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**Fool-proofing Supply Chain
Analytics**

Track 4 Session 1



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**“Fool-Proofing Supply Chain
Analytics”
or
Use “Frameworks”
To Make Supply Chain Analytics Work
For Your ENTIRE Planning Horizon**

Tan Miller

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Abstract

The whole Big Data thing can give you shingles if you are not careful. Analytics is simply the toolset to process (big) accumulations of operational data to support effective decision making. According to our speaker, the trick to organizing your Analytics plan is to first segment your planning horizon (elements of your business) into relevant time frames: operational (short-term), tactical (mid-term) and strategic (long-term). Then ensure that the tools you engage will uniquely support each time frame, they are adaptable in your business, and the needed data exists.

A decorative background consisting of a network of light blue lines connecting various nodes, forming a complex web-like structure that spans the top and bottom of the slide.


Agenda

- 1. Introduction**
- 2. Background**
- 3. Hierarchical Supply Chain Planning Frameworks**
- 4. Examples of Individual Supply Chain Frameworks**
- 5. Overview of Decision Support Systems (DSS) Tools and Data Bases**
- 6. Case Study For Warehouse DSS**
- 7. Key Takeaways, Conference Cloud, Questions**

1. Introduction

A Recent History of SCM Network Planning

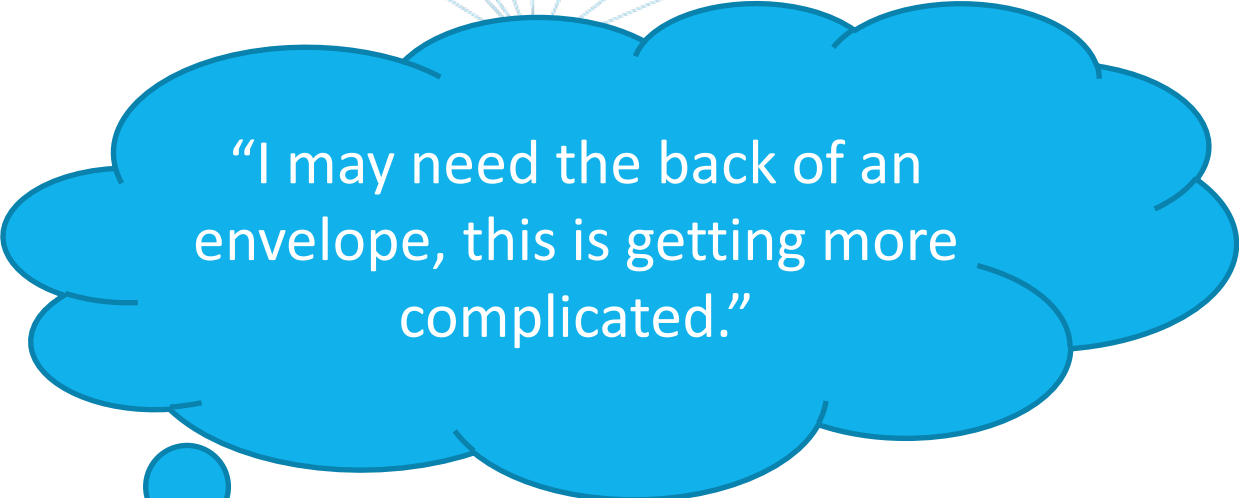
**1980's
Logistics/SCM
Leader**

A man in a dark suit, light blue shirt, and dark tie is shown from the waist up, gesturing with his right hand. A large blue thought bubble is positioned above his head, connected by three smaller blue circles. The thought bubble contains the text "I can figure this out in my head over lunch."

**"I can figure this out in my
head over lunch."**



**1990's
Logistics/SCM
Leader**




“I may need the back of an envelope, this is getting more complicated.”





**2000's
Logistics/SCM
Leader**

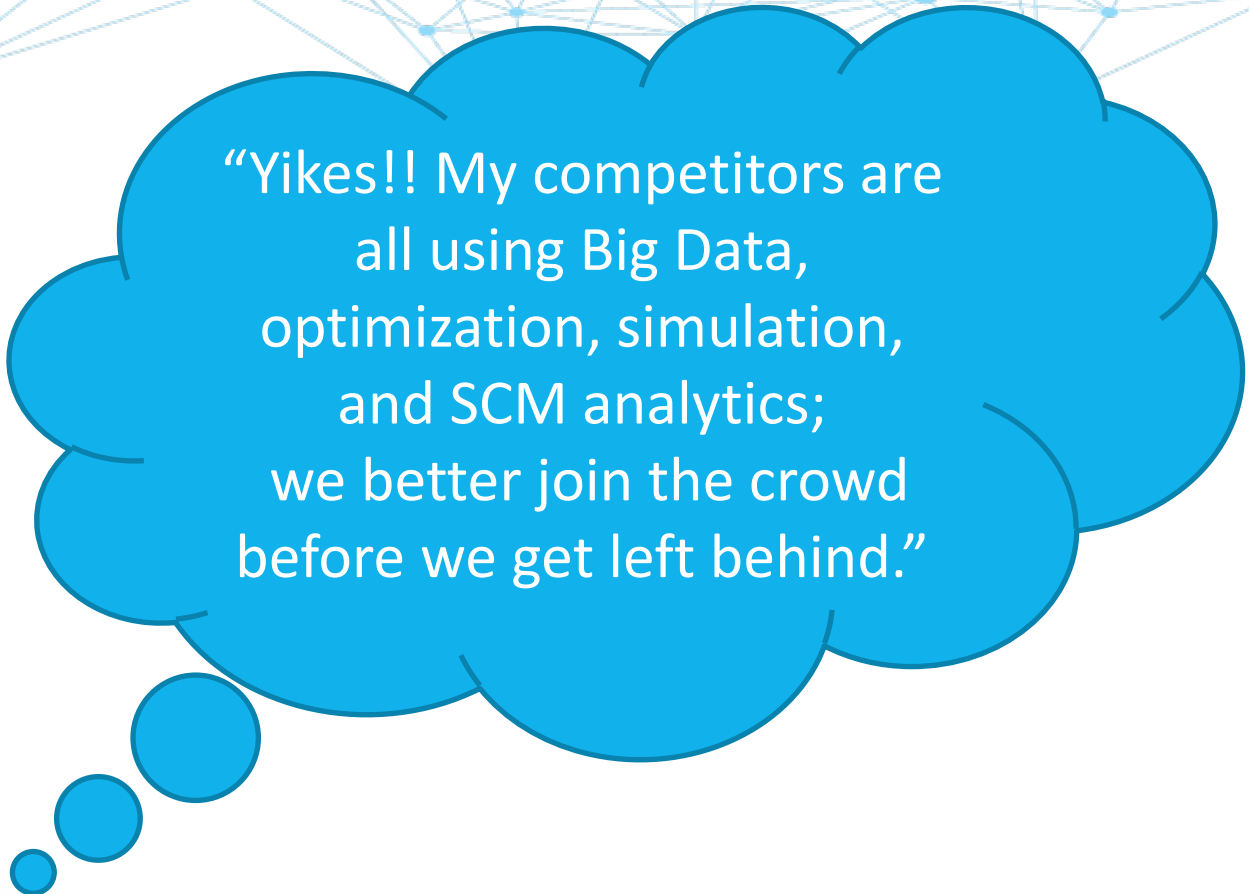


“I think we better start using
Excel, this is getting really
complex.””





**2010's
Logistics/SCM
Leader**



“Yikes!! My competitors are all using Big Data, optimization, simulation, and SCM analytics; we better join the crowd before we get left behind.”



2. Background

- “BIG DATA” has become the “RAGE”
- More specifically → Business Analytics and Supply Chain Analytics
 - Have become a Standard Decision Support Capability for firms
 - Provide extremely broad, diverse set of capabilities

Historical Perspective

Airline Industry



Oil Industry



Defense Industries



60 + Years
Of
Intensive
Analytics

Last 15
Years

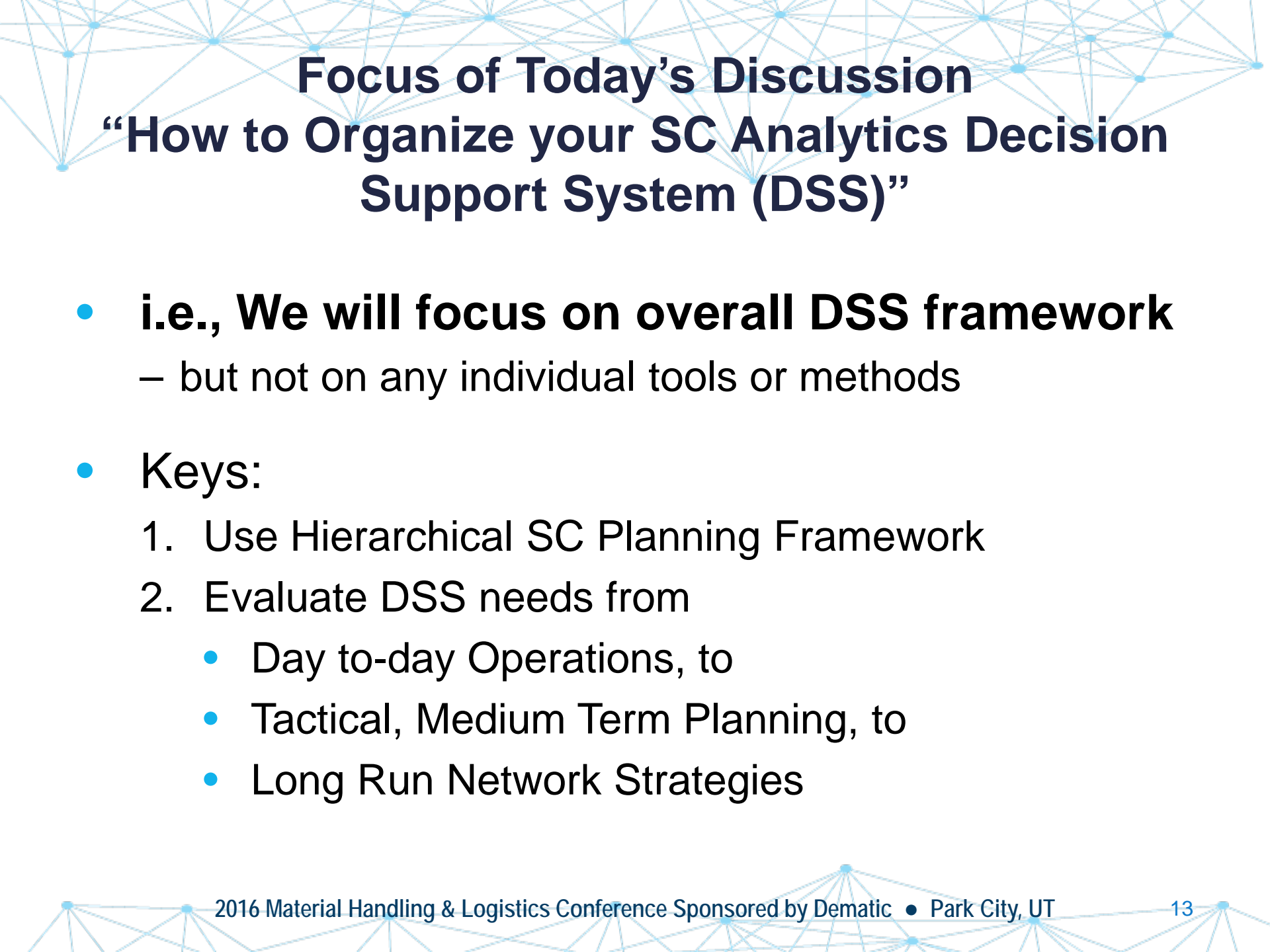
- Rapid, commercial user friendly technological advances
- Global awareness of power of data

➔ **All Industries
Now USE**

A Perspective For Our Discussion Today

- **Supply Chain Analytics includes the use of:**
 - Large scale databases
 - Data mining and analysis
 - Mathematical optimization tools
 - Mathematical simulation tools
 - Statistics and forecasting models

“ To facilitate efficient and effective decision-making”

A decorative background consisting of a network of light blue nodes connected by thin lines, forming a complex web-like structure.

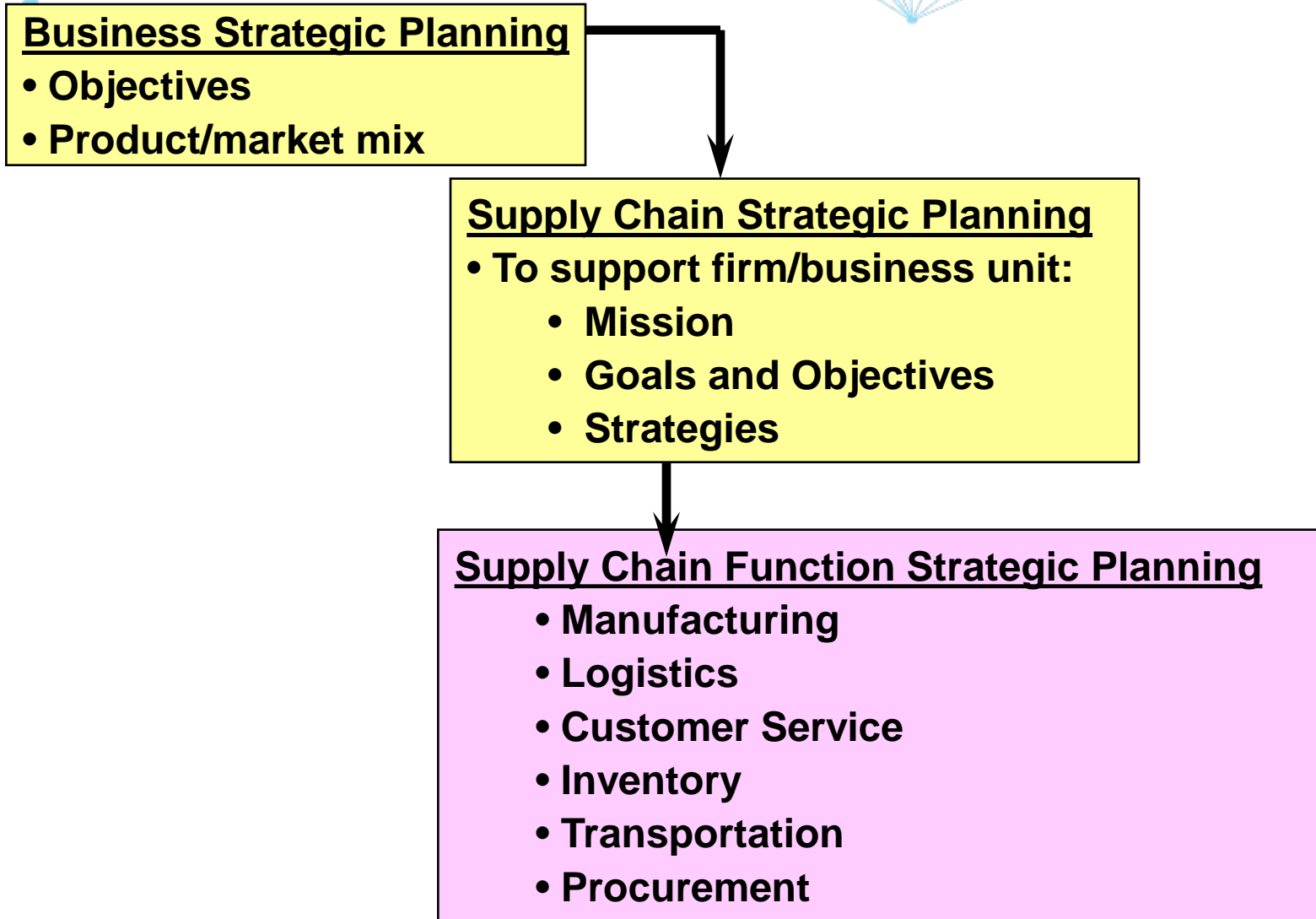
Focus of Today's Discussion

“How to Organize your SC Analytics Decision Support System (DSS)”

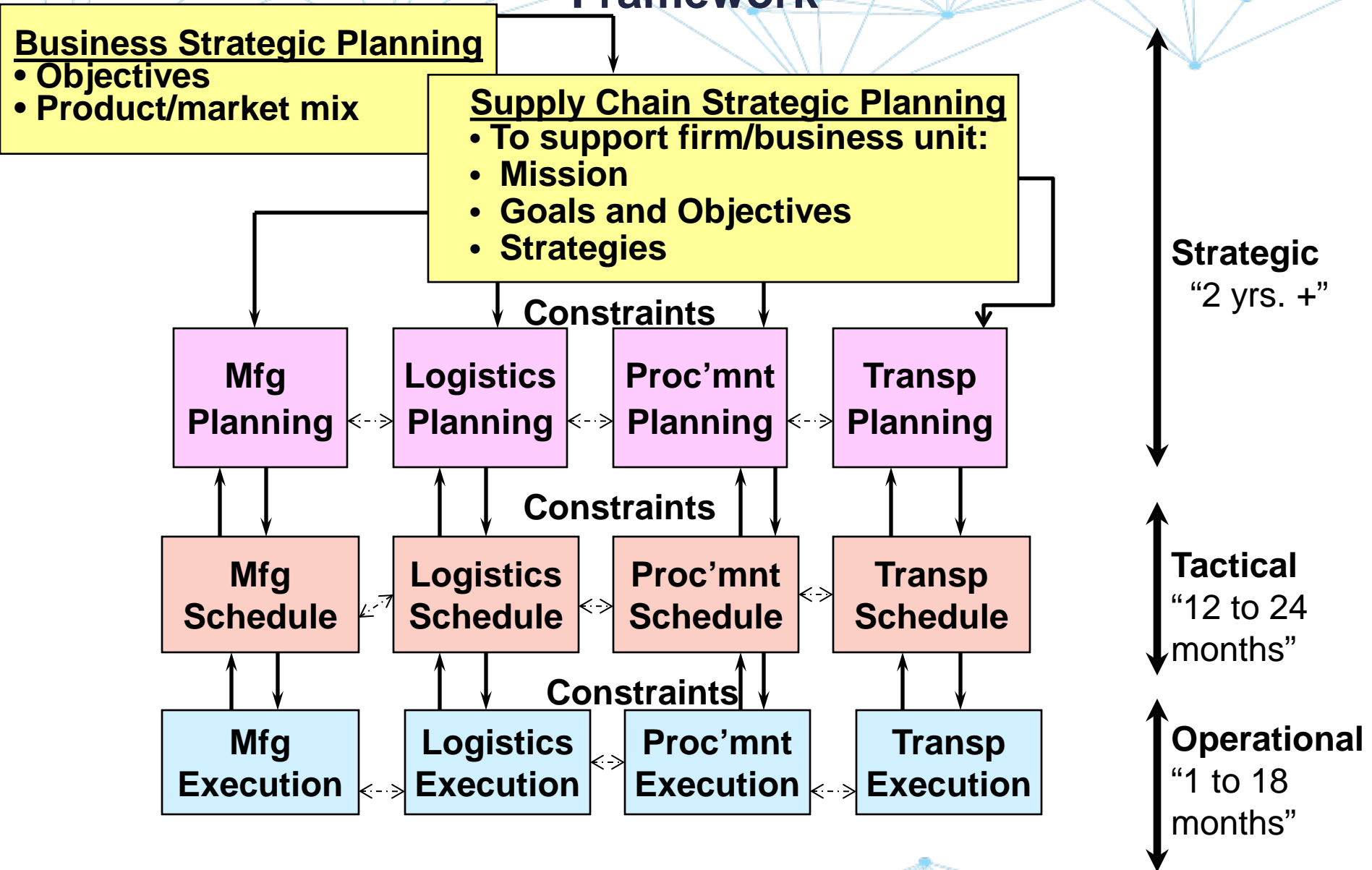
- **i.e., We will focus on overall DSS framework**
 - but not on any individual tools or methods
- **Keys:**
 1. Use Hierarchical SC Planning Framework
 2. Evaluate DSS needs from
 - Day to-day Operations, to
 - Tactical, Medium Term Planning, to
 - Long Run Network Strategies

3. Hierarchical Supply Chain Planning Framework

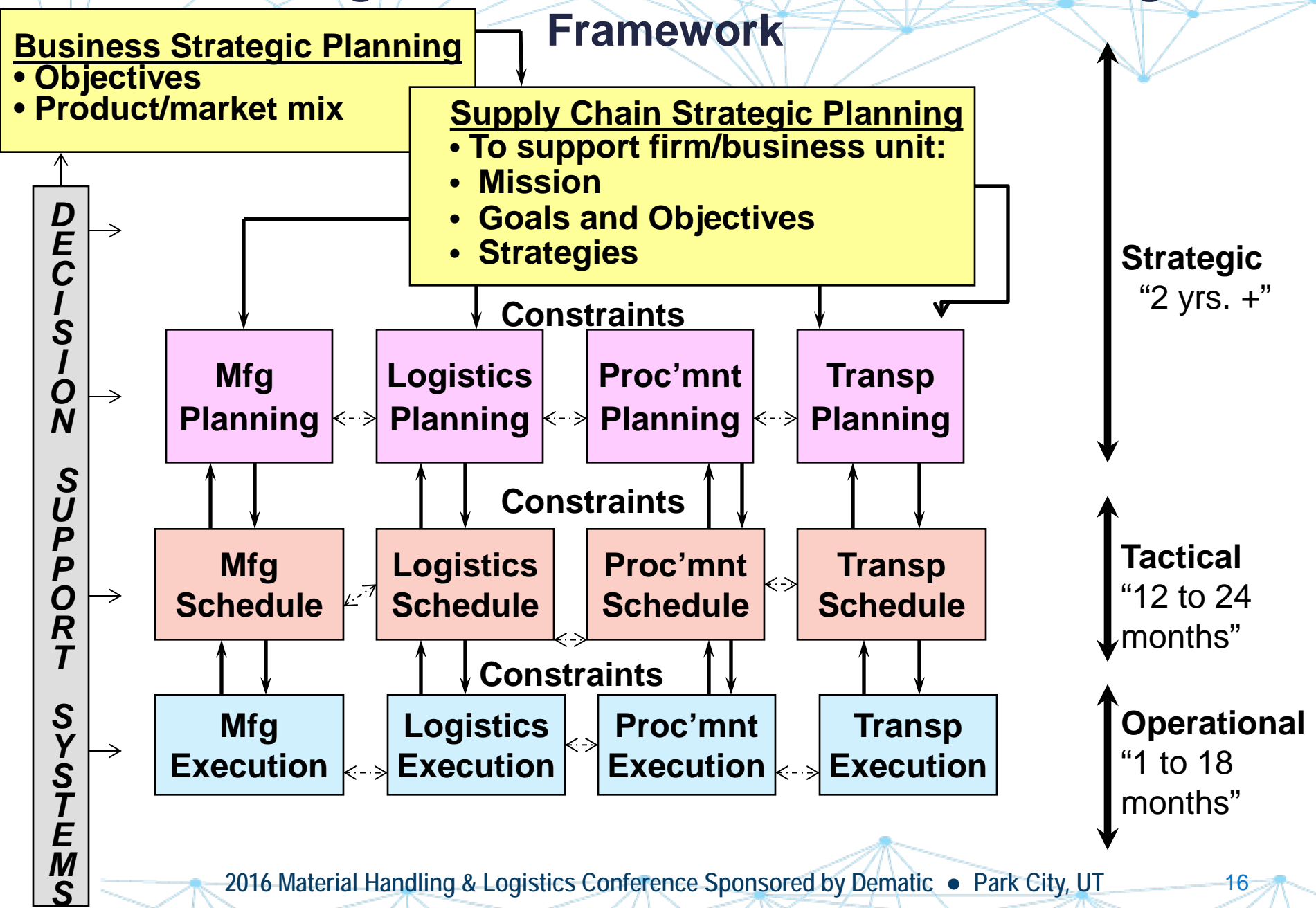
Integrated Business And Supply Chain Strategic Planning Framework



A Unified Business And Supply Chain Planning Framework



DSS Integration Into Business and SC Planning Framework



4. Examples of Individual Supply Chain Frameworks

Example 1: Hierarchical Warehouse Planning Framework

Network Design and Warehouse Location

- Overall Network Capacity
- Number of Echelons

Facility Design and Technology Selection

- Scale Trade-Offs

Strategic

Constraints

Aggregate Planning

- Capacity Balancing Across Network
- Capacity Planning Within DC
- Sku/Item Location and Allocation

Tactical

Constraints

Operating Procedures and Policies

Operational

Daily and Short Run Scheduling

Example 2: Hierarchical Manufacturing and Distribution Planning Framework

Supply Chain Strategic Planning

- To support firm/business unit:
 - Mission
 - Goals and Objectives
 - Strategies

Mfg & Distr & Planning

- Capacities
- Facilities
- Locations
- Resources

Strategic
(2 yrs. +)

Constraints

Agg Prod & Distr Planning

- Allocates capacity and resources to product lines
- Assigns sales regions to DC's & plants

Tactical
(12 to 24 months)

Constraints

Operations Scheduling

- Master production sched
- Short run DC workload sched
- Transport scheduling

Operational
(1 to 18 months)

Constraints

**Short-term scheduling
(shop floor)**

5. Overview of DSS Tools and Data Bases

Illustrative Supply Chain Decision Analytics Tools

Supply Chain DSS Tools

- Network optimization models
- Network simulation models
- Forecasting models (summary and detailed)
- Inventory management (DRP) models
- Plant scheduling models (Product Family-higher level)
- Plant scheduling models (MPS – item level)
- Warehouse (DC) capacity models (high level)
- Warehouse (DC) short-run scheduling models
- Transportation scheduling models

Illustrative Corporate/SC Data Bases

Products

Sales

Transportation

Inventory

Master Data

Customers

Suppliers

**Cost
Accounting**

- **Is there good accessibility to data? Corporate servers, cloud, mobile??**

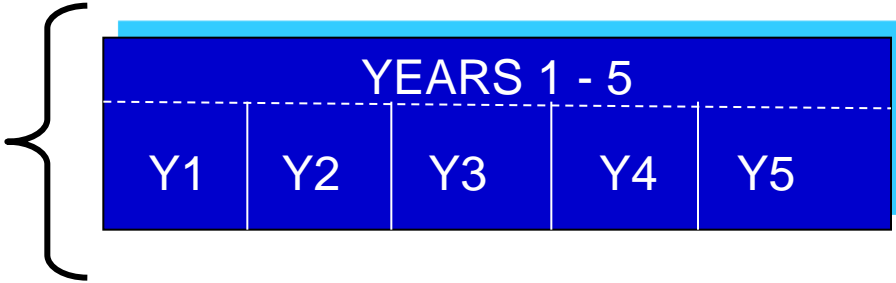
Planning Horizons, Product Aggregations And Models For Integrated Hierarchical Planning

Planning Horizons

Product Aggregations

Models

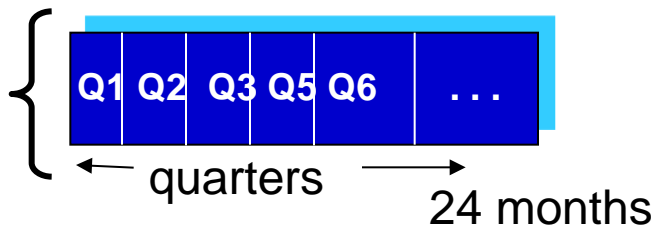
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- Divisions
- Product Lines
- Product Families

- Optimization
- Simulation

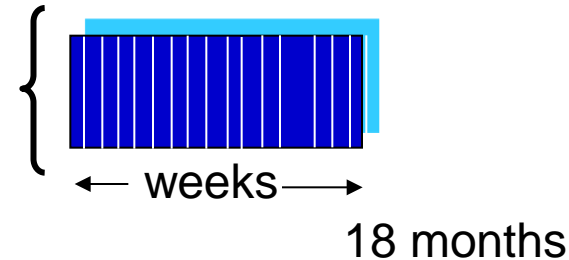
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- Product Families

- Optimization
- Simulation

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- Product Families
- Items
- SKU's

- DRP
- MPS
- MRP
- Optimization
- Simulation

Internal Review Questions To Evaluate SC Analytics and DSS Tools

1. Do we have databases & tools to support each planning level?
2. Are there any major, standard business decisions that lack appropriate data or DSS tools?
3. Are the DSS tools that we have incorporated into our standard business processes?
4. Are the databases and tools that support each planning level aligned?
 - Or are there separate databases at each level that contain unsynchronized, conflicting data?

6. Case Study For Warehouse DSS

Hierarchical Warehouse Planning

Network Design and Warehouse Location

- Overall Network Capacity
- Number of Echelons

Facility Design and Technology Selection

- Scale Trade-Offs

Strategic

Constraints

Aggregate Planning

- Capacity Balancing Across Network
- Capacity Planning Within DC
- SKU/Item Location and Allocation

Tactical

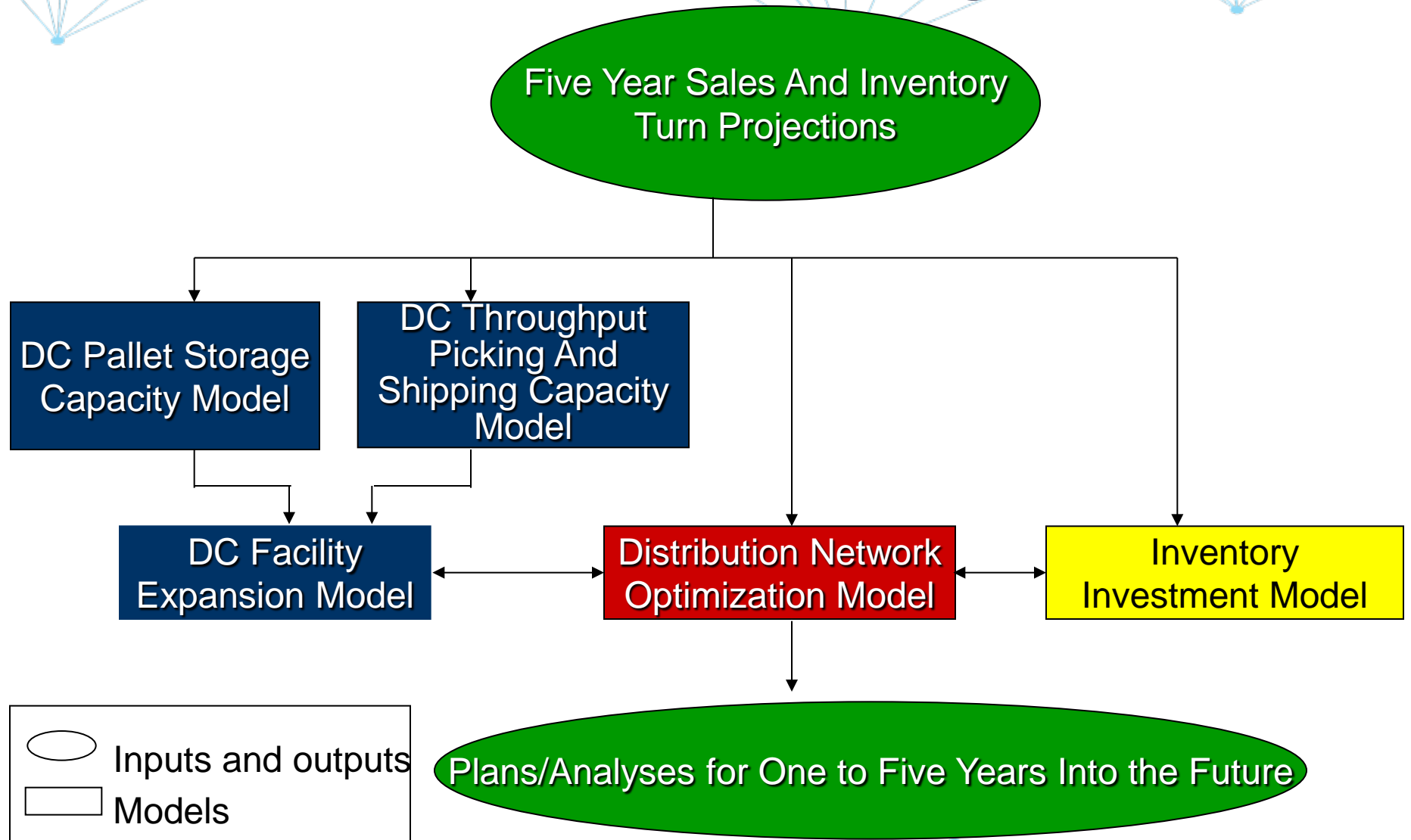
Constraints

Operating Procedures and Policies

Operational

Daily and Short Run Scheduling

DSS Components For Strategic and Tactical Warehouse Planning



Illustrative Elements of Operational DSS

DSS Tools Supported By Real-Time Databases

- **A customer logistics scorecard**
- **An order cycle monitoring tool**
- **An on-time delivery monitoring tool**
- **An inventory level and turns monitoring tool**
- **A detention and delivery unload monitoring tool**
- **Daily alerts to transportation load planners on schedule improvement opportunities**
- **Daily alerts to planners on on-time delivery performance results**
- **Daily alerts to customers detailing any backorders that occurred**

Illustrative Components of Operational DSS (con't)

Illustrative Customer Logistics Scorecard

Customer	On-Time Delivery		Order Cycle Time	
	Actual	Goal	Actual	Goal
Customer 1	98%	97%	8.9	8.0
Customer 2	97%	97%	6.1	7.0
Customer 3	94%	97%	6.5	7.0
Customer 4	98%	97%	46.0	7.0

Customer	Line Item Fill Rate		Freight Cost Per Pound	
	Actual	Goal	Actual	Goal
Customer 1	97.9%	98%	\$0.024	\$0.030
Customer 2	97.1%	96%	\$0.027	\$0.035
Customer 3	96.4%	97%	\$0.036	\$0.049
Customer 4	97.5%	98%	\$0.031	\$0.037

Illustrative Components of Operational DSS (con't)

Illustrative Customer Logistics Scorecard

Customer	Percent of Cases Picked at DCs in Full Pallet and Full Layer Quantities		Inventory Turns	
	Actual	Goal	Actual	Goal
Customer 1	94.1%	90%	7	7
Customer 2	80.7%	85%	3	4
Customer 3	75.0%	70%	6	5
Customer 4	96.8%	99%	8	7

Customer	Carrier Handling Charges	Shortage Claims	Carrier Charges Total	Total Accesorials
Customer 1	\$10,000	\$5,000	\$9,000	\$24,000
Customer 2	\$2,000	\$0	\$2,000	\$4,000
Customer 3	\$10,000	\$10,000	\$4,000	\$24,000
Customer 4	\$7,000	\$15,000	\$7,000	\$29,000

Daily Warehouse Operations DSS

Daily DSS

Inputs

All Orders

Forecasts

Shipment
History

Current
Inventory

Trailers In
Yard

Analytic
Models

Decision Support Modeling System
Runs 5:30am – 6:30am each day

Illustrative
Outputs

Decision Support Reports For DCs

- Hot Trailers
- Outside DC To Inside DC Inventory Deployment
- Excess Inventory Inside DC (to move outside)
- Communications to Copacker Promotions Planners

7. Key Takeaways

- Today touched on just a few of the dimensions and questions to consider re: Big Data/SC Analytics DSS
- Requirements, needs, opportunities vary by firm and industry
- **What is a Constant: Firms must consider and support their entire planning and scheduling horizon with SC Analytics and DSS**
- **SC Frameworks provide key perspective to organize, plan and evaluate your SC analytics and DSS tools (i.e., “Big Data”)**

Conference Cloud

Additional Resources

- **“Make Big Data Work for Your Planning Horizon”, Materials Handling and Logistics, November/December, 2015, by Tan Miller**
- **“Framework Makes A Solid Supply Chain”, Materials Handling and Logistics, July, 2013, by Matthew Liberatore and Tan Miller**
- **Supply Chain Planning: Practical Frameworks For Superior Performance, Business Expert Press, New York, 2012, by Matthew Liberatore and Tan Miller**
- **“A Practical Framework For Strategic Planning”, Supply Chain Management Review, March/April, 2011, by Matthew Liberatore and Tan Miller**



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Questions?