A Holistic Supply Chain Management Solution

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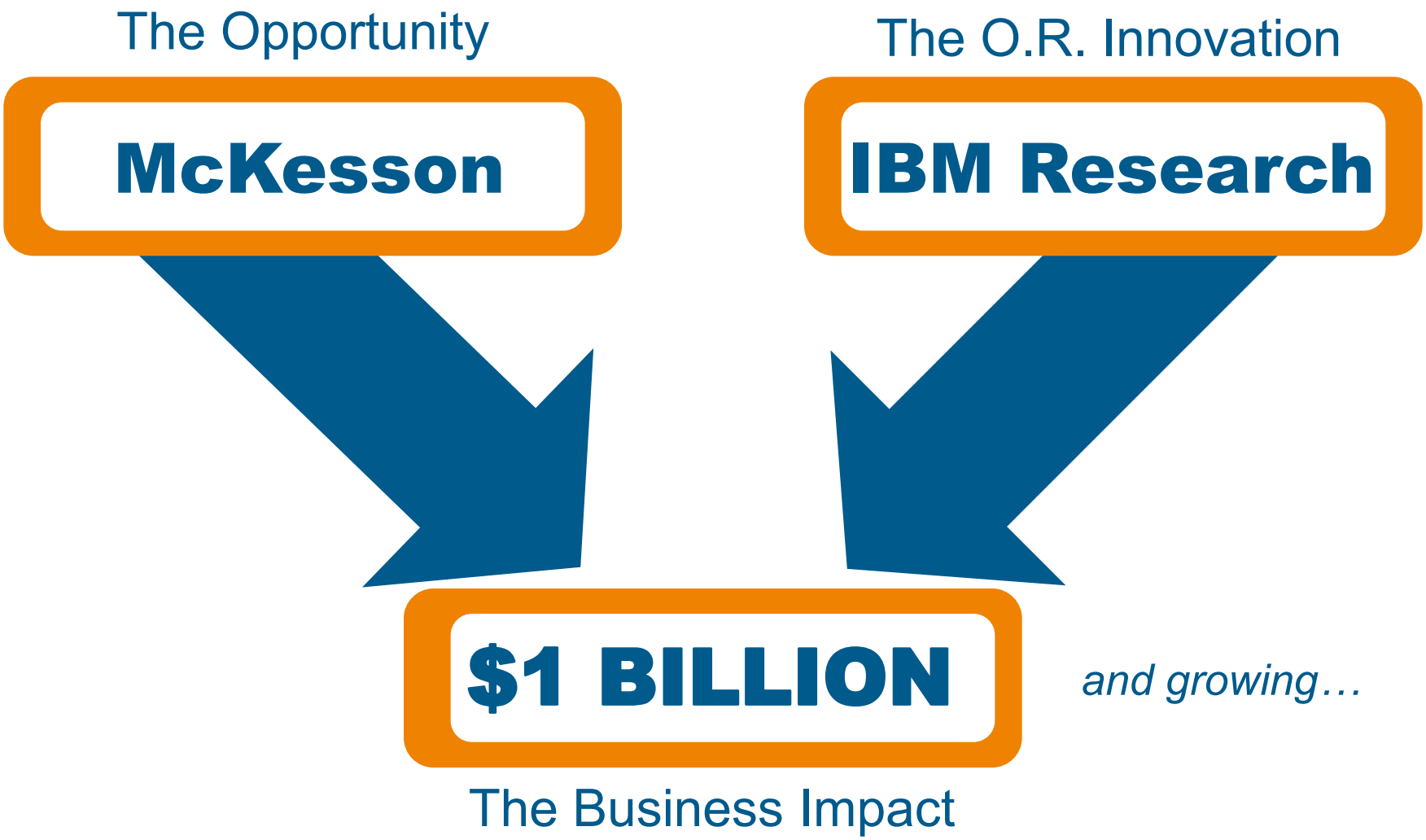
BUSINESS CARE CONNECTIVITY

OR helped us save over $1 Billion



McKesson: Oldest and Largest Healthcare Service Provider

IBM

McKesson At-A-Glance

- America's oldest and largest healthcare services company
- Celebrating 180 years
- Ranked 14th on *Fortune's* list with $122.7 billion in revenues
- Headquartered in San Francisco
- More than 37,000 employees
- Two segments: Distribution Solutions and Technology Solutions

Distribution Solutions

- #1 pharmaceutical distributor in U.S. and Canada
- #1 generics distributor
- #2 in specialty distribution and services
- #1 in medical-surgical distribution to alternate care sites
- 2,900+ Health Mart® retail pharmacy franchisees
- Comprehensive retail information systems and automation offerings

A Look Inside McKesson Distribution

Distribution is McKesson's Core Business

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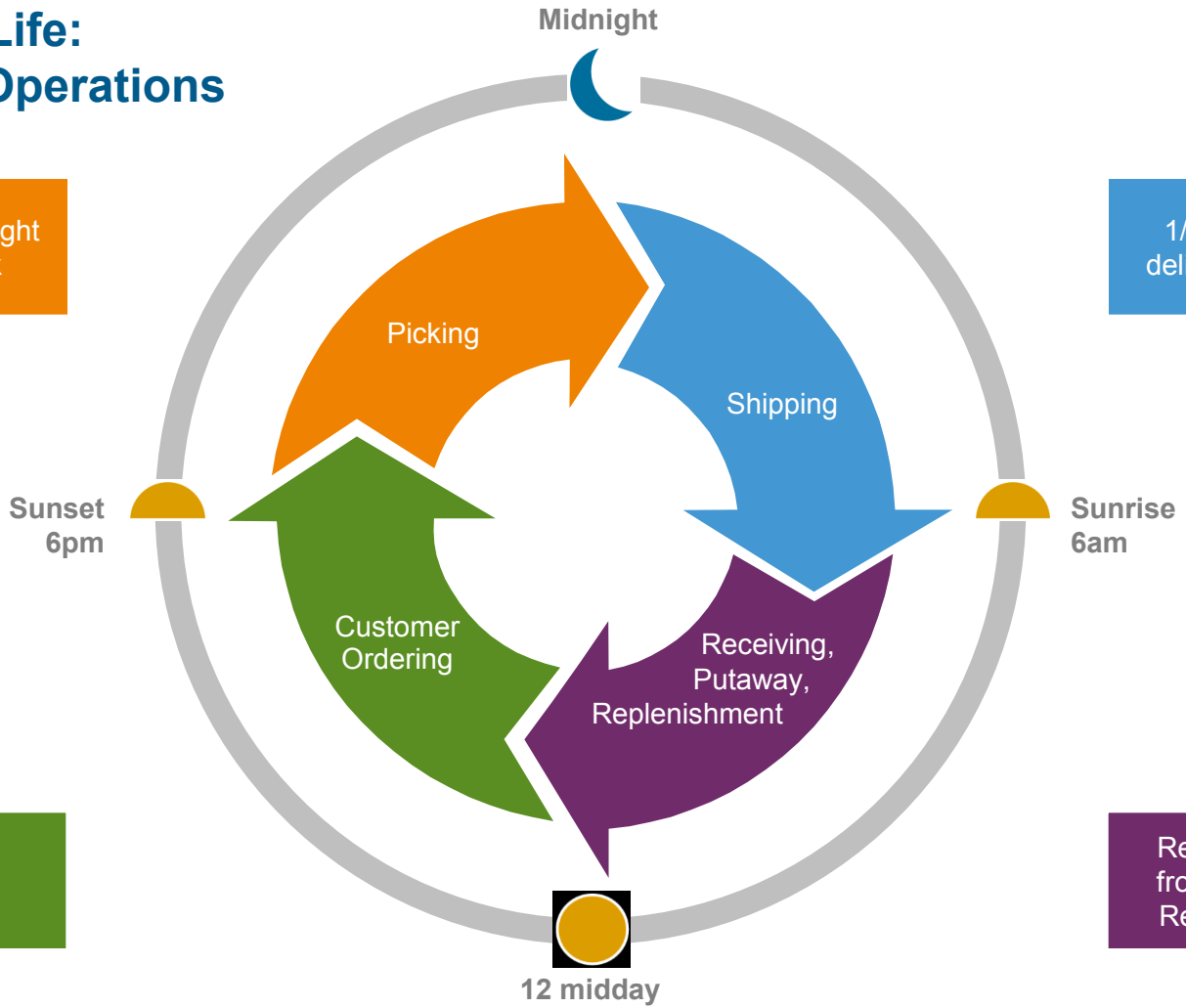
The right product to the right customer at the right time

A Day in the Life: Distribution Operations



1.2 million lines per night across the network

2,200 SKUs
80% of Volume

1/3 of all Rxs in U.S. delivered by McKesson

26,000
Deliveries per Day

$32B
In Web Orders

29,000 orders received per day

43,000
SKUs

Receive product daily from Manufacturers & Redistribution Center

McKesson's Supply Chain

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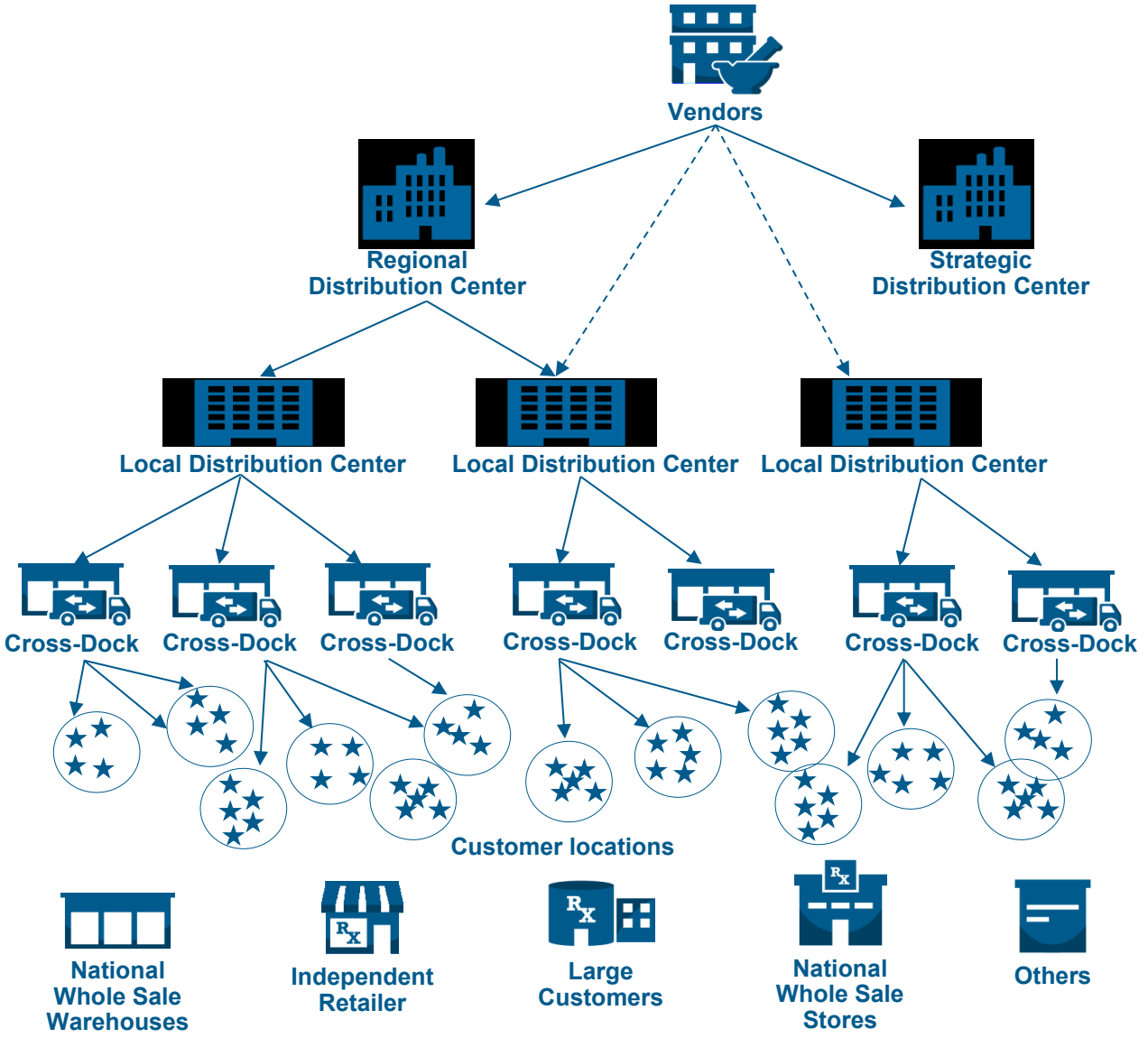
- 2,500 Vendors
- 43,000 Items
- 30 Distribution centers
- 250 Cross-docks
- 26,000 Customer locations
- $8 Billion inventory



McKesson and IBM Research: The ingredients of our innovation partnership

IBM Research had

- **The IBM First of A Kind (FOAK) program**
- **Detailed supply chain sustainability modeling**
- **Innovative supply chain models and research**

McKesson needed

- **A holistic, cross-functional supply chain model for analysis**
- **The ability to view results through a financial lens**
- **To explore ideas we could not explore without integrated modeling**
- **To identify opportunities for improved service and savings**
- **A repeatable process for analysis**

Opening Remarks

Mark Walchirk
President, U.S. Pharmaceutical
McKesson

The O.R. Innovation

A solution to optimize policies, connect all metrics and answer questions fast!

How do we impact each others' metrics?

Challenges

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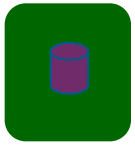
Develop end-to-end supply chain model

Integrate large & diverse data

Incorporate sustainability to the model

Optimize policies and calculate trade-offs



Maximize computational performance

Create a fast and interactive online solution

We developed and integrated many components to build the solution

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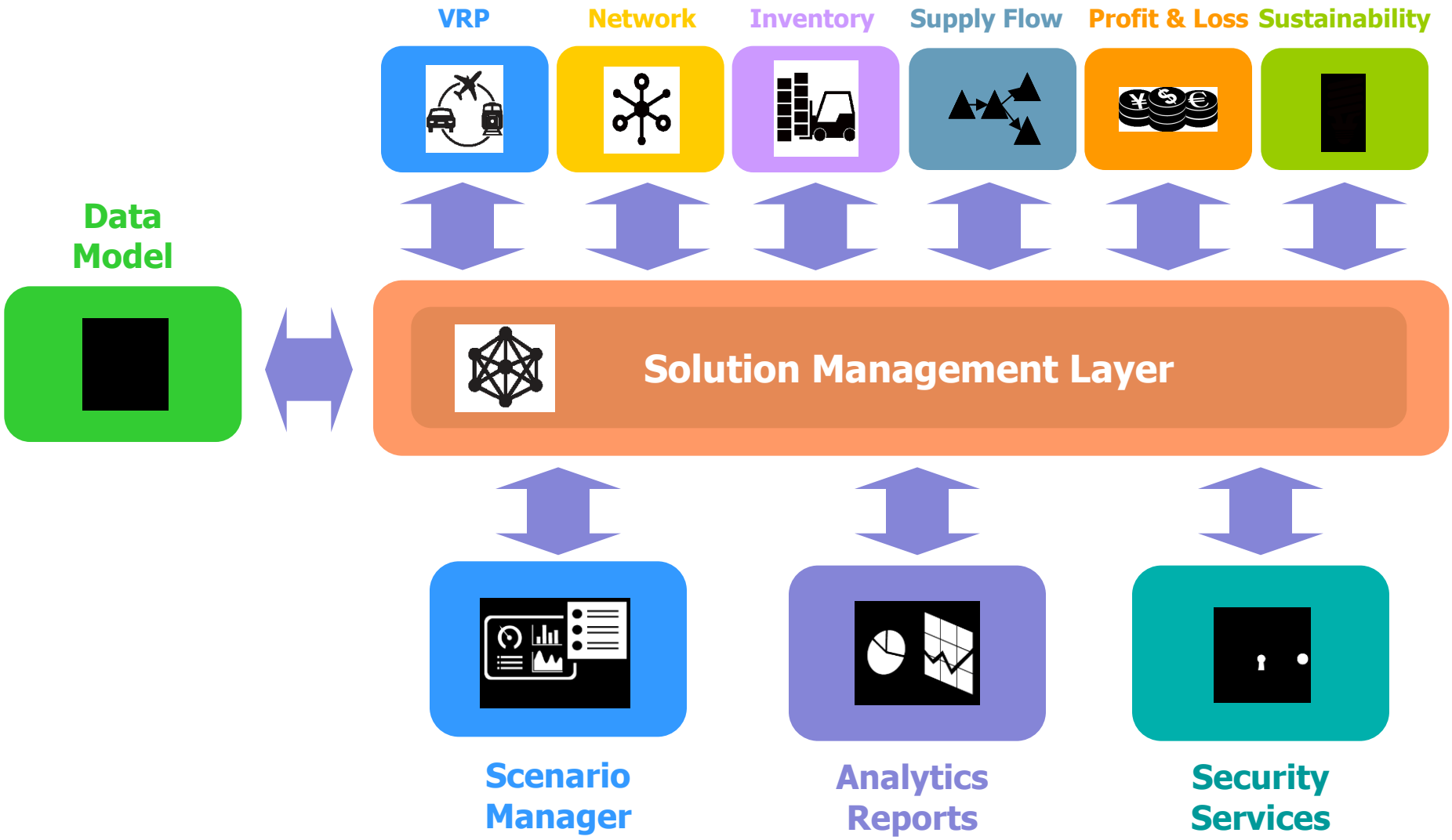
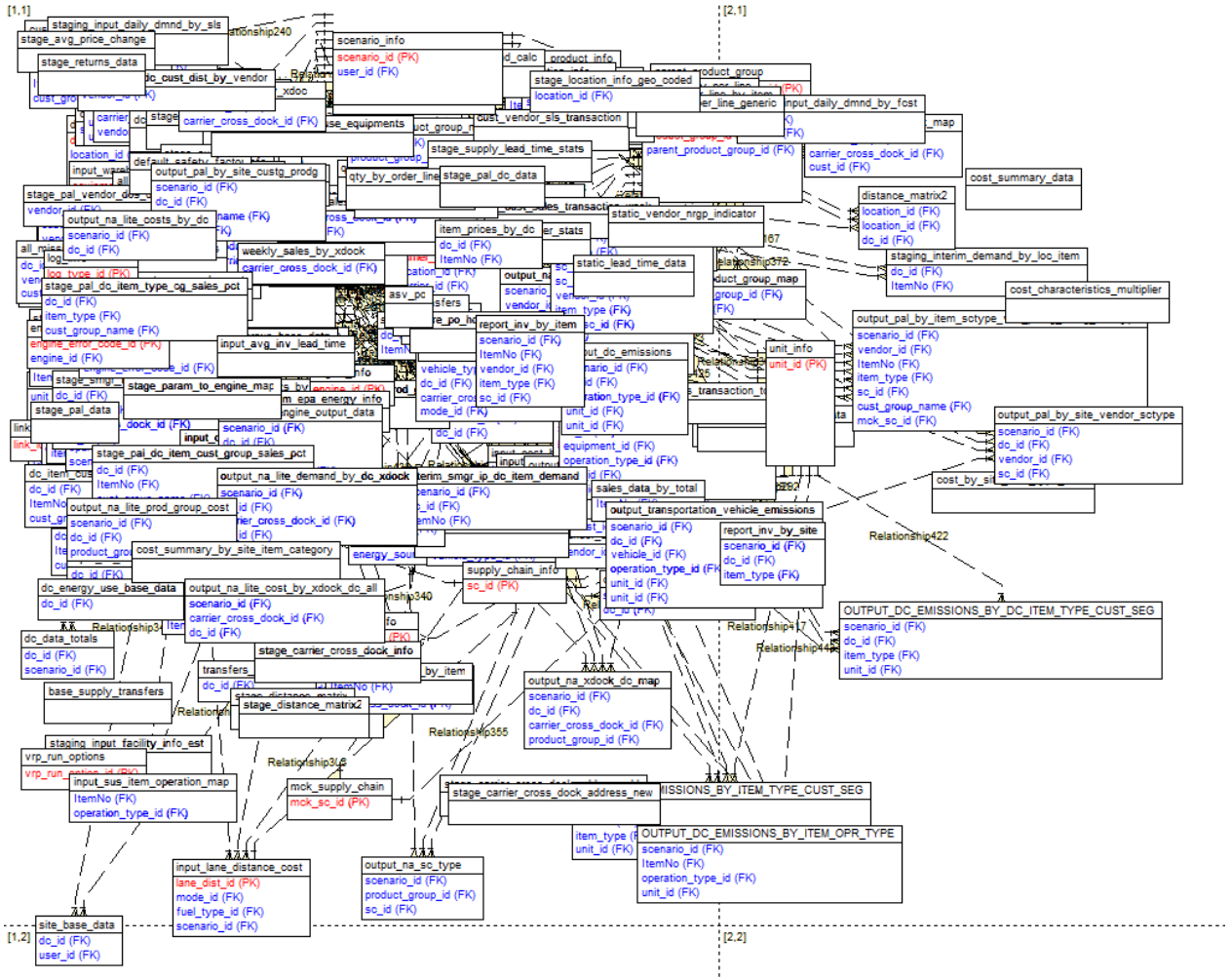
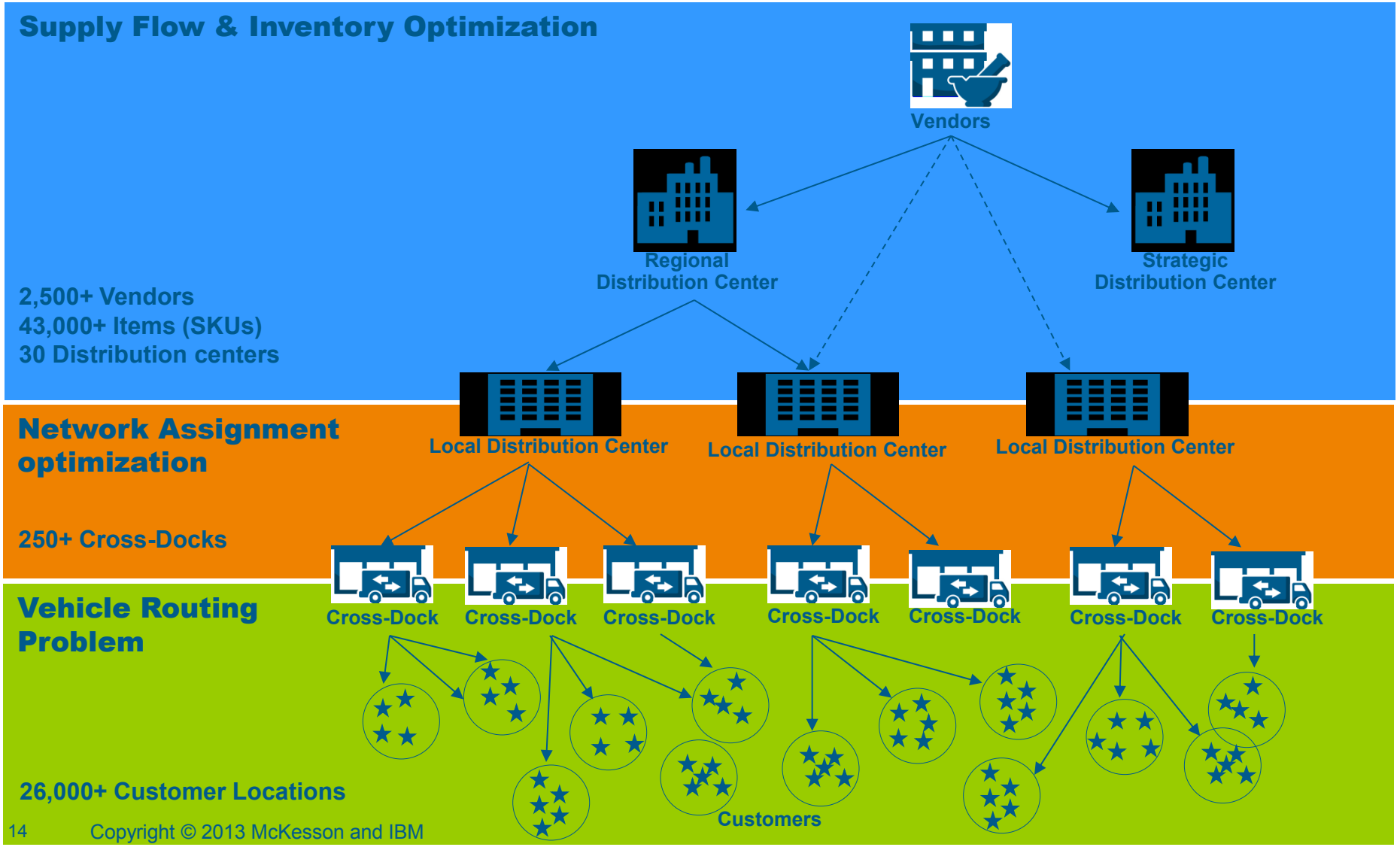


The data model had to cover everything

- **Hundreds of millions of records**
- **Transaction level details**
  - Supply transactions
  - Shipment transactions
  - Sales transactions
- **Many different elements**
  - Customers
  - Vendors
  - Products
  - Network
  - Sites
  - Inventory
  - Equipment
  - Energy consumption
- **etc.**



Integrated OR models for a problem too complex to solve as a single optimization



How are the models connected?

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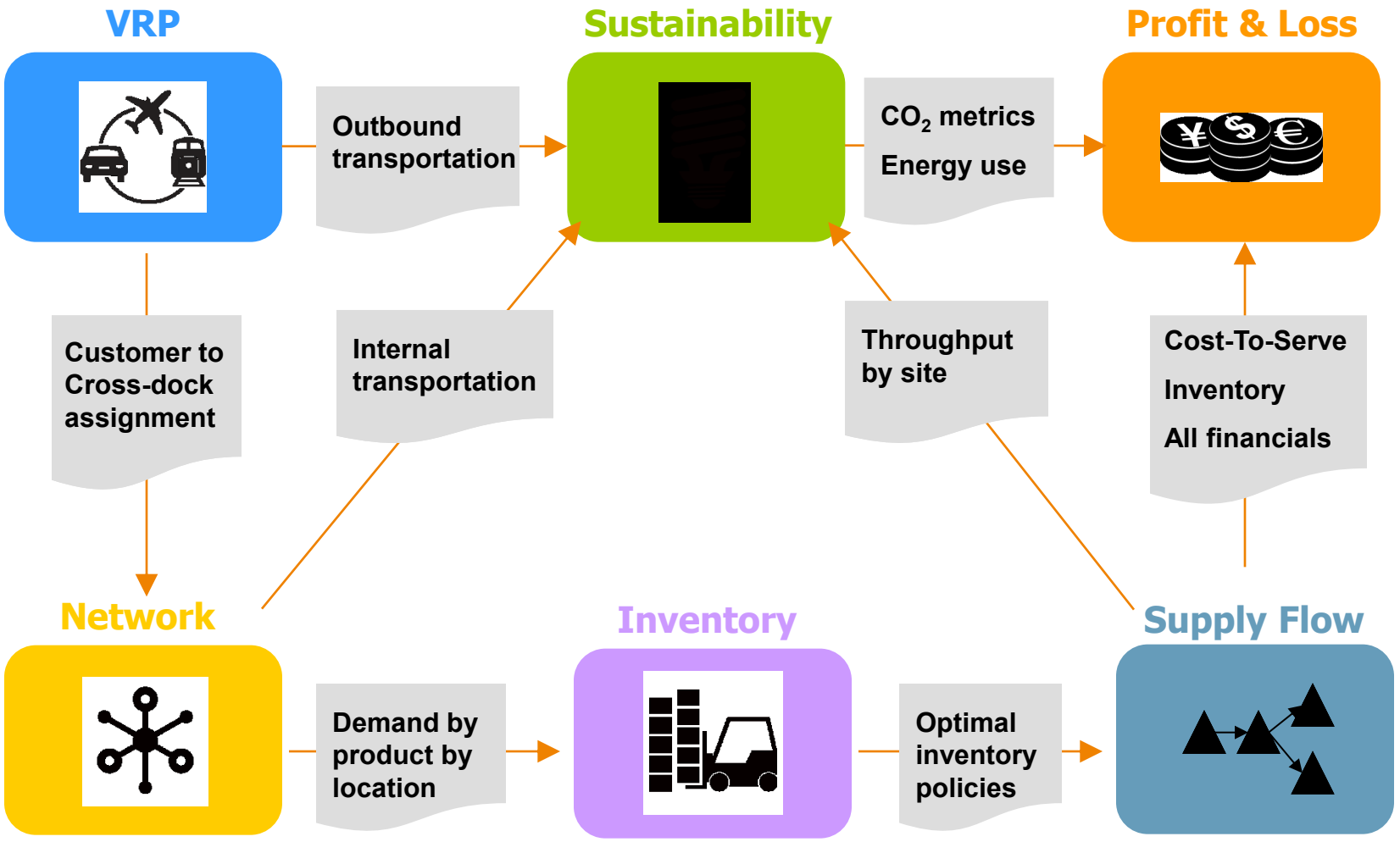

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Vehicle Routing Problem

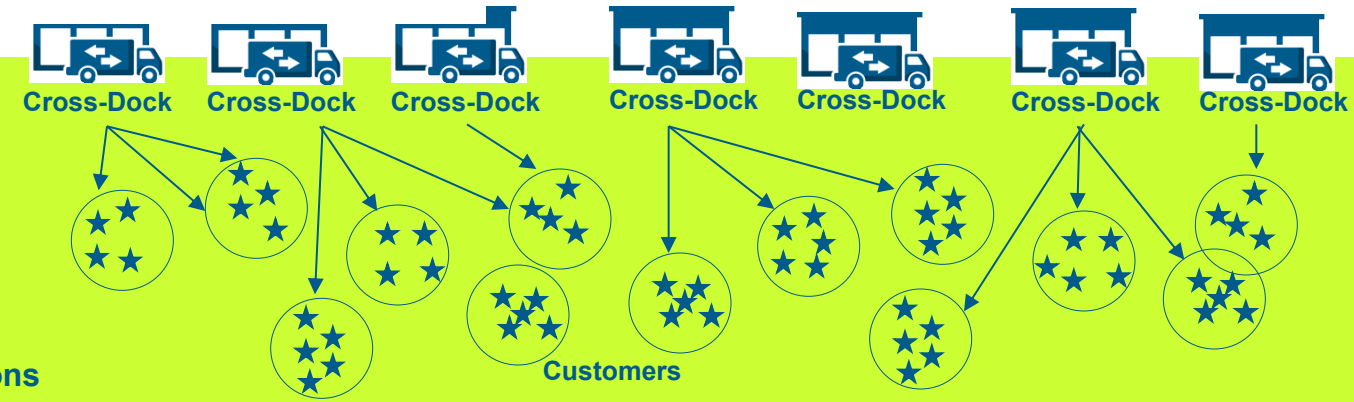
Challenges

- ✓ 26,000 customer locations
- ✓ Over half a billion distance calculations
- ✓ Delivery time windows
- ✓ Need to compute in a few minutes

Solution Approach

- ✓ Assign customers to cross-docks by business rules
- ✓ Optimize routes separately for each cross-dock
- ✓ Develop a regression model to estimate VRP costs

Vehicle Routing Problem



26,000+ Customer Locations

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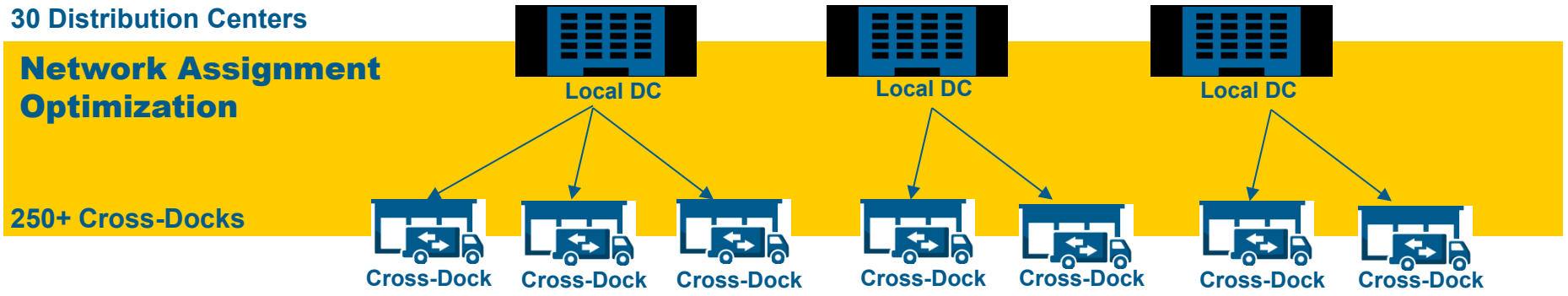
Network Assignment Optimization

Challenges

- ✓ Potentially infeasible scenarios
- ✓ 43,000 SKUs
- ✓ Need to compute in a few minutes

Solution Approach

- ✓ Greedy algorithm
- ✓ Use “soft” constraints
- ✓ Use the regression model from VRP to estimate transportation costs



Inventory & Supply Flow Optimization

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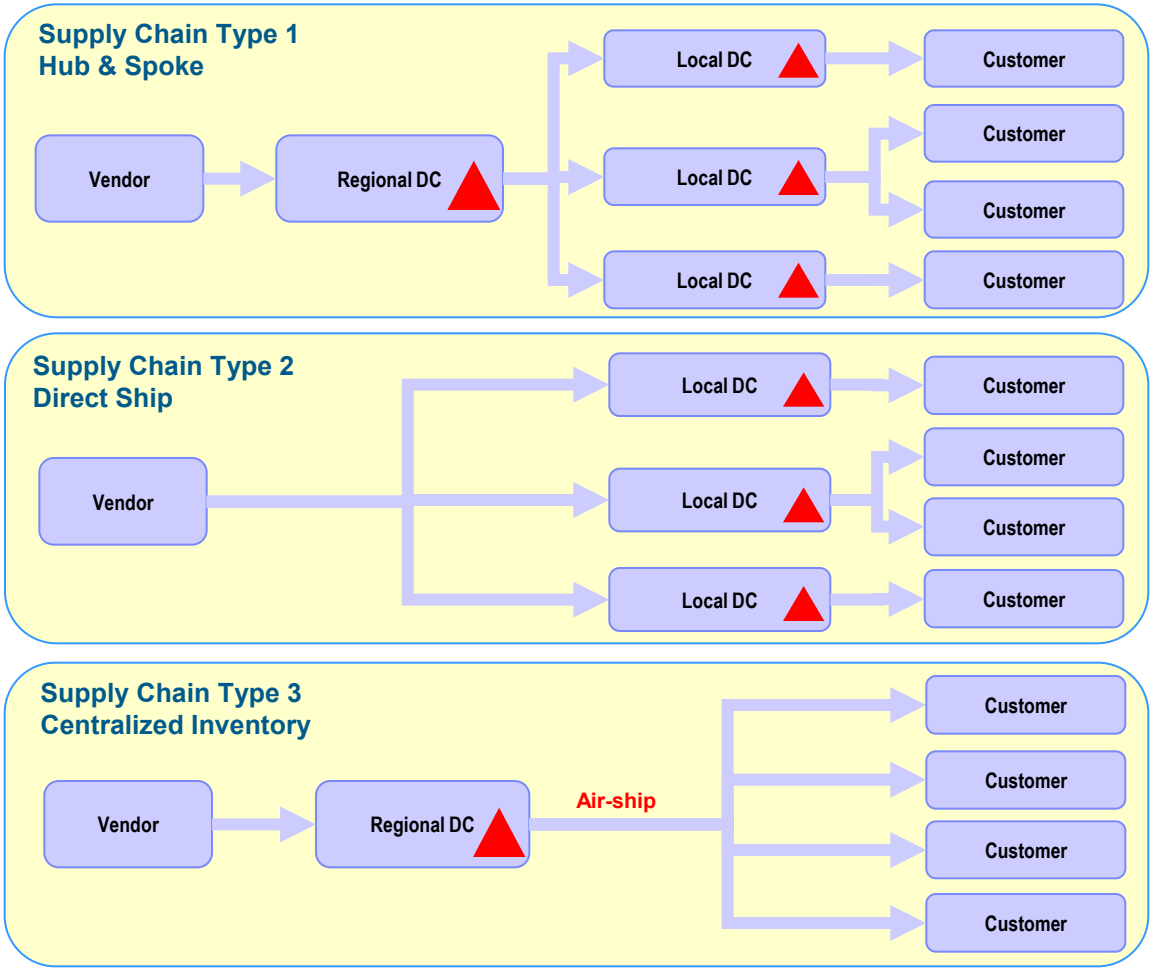
Challenges

- ✓ 43,000 SKUs
- ✓ 2-echelon
- ✓ Lost sales
- ✓ Service constraints
- ✓ Stochastic demand & lead times
- ✓ Need to solve in a few minutes

Solution Approach

- ✓ EOQ for lot-size
- ✓ Use regression to estimate re-order point at regional DC
- ✓ Approximate optimal re-order points at local DCs
- ✓ Independent items (SKUs)



Sustainability Model

Objectives

- ✓ Compute sustainability metrics
- ✓ Evaluate sustainability actions
- ✓ Quantify impacts of operational changes

Methodology

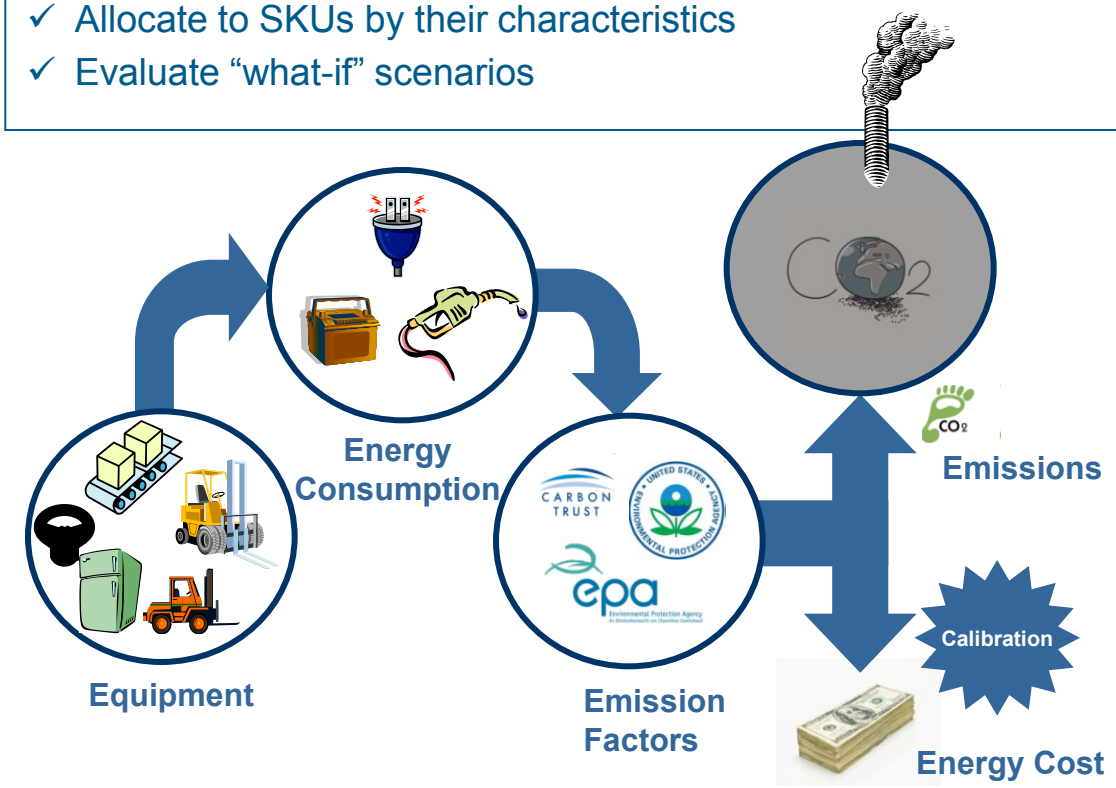
- ✓ Start at equipment level
- ✓ Aggregate to operations and sites
- ✓ Calibrate to match utility bills
- ✓ Allocate to SKUs by their characteristics
- ✓ Evaluate “what-if” scenarios

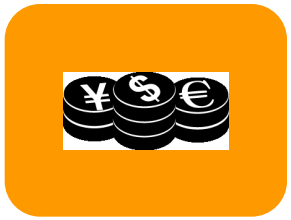
Inputs

- ✓ Equipment data
- ✓ Energy characteristics
- ✓ Throughput
- ✓ Emission factors, etc.

Outputs

- ✓ Energy Use/Cost/Efficiency
- ✓ CO2 Emissions/Cost/Efficiency
- ✓ By Site, By Operation, By SKU





Profit & Loss Model

Objectives

- ✓ Connect operational and financial metrics
- ✓ Compare scenarios

Challenges

- ✓ 43,000 P&Ls
- ✓ Need all metrics at SKU level
- ✓ Match the official P&L

Inputs

- ✓ Equipment data
- ✓ Outputs of OR models
- ✓ Transactions
- ✓ Sales & supply terms
- ✓ Income sources
- ✓ Cost sources

Outputs

- ✓ Revenue
- ✓ Cost of operations, SG&A
- ✓ Working capital
- ✓ Cost of capital, PBT, etc.

Methodology

- ✓ Use SKU characteristics to allocate metrics to SKUs
- ✓ Calibrate to match P&L

The solution supported numerous analyses, generated insights and triggered business actions

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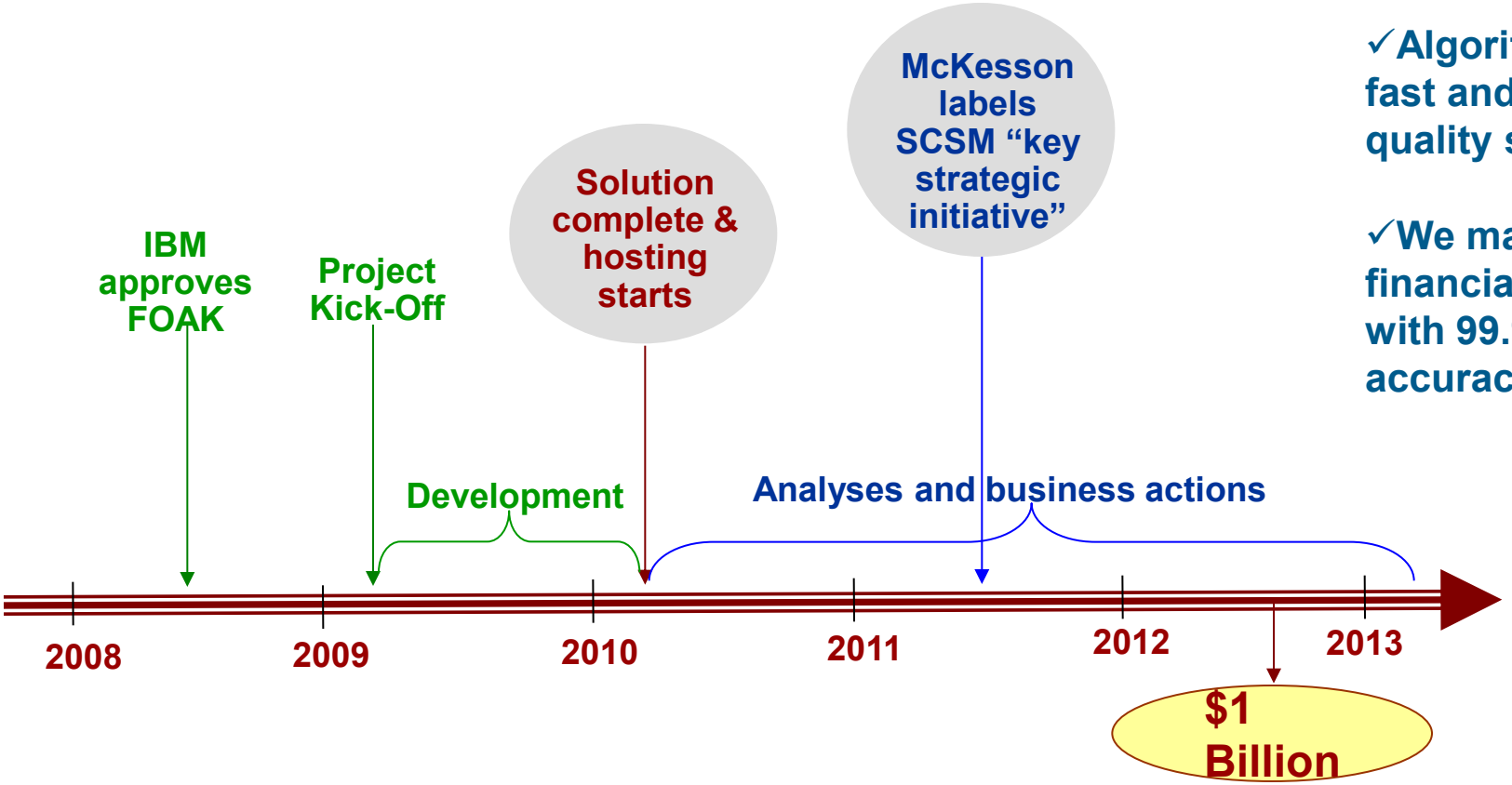

✓Our integration approach worked

✓Algorithms were fast and gave high quality solutions

✓We matched financial metrics with 99.9% accuracy

Insider Perspectives

Implementation & Business Impact

Challenges and Acceptance

IBM

Data Collection

- Too much data - Right balance between detail and summary
- Relate un-related data
- Original financial data

Model Credibility

- Baseline reports needed to match P&L at the detail level

Managerial Considerations

The model recommended shifting 35% of items to a different supply chain

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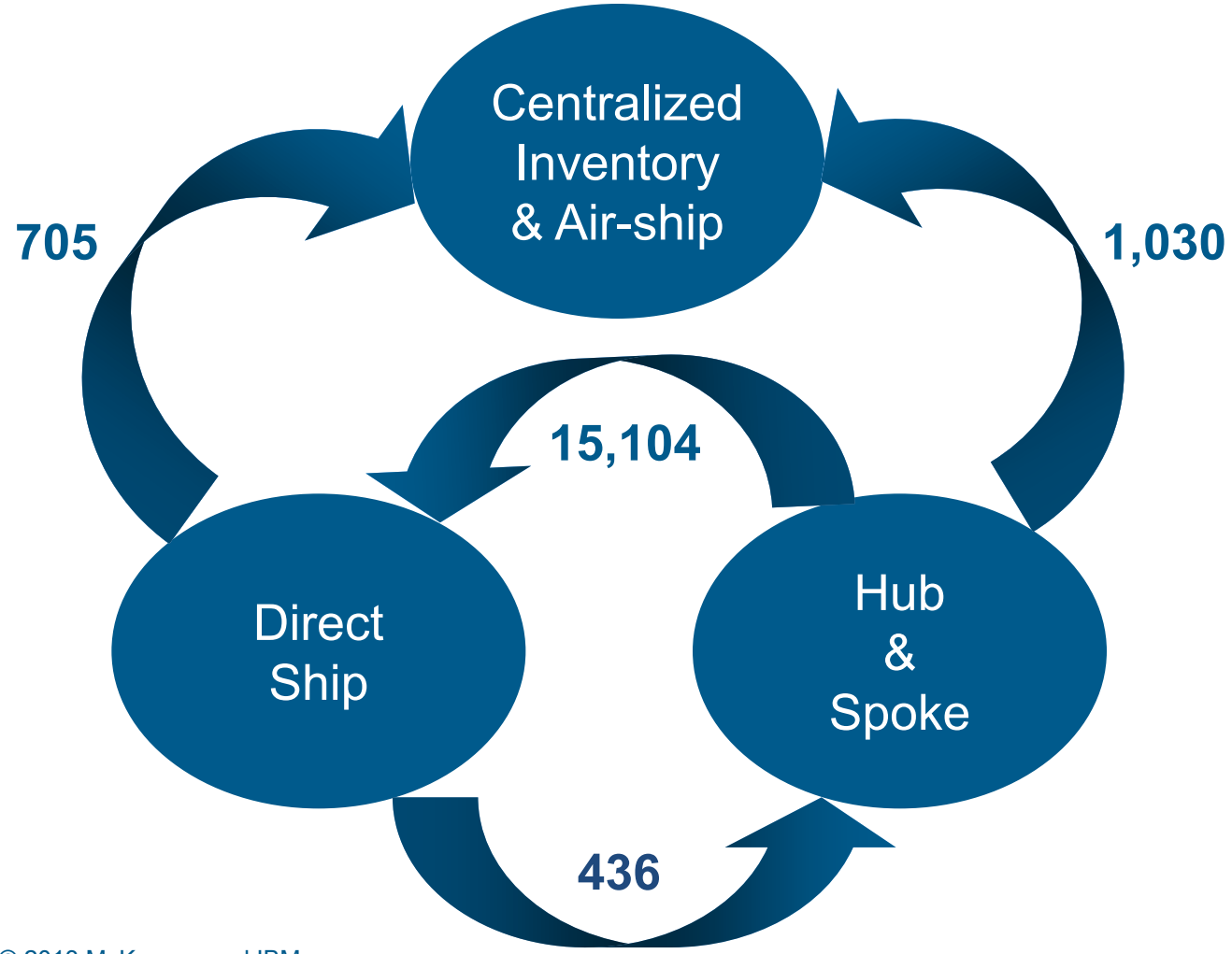
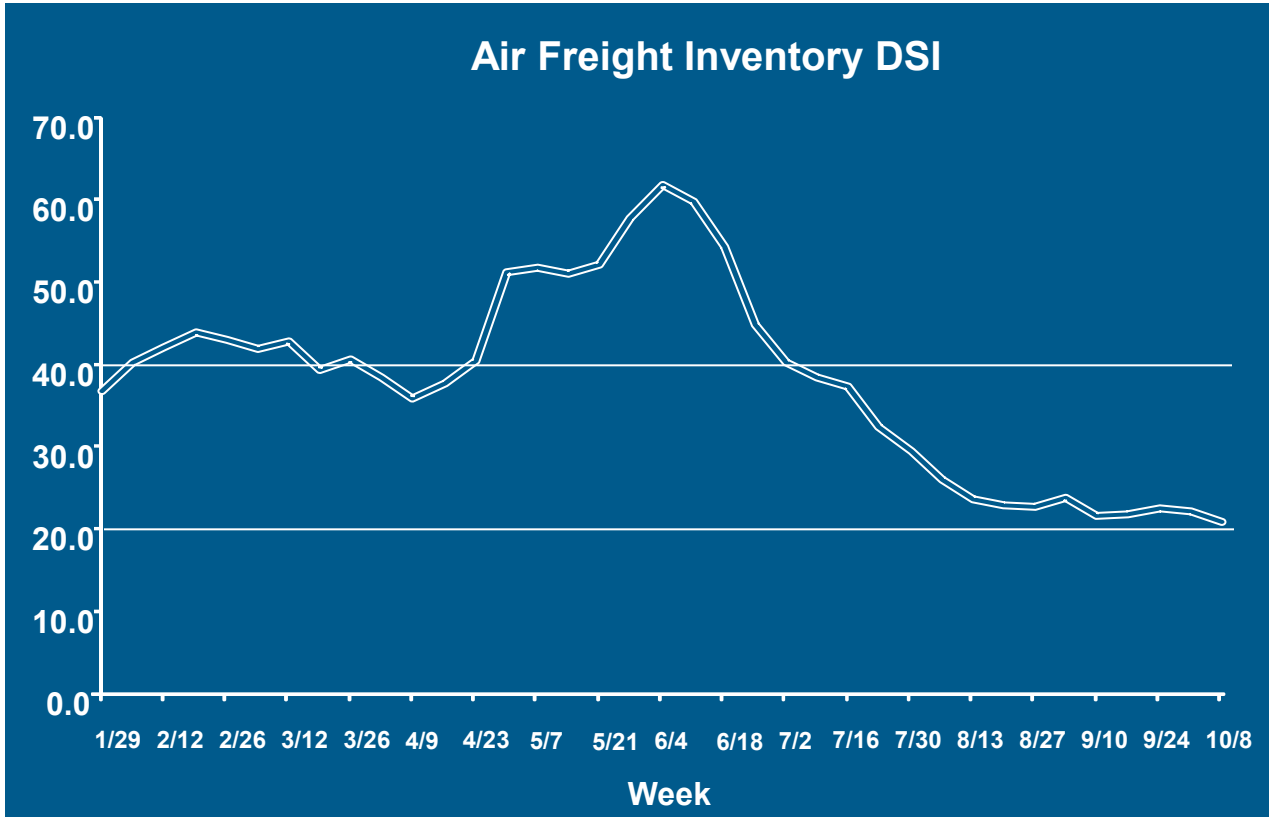


The model showed opportunity for air-freight, cut inventory by half and improved service to 99%

The SCSM solution:

- Provided the total financial impact of air-freight
- Recommended products for air-shipment



Actions Taken from SCSM Opportunities

IBM

Vendor


Updated national account bid and redistribution pricing models


Negotiated lower days-on-hand inventory limits with vendors


Changed supply order timings in a week

Customer


Created a new air freight supply chain

Internal


Increased frequency of deliveries from hub to Local DC


Streamlined supply receiving process from vendors


Added and removed distribution centers

SCSM identified new in-transit working capital by individual vendor

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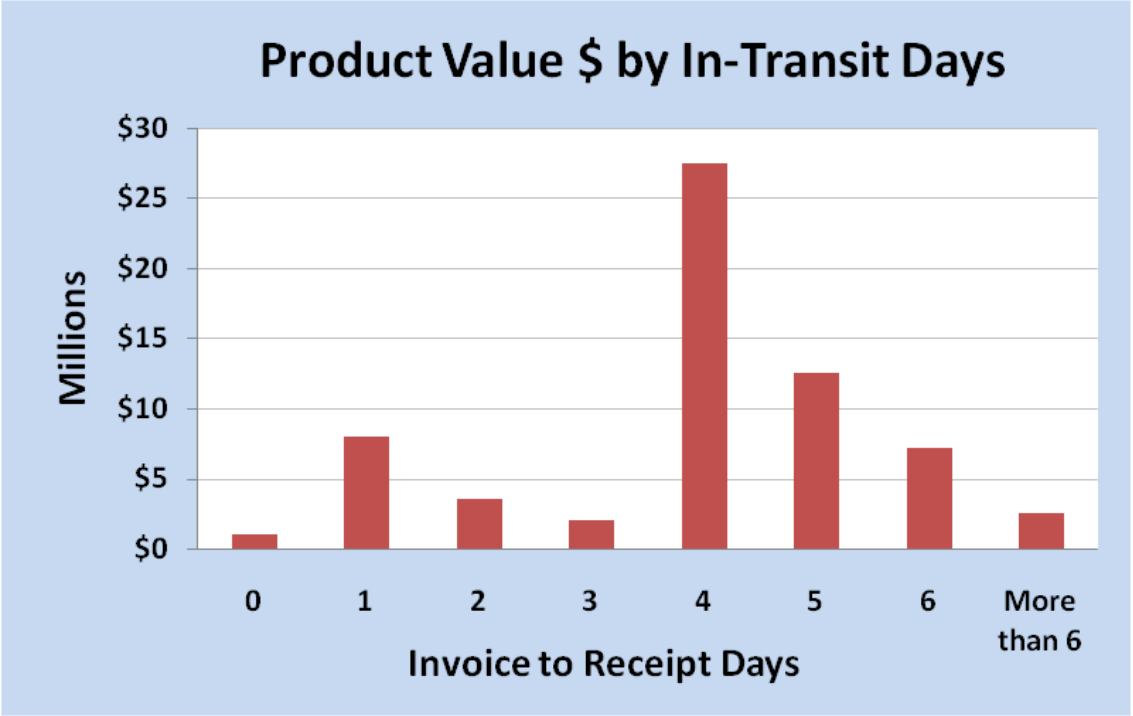
ACTIONS

- created vendor in-transit database
- provided detailed reports to key vendors



In-Transit Project: Took over specific vendor shipping

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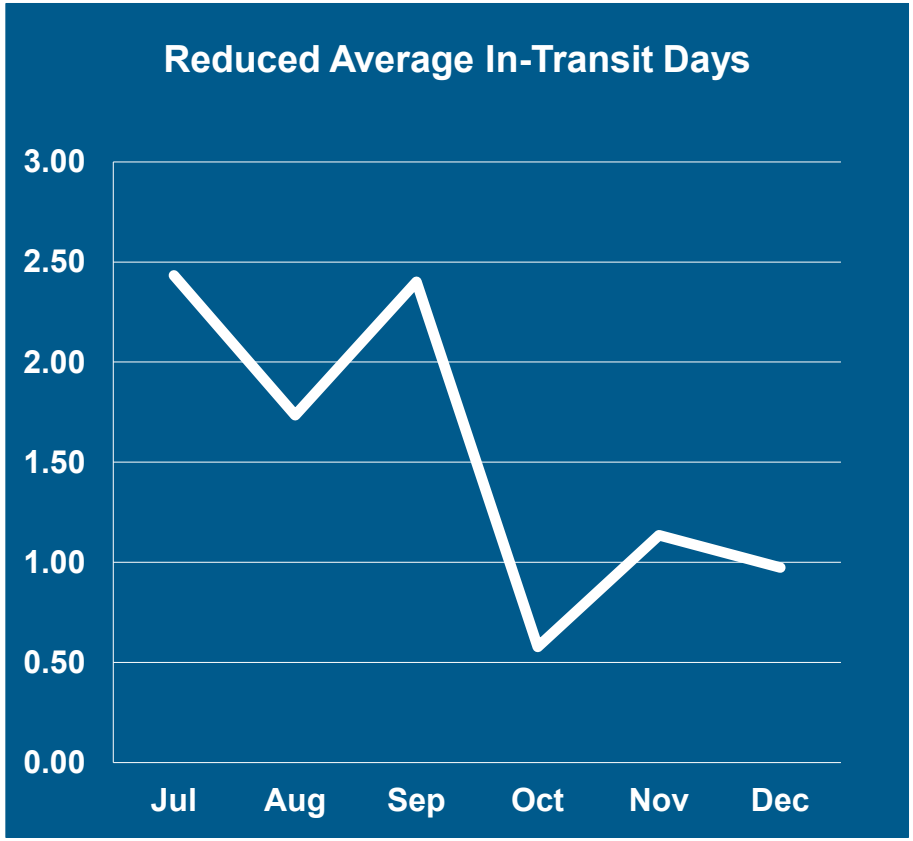
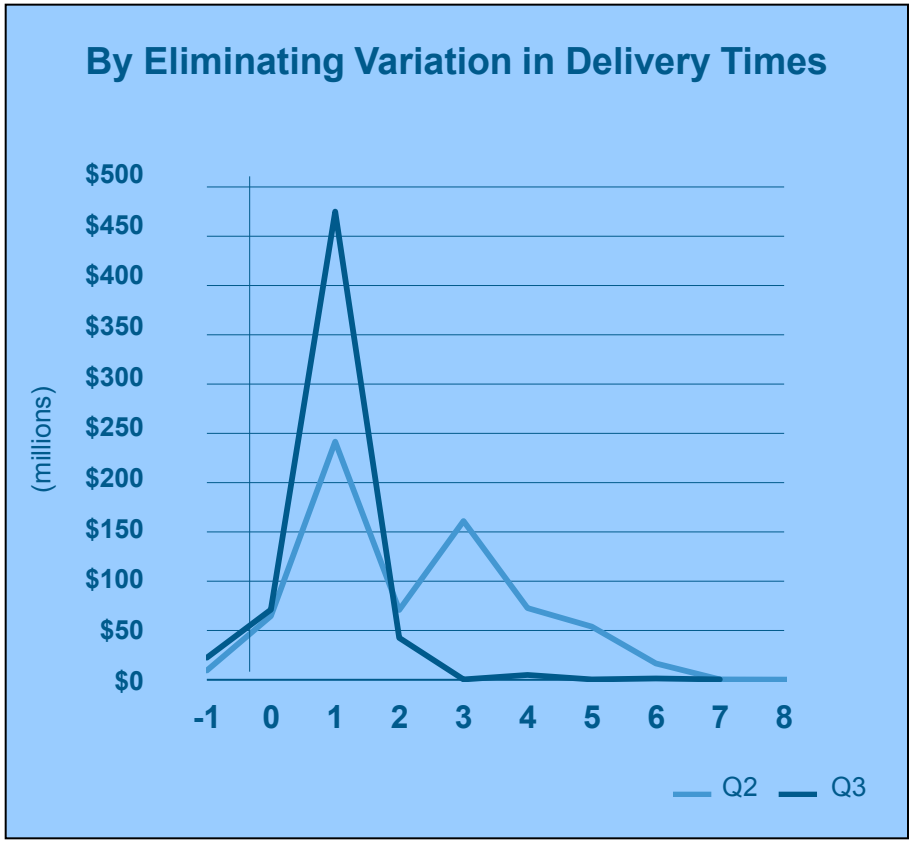
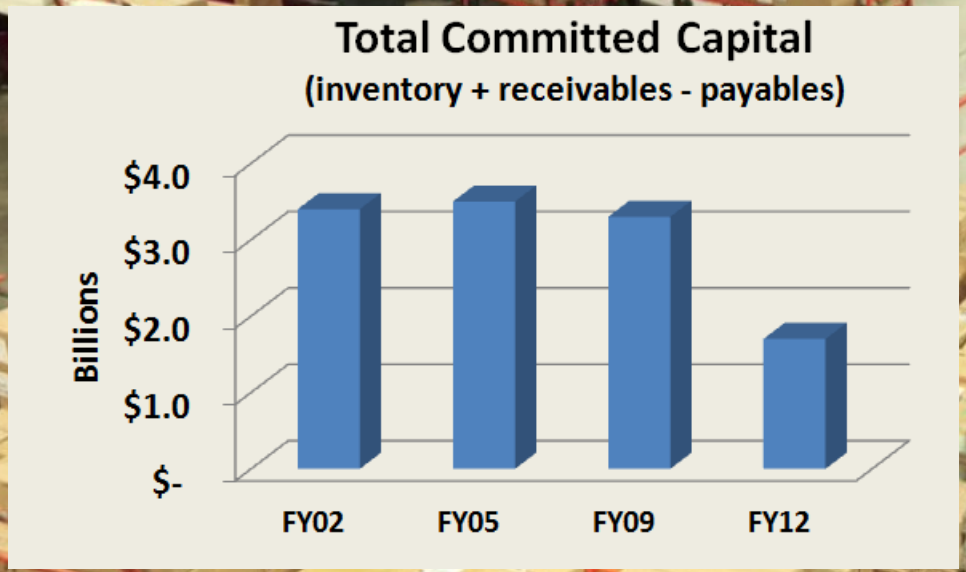




Overall Financial Impact



Branded Rx Capital Reduction ($million)	
Inventory Savings	723
Internal Transit	50
Vendor Transit	318
Total	**1,091**

How this Work Saved McKesson $1 Billion in Working Capital

IBM

Made the Invisible … Visible

Profitability by Supply Chain

Modeled new supply chain

Total impact of cross functional tradeoffs

Gap between our current operation and potential

In Transit working capital by Vendor

Provided a roadmap to saving over $1 billion

Closing Remarks

Mark Walchirk
President, U.S. Pharmaceutical
McKesson

The Team

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Karthik Sourirajan

Howard Smith

Karthik Subbian

Takashi Yonezawa


Thank
You

Q & A