

A large cargo ship is docked at a port at night. The ship is illuminated by city lights and port cranes. The background shows a city skyline with various buildings and lights. The overall scene is a busy port at night.

LLAMASOFT SESSION

The business solutions required to enable smart, fast, and frequent supply chain decision making

Toby Brzoznowski
Co-Founder, EVP

A large cargo ship is docked at a port at night. The ship is heavily loaded with colorful shipping containers. Several large cranes are visible, some with their lights on. In the background, a city skyline is visible under a dark blue sky. The water in the foreground is dark, with some reflections of light.

RUNNING A SUPPLY CHAIN ISN'T EASY

...and it's only getting worse.

Today's supply chains have an unprecedented level of complexity...



...and volatility and change are the new norm.



Volatility and change are creating more questions

Who should source each customer?

Which ports should I be using?

Am I at risk of hitting capacity constraints? When do I need more capacity?

Can I combine inbound and outbound shipments?

How much does it cost to serve each customer?

Should I lease or build new sites?

INVENTORY

Should I consolidate my inbound through a cross-dock?

Should I postpone or stock finished goods?

Where should I make each product?

NETWORK STRUCTURE

Should I be outsourcing production?

Where should I stock each product?

How can I reduce my empty miles?

How many shipments will be late?

Can I single-source key components?

SERVICE

How many routes and assets do I need?

TRANSPORTATION

Can I reach my customers within one day?

Should I source local or low-cost?

Do I need to pay for backup suppliers?

PRODUCTION

How many routes and assets do I need?

Do I have the right balance of capacity?

Should I buy in bulk or just in time?

FOOTPRINT

What if I change delivery frequency?

How do I consolidate assets?

or just in time?

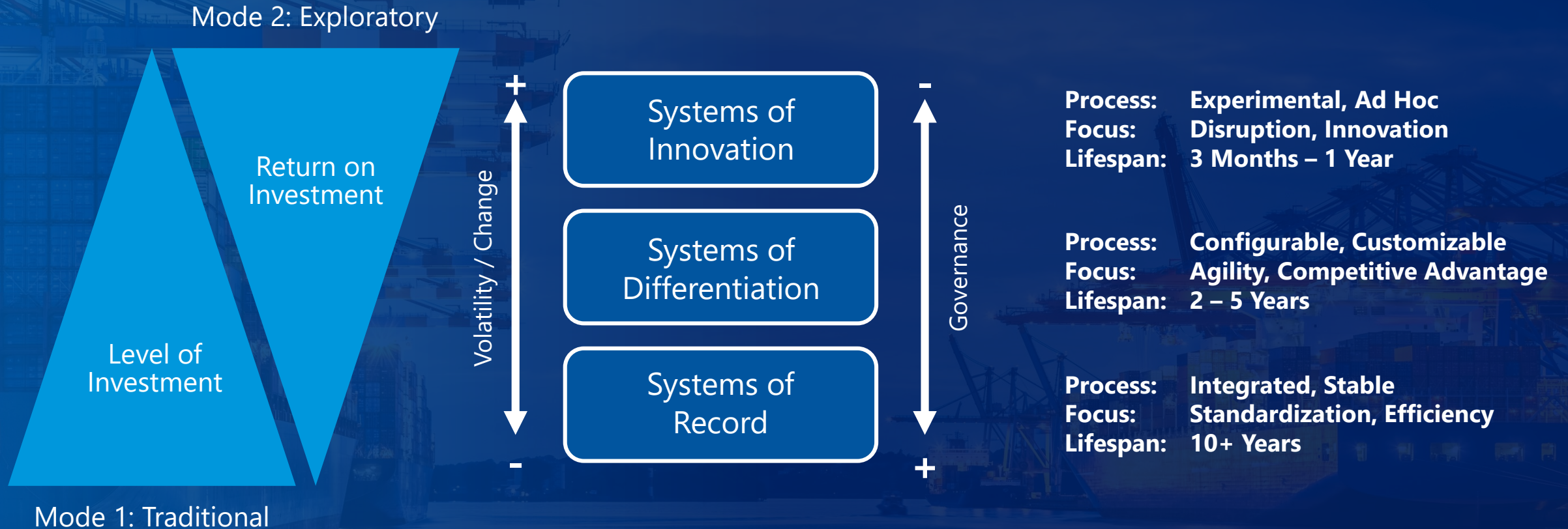
When should I pre-build?

How much inventory do I need?

What will it cost to achieve my service level targets? **PRODUCT FLOW**

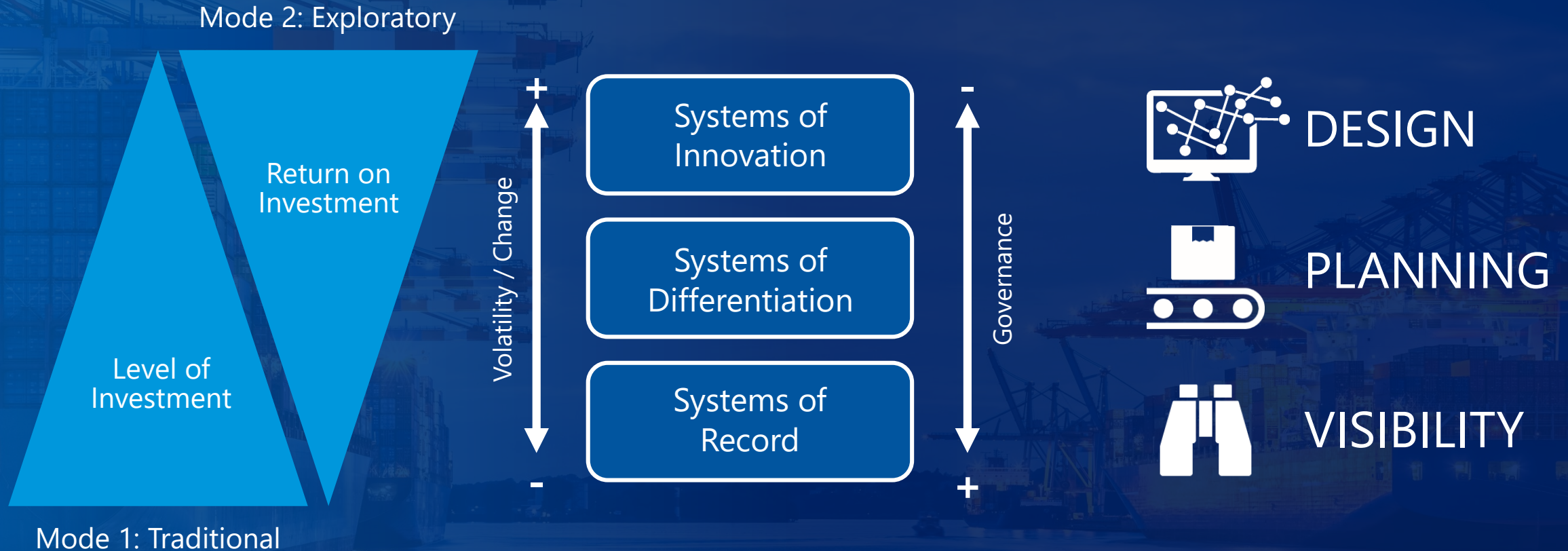
Leaders can answer these questions...
Faster. Smarter. More Frequently.

Systems Supporting Supply Chain Management



Source: Gartner Pace Model for Supply Chain Systems

Systems Supporting Supply Chain Management



Source: Gartner Pace Model for Supply Chain Systems

We call this

SUPPLY CHAIN BY DESIGN



DESIGN

How can we change our supply chain to make it better?



PLANNING

How can we best run our existing supply chain?



VISIBILITY

What information is available about our supply chain?

“Everyone designs who devises courses of action aimed at changing existing situations into preferred ones.”

-Herbert Simon

Technology Building Blocks Enabling Supply Chain by Design



Library of Advanced Analytics Solvers



Data Integration Management



Visual & Collaborative User Experience

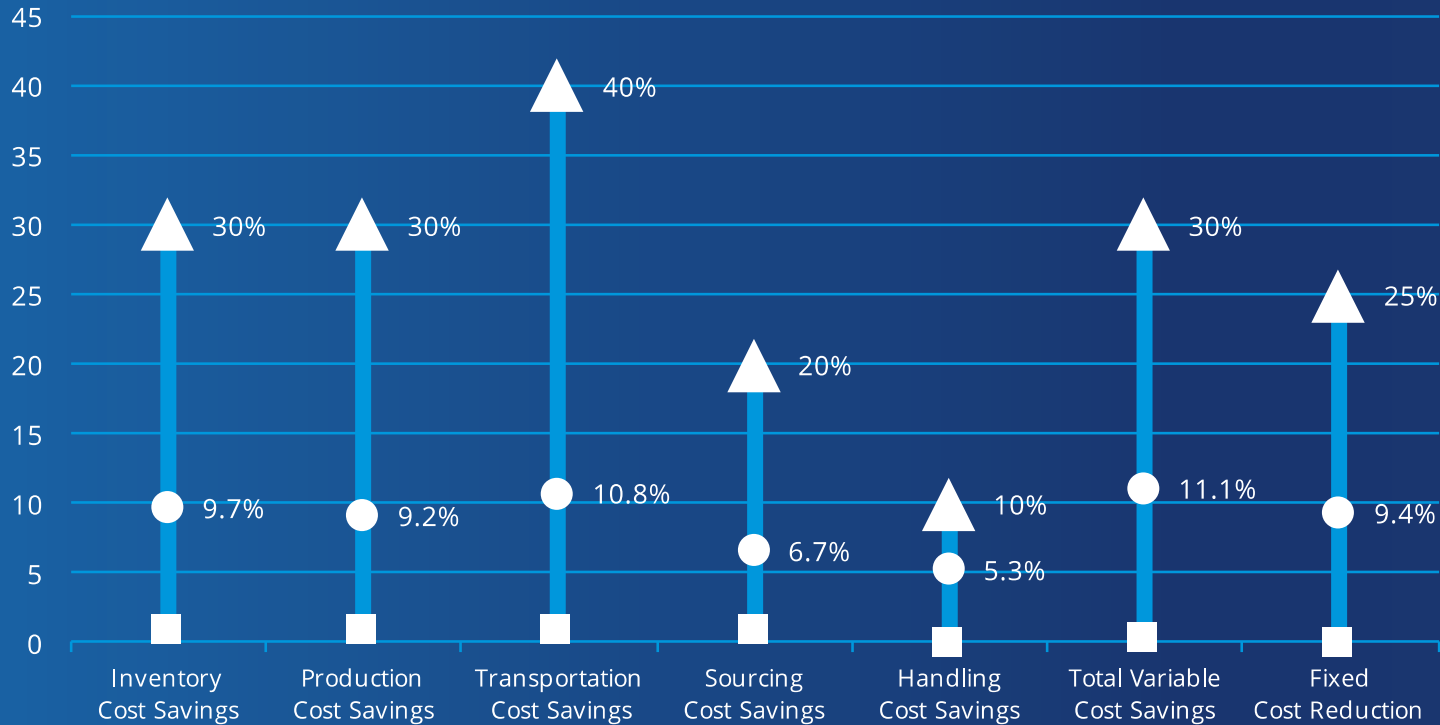


Structured Data Model & Flexible Attributes



Supply Chain By Design Drives Significant Cost Savings

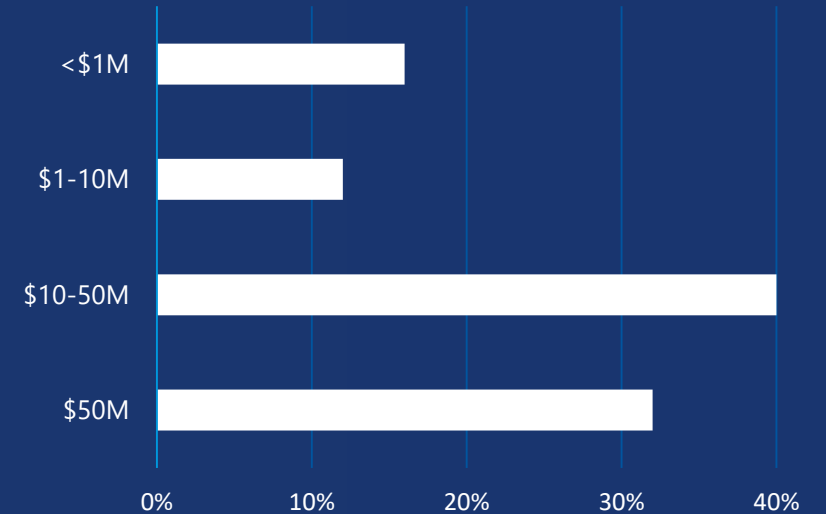
Making Your Supply Chain a Competitive Advantage



● Average ▲ Max ■ Min

Percent Improvement from Llamasoft Projects

410 Respondents from 211 Companies



2015 University of Michigan Study
SC Design COE's Impact
Ajit Sharma, Ross School of Business

Supply Chain By Design Platform

VISIBILITY



What **INFORMATION** is **AVAILABLE** about our supply chain?

DESIGN



How can we change our supply chain to make it **BETTER**?

PLANNING



How can we **BEST RUN** our **EXISTING** supply chain?

ANALYTICS LIBRARY

- Optimization solvers & prescriptive analytics
- Machine learning algorithms
- Simulation engines & predictive analytics

DATA MANAGEMENT

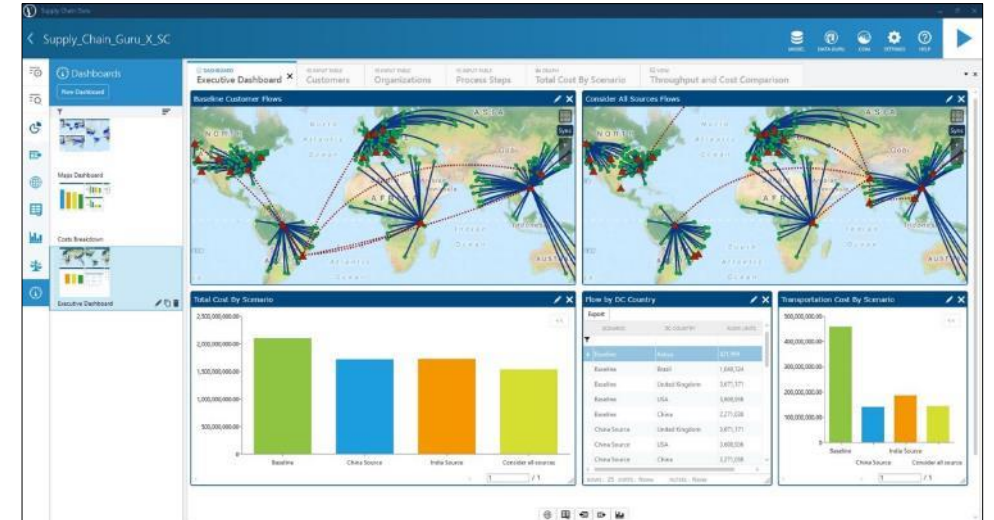
- Enterprise data system connectivity
- Master data management
- Data blending, validation, harmonization



SUPPLY CHAIN GURU, SUPPLYCHAINGURU.COM

Build end-to-end digital models
of your supply chain to:

- Visualize the current supply chain
- Analyze alternate strategies
- Optimize for best performance
- Simulate to test potential changes



The screenshot shows a 'Scenario Comparison' window with a detailed data table. The table compares various scenarios across multiple metrics:

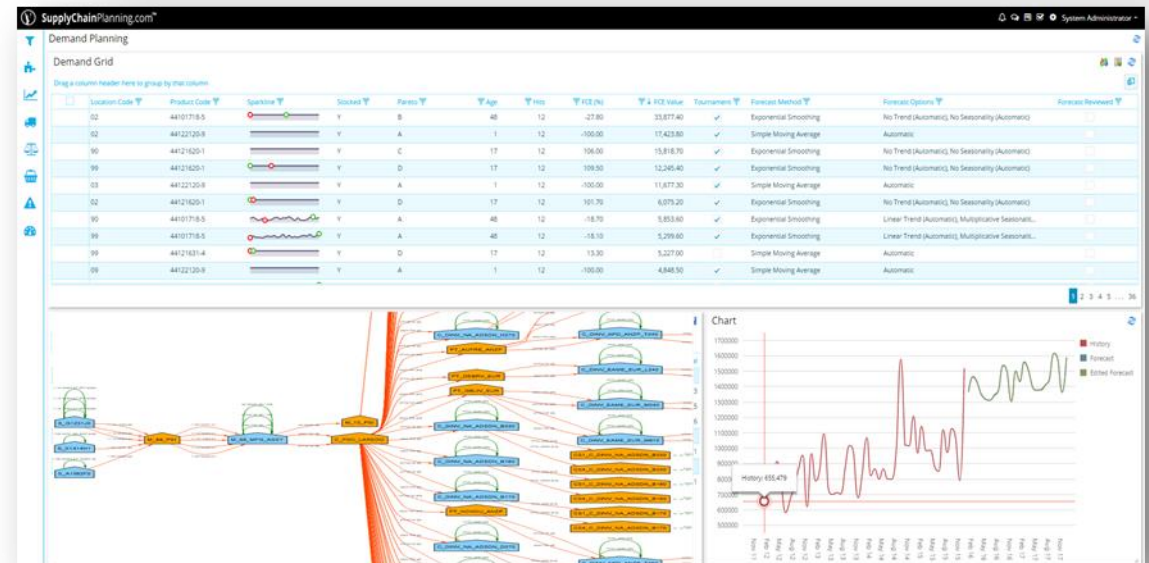
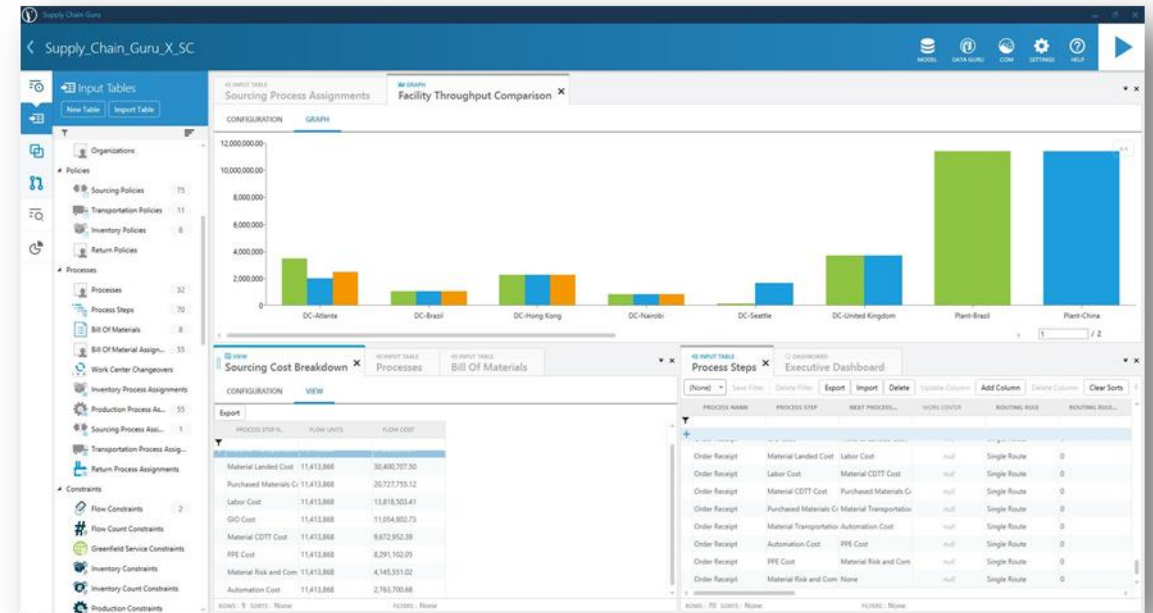
Scenario	Optimized Status	Throughput Level	Throughput Base	Total Cost	Total Fixed Costs	Total Z
Baseline	Open	0	0.0000	0.0000	0.0000	0.0000
China Source	Open	0	0.0000	0.0000	0.0000	0.0000
India Source	Open	0	0.0000	0.0000	0.0000	0.0000
Consider all sources	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 1	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 2	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 3	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 4	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 5	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 6	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 7	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 8	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 9	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 10	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 11	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 12	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 13	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 14	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 15	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 16	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 17	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 18	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 19	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 20	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 21	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 22	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 23	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 24	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 25	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 26	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 27	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 28	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 29	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 30	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 31	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 32	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 33	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 34	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 35	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 36	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 37	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 38	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 39	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 40	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 41	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 42	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 43	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 44	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 45	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 46	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 47	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 48	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 49	Open	0	0.0000	0.0000	0.0000	0.0000
Scenario 50	Open	0	0.0000	0.0000	0.0000	0.0000



SUPPLYCHAIN PLANNING.COM

A model-based apps approach to supply chain planning:

- Quickly design planning apps
- Easy to use and easy to deploy
- Powerful optimization, simulation, and machine learning engines

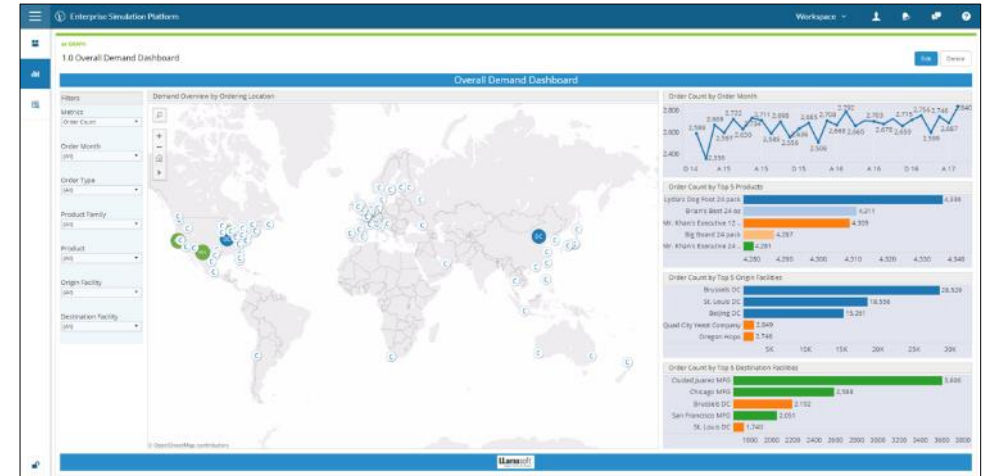




ESP

Data integration platform enabling interactive visualizations, investigating, and monitoring:

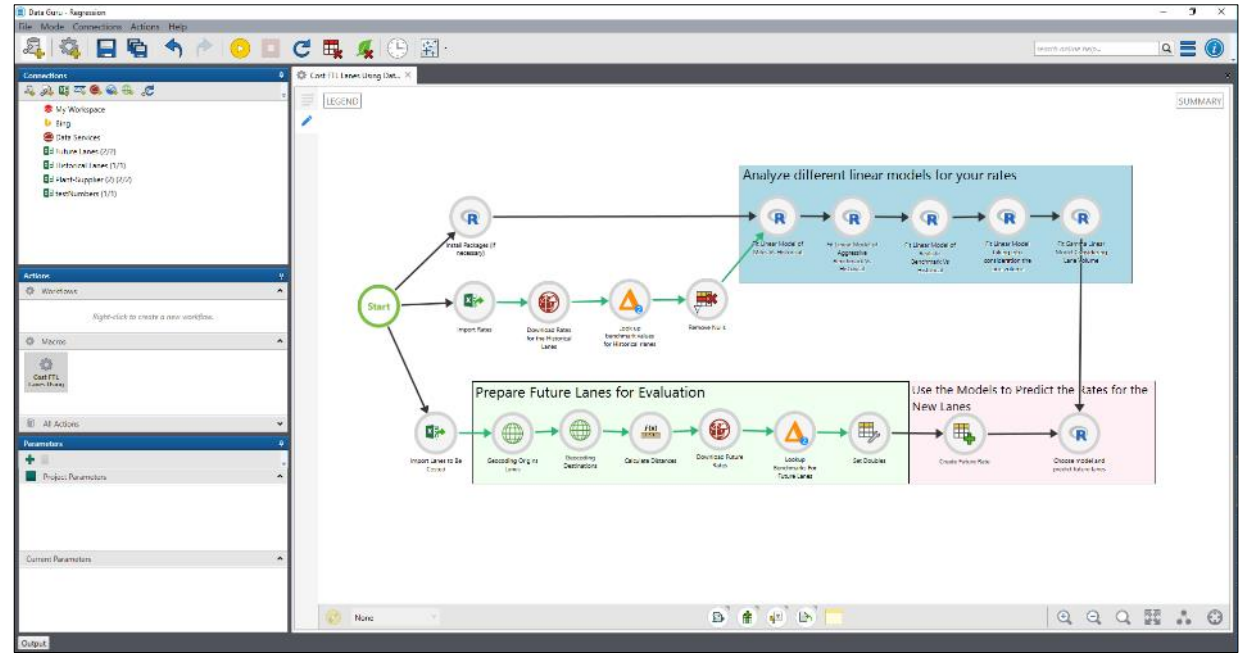
- Quickly consolidate all data sources
- Automatically apply advanced analytics
- Configure interactive dashboards and reports





DATA GURU

- Universal Connectivity
- Rapid Data Integration
- Data Validation
- Data Enrichment
- Data Transformation
- Master Data Administration
- Exception Handling
- Data Lineage Tracking



Source



Validate



Blend



Analyze



Publish



DATA SERVICES

- Fortify models with **outside** data to fill information gaps
- Automatically refresh data for accurate models
- Data sets include:

FREIGHT

Transport Rates
Transit Times
TL, LTL, Parcel
Ocean, Rail

LOCATION

Rental Rates
Labor Rates
Space Availability
LTL Terminals

RISK

Logistics
Climate
Political
Corruption

KPIS

Capacity Utilization
Inventory Turns
Transport Spend
Modes Utilized

The Brain of Supply Chain by Design:

LLamasoft's library of **integrated solvers and algorithms**

NETWORK



SERVICE



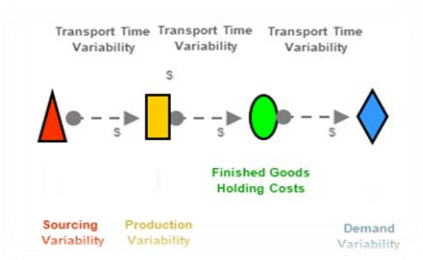
PRODUCT FLOW



VEHICLE ROUTING



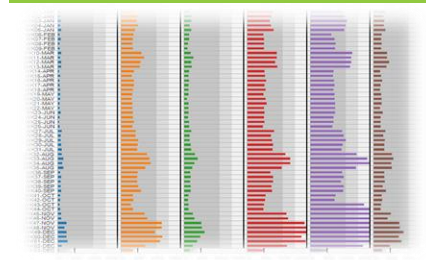
INVENTORY



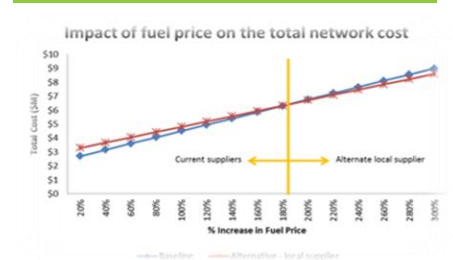
SIMULATION



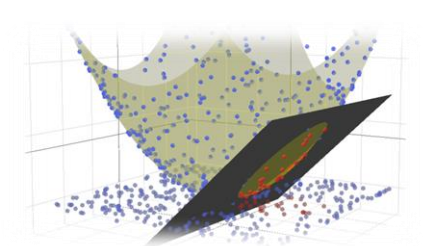
PRODUCTION



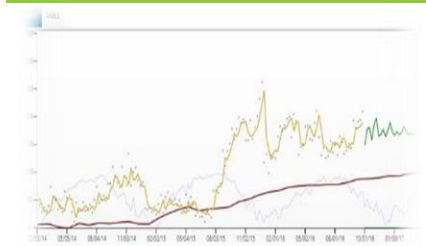
RISK



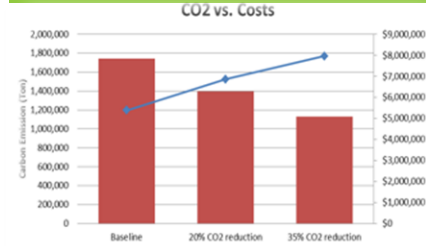
MACHINE LEARNING



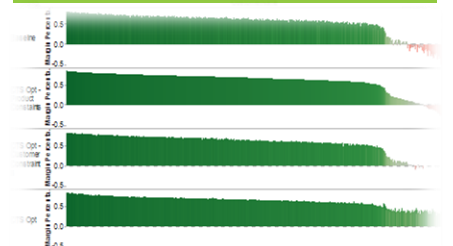
DEMAND



SUSTAINABILITY



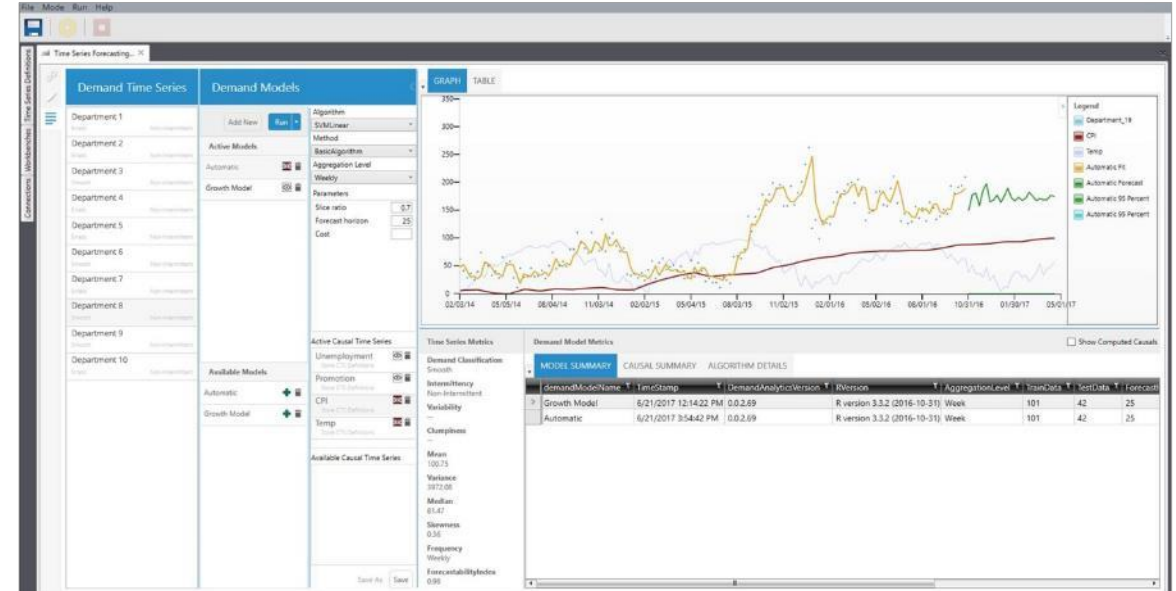
COST-TO-SERVE





DEMAND GURU

- Explore key drivers of demand
- Model and analyze demand
- Predict demand patterns into the future
- Access external time series data to better predict demand
- Improve long range forecast accuracy (beyond your corporate collaboration horizon)



BUILDING COMPETENCY

People • Process • Technology

Supply Chain By Design Maturity Model

Key Drivers for Maturity Progression



Trekking In



Base Camp Establishment



Design Ascension



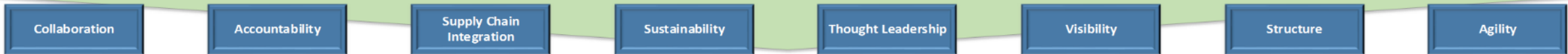
Peak Discovery



Summit Attainment

Trekking In <i>The Journey Begins</i>	Base Camp Establishment <i>Establishing a SCD Process</i>	Design Ascension <i>Repeatable Process Aligned with Business Strategy</i>	Peak Discovery <i>SCD Influencing Business Strategy</i>	Summit Attainment <i>SCD Enabling Strategic Competitive Advantage</i>
<div>Collaboration One Man Band</div> <div>Accountability Primarily Supporting Analytics</div> <div>SC Integration Isolated Projects/ Analytics</div> <div>Sustainability SCD as Proof of Concept</div> <div>Thought Leadership Singular Focus</div> <div>Visibility Limited to Defined Scope</div> <div>Structure Learn as You Go; Lack Standards</div> <div>Agility Reactive Analysis</div>	<div>Collaboration Within Internal SCD Organization</div> <div>Accountability Recommendations with Some Adoption</div> <div>SC Integration Extending SC Reach; Multiple Functions</div> <div>Sustainability Targeted Internal Advocates</div> <div>Thought Leadership Narrow Focus; SCD Technicians</div> <div>Visibility Long Term, Strategic</div> <div>Structure Defining Standards; Sporadic</div> <div>Agility Request Driven, Static SCD</div>	<div>Collaboration SCD Expanding to Larger Organization</div> <div>Accountability Consistent Implementation</div> <div>SC Integration Consideration Across Most SC Functions</div> <div>Sustainability Aligned Across SC Organizations</div> <div>Thought Leadership SCD Consultants</div> <div>Visibility Introducing Tactical</div> <div>Structure Defined Governance and Standards</div> <div>Agility Some Proactive and Dynamic SCD</div>	<div>Collaboration Normal Participation from Business</div> <div>Accountability KPI's to Measure Effectiveness</div> <div>SC Integration Holistic Internal SC Considered</div> <div>Sustainability Active Engagement Across Organization</div> <div>Thought Leadership Driving Supply Chain Policies & KPI's</div> <div>Visibility Routine Cadence; Current View of SC</div> <div>Structure People, Process, Technology Strategy</div> <div>Agility SCD Setting Contingency Plans</div>	<div>Collaboration SCD Incorporating External Partners</div> <div>Accountability Closed-Loop Value Tracking</div> <div>SC Integration Consideration of External Value Chain</div> <div>Sustainability SCD Viewed as Required Function</div> <div>Thought Leadership Lead Transformative Change</div> <div>Visibility Monitor Internal and External SC</div> <div>Structure SCD Systematized</div> <div>Agility Capable of Real-Time SC Change</div>

Supply Chain Design Maturity Drivers



Assessments

Supply Chain Design Maturity – Current Overall Design Example

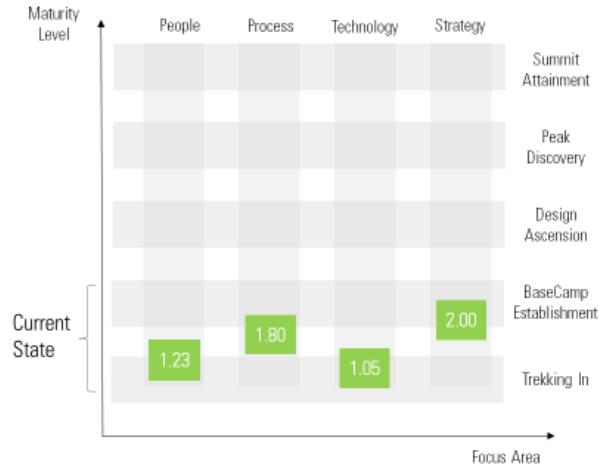
Benchmark

Industry Best In Class	2.89
Region Best In Class	3.88
Best In Class	4.75
Worst In Class	1.08

Maturity Level

1.6

Design Maturity Status



Best In Class Design Project Focus

- E2E Network Optimization – NPV Maximization Base
- Contingency Planning
- Margin to Serve Optimization
- Inventory Optimization & Service Level Optimization
- Company Wide Synergy Optimization (Internal & External)
- S&OP Support
- Data Standardization / Data Visibility (ESP)
- Portfolio Optimization
- Transportation Route Design & Asset Optimization

Maturity Progression Example (3 years)

Initial Maturity Status : Level_1

- Collaboration**
One Man Band
- SC Integration**
Isolated Projects/ Analytics
- Thought Leadership**
Singular Focus
- Structure**
Learn as You Go; Lack Standards

Final Maturity Status : Level_4

- Accountability**
Primarily Supporting Analytics
- Sustainability**
SCD as Proof of Concept
- Visibility**
Limited to Defined Scope
- Agility**
Reactive Analysis



Detailed Plan - Skills Assessment

- Developing a skills assessment of current supply chain design capability using Supply Chain Guru®, we identified that modeling capability aligns with current design maturity
- Training has been defined to bridge the gaps to Maturity level 4.



Convention Grade	0	1	2	3
Untrained				
Beginner				
Intermediate				
Advanced				

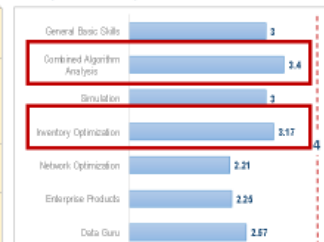
Maturity: **Level_2**



Skill Analysis

	Score	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4	Maturity Level 5	Max Gap
Concepts and Theories							
Data Guru							
Enterprise Products							

Gap Analysis



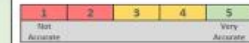
Process Development Plan

Supply Chain Design Process Survey



ABC

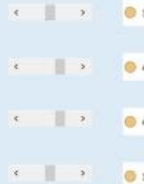
Select the response for the statements below that best represents the level of accuracy within your organization.



Project Development Methodology

- Your SCD organization has an active project pipeline covering at least the next 12 months
- You have a process for prioritizing projects within your pipeline that considers budget, ROI, scope, resource skill set
- You engage business owners as part of your project pipeline development process
- Your SCD project pipeline aligns with your corporate goals

Self Assessment Rating



Competency Development Plan

Suggested Training

Training Sessions are based on the basic skills to be completed as the projects progress. This makes the assumption that the projects to be developed initially will be pretty standard and will combine both quick wins and longer term cost avoidance analysis. As more people are involved in the team, training will be provided to refresh and to teach the new recruits.

Skill	Month_1	Month_2	Month_3	Month_4	Month_5	Month_6	Month_7	Month_8	Month_9	Month_10	Month_11	Month_12
Combined Algorithms	1	0	0	0	0	0	0	0	0	0	0	0
Network Optimization	0	0	0	0	0	0	0	0	0	0	0	0
Data Guru	1	0	0	0	0	0	0	0	0	0	0	0
	0.5	0	0	0	0	0.5	0	0	0	0	0	0
	0.5	0	0	0	0	0	0	0	0	0	0	0
Transportation Optimization	0	0	0	1	0	0	0	0	0	0	0	0
Network Optimization	0	0	0	0	0	0	0	0	1	0	0	0
Inventory Optimization	1	0	0	0	0	0	0	0	0	0	0	0
Enterprise Products / Network Optimization	1	0	0	0	0	0	0	0	0	0	0	0
Inventory Optimization	1	0	0	0	0	0	0	0	0	0	0	0
Simulation	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
Network Optimization	0	1	0	0	0	0	0	0	0	0	0	0
Network Optimization	0	0	0	0	0	0	1	0	0	0	0	0
Network Optimization	0	0	0	0	0	0	0	0	1	0	0	0
Combined Algorithms	0	0	0	0	1	0	0	0	0	0	0	0

	Sessions Per Month												Total Annual Sessions	
Year 1	4	0	0	1	0	0.5	0	0	1	0	0	0	0	6.5
Year 2	2	0	1	0	0	0	0	0	0	0	0	0	0	3
Year 3	0	1	0	0	1	0	0	1	0	1	0	0	0	4

Timeline Definition 101 – Rules of Thumb for Project Types

Quick Wins – Can be done relatively quickly

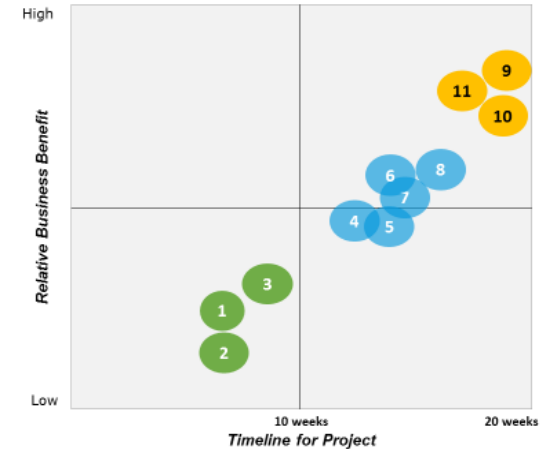
1. Product Flow – sample set of 10-20 SKUs – basic cost to serve
2. Greenfield Analysis – initial site discovery
3. Safety Stock Optimization – sample SKUs and inventory positioning and demand classification

Core Projects – 12+ week range

4. One GEO NO project – outbound or inbound focus: no production
5. Vehicle routing – basic routing analysis for a GEO
6. Production analysis – subset of GEO plants with a handful of lines
7. Warehouse capacity analysis – single GEO
8. Sourcing and Cost to Serve – single GEO

Larger Scale Projects – 16+ weeks

9. Global NO project – end to end analysis
10. Duties & Taxes – GEO or global analysis
11. S&OP production and sourcing analysis – GEO or global, integrated with ERP data, automated flows



Detailed Plan - Schedule & Technology Example

Financials

ROI	61%
Payback	0.61
NPV	\$765,956

Initiatives	2016											
	September	October	November	December	January	February	March	April	May	June	July	August
Implementation Tracking	0.5	0	0	0	0	0.2	0	0	0.2	0	0	0.2
New Facility Allocation Network Redesign	0	0	0	0	0	0	1	0.8	0.8	0	0	0
Data Standardization	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Distribution Network Optimization (DNO)	0	0.8	0.8	0.8	0.8	0	0	0	0	0	0	0
Manufacturing Network Optimization (MNO)	0	0	0	0	0	0	0	0	1	1	0.8	0.8
Ad-Hoc Projects	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Transportation Mode/Carrier Optimization	0	0.8	0.8	0.8	0	0	0	0.8	0.8	0	0	0
Inventory Optimization	0	0	0	0	0	0	0	0	0	0	0	0
S&OP Support	0	0	0	0	0	0	0	0	0	0	0	0
Optimal Balance Own Fleet vs. 3rd Party Fleet	0	0	0	0	0	0	0	0	0	0	0	0
EZE Network Optimization	0	0	0	0	0	0	0	0	0	0	0	0
Portfolio Optimization	0	0	0	0	0	0	0	0	0	0	0	0
EZE Service Level Optimization	0	0	0	0	0	0	0	0	0	0	0	0
Mergers & Acquisitions	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Hours Investment	\$5,277	\$21,889	\$21,889	\$21,889	\$11,751	\$15,206	\$11,078	\$21,216	\$26,186	\$14,246	\$11,751	\$13,553
Training Required	\$5,000	\$0	\$0	\$0	\$0	\$5,000	\$0	\$0	\$0	\$0	\$0	\$0
Workshops	\$2,000	\$0	\$0	\$0	\$2,000	\$0	\$0	\$2,000	\$0	\$0	\$2,000	\$0
Health Checks	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Taxes	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Expenses	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
SCG - Named User	0	0	0	0	0	0	0	0	0	0	0	0
SCG - Without TO Module	0.3	0	0	0	0	0	0	0	0	0	0	0
SCG Cloud Server - 200 hours	1	0	0	0	0	0	0	0	0	0	0	0
SCG Cloud Server - 500 hours	1	0	0	0	0	0	0	0	0	0	0	0
TO - Named User License	0	0	0	0	0	0	0	0	0	0	0	0
LogicTools - LogicNet Plus	0	0	0	0	0	0	0	0	0	0	0	0
LogicTools - Inventory Analyst	0	0	0	0	0	0	0	0	0	0	0	0

Suggested Projects

New Facility Allocation Network Redesign
Distribution Network Optimization (DNO)
Transportation Mode/Carrier Optimization
Manufacturing Network Optimization (MNO)
Ad-Hoc Projects

Transportation Mode/Carrier Optimization
Inventory Optimization
S&OP Support
Optimal Balance Own Fleet vs. 3rd Party Fleet
EZE Network Optimization
Ad-Hoc Projects

Transportation Mode/Carrier Optimization
Inventory Optimization
S&OP Support
Optimal Balance Own Fleet vs. 3rd Party Fleet
EZE Network Optimization
EZE Service Level Optimization
Mergers & Acquisitions
Ad-Hoc Projects

Data Standardization
Implementation Tracking

Data Standardization
Implementation Tracking

Implementation Tracking

Year 1 - Maturity Goal 2

SCG V8.4 – New Functionality
Modeling Best Practices & SCG.com
Data Management

Year 2 – Maturity Goal 3

Inventory Optimization Strategies
Simulation Modeling
PVO Support Best Practices

Year 3 – Maturity Goal 4

Inventory Optimization Strategies
Simulation Modeling
M&A Best Practices

Monthly 1h Alignment
Quarterly Review – Maturity Health Check
End of Year Review

Monthly 1h Alignment
Quarterly Review – Maturity Health Check
End of Year Review

Monthly 1h Alignment
Quarterly Review – Maturity Health Check
End of Year Review

1 Supply ChainGuru®
1 SupplyChainGuru.com Package
1 Data Guru®

2 Supply ChainGuru®
1 SupplyChainGuru.com Package
2 Data Guru®

2 Supply ChainGuru®
2 SupplyChainGuru.com Package
3 Data Guru®

CONCLUSIONS



Volatility and change are the new normal

Leaders are good at both operating & innovating

Innovation requires People, Process, & Technology