



## MIT Center for Transportation & Logistics

### Supply Chain Management: Driving Strategic Advantage



Program Review  
MIT CTL Exec Ed  
Program  
Jan 20, 2017

### SC Management: Driving Strategic Advantage

- Tuesday: E51-335 & Samberg
  - Introduction & Ice Breaker
  - Halloran Metals Case Discussion: Jonathan Byrnes
  - Beer Game: Josué Velázquez
  - Beer Game Debrief: Roberto Perez-Franco
  - Journal
  - Reception at Champions (Marriott)
- Wednesday: E51-335
  - Supply Chain Financial Analysis: Jarrod Goentzel
  - Financial Simulation
  - Supply Chain Risk Management: Jim Rice
  - SC Resilience SCREAM Exercise: Josué Velázquez
  - Wal-Mart Case Discussion: Jim Rice
  - Journal

## SC Management: Driving Strategic Advantage

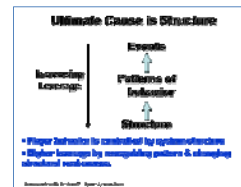
- Thursday E51-335
  - SCM Introduction & info on recruiting: Sue Wang
  - SCREAM Debrief: Josué Velázquez
  - Omni-Channel Distribution: Eva Ponce
  - Last Mile Logistics: Matthias Winkenbach
  - Apple Case Discussion: Jim Rice
  - Global SC Business Simulation: Jarrod Goentzel
  - Journal
  
- Friday SAMBERG
  - Global SC Simulation Debrief: Jarrod Goentzel
  - Sustainable Supply Chains: Josué Velázquez
  - Future Freight Flows: Chris Caplice
  - The Future of Supply Chain Mgt: Yossi Sheffi
  - Journal & Summary

## Halloran Case

- Does Halloran have a strategy? Is it a good strategy?
  
- Allied & Halloran
  - Distinct strategies, competing in different ways – both can be successful
  
- Strategy
  - Deciding what you WON'T do!
  
- Alignment is critical
  - The supply chain must serve the business strategy

## The Beer Game

- Playing the Game
  - Mayhem, limited data, uncertainty
    - Similar to the real world
  
- Debrief
  - Tendency to respond to events
    - Events → manifestations of patterns
  - The possibilities: 10X improvement!
  - Key patterns found in SCs
    - Oscillation, Amplification, Phase Lag
    - AKA the Bullwhip Effect
  - Evolution of SCM

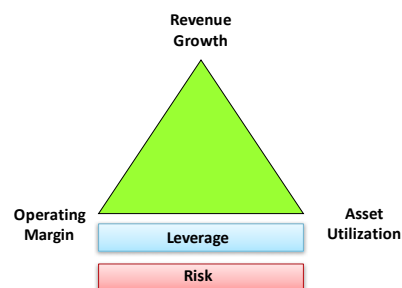


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## Supply Chain Financial Analysis

- Sunflower Nutraceuticals: distributor with thin margins, flat sales, and capital constraints.
- Identify the levers for the CEO to “fly the plane”
- Assess the levers (ratios) and consider tradeoffs to make business decisions
  - DuPont Analysis
- Ways to balance tradeoffs
  - ROIC = return on invested capital
  - EVA™ = economic value added

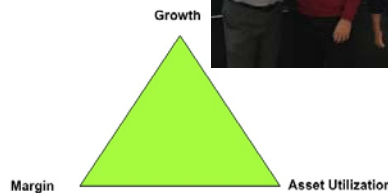


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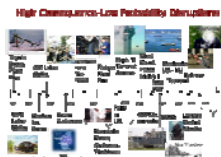
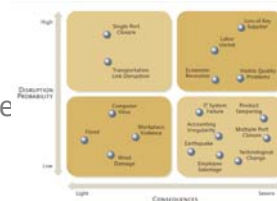
## Supply Chain Financial Analysis

- Sun Nutraceuticals: Distributor with high turnover, thin margins, breaking even, high receivables, flat growth....
- Considering investment options
- WACC vs Cost to borrow
- Cash constrained
- Balancing Margin – Revenue Growth – Asset Utilization



## Supply Chain Risk Management & Resilience

- Low probability/high impact disruptions
- Failure mode focus – prepare for predictable outcomes – lost capacity to:
  - Acquire materials
  - Ship/transport
  - Communicate
  - Convert
  - Human resources
  - Financial flows
- Flexibility & Redundancy
- Many paths to flexible SC
  - Interchangeability, Postponement, Flexible Supply, Flexible Distribution, Flexibility culture

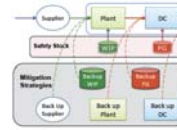


### Adding Resilience to a Supply Chain

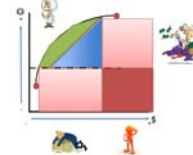


## SCREAM Exercise

- Not all Sunny days ....choosing one policy for multiple scenarios
- Multiple ways to protect, at diff costs
  - Different policies do well under different scenarios
  - Understanding the right scenario portfolio is key
- Downstream matters more than Upstream
  - Protecting the DC is more important than protecting the plant or the supplier
- Combination of Robustness & Flexibility
  - Typically most reasonable approach is mixed
  - Robustness to cover the Response Time for Back Ups
  - Flexibility (backups) relied on for longer term
- And the winners are ..... →



Assessment of mitigation strategies



| Stock Name                    | Min Inventory | Max Inventory | Min Stock | Max Stock |
|-------------------------------|---------------|---------------|-----------|-----------|
| 1 The Almighty Goose          | 1500          | 1500          | 2         | 2         |
| 2 TPU                         | 225           | 225           | 5         | 6         |
| 3 Bombardier, Ewing, Andrew   | 105           | 100           | 6         | 6         |
| 4 Jeffrey-Catalina-Gary       | 500           | 500           | 6         | 6         |
| 5 Stone, Marlene and Kimberly | 200           | 200           | 5         | 5         |
| 6 Jackson Brown               | 1000          | 400           | 5         | 5         |
| 7 JACO, Rick S, S             | 400           | 0             | 6         | 5         |
| 8 Juchaczewski                | 300           | 300           | 6         | 6         |
| 9 Josh-Duc-Loren              | 0             | 0             | 6         | 6         |
| 10 K                          | 400           | 400           | 6         | 6         |
| 11 The International V        | 100           | 100           | 6         | 7         |



## Wal-Mart Case

- The world's most efficient supply chain
- Partnerships upstream
- Innovation and data integration aligns and informs the supply chain
- Data analytics – RetailLink
- Network of 8500 stores and 150 DCs
- But...threatening competitors, flagging same-store sales
- Can Wal-Mart's efficient supply chain be used to compete:
  - As an e-commerce provider?
  - In small-store format?
  - Internationally?



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## Recruiting Opportunities: MIT SCM Program

**Pioneering Program**  
Founded in 1998



**Short & Focused**  
10-month program



**Focused Cohort**  
35-40 students per year  
3-8 years of experience



**Industry Engagement**  
Industry partners involved  
in thesis projects



**Global Perspective**  
Integrated with MIT Global  
SCALE Network in  
Colombia, Spain, and  
Malaysia



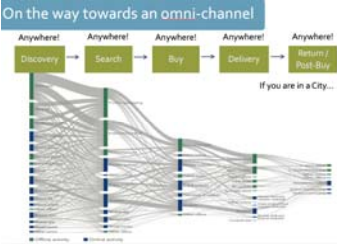
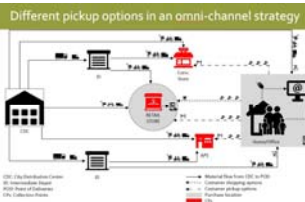
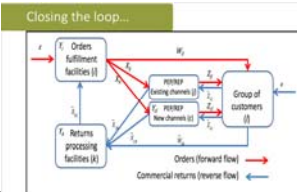
**Embed Problem Solving  
& Leadership Skills**  
Combine theory & practice  
Negotiate, persuade,  
communicate






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## Omni-Channel Distribution

- Succeeding amidst the chaos!
- Main challenges
  - Where to prepare the orders?
  - Where should the order meet the customer?
  - How does the order meet the customer?
- Integrating capabilities
  - End-to-end SC solutions
  - Inventory visibility
- Commercial returns
  - Return rates can be 35% to 40%
  - Returns as opportunities for new sales


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## Last Mile Logistics



- Urban last-mile operations
  - immediately affect the hotspots of future economic growth and population.
- Every city is different
  - and requires tailor-made approaches to last-mile delivery.
- Extreme levels of density and heterogeneity
  - are two key challenges of last-mile operations in the emerging markets.
- Nanostores
  - dominate the retail sector in many emerging economies, making last-mile operations particularly fragmented and challenging.
- Delivery anywhere, anytime
  - ...other innovations in retail requires demand density to be feasible.
- Market pressures and technology innovations
  - force companies to re-think and re-design their last-mile operations.
- Data analytics and visualization
  - is the key to understanding city dynamics and operational performance and to improve last-mile design, planning, execution.



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## Apple Case



- Perhaps world's most responsive supply chain
  - Rapid ramp for blockbuster products
- Control throughout the supply chain
- High volume & control → low cost parts, exclusive supply
- Upstream partnerships and investments
- Creates and responds to Bullwhip
- But....stock price down 25%, no blockbusters on horizon.
  - Can they still produce blockbuster products without Jobs?
- Can Apple's responsive supply chain be used to compete:
  - On the basis of price?
  - In the services business?

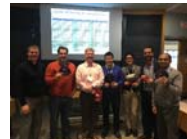


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## Global Supply Chain Simulation

- Design, forecasting, procurement and production planning to make money and keep the board happy
- Accurate forecasts
  - Gather more data, especially individual forecasts
  - Capture the standard deviation of the individual forecasts
  - A small amount of pre-launch information or actual demand can really improve forecasts
- Responsive supply
  - Structurally aim to shorten lead times and increase reactive capacity
  - Consider which products to produce with speculative/reactive capacity
- Appropriate inventory\*
  - There are incentives to produce more or less than the forecast
  - Critical Ratio based on the cost of being under/over (e.g. stockout/markdown cost) can be used to set appropriate inventory/service levels



\* These relate to newsvendor problem. Contact Jarrod for more details and application...



## Sustainable Supply Chains

- Revisit decision-making models (e.g. facility location problems) that were designed under assumptions more suitable to the US and Europe environments.
- Specific characteristics of retail distribution in large urban areas may lead to structurally different logistics models.
- Companies may use Sustainable Facility Location model to trade-off cost and CO2 when deciding facility location.
- The Multi-Objective Combinatorial Optimization Cross-Entropy Method (MOCO CEM) is an alternate algorithm to approximate the Pareto frontier for MOCO problems.



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## Future Freight Flows

- Four Future Freight Flow Scenarios
  - Naftastique!, Millions of Markets, Global Marketplace, One World Order
- Digital Freight Marketing
  - Uber for freight? → Fit: Local real-time, on-demand delivery
- TMS Trends
  - Shipper decision unchanged, Implementation speed is concern, most have Digital Freight Marketing
- Mobile Communications
  - Real-time tracking? E-Log books? Transparency to drivers?
- Autonomous Vehicles
  - From “If” to “What, When, Where, & How”



## The Future of Supply Chain Management: ICT Advances with SCM Applications

- Digital control
- Robotics/3D
- Autonomous vehicles
- Artificial intelligence
- IoT
- Sensing
- Big data
- Cloud Computing
- Blockchain



Today you leave with.....

- A tool set of frameworks and methods for thinking differently about designing and running your supply chain/supply network,
- Many illustrations of these methods with examples of the great potential
- Some insights into the future challenges for firms
- A new network of contacts

How will you apply these learnings?



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Thank you.....

- For investing your time with us
- For engaging so actively
- For sharing your feedback via Survey Monkey
  - Your input helps us revise to improve
  - Takes ~7 minutes
  - <https://www.surveymonkey.com/r/HN9XCLL>
- For telling others about your great experience
- For sending colleagues to future exec ed programs
- For considering our Supply Chain Exchange



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