Enabling Success Through Better Supply Chain Design
About LLamasoft

We are:

- The global leader in supply chain design technology, services and solutions
- Unparalleled expertise and experience, with a culture of service and integrity
- Headquartered in Ann Arbor, Michigan with support centers around the world
- 200+ employees
Why Is Supply Chain Design Important?

Volutility and change is the new normal

External Factors

Internal Factors
With Volatility and Change... Come More Questions to Answer

There is Seemingly No Limit to the Questions

**Network Structure**
- Where should I add new sites?
- Which hub should supply each SDP?
- When do I need more capacity?

**Inventory**
- How much inventory do I need?
- How much additional inventory to increase availability?
- Where should I stock each product?

**Transportation**
- How many routes & assets do I need?
- What if I change delivery frequency?
- How can I reduce my empty miles?
- Can I combine inbound/outbound shipments?

**Service & Performance Metrics**
- How does a change in inventory policy effect my service rates?
- How many products expire?
- Am I at risk of hitting capacity constraints with new product introductions?

**Product Flow**
- How much does it cost to serve each customer?
- Should I bypass a layer in the network?

**Product Demand**
- How are SDPs consuming our products?
- What is the variability in demand?
An Integrated Supply Chain Design Platform Enables Businesses To:

- Quickly generate models to help **visualize and analyze the current supply chain** operations
- Validate potential supply chain changes and continuously **test new what-if scenarios**
- Optimize the supply chain for the right balance between cost, availability & risk
- React rapidly to unplanned disruptions, market fluctuations, or new business strategies
Only application to integrate multiple design technologies:

- Network Optimization
- Inventory Optimization
- Vehicle Route Optimization
- Enterprise Simulation
### Commercial Customers Worldwide

#### Automotive
- Renault
- Goodyear
- Ford
- Alm
- Toyota
- Caterpillar
- Bridgestone
- Textron

#### Hi-Tech / Electronics
- HP
- Tyco Electronics
- Arrow
- NetApp
- Philips
- Ericsson
- Cisco

#### Life Sciences
- gsk
- Covidien
- OM
- Baxter
- Owens & Minor
- Carestream
- Baxter Healthcare

#### Apparel
- Nike
- Nordstrom
- Limited Brands
- Under Armour
- Macy's
- Coppel

#### Logistics
- J.B. Hunt
- Ryder
- Expediters
- C.H. Robinson
- ModusLink
- DHL

#### Consumer Goods
- Colgate-Palmolive
- P&G
- Northrop Grumman
- Navistar
- Unilever
- Spectrum Brands

#### Food
- Kellogg's
- Pepperidge Farm
- Campbells
- Del Monte
- General Mills
- Hershey's

#### Beverage
- Coca-Cola
- AB InBev
- Lion
- ThaiBev
- PepsiCo

#### Grocery
- Publix
- Giant Eagle
- Migros
- Safeway
- Supervalu

#### Global Health
- The World Bank
- USAID
- JSI

#### Manufacturing
- Honeywell
- Masco
- Electrolux
- Allied Signal
- CEEPM

#### Petroleum
- ExxonMobil
- Mi SWACO
- Caltex
- ConocoPhillips
- Schlumberger

#### Retail
- Walmart
- Best Buy
- CVS
- Staples

#### Chemical
- 3M
- Dow
- LyondellBasell
- Dow Corning
Global Health Engagements
SC Design Cases we’ve seen today

- Mozambique
- Benin
- Ethiopia
SC Design Cases we’ve seen today

• Mozambique
  o Skip District Level (go direct from province)
  o Reduce frequency for remote facilities

• Benin
  o Change from facility pickup to delivery

• Ethiopia
  o Skip Zonal Level (go to Woreda)
  o Frequency: Monthly delivery

What effect on cost and availability?

How best to do?
An integrative case: Tanzania

• Direct Delivery: 5000+ facilities

• Skipping a layer (DMO) and stopping pickup

• Essential Medicines
An integrative case: Tanzania

• Which Hubs to which SDPs?

• What routes, how many vehicles?
An integrative case: Tanzania
An integrative case: Tanzania

• Data Collection and Feedback

• Continuous Process: Owning the tool

• Private Sector (Outsourcing/3PL bid assessment)

• Integration across programs
Thank You!
BACKUP:
Supply Chain Design
Client Use Cases
What Does My Supply Chain Look Like?
Four Regional Distribution Centers
Customers Throughout the Country
Widely Varying Demand by Customer
As-Is Costs and Operations
Port Flow Balancing

[Map showing port flow balancing with various colored lines and dots representing different values.]

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Cost-to-Serve Optimization
Capacity Modeling & Optimization
Supply Chain Segmentation
Safety Stock Optimization

**Multi-Echelon Safety Stock Optimization**

- Transport Time Variability
- Transport Time Variability
- Transport Time Variability
- Sourcing Variability
- Production Variability
- Finished Goods Holding Costs
- Demand Variability

**Key Benefits and Usage**

- Multi-Echelon Safety Stock optimization allows the model to achieve savings in working capital while simultaneously maintaining or increasing service level to stores.
- Scientifically quantify cost or benefits of service level, sourcing, and contractual lead time agreement changes.
- Combine with network optimization to set optimal inventory planning policies. ie Reorder point, order quantities by site by product.
- Model can automatically profile historical sales data or use forecast and forecast error as inputs.
- IO Select functionality allows automated filtering of products with non-normally distribution demand.

Increasing OTIF to 97% increases working capital by 14% while Decreasing OTIF to 93% decreases working capital by 10%
New Transportation Routes
Service Based Optimization

Service Based Greenfield Formulation

Center of Gravity Greenfield Formulation

Key Benefits and Usage

- Depending on the objective, Greenfield analysis can either be performed using **Center of Gravity** or **Service Based** methods.

- Service Based Optimization allows the model to decide “**How Many?**” And “**Where?**” given customer locations and service requirements.

- Service Based Optimization can provide a strategic advantage from a service lead time perspective. The objective is to cover the most number of customers using the fewest number of distribution points within a defined set of service goals.

- Center of Gravity Formulation solves the “**Where?**” question given customer locations, demand volumes and number of DCs as inputs.

- The Center of Gravity method can often yield the lowest cost solutions from a freight perspective. It is often utilized for completely realigning the current footprint or identifying the next best location to setup a facility.

1 Day service increases by 38% from baseline with Center of Gravity Analysis. It further increases by 5% when Service Based GF Analysis is applied.
Sales & Operations Planning

Pre-Position

Pre-Build

Demand
Production Modeling & Simulation

Historical Inventory Pattern

Simulated New Inventory Pattern

- 40% lower stocks.
- Less warehouse space required
- No expediting or exceptional costs
- Regular stable pattern of orders
Huanghua DC shut down increases freight spend by 2% while service distance increases by 7%.
**Key Benefits and Usage**

- Pre-plan supply chain responses in response to various risks in supply, demand, weather and geo-political events.
- Identify optimal alternate suppliers, carriers, production sites, distribution paths, etc. prior to supply chain risk events occurring.
- Understand the impact to capital expenditures, operating expenses and service to customers.
- Combine optimal designs with discrete event simulation to predict and anticipate impact to daily operations.
- Model varying lengths of risks for different supply chain responses.
Optimized Network without Tax Considerations

Tax Efficient Network

Key Benefits and Usage

- Optimize network with tax/duties considerations
- Apply tax/duties/tariffs based on transfer pricing across regions
- Calculate tax/duties/tariffs based on revenue
- Calculate tax/duties/tariffs based on import/export arrangements
- Capture region specific product standard cost based on production cost and exchange rate differences
- Determine tax/duties/tariffs based on region to region movements
- Account for tax/duties/tariffs based on invoicing locations
Sustainability Optimization

Baseline GHG Network Profile

35% GHG Reduction Network Profile

Key Benefits and Usage

- Quantify financial benefit or costs of achieving sustainability goals
- Built in published emission factors accurately models and outputs emissions from various forms of transportation
- Optionally, carbon offsets are calculated as a part of the profit and loss calculations
- Fees and duties as a result of non-green equipment/facility usage can be incorporated into the overall profit and loss calculations
- Ramp up of sustainability efforts can be modeled as a multi-year green house gas reduction initiative
Freshness Considerations

Baseline Sourcing Pattern

- Cycle Inventory Optimization
- Shelf Life Constrained Optimal Inventory
- Average Touches in SC Design
- Age Curve Generation
- True Cycle Evaluation

Key Benefits and Usage

- Production with freshness – what if’s to optimize production lot size against probability of dumping
- Product flow contingency planning with freshness – flow paths that minimize freight, inventory and spoilage costs
- Inventory planning with freshness – minimize inventory with respect to shelf life, service level agreements and production constraints
- Ability to track to true age of productions
- Minimize obsolescence and cost write downs for high turn-over items (ie fashion, electronics)
Using Car-Track to improve Digital Road Network: Nigeria Example
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