of Applications

- **Transportation & Logistics Teams**: Network Design, Network Optimization, Routing & Scheduling, Optimal Fleet Sizing
  - Lower Cost, Increased Reliability, Higher Efficiency: 19% of Applications

- **Sourcing Teams**: Supplier Optimization, Disruption Planning, LT Capacity Planning, Product Introductions
  - Minimized Disruption, Lower Cost, Increased Reliability: 3% of Applications
IBP / S&OP Optimization; Examples
Why powering IBP with Modelling & Optimization?
Our clients in Supply Chain Optimization & IBP
Worldwide Customers (part)
Asia Pacific Clients (Part)
Supply Chain Optimization; scope
AIMMS for Supply Chain Optimization
mapping of AIMMS example use cases on the SCOR model

To existing platforms dealing with workflow management, data manipulation, and basic sequencing, AIMMS adds the force of Optimization Technology
AIMMS for Supply Chain Optimization

AIMMS client cases

**Heineken & Shell**
Supply Chain Network Optimization

Used to manage the number, location, allocation and deployment of production & logistics facilities. AIMMS is an intelligent analytics tool that allows our clients to assess the impact of changing markets, disruptions, acquisitions and divestments, and to set out growth strategies.

**TNT Express**
Global Disruption Response Optimization

The 2008 economic downturn brought TNT quickly into large losses. In 6 weeks, the EMEA network was modeled and re-shaped. This enabled TNT to make well-founded decisions to cut costs by over EUR 80 million in the short run and over EUR 200 million over the period 2008-2011.

**ASML & Xstrata**
Tactical Supply Chain Wide Optimization

Tactical planning, scenario evaluation and optimization of the end-to-end supply chain, ranging from sourcing to production and distribution. AIMMS allows our clients the greatest flexibility of scope.

**GruboPlast (& Sanofi, Air-Liquide)**
Complex Production Planning & Scheduling

PVC Floor production requires different jobs, with varying duration and sequence, while changeover times depend on the sequence of jobs and colors. Due to the complexity of its situation, for GruboPlast, only AIMMS could successfully optimize its processes.
Some Examples

**European Metals company**

- Highly specific purchasing process
- Optimizing multiple aspects:
  - Mix of raw materials
  - Timing of purchase
  - Batch size
  - Re-use of scrap material
- Relatively small App
- 10 mln annual savings

**Worlds largest meat company**

- Complicated production planning
- Optimizing within numerous constraints
  - Certification requirements of 100+ countries
  - Capabilities & certifications of 54 plants
  - Source material specs & prices
  - Demand product volume & prices
  - Tax legislations
- ‘Huge’ App driving enterprise business
- 3% increase of company profits
Some Examples

High Tech Company

> Multi-Echelon inventory
> Optimizing outside the company
  > Include the distributors inventory
  > Sharing clients demand
  > For all thousands of SKU
> Healthy inventory composition (ME)
> End-to-end visibility & predictability

Large USA Retailer with 2,000+ stores

> Maximize impact promotional budget
  > which of the supplier suggested promotions to adopt?
  > what amount of funding to allocate to which promotional activity?
  > what new or replacement items to introduce, and when?
  > how to modify the overall product assortment for each category?
  > how to best cater to continuously changing customer preferences?
> Category management has full visibility into costs and customer trends
> Better decisions faster about pricing, promotions and assortment
Supply Chain Optimization is key to Bigger Success

We breathe optimization and live to make it useful
We believe solving the problem is **not enough**
We believe in **creating valuable information** around the problem
We believe in **providing an optimization and collaboration platform**
We believe in **providing an ecosystem** of people, partners, tools, etc.

We can help you as well to
• Be (more) competitive
• Increase your bottom line
• Decrease you total cost
• Improve your efficiency
• Increase your customer satisfaction
...