AI & Strategic Sourcing
Recent Advances, Imminent Changes and A Longer Term Forecast

Dr. Alan Holland, Founder & CEO

CIPS Seminar, Zurich, Sept 20th 2017
About Keelvar

- Mission: Automate best-practice strategic sourcing
  1. Optimization
  2. AI for Automation of Optimization
- Founder: Alan Holland, PhD
  - Former Lecturer in AI,
  - Programme Committee for IJCAI, AAAI, ECAI
- UCC spinout 2012: AI Research Lab
  - Team of 20 PhDs in AI
  - Optimization, Algorithms, Game Theory, Algorithmic Mechanism Design, Machine Learning, NLP
Agenda

- Best Practice & Sourcing Optimization
- Artificial Intelligence
  - What is it and how can it be applied in Strategic Sourcing?
  - **Key benefits**
- Recent Advances
- Imminent Changes
- Longer Term Forecast
Sourcing Optimization

- Combinatorial Bid Events: Split Demand into smaller atomic units of award
  - Invite bids on individual contracts
  - List bundles that can receive bids
  - Bidders tailor their bundles & tiered discount schedules & capacity constraints
  - Multiple bid rounds

- Advantages
  - Savings (approx. 3%-12% extra)
  - Deeper insights / trade-offs
  - Fine control of outcomes
  - Speed – one click evaluation
  - Marry corporate strategy to outcomes.
Most Relevant Categories

- Packaging
- Food Ingredients
- Transportation (Land, Short-Sea, Ocean, Air)
- Temporary Labor
- Fleet
- Print
- Raw Materials
- Electronics
- Process Equipment
- MRO
- Car Hire, Legal Services, ….
- Spend time upfront on a strong event design
- Disaggregate to smaller units of award
  - Bidders can be allowed to bundle bid
  - Analysis, Reporting and Award can aggregate
- Configure your bid sheet design
- Capture valid data

<table>
<thead>
<tr>
<th>Star Rating</th>
<th>Field Description</th>
<th>Control Type</th>
<th>Associated Component</th>
<th>Visibility</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>★</td>
<td>Annual Volume (Shipments)</td>
<td>Number</td>
<td>Purchaser</td>
<td>Visible to bidders</td>
<td>Mandatory</td>
</tr>
<tr>
<td>★</td>
<td>Hazardous?</td>
<td>Text</td>
<td>Bidder</td>
<td>Visible to bidders</td>
<td>Mandatory</td>
</tr>
<tr>
<td>★</td>
<td>Delivery Charge (Rate/kg)</td>
<td>Currency</td>
<td>Bidder</td>
<td>Visible to bidders</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

Limit the values which can be provided for this column
Enter one option per line.

- North America
- South America
- Europe

Minimum value
1000

Maximum value
1000
INCENTIVIZE BIDDERS

- Incentivize bidders
  - Traffic lights based on rank or proximity to targets
  - Watch out for feedback that could act as a disincentive

<table>
<thead>
<tr>
<th>Winning Status</th>
<th>Traffic Light</th>
<th>Rank</th>
<th>Difference to next rank (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>★</td>
<td>⚫</td>
<td>1</td>
<td>0.00%</td>
</tr>
<tr>
<td>✗</td>
<td>Ṫ</td>
<td>2</td>
<td>49.40%</td>
</tr>
<tr>
<td>✗</td>
<td>Ṫ</td>
<td>2</td>
<td>10.33%</td>
</tr>
<tr>
<td>★</td>
<td>⚫</td>
<td>1</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

**Winning Status**
Tells a bidder whether or not they are winning a lot.

**Winning Bid Value**
Tells a bidder the current winning bid on a lot.

**Winning Bundle**
Tells a bidder whether or not they are winning a lot as part of a package bid.
STRATEGIC ANALYSIS

- Supplier consolidation / diversity / cost
- Incumbent switching trade-offs
- Risk Management
- Speed / Cost trade-offs
- Bonus / Malus
- F2F reporting
BEST PRACTICE IS PREDICTABLE

- Best practice upfront design improve speed, control and results
- Best practice has predictable patterns for each category
Artificial Intelligence 101
Imagine you wanted an app to tell you each morning whether to wear a coat or not.

To do this, you can build a simple classifier based on the data you've collected:

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp</th>
<th>Wind (mph)</th>
<th>Precipitation</th>
<th>Wear Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/17</td>
<td>50</td>
<td>2</td>
<td>2mm</td>
<td>Yes</td>
</tr>
<tr>
<td>1/2/17</td>
<td>60</td>
<td>5</td>
<td>10mm</td>
<td>Yes</td>
</tr>
<tr>
<td>1/3/17</td>
<td>75</td>
<td>4</td>
<td>0mm</td>
<td>No</td>
</tr>
<tr>
<td>1/4/17</td>
<td>40</td>
<td>15</td>
<td>0mm</td>
<td>Yes</td>
</tr>
<tr>
<td>1/5/17</td>
<td>45</td>
<td>12</td>
<td>2mm</td>
<td>Yes</td>
</tr>
<tr>
<td>4/30/17</td>
<td>74</td>
<td>9</td>
<td>0mm</td>
<td>No</td>
</tr>
</tbody>
</table>

Wear Coat Classifier:

- **Precip >= 5mm**: Yes
- **Temp < 50**: Yes
- **Wind > 10**: Yes

More Advanced Classifiers would lack readability but improve accuracy.
Automated Column Header Configuration

<table>
<thead>
<tr>
<th>Column Text</th>
<th>Mandatory</th>
<th>Purchaser Input</th>
<th>Data Type</th>
<th>Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Origin Port”</td>
<td>True</td>
<td>True</td>
<td>Text</td>
<td>0</td>
</tr>
<tr>
<td>“Destination Port”</td>
<td>True</td>
<td>True</td>
<td>Text</td>
<td>0</td>
</tr>
<tr>
<td>“BAF”</td>
<td>True</td>
<td>True</td>
<td>Monetary</td>
<td>2</td>
</tr>
<tr>
<td>“Cost per TEU”</td>
<td>True</td>
<td>False</td>
<td>Monetary</td>
<td>2</td>
</tr>
<tr>
<td>Transit Time</td>
<td>True</td>
<td>False</td>
<td>Numeric</td>
<td>0</td>
</tr>
<tr>
<td>Historical Cost</td>
<td>False</td>
<td>True</td>
<td>Monetary</td>
<td>2</td>
</tr>
</tbody>
</table>

Training Set – Tell the App your decision each day

Mandatory Classifier

Partial Example Decision Tree Predicting Input Type (Number, Currency, Text)
Automated Column Header Configuration

- Speed-up of ~50x
- Accuracy improvement (and continuously improving)
### Combinatorial Optimization of Scenarios

Leverage package bids to combine suppliers in allocations that are aligned with business rules

Algorithms traverse a vast search tree where every bid can be awarded (1) or not awarded (0)

<table>
<thead>
<tr>
<th>Name</th>
<th>Rules</th>
<th>Lots</th>
<th>Allocations</th>
<th>Winners</th>
<th>Total</th>
<th>Adjusted total</th>
<th>Historic price</th>
<th>Savings</th>
<th>Savings (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Cost Baseline</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td>4</td>
<td>$23,852,064.00</td>
<td>$23,852,064.00</td>
<td>$27,453,300.00</td>
<td>$3,601,236.00</td>
<td>13.12%</td>
</tr>
<tr>
<td>1 Winner Only</td>
<td>1</td>
<td>20</td>
<td>20</td>
<td>1</td>
<td>$24,275,484.00</td>
<td>$24,275,484.00</td>
<td>$27,453,300.00</td>
<td>$3,177,816.00</td>
<td>11.99%</td>
</tr>
<tr>
<td>Award Exact Shares as Last Year</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>Infeasible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred for Top Lanes</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>4</td>
<td>$24,076,535.60</td>
<td>$24,076,535.60</td>
<td>$27,453,300.00</td>
<td>$3,376,766.40</td>
<td>12.30%</td>
</tr>
<tr>
<td>One Winner per Origin Region</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>4</td>
<td>$24,184,184.00</td>
<td>$24,184,184.00</td>
<td>$27,453,300.00</td>
<td>$5,299,146.00</td>
<td>12.05%</td>
</tr>
<tr>
<td>Fast Carrier with Time Sensitive Lanes</td>
<td>1</td>
<td>30</td>
<td>36</td>
<td>4</td>
<td>$23,918,369.40</td>
<td>$23,918,369.40</td>
<td>$27,453,300.00</td>
<td>$3,534,930.60</td>
<td>12.88%</td>
</tr>
<tr>
<td>Alliance Risk Management</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>3</td>
<td>$24,523,900.00</td>
<td>$24,523,900.00</td>
<td>$27,453,300.00</td>
<td>$2,929,400.00</td>
<td>10.67%</td>
</tr>
<tr>
<td>Two winners</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>2</td>
<td>$23,963,784.00</td>
<td>$23,963,784.00</td>
<td>$27,453,300.00</td>
<td>$3,489,516.00</td>
<td>12.71%</td>
</tr>
<tr>
<td>Three winners</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>3</td>
<td>$23,888,814.00</td>
<td>$23,888,814.00</td>
<td>$27,453,300.00</td>
<td>$3,564,486.00</td>
<td>12.98%</td>
</tr>
</tbody>
</table>
Autopilot Execution

- Car Rental example presented by Siemens at BME Nov 2016
- Full Automation of Post-publish execution
  - Automated selection of tentative award – optimized menu of scenarios
  - Automated feedback
  - Automated Round Opening / bidder withdrawl
  - Automated Stopping Criterion
- **Much** Faster
- Senior sales team oversee bidding
- Not in general production – deployments with development partners only
Pause to interject at any stage
Just sit back and observe
It's not an auction because it explores complex tradeoffs between price and non-price objectives to find optimal trade-off.
Explores solution space faster
It does drive savings but this can be win-win via expressive bids
<table>
<thead>
<tr>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Design</td>
</tr>
<tr>
<td>• Data Upload Cleansing</td>
</tr>
<tr>
<td>• Benchmark integration</td>
</tr>
<tr>
<td>• Mechanism Design</td>
</tr>
<tr>
<td>• Bidder Management</td>
</tr>
<tr>
<td>• Evaluation</td>
</tr>
<tr>
<td>• Negotiation / Intelligent Bargaining</td>
</tr>
<tr>
<td>• Risk Management / CSR / Governance implementation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Supplier Relationship Management</td>
</tr>
<tr>
<td>• Innovation Management</td>
</tr>
<tr>
<td>• Supplier Certification / Approval</td>
</tr>
<tr>
<td>• Over-arching Strategy Definition</td>
</tr>
<tr>
<td>• Risk Management Policies</td>
</tr>
<tr>
<td>• CSR Policies</td>
</tr>
</tbody>
</table>
Automated Sourcing

**Monitored Sourcing**
- Unstructured flow of data using Word and Excel for data gathering.
- All data captured in structured Tables with reasoning, evaluation and reporting conducted using structured queries.
- Decision tree guided scenario awards - rule guidance.
- Auto-detection of category, strategy configuration and execution.

**Unmonitored Sourcing**
- Detection of bidder invitations and extension to competitive suppliers based on intelligent benchmarking.
- Automated design, execution and evaluation via sourcing bots with automated governance when manual overrides don't obey policy.

**Levels**
- **Level Zero**: Driver Only
- **Level One**: Assisted
- **Level Two**: Partial Automation
- **Level Three**: Conditional Automation
- **Level Four**: High Automation
- **Level Five**: Full Automation
The Future of Sourcing

- Bots that automate operational activities as per policy
- More time for Relationship building & analysis
- Best Practice becomes standard practice
- Improved Oversight and Control
- More effective use of data (e.g. risks, performance)
- Software to achieve this will be more customer friendly
  - Customer Success Teams
  - On-Demand or Annual User Licences
  - Easier to try new systems

https://keelvar.com/white-paper-download/
app.keelvar.com/on-demand
Try it out: 7 days free access